verizon

Thingspace

Global Asset Tracker

Technical Guide

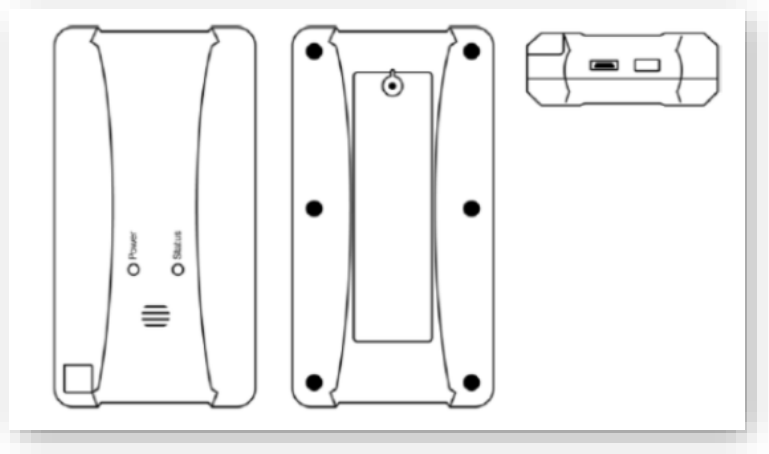
Verizon Customer Support 1-800-922-0204

Contents

Introduction

GAT (Global Asset Tracker) is a compact global cellular-based asset tracker that tracks, monitors and reports on mobile assets. The tracker has a GPS and WIFI receiver to report location as well as various embedded sensors including temperature, pressure, humidity, ambient light, and an inertial movement unit (IMU) with 3 axis accelerometer and gyro for inertial movement sensing and reporting. The device has the ability to report location and sensor data on a configurable interval as well as report near real-time events based on a configurable threshold. The device utilizes the Qualcomm MDM9206 based Quectel BG96 (Global) cellular modem with LTE CAT-M1, NB1, and 2G (GSM/GPRS/EDGE) support for global cellular connectivity. The device has a BLE (Bluetooth Low Energy) chipset to support BLE based sensors such as BLE temperature sensor(s). The device is IP67 rated according to the IEC 60529 standard.

The Global Asset Tracker is securely managed using the Verizon ThingSpace (TS) service to provide device/sensor configuration and cloud data storage/access.



This document describes the interface and data model intended for use by developers integrating the device into their custom applications. For details on Thingspace and background information on the use of data models, characteristics and the MQTT protocol, please refer to the Thingspace client API's and device SDK

Device Configuration and Requests

HTTP Request and Header values

The HTTP request is: `POST https://thingspace.verizon.com/api/cc/v1/devices/configuration/actions/set`

The request header must contain a current ThingSpace authorization token, a current VZ-M2M session token and must set the content-type to JSON. For more details on how to get these credentials, visit Getting credentials and tokens to use the API

The Request Body

The request body identifies the device and the values to set and requires the following JSON objects:

- **accountidentifier** The ID of the authenticating billing account, in the format {"billingaccountid":"1234567890-12345"}.
- **resourceidentifier** A device ID type and value that identifies the device to change. This can be any unique device identifier such as ICCID, EID, or IMEI.
- **configuration** (optional) A comma separated list of the field names and values to set
- **$selection (**optional) this is a comma-separated list of properties and comparator values to match against devices in the ThingSpace account. If the request does not include ***$selection*** or **resourceidentifier**, the response will include all devices to which the requesting user has access.

Example Request to Set Reporting Frequency to "Low"

```
curl -X POST https://thingspace.verizon.com/api/cc/v1/devices/configuration/actions/set
-H HTTP/1.1
-H Host: {URL}
-H Content-Type: application/json
-H VZ-M2M-Token: {M2M-token}
-H Authorization: Bearer {access_token}
-H Content-Length: 184
-d '{
"accountidentifier":{"billingaccountid":"{billing account id}"},
"resourceidentifier":{"imei":{15-digit IMEI},
"configuration": { "frequency": "Low", "location_mode": "gps" }
}'
```

Example Request to find a device with a specific IMEI

```
curl POST https://thingspace.verizon.com/api/cc/v1/devices/actions/query
-H HTTP/1.1
-H Host: {URL}
-H Content-Type: application/json
-H VZ-M2M-Token: {M2M-token}
-H Authorization: Bearer {access_token}
-H Content-Length: 109
-d '{
"accountidentifier":{"billingaccountid":"{billing account id}"},
"resourceidentifier":{"imei":{15-digit IMEI}}
}'
```

Example Request to find all devices that are set to report at "high" configuration

```
curl POST https://thingspace.verizon.com/api/cc/v1/devices/actions/query \
  -H 'Authorization: Bearer 021833fbee3e118019f67777e028067f' \
  -H 'VZ-M2M-Token: f1ffff45-ed4c-4db0-a98c-a371afe23b6a' \
  -H 'Content-Type: application/json' \
  -d '{
  "accountidentifier": {"billingaccountid":"1223334444-00001"},
  "$selection": {"createdon gt": "2018-12-01"}
 }'
```

deviceConfig Characteristic

The **deviceConfig** characteristic controls the basic high-level operating modes of the Device.

```
{
   "deviceConfig":{
      "device":{
         "opMode":{
            {
               "value"
            }
         },
         "ledMode":{
            {
               "value"
            }
         },
         "commSynchPeriod":{
            {
               "value"
            }
         },
         "commMaxAwakeDuration":{
            {
               "value"
            }
         },
         "commMinAwakeDuration":{
            {
               "value"
            }
         },
         "commTypeUpdate":{
            {
               "value"
            }
         },
         "bufferMode":{
            {
               "value"
            }
         }
      }
   }
```

Operation Mode

The **opMode** is intended to control the overall behavior of the Device.

Parameter	Value	Description
opMode	0	Disabled: The Tracker is not monitoring sensors or reporting data.
	1	Standby: The Tracker is on hold waiting for either manual (a short press) or new remote configuration to start operation.
	2 (default)	Enabled: Comm Sync is enabled. The Tracker is monitoring sensors and reporting data.

NOTE: If programmed, it is recommended that the parameter be set to its default, 2.

LED mode

The **ledMode** controls LED behavior during device operation. Please refer to the GAT Device Guide for LED Behavior.

Parameter	Value	Description
ledMode	0	LEDs primarily remain OFF during device operation, even while the radio is on. This mode offers the most power savings, with little LED feedback.
	1 (default)	LEDs primarily remain OFF during device operation, and are illuminated momentarily depending on device event(s). This mode offers a compromise between power savings and LED feedback.
	2	LEDs are fully activated while the radio is on and for device event(s). This mode offers the least power savings and most LED feedback.

Communication Sync Period

The **commSyncPeriod** determines how often the Tracker turns on its radio to establish a connection to the Thingspace platform, while the device is using “forced” or “GSM” type power savings mode (PSM). During “active”, “auto”, and “silent” PSM modes, this setting may be overridden due to Network PSM operation. It is specified in seconds.

Parameter	Value	Description
commSyncPeriod	0 - 31,536,000 seconds	**0**: Radio remains powered on always. **900**: (default) Other values: The period of time which the radio is powered OFF until the next connection will be made.

Communication Minimum Awake Duration

The **commMinAwakeDuration** specifies the minimum time the tracker will remain awake before reentering power savings mode (PSM). It is specified in seconds.

Parameter	Value	Description
commMinAwakeDuration	0, 20-65,535 seconds	**40**: (default) Other values: the minimum amount of time the tracker will remain awake before reentering PSM.

The Communication Minimum Awake Duration should be programmed using values which are less than or equal to the communication maximum awake duration.

When PSM is enabled (commSyncPeriod ≠ 0), this value cannot be configured to values less than 20 seconds and cannot be greater than the either the commSyncPeriod or the commMaxAwakeDuration. The parameter is not utilized when PSM is disabled (i.e. commSyncPeriod is 0).

Communication Maximum Awake Duration

The **commMaxAwakeDuration** specifies the maximum time the tracker will remain wake before reentering power savings mode (PSM). It is specified in seconds.

Parameter	Value	Description
commMaxAwakeDuration	0, 20-65,535 seconds	**80**: (default) Other values: the maximum amount of time the tracker will remain awake before reentering PSM.

The Comm Max Awake duration should be programmed to values which are greater than or equal to the comm Min Awake Duration, and less than the CommSyncPeriod.

NOTE: When PSM is enabled (commSyncPeriod ≠ 0), this value cannot be configured to values less than 20 seconds, cannot be less than the **commMinAwakeDuration**, and cannot be greater than the **commSyncPeriod**. The parameter is not utilized when PSM is disabled (**commSyncPeriod** is 0).

Buffer Mode

The **bufferMode** buffers sensor readings and alarms delivered to Thingspace, even when out of cellular coverage. If the tracker is out of coverage for an extended period of time, the buffer will ultimately fill up to capacity. The buffermode specifies which action is to be taken when a new reading is produced while the buffer is full. The **bufferMode** and specified actions are as follows:

Parameter	Value	Description
bufferMode	0 (default)	Discards the oldest reading in the queue to make space for the new reading.
	1	Discards the newest reading and retains the oldest reading(s).

Communication Type

The **commType** is a 'report only' parameter and reported by the **deviceConfig** as an indication of the type of power savings mode (PSM) in effect by the device.

Parameter	Value	Description
commType	"forced"	The PSM period is defined by the **commSyncPeriod**. The Device does not use Network PSM. With "forced" PSM, PSM is not entered if the **commSyncPeriod** is set to zero
	"active"	PSM is disabled

Sensor Reporting

The following table shows the parameters for configuring the periodic intervals for reading and reporting each sensor:

Parameter	Value	Description
opMode	0 – Disabled 1 – Normal (Enabled)	The operational mode controls whether the sensor is enabled or not.
reportType	0 – Disabled 1 – One Time 2 – Periodic 3 – Periodic On Change 4 – Periodic, On Demand (WIFI sensor only)	To preserve power and maximize battery life, sensors in the module are not continuously active. Each sensor is read on a periodic interval specified using the "Monitoring Period" configuration parameter in the sensor configuration characteristic. The Reporting Type and Reporting Period parameters control the frequency of when sensor readings are sent to the Thingspace platform. 0 - The sensor does not send any reading reports to the Thingspace portal. This setting is usually used in conjunction with configuring a sensor alarm, but with periodic reporting disabled for the sensor. 1 - The sensor will read and report its value once, scheduled per the Reporting Offset. If the scheduled time per the Reporting Offset has already passed, the one-time reading and report will be performed immediately. 2 - The sensor initially report a reading, scheduled per the Reporting Offset. Then, a reading is performed each Monitoring Period interval. The reading(s) are reported at each Reporting Period interval. If the Reporting Period is not a multiple of the Monitoring Period, reading(s) are sent on the first following Monitoring Period to the expected time. 3 - The sensor will initially report a reading per the scheduled Reporting Offset. Thereafter, reported each Reporting Period interval, but only if the value is different from the previous

		report period. The Monitoring Period should be configured, but is effectively ignored during this configuration. 4 – See the Wifi configuration section
monitorPeriod	0 – TIME MAX*, seconds	Defines the time monitoring the device in seconds. *TIME MAX is the maximum Unix Epoch or Coordinated Universal Time (UTC) of 4,294,967,295 seconds (2^32 - 1)
reportPeriod	0 – TIME MAX*, seconds	Defines the period of time to report in seconds. *TIME MAX is the maximum Unix Epoch or Coordinated Universal Time (UTC) of 4,294,967,295 seconds (2^32 - 1)
reportOffset	0 – Immediate 0 - 31,536,000 – relative time, seconds 31,536,001 – TIME MAX * YYYY-MM-DDTHH:MM:SSZ – absolute UTC time, GMT	The reporting offset is used to set a starting time to commence sensor monitoring and reporting. 0 to 31,536,000 : A relative offset in seconds, which is used to start monitoring/reporting from the time the configuration is received. Other numeric values: The absolute Epoch time to begin monitoring/reporting. Monitoring/reporting will not commence until the absolute time is reached or surpassed String in the format, "YYYY-MM-DDTHH:MM:SS": The absolute Epoch time to begin Monitoring/reporting, as a string (e.g. "2019-06-18T17:20:00"). Sensor monitoring and reporting commences immediately if the time scheduled per the Reporting Offset has already elapsed. *TIME MAX is the maximum Unix Epoch or Coordinated Universal Time (UTC) of 4,294,967,295 seconds (2^32 - 1)
scanDuration	0-65535, seconds (WIFI and BLE sensor only)	The Scan Duration parameter specifies the duration in seconds which a 'sensor' will actively read or scan for data.

minSigStr	-255 to +255, dBm (WIFI sensor) -128 to +127 dBM (BLE sensor)	The Minimum Signal Strength parameter specifies the minimum received signal strength (RSSI) in which a 'sensor' report its associated data, in units of dBm.

WiFi

Identifier used to configure the sensor for reporting: **reportType: 2**

In addition to the **reportType** values supported as described in the Sensor Report section. The wifi sensor supports **reportType** value 2. When the wifi sensor **reportType** is set to 2, a periodic wifi report is made only when GPS cannot be obtained when the device is scheduled to make a location sensor (GPS) reading.

Type-4 reporting requires that the wifi sensor be configured with the identical monitor period and report period as the location sensor and that the location sensor reportType be set to 2 for periodic reporting.

Identifier indicated by the device when the parameter is reported: **wifi**

Identifier used to configure the sensor alarm: There is no alarm support by the wifi sensor.

NOTE: WiFi is a sensor report ONLY feature. It is converted to a location report on the cloud side and does not support a device alarm event.

The value reported by the wifi sensor is the Thingspace-side translation of monitored WIFI access points to a latitude and longitude. The location data reported by Thingspace would be identical to the location sensor, except that the "type" field reflects, "**wifi**".

Alarm Behavior

Single Value Sensor Alarms

All “single value” sensors each support a dedicated single, configurable alarm defined by the following table. The following sensors are supported by this configuration:

- Temperature
- Humidity
- Pressure
- Light
- Battery
- Signal strength

```
"deviceAlarm":{
   "{type of alarm (see Sensor Specifications)}":{
      "alarmType":”{0 through 4}”,
      "threshold":”{the sensor reading that will trigger notification}”,
      "thresholdRange":”{the range of the sensor or a subset range within}”,
      "hysteresis":”{rate of sensor value change}”,
      “holdoff”:”{period of time for the sensor to be at a threshold value before notification}”
   },
```

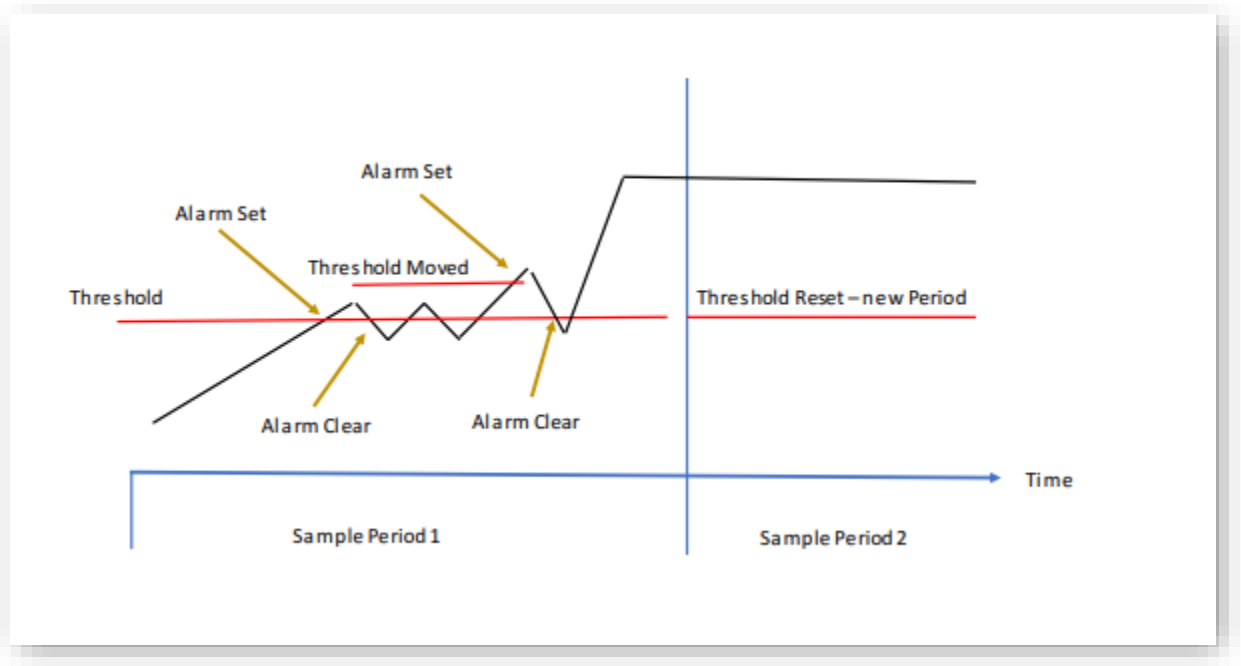
Single Value Sensor Alarms (continued)

Parameter	Value	Description
alarmType	0 - Disabled 1 – Value Change 2 – Exceed Threshold 3 – Below Threshold 4 – Out Of Range	0 - Deactivates the alarm for the sensor. 1 - The alarm will be triggered if the sensor value changes. The Threshold value specifies minimum absolute change or movement required to trigger the alarm. 2 - The alarm is triggered when the sensor value moves above the alarm threshold. The alarm clears when the sensor value falls back to or below the threshold less hysteresis. 3 - The alarm is triggered when the sensor value moves below the alarm threshold. The alarm clears when the sensor value reaches or exceeds the threshold plus hysteresis. 4 - The alarm is triggered when the sensor reading moves outside of a specified range defined by the threshold range (upper bound) and the threshold (lower bound). The alarm clears when the sensor reading moves back to either of the two threshold values or within the range defined by them, including hysteresis.
threshold	Varies by sensor	See the individual sensors for this information.
thresholdRange	Varies by sensor	See the individual sensors for this information.
hysteresis	Varies by sensor	Similar to holdoff but it is the sensor's rate of change, set in the senor's units, of how fast the sensor will exceed a threshold.
holdoff	0 – Immediate 0 - 31,536,000 – relative time, seconds	The holdoff is used to set a period of time for the threshold range to be exceeded before an alarm is sent.

NOTE: Alarm hysteresis is indicated only within an alarm's configuration, and is reported by the configuration only if the hysteresis value is non-zero.

NOTE: Signal Strength (RSSI) does not support hysteresis or holdoff. These parameters are ignored.

NOTE: Alarm operation is closely tied to the sensor monitoring and reporting. If an alarm is configured for any given sensor, the sensor's **opMode** parameter must be configured with a non-zero value. The operation of the different alarm modes is closely tied to the sensor monitoring and reporting periods described in the previous section. In most cases, the alarms are checked each time the sensor value is read, which is specified by the monitoring period. Once an alarm is triggered, a report is immediately sent to the ThingSpace platform. One problem that can occur with many sensor is an oscillating effect where successive readings fluctuate slightly. This is normally not an issue, but causes a potential problem when the sensor is at the threshold of an alarm. This situation can lead to stream of alarms as the value fluctuates above and below the threshold. To combat this problem, a corrective adjustment, referred to as threshold range, is included for most alarm definitions. When a sensor reading crosses an alarm threshold, an alarm is triggered, and the threshold is then offset by the corrective adjustment to form a new alarm level for the remainder of the sampling period. If the alarm is cleared it will not re-trigger until the new threshold is crossed. If the original alarm is not cleared and the value crosses the new threshold a new alarm is generated, and the offset re-applied to the active threshold. This operation is illustrated in the following example:



Sensor Specifications

Temperature

Identifier used to configure the sensor for reporting: **temperature**

Identifier indicated by the device when the parameter is reported: **temperature**

Identifier used to configure the sensor alarm: **tempAlarm**

Identifier indicated by the device when the alarm is reported: **temperature**

Details	Description
tempAlarm	Measures the ambient air temperature around the device.
Units	Degrees Celsius
Range	-40.0 to 85.0
Value	The value is reported as a decimal number in tenths of a degree Celsius.

Humidity

Identifier used to configure the sensor for reporting: **humidity**

Identifier indicated by the device when the parameter is reported: **humidity**

Identifier used to configure the sensor alarm: **humiAlarm**

Identifier indicated by the device when the alarm is reported: **humidity**

Details	Description
humiAlarm	Measures the relative air humidity around the device.
Units	% Relative Humidity
Range	0 - 100
Value	The value is reported as a whole number.

Atmospheric Pressure

Identifier used to configure the sensor for reporting: **pressure**

Identifier indicated by the device when the parameter is reported: **pressure**

Identifier used to configure the sensor alarm: **presAlarm**

Identifier indicated by the device when the alarm is reported: **pressure**

Details	Description
presAlarm	Measures the air pressure around the device.
Units	Hectopascal – hPa (identical to Millibar or mBar)
Range	300 – 1100
Value	The value is reported as a decimal number in tenths of a Hectopascal.

Ambient Light

Identifier used to configure the sensor for reporting: **light**

Identifier indicated by the device when the parameter is reported: **light**

Identifier used to configure the sensor alarm: **liteAlarm**

Identifier indicated by the device when the alarm is reported: **light**

Details	Description
liteAlarm	Measures the ambient light around the device.
Units	LUX
Range	1 to 65,535
Value	The value is reported as a whole number.

For reference, some common LUX levels are:

- 0.05 – 0.36 – full moon on clear night
- 3.4 – defined value for official twilight under a clear sky
- 400 – sunrise and sunset on a clear day
- 1000 – overcast day

- 10K – 25K – full daylight in indirect sun
- 32K – 100K – direct sunlight

Battery

Identifier used to configure the sensor for reporting: **battery**

Identifier indicated by the device when the parameter is reported: **battery**

Identifier used to configure the sensor alarm: **battAlarm**

Identifier indicated by the device when the alarm is reported: **battery**

Details	Description
battAlarm	Provides an indication of the estimated remaining battery life.
Units	Percentage (%)
Range	0 - 100
Value	The value is reported as a whole number

Signal Strength

Identifier used to configure the sensor for reporting: **rfSignal**

Identifier indicated by the device when the parameter is reported: **signalStrength**

Identifier used to configure the sensor alarm: **rssiAlarm**

Identifier indicated by the device when the alarm is reported: **rfSignal**

Details	Description
rssiAlarm	Measures the signal strength of the cellular signal.
Units	Decibel milliwatts (dBm)
Range	-130 to 0
Value	The value is reported as a negative whole number.

NOTE: Signal Strength (RSSI) does not support hysteresis or holdoff. These parameters are ignored.

Inertial Measurement Unit (IMU) and Orientation Sensor Alarms

Inertial Measurement Unit (IMU) and Orientation (Gyro Sensor) alarms are IMU/Gyro sensor-based alarms used to trigger on device motion, non-motion, double-tap, shock, and tilt. Inertial Measurement Unit (IMU) and Orientation (Gyro Sensor) alarms are considered a separate class of alarms from "single" sensor alarms.

Orientation

Identifier used to configure the sensor for reporting: **gyro**

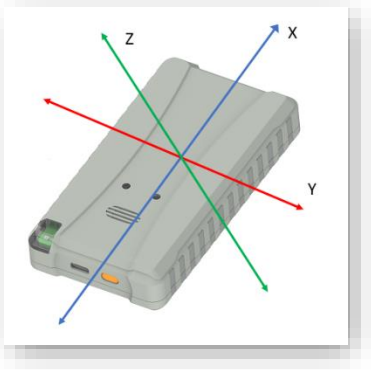
Identifier indicated by the device when the parameter is reported: **orientation**

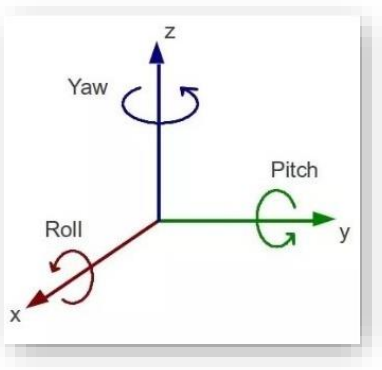
Identifier used to configure the sensor alarm: **gyroAlarm**

Identifier indicated by the device when the alarm is reported: **gyro**

Details	Description
gyroAlarm	Measures the angular orientation of the device relative to horizontal. Orientation is provided for the x and y axis. This is also commonly referred to as pitch(X) and roll (Y).
Units	Decimal degrees
Range	0 – 359.0 (Note: Z-axis tilt (**tiltZ**) and **gyroAlarm tilt_angle** range 0 to 180)
Value	The value is reported as a decimal number in decimal degrees.

Objects exist in three dimensions which can be defined by three axes: X, Y and Z. These axes are also called "Roll", "Pitch" and "Yaw":





NOTE: The "Y" axis will rotate clockwise facing the device and the "X" axis rotates counter-clockwise facing the device.

Accelerometer

Identifier used to configure the sensor for reporting: **accelerometer**

Identifier indicated by the device when the parameter is reported: **acceleration**

Identifier used to configure the sensor alarm: **acclAlarm**

Identifier indicated by the device when the alarm is reported: **acceleration**

Details	Description
acclAlarm	Measures the current acceleration acting on each axis of the device.
Units	Multiples of gravitation force (g)
Range	-16.0g to +16.0 g
Value	The value is reported as a decimal number.
motionDetected	acclAlarm Type 5 (Any Motion)
noMotionDetected	acclAlarm Type 13 (No Motion)
shock	acclAlarm Type 12 (Shock)
vibration	acclAlarm Type 8 (Tap/Vibration)

Location

Identifier used to configure the sensor for reporting: **location**

Identifier indicated by the device when the parameter is reported: **location**

Identifier used to configure the sensor alarm: Currently, only the GPS GeoFence alarm is supported

Thingspace will translate the parameters reported by the device or WiFi AP (when enabled), into a device latitude and longitude if the device cannot obtain GPS. The fields reported by the device are as follows:

Details	Description
longitude	Specifies the longitude of the device relative as measured by the device's GPS receiver (or ThingSpace location service).
Units	Decimal Degrees
Range	-180.0 to +180.0
Value	The value is reported as a decimal degrees.
latitude	Specifies the latitude of the device relative as measured by the device's GPS receiver (or ThingSpace location service).
Units	Decimal Degrees
Range	-90.0 to +90.0
Value	The value is reported as a decimal degrees.
accuracy	Specifies the location accuracy.
Units	Meters
Range	N/A
Value	The value is reported as a whole number in meters.
type	Specifies the type or source of the location data.
Units	N/A - string

Range	N/A - string
Value	"**gps**" : the reported location is derived from the Device's GPS receiver "**cellid**" : the reported location is derived from the Device's Network Cell ID "**wifi**" : the device obtained the reported location information using Thingpsace portal supported WIFI LAAS (location as a service)

Bluetooth Low Energy (BLE, BT Peripheral)

Identifier used to configure the sensor for reporting: **ble**

Identifier indicated by the device when the sensor readings are reported: **ble**

Identifier used to configure the sensor alarm: There is no alarm support for the bluetooth sensor.

As of Release 2.9.0, the GAT supports the following sensor data reporting formats for the BTM250 tags:

- BTM250-T (legacy) format (configuration parameter "dataMode" = 0)
- Manufacturing Data format (configuration parameter "dataMode" = 1)
- Extensible -- new "BLE(X)" -- format, for all BTM250 tag types (configuration parameter "dataMode" = 2):
  - BTM250B (beacon-only)
  - BTM250T (beacon, plus temperature sensor data)
  - BTM250HT (beacon, plus temperature and humidity NIST)
  - BTM250E (beacon, plus temp, humidity and pressure)

The fields reported by the device in the BLE Sensor Report are described in the following sub-sections:

Details	Description
dataMode	Specifies the data mode
Units	Number
Range	N/A
Value	**0** - BTM250T Advertisement Data, **1** - Manufacturer Advertisement Packet **2** - BLE(X) Advertisement Data
manufacturerId	Bluetooth SIG Standard defined Company identifiers, see https://www.bluetooth.com/specifications/assigned-numbers/company-identifiers/
Units	Number
Range	0 to 65535
Value	**0** - Mobilogix

numReport	Specifies the number of reports in the message.
Units	Number
Range	1 to 300
Value	Integer

BLE Sensor list

Details	Description
sensorList	The "**sensorList**" is a json array consisting of "**numReport**" entries of the following name/value fields, some of which are only included in the Report based on the configured "**dataMode**" parameter:
advPacket only "datamode" = 1	Null-terminated string of (up to 32 bytes) Manufacturing Advertisement Data
Units	String
Range	Up to 32 bytes
Value	Variable
rssi "datamode" = 0 or 2	Specifies the received signal strength (RSSI).
Units	dBm
Range	-128 to +127
Value	Integer
serialNum only "datamode" = 0	Specifies the serial number minor part.
Units	integer
Range	2 bytes

Value	Integer
serialNum only "datamode" = 2	Specifies a unique 15-digit serial number
Units	Integer (64-bit)
Range	7 bytes
Value	Decimal number, when converted to hex, yields the following packed fields: **B [0]** Tag type, 1 of {0x0=BTM250B, 0x1=BTM250T, 0x2=BTM250E, 0x3=BTM250HT); these enumerations are identified in the High-Order byte of the (hex-converted), "**serialNum**" field in the "**ble**" Reading Reports on the ThingSpace server (e.g. Portal Device History page). **B [1-2]** Always 0x0 (reserved for future use) **B [3-4]** Major, reverse bytes (little-endian), then convert to decimal **B [5-6]** Minor, reverse bytes (little-endian), then convert to decimal For example, decimal 562953862735363 is 0x02_0000_E903_6606, which is Little-Endian, so when converted is 0x00_0002_03E9_0667, or: • Type: BTM250E tag • Major: 1001 • Minor: 1639
battery "datamode" = 0 or 2, excluding BTM250B	Specifies battery level
Units	%
Range	1 to 100
Value	Integer

temperature "datamode" = 0 or 2, excluding BTM250B	Specifies the temperature of the BLE module.
Units	Degrees Celsius
Range	40 to +120 degrees Celsius
Value	The value is reported as a decimal number in hundredths of a degree Celsius
humidity only "datamode" = 2, and only BTM250E/HT	Measures the relative air humidity around the BLE tag.
Units	% Relative Humidity
Range	0 to 100
Value	The value is reported as a whole number.
pressure only "datamode" = 2, and only BTM250E	Measures the air pressure around the BLE tag.
Units	Hectopascal – hPa (identical to Millibar or Mbar)
Range	300 – 1100
Value	The value is reported as a decimal number

Sensor Report Example

The following is an example of a temperature sensor report request:

```
curl POST https://thingspace.verizon.com/api/cc/v1/devices/fields/temperature/actions/his
tory
-H HTTP/1.1
-H "Host": "thingspace.verizon.com",
-H "Authorization": "{bearer_auth}",
-H "VZ-M2M-Token": "{M2M_token}"
-H "Content-Type": "application/json"
Content-Length: 137
-d '{
"accountidentifier": {"billingaccountid": "value"},
"resourceidentifier": {"imei": "value"},
"$limitnumber": 10
}'
```

Response:

```
{
   "action":"update",
   "createdon":"2022-03-11T00:30:00Z",
   "deviceid":"{15-digit IMEI}",
   "fields":{
      "temperature":22.1
   },
   "id":"value",
   "kind":"ts.event",
   "lastupdated":"2022-03-11T00:30:28.608Z",
   "state":"update",
   "transactionid":"value",
   "version":"1.0",
   "versionid":"value"
}
```

Configuration Characteristics Description

The following pseudo JSON illustrates the complete configuration characteristic table for the device given as a response:

```
"deviceConfig": {
      "location": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "temperature": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "humidity": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "pressure": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "light": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "battery": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
      },
      "accelerometer": {
            "opMode":
```

```
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
            "scalefactor":
            "sensitivity":
      },
      "rfSignal": {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
},
      "wifi" : {
            "opMode":
            "reportType":
            "reportPeriod":
            "reportOffset":
            "monitorPeriod":
            "minSigStr" :
            "scanDuration":
      },
      "ble" : {
           "opMode":
           "reportType":
           "reportPeriod":
           "reportOffset":
           "monitorPeriod":
           "dataMode":
           "scanDuration":
           "minSigStr":
           "maxNumScan":
           "manufacturerId":
      },
      "device": {
            "opMode":
            "ledMode":
            "commSynchPeriod":
            "bufferMode":
            "commType":
            "commTypeUpdate":
      },
      "tempAlarm": {
            "alarmType":
            "threshold":
            "thresholdRange":
```

```
        "hysteresis":
        "holdoff":
    },
    "humiAlarm": {
        "alarmType":
        "threshold":
        "thresholdRange":
        "hysteresis":
        "holdoff":
    },
    "presAlarm": {
        "alarmType":
        "threshold":
        "thresholdRange":
        "hysteresis":
        "holdoff":
    },
    "liteAlarm": {
        "alarmType":
        "threshold":
        "thresholdRange":
        "hysteresis":
        "holdoff":
    },
    "battAlarm": {
        "alarmType":
        "threshold":
        "thresholdRange":
        "hysteresis":
        "holdoff":
    },
    "acclAlarm": {
        "accel_thresh":
        "alarmType":  5  /* anyMotion */
        "enabled":
        "holdoff":
        "locationRequired":
        "p1":
        "p2":
        "p3":
        "p4":
        "p5":
        "setOnlyOnce":
        "stopped_period":
        "stopped_thresh":
    },
    "acclAlarm": {
        "alarmType": 13 /* noMotion */
```

```
        "enabled":
        "holdoff":
        "locationRequired":
        "p1":
        "p2":
        "p3":
        "p4":
        "p5":
        "setOnlyOnce":
        "stopped_period":
        "stopped_thresh":
},

"acclAlarm": {
        "alarmType": 12    /* shock */
        "enabled":
        "holdoff":
        "locationRequired":
        "setOnlyOnce":
        "shock_duration":
        "shock_thresh":
        "x_axis":
        "y_axis":
        "z_axis":
},
"acclAlarm": {
        "alarmType": 8     /* vibration */
        "enabled":
        "holdoff":
        "locationRequired":
        "tap_duration":
        "tap_thresh":
} ,
"gyroAlarm": {
        "alarmType":
        "clear_duration":
        "enabled":
        "holdoff":
        "locationRequired":
        "p1":
        "p2":
        "p3":
        "p4":
        "p5":
        "setOnlyOnce":
        "tilt_angle":
        "tilt_duration":
        "x_axis":
```

```
            "y_axis":
            "z_axis":
      },
      "rssiAlarm": {
            "alarmType":
            "threshold":
            "thresholdRange":
      }
}
```

Device Alarm

The following pseudo JSON illustrates the complete alarm table settings for the device:

```
"deviceAlarm" {
   "temperature" {
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state":
   },
   "humidity" {
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state":
   },
   "pressure" {
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state":
   },
   "light" {
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state":
   },
   "battery" {
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state":
   },
```

```
"motionDetected" {
      "accel_thresh":
      "alarmType":
      "holdoff":
      "location" {
            "accuracy":
            "latitude":
            "longitude":
            "type":
            },
      "locationRequired"{
            "setOnlyOnce":
            "state":
            "stopped_period":
            "stopped_thresh":
            "x":
            "y":
            "z":
            },
   },
 "noMotionDetected"{
      "alarmType":
      "holdoff":"60",
            "location"{
                  "accuracy":
                  "latitude":
                  "longitude":
                  "type":
               },
            "locationRequired"{
                  "setOnlyOnce":
                  "state":
                  "stopped_period":
                  "stopped_thresh":
                  "x":
                  "y":
                  "z":
            },
   },
   "shock" {
      "alarmType":
      "holdoff":
            "location" {
                  "accuracy":
```

```
                "latitude":
                "longitude":
                "type":
    },
          "locationRequired"{
                "magnitude":
                "setOnlyOnce":
                "shock_duration":
                "shock_thresh":
                "state":
                "x":
                "x_axis":
                "y":
                "y_axis":
                "z":
                "z_axis":
          },
  },
  "vibration" {
    "alarmType":
    "holdoff":
          "location" {
                "accuracy":
                "latitude":
                "longitude":
                "type"
                },
          "locationRequired"{
                "magnitude":
                "setOnlyOnce":
                "state":
                "tap_duration":
                "tap_thresh":
                "x":
                "y":
                "z":
          },
  },
  "gyro"{
    "alarmType":
    "tilt_angle":
    "x_axis":
    "y_axis":
    "z_axis":
```

```
      "tilt_duration":
      "inclination":
      "clear_duration":
      "holdoff":
            "location"{
                  "accuracy":
                  "cellID":
                  "latitude":
                  "longitude":
                  "type":
            },
            "locationRequired"{
                  "setOnlyOnce":
                  "state":
                     "orientation":{
                        "motionInX":
                        "motionInY":
                        "motionInZ":
                        "tiltZ":
            },
      },
   },
   "rfSignal"{
      "alarmType":
      "threshold":
      "thresholdRange":
      "sensorReading":
      "state"
   },
}
```

Device Diagnostics

The following is an example of a device diagnostic request and response. The process to retrieve this information is asynchronous as follows:

1. Send diagnostic request

```
curl --location --request POST
'https://thingspace.verizon.com/api/cc/v1/devices/actions/get' \
--header 'Content-Type: application/json' \
--header 'VZ-M2M-Token: "value" \
--header 'Authorization: Bearer "value" \
--data-raw '{
    "accountidentifier": {
        "billingaccountid": "value"
        },
    "resourceidentifier": {
        "imei": "value"
        },
    "deviceDiagnostic": {}
}'
```

2. Wait until next scheduled device check in for diagnostic report (this depends on the configured reporting period)

3. Send device search request:

```
curl --location --request POST
'https://thingspace.verizon.com/api/cc/v1/devices/actions/search' \
--header 'Content-Type: application/json' \
--header 'VZ-M2M-Token: "value" \
--header 'Authorization: Bearer "value" \
--data-raw '{
    "accountidentifier":{"billingaccountid":"value"},
    "resourceidentifier":{"imei":"value"}
}'
```

Response:


```
"deviceDiagnostic": {
    "firmwareVersion": "2.11.2",
    "fotaFirmwareVersion": "0.15.0",
    "radioFirmwareVersion": "BG96MAR04A05M1G",
    "tsSdkFirmwareVersion": "TSSDK_V2.1.11.0-GAT"
```

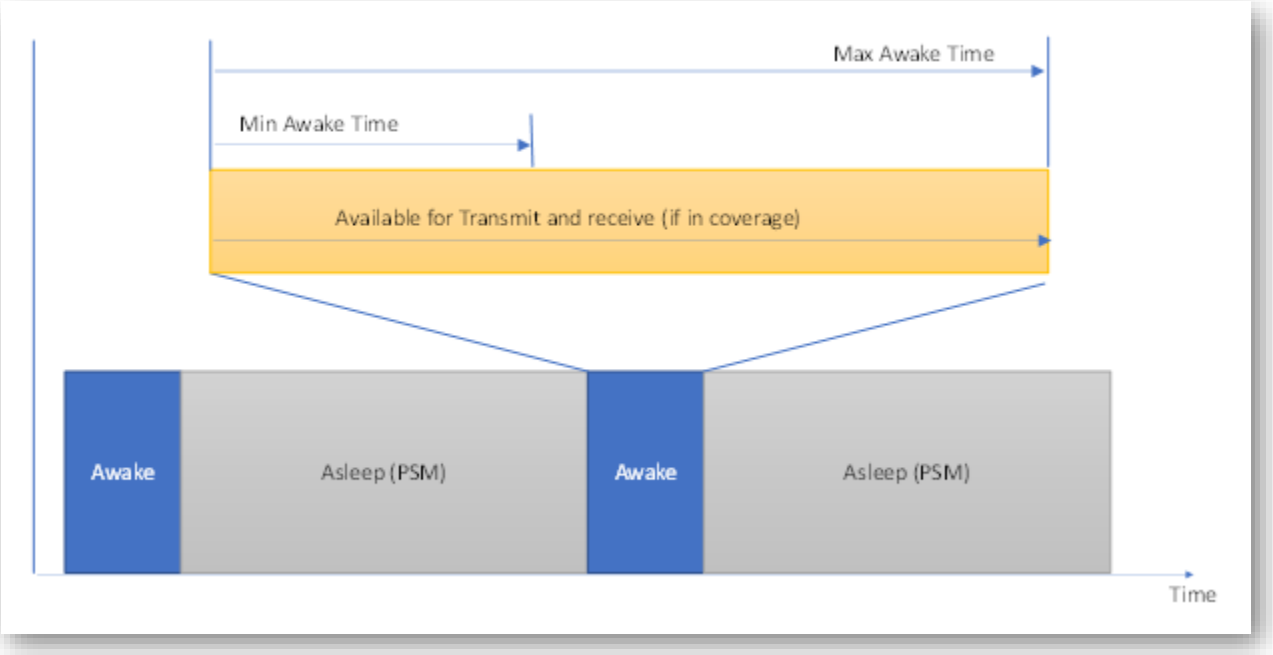
Power Savings Mode (PSM)

This section describes the implementation of the PSM functionality of the Device, designed to reduce battery power consumption of a deployed device.

PSM is a feature useful in a certain class of cellular devices that are mostly inactive but need to wake up periodically to communicate with a network service.

PSM Cycle Overview

The Device uses 'Forced,' also referred to as, 'Virtual' PSM according to the following diagram.



When the Device exits PSM, it will attempt to contact Thingspace and deliver any outstanding sensor data. Since the time to deliver this data is variable, due to the amount of sensor data, quality of service etc. the duration the device is awake will also vary. Additionally, there could be new configuration data available for the device to receive during this connection period. To balance the requirements of low battery usage (i.e. short connection duration), along with flexibility, the data model supports a configurable minimum and maximum awake duration to offer finite control of PSM. When the device exits PSM, it remains awake for at least the "min awake time", regardless. Since it's possible all outstanding data cannot be transmitted within the "min awake time", an upper limit called "max awake time" is available. The device will enter PSM at Max Awake time, even if there is still data to deliver.

PSM Configuration

The PSM parameters controlled via deviceConfig characteristics are as follows:

commSynchPeriod: Specifies the duration of the PSM sleep, during which the radio is powered off, In seconds.

commMinAwakeDuration: Specifies the minimum amount of time in which the radio stays powered on after exiting PSM. In seconds.

commMaxAwakeDuration: Specifies the maximum amount of time which the radio is allowed to stay powered on after exiting PSM. In seconds.

commTypeUpdate: Specifies the type of PSM is operated by the device. These parameters can be tested using a postman SET command with the following example body contents:

```
{
"deviceConfig":{
        "device":{
                        "commSynchPeriod":900,
                        "commMinAwakeDuration":40,
                        "commMaxAwakeDuration":80,
                        “commTypeUpdate”:“forced”
                }
        }
}
```

PSM and sensor usage hints

In order to provide timely sensor data reporting, the Sensor Processor wakes the Radio out of PSM per each sensor's Reporting Period. The Radio stays on for at least the **commMinAwakeDuration**, and is shut down for PSM when all buffered reports have are transmitted, or until the **commMaxAwakeDuration** is reached.

For optimal battery life, it is recommended that the **commSyncPeriod** be configured to values less than 5 minutes.

- The **commSyncPeriod** should be no lesser than the most frequent reporting period among all sensors
- If possible, the **commSyncPeriod** should be a multiple of the sensor reporting period(s)
- All sensors should share a common reporting period and a common reporting offset
- It is recommended that all active sensors share a common reporting period an offset to aggregate (therefore minimize) over the air radio time required to transmit sensor data. The entire sensor configuration and the **commSync** period should be configured together at the same time
- Sensor alarm thresholds, hysteresis, and hold-off times (where applicable or supported) should be carefully configured to minimize alarm jitter
- With these considerations kept in mind, the **commSyncPeriod** will stay in-phase with sensor reporting, and the Radio will not be woken up by the Sensor Processor more frequently than is necessary.
- Further details for setting the **commSyncPeriod** are provided in the next section.
- Radio will extend beyond **minRadioOnTime** upto **maxRadioOnTime** for either one of these two conditions:
    - There is still data in message store
    - location GPS is not obtained yet

Setting the commSyncPeriod and Behavior

This section provides details regarding how the **commSyncPeriod**, changes and device events affect when and how the radio wakes up periodically.

In summary, the **commSync** wake-up time is effectively rescheduled with each wake-up of the radio. Therefore, each time the radio is woken out of PSM for reporting, the **commSyncPeriod** is effectively re-aligned with reporting.

Two Second Touch

Performing a two-second touch button press can wake up the radio before the next scheduled **commSync** or report period. The **commSyncPeriod**, if scheduled more frequently, will wake-up the radio before the next reporting time. Upon the following wake-up for sensor reporting, the **commSyncPeriod** wake up time is re-aligned with reporting. So, if the **commSync** periodicity matches reporting periodicity, the **commSync** time will effectively end-up being re-synced to future reporting times.

Enable / Disable PSM

If PSM is disabled, and then re-enabled, the **commSyncPeriod** will be rescheduled immediately. The device will most likely have already been powered on for the **commMaxAwakeDuration**, so the device enters PSM and sleeps immediately. The PSM period, if more frequent than the sensor reporting period, will wake up the radio before the next reporting time, and may appear out of phase with reporting. But, since the **commSyncPeriod** wake up time is rescheduled at the next reporting time, and provided the **commSync** periodicity is in-phase reporting periodicity, the **commSync** wake up time will effectively end-up being re-synced to future reporting times.

Changing commSyncPeriod Value Over the Air

If the **commSyncPeriod** is changed over the air, it will be put into effect upon the next radio wake-up. The radio will then be scheduled to wake up regularly per the new **commSyncPeriod**. If the **commSyncPeriod** matches the reporting period or evenly divides into the reporting period, then the **commSync** time will effectively end-up being re-synced to future reporting times.

Changing Reporting Period of the Entire Sensor Configuration Over the Air

If the entire sensor configuration is re-configured all at once over the air, the **commSyncPeriod** still ends up being rescheduled from the report period which wakes the device out of PSM. So, if the **commSyncPeriod** matches the reporting period or evenly divides into the reporting period, then the **commSync** time will effectively end-up being re-synced to future reporting times.

An alarm fires between **commSyncPeriod** s and/or reporting periods

If an alarm wakes up the radio between both **commSync** time and/or reporting time, then the **commSyncPeriod** may become temporarily out of phase with the reporting time, but the **commSyncPeriod** will be effectively re-synced with reporting at the next reporting period which wakes the device from PSM.

Changing the Reporting Period of a Single, Individual Sensor to Become Out of Phase with Other Sensors

Changing the configuration of a single sensor may cause that single sensor to become out of phase with the reporting time(s) of all other sensors. Therefore, because the **commSyncPeriod** is re-computed as the radio is awoken for this sensor as well as all other sensors, the radio may be awoken doubly, due to reporting of the out of phase sensor, and due to reporting for all other sensors. This will happen especially if the **commSyncPeriod** is more frequent than the reporting periods. To avoid this scenario, all sensors should be re-configured at the same time, even if the configuration change effectively applies to only one sensor.

GPS and Location Fixes

Since PSM essentially invokes a full shutdown of the radio, the GPS subsystem must re-establish a fix each time coming out of PSM. If a fix is required due to sensor reporting of location or an IMU/Orientation alarm requiring embedded location, the BG96 firmware will hold-off entering PSM until the fix is obtained, or until the **commMaxAwakeDuration** time is reached.

Radio On Time While Out Of Network Or Poor Coverage

If the radio is out of network or has very poor coverage, the datastore buffer will accumulate sensor readings and alarm reports until normal coverage is re-established. While the datastore isn't empty, the Radio stays powered until the **commMaxAwakeDuration**, each PSM cycle, until the datastore is completely transmitted to Thingspace. Consequently, each PSM cycle the device can remain ON for at least the minimum radio on time (i.e. 40 seconds default, configurable), up to the **commMaxAwakeDuration** (i.e. 80 seconds default, configurable) attempting to connect to the network or establish a data transfer session.

Geofence / Geopath

Overview

A **Geofence** is a geographical region identified by 1 of:

- Four (4), GNSS coordinates of the corners of a quadrangle
- The GNSS coordinates identifying the center of a circle, and an associated radius measured in meters

A **Geopath** is simply the union or intersection of two (2) or more touching or overlapping Geofences.

Executing on the GAT device are the software and hardware components that can be configured for up to five (5) of these geographic regions, in any combination of circles/paths, and for which GNSS coordinates (i.e. location) of the GAT device are (is) sampled periodically and compared against configured parameters to determine whether the device is located inside or outside of any/all of the regions.

Alarm Configuration

The following sections provide the CURL scripts used to command the ThingSpace Provider to configure the Device-Under-Test's Geopath, which elicited the Alarm Reports during a drive-by-test, as detailed in the associated "Alarm Reports" sections to follow.

Sample 1

The following CURL script configures a Geopath comprised of 5, non-overlapping, circle regions.

```
curl -k -v -H "Authorization: Bearer {Auth token}" -H "content-type: application/json" ht
tps://thingspace.verizon.com:443/api/v2/devices/{M2M-token}/actions/set -d '{
"deviceConfig": {
    "profileId":2,
    "cfgRefTime" {
        "activationTime" : 0
        }
},
"device": {
    "opMode": 2,
    "compMode": 1,
    "ledMode": 1,
    "commSynchPeriod": 600,
    "commMaxAwakeDuration": 90,
    "commMinAwakeDuration": 90,
    "commTypeUpdate": "forced",
    "bufferMode": 0
},
"accelerometer": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
```

```
    "sensitivity":5,
    "scalefactor":8
},
"gyro": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"humidity": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"light": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"location": {
    "monitorPeriod": 240,
    "opMode": 1,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
    "lastUpdt": 0
},
"pressure": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"rfSignal": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
    "sensitivity":5,
    "scalefactor":8
},
"wifi": {
    "monitorPeriod": 300,
```

```
    "opMode": 1,
    "reportOffset": 0,
    "reportPeriod": 300,
    "reportType": 2,
    "scanDuration": 10,
    "minSigStr": -115
},
"ble": {
    "monitorPeriod": 300,
    "opMode": 1,
    "reportOffset": 0,
    "reportPeriod": 300,
    "reportType": 2,
    "scanDuration": 15,
    "minSigStr": -115,
    "dataMode": 0,
    "maxNumScan": 20,
    "manufacturerId": 0
},
"acclAlarm": {
    "alarmType":5,
    "enabled":1,
    "setOnlyOnce":0,
    "locationRequired":1,
    "accel_thresh":0.1900,
    "accel_post_thresh":0,
    "detect_period":0,
    "stopped_thresh":0.15,
    "stopped_period":60.0,
    "holdoff":120.0
},
"battAlarm": {
    "alarmType": 1,
    "holdoff": 30,
    "threshold": 95,
    "thresholdRange": 99,
    "hysterisis": 6
},
"gyroAlarm": {
    "alarmType": 5,
    "tilt_angle": 5,
    "x_axis": 0,
    "y_axis": 0,
    "z_axis": 1,
    "tilt_duration": 5.0,
    "clear_duration": 5.0,
    "enabled": 1,
    "holdoff": 30.0,
    "locationRequired": 0,
    "setOnlyOnce": 0
},
"humiAlarm": {
    "alarmType": 1,
    "holdoff": 30,
    "threshold": 42,
```

```
    "thresholdRange": 45,
    "hysterisis": 5
},
"liteAlarm": {
    "alarmType": 1,
    "holdoff": 33,
    "threshold": 14,
    "thresholdRange": 12,
    "hysterisis": 4
},
"tempAlarm": {
    "alarmType": 1,
    "holdoff": 31,
    "threshold": 5.7,
    "thresholdRange": 2.3,
    "hysterisis": 3
},
"presAlarm": {
    "alarmType": 1,
    "holdoff": 30.0,
    "threshold": 935.0,
    "thresholdRange": 938.0,
    "hysterisis": 2
},
"locAlarm": {
    "alarmType": 2,
    "motion": 0,
        "geoFenceList": [
            "baseCoordinate": {
                "latitude": 40.918714,
                "longitude": -74.7088049},
            "circRadius": 156},
            "baseCoordinate": {
                "latitude": 40.9346,
                "longitude": -74.7194},
            "circRadius": 178},
            "baseCoordinate": {
                "latitude": 40.897029,
                "longitude": -74.705256},
            "circRadius": 124},
            "baseCoordinate": {
                "latitude": 40.86840,
                "longitude": -74.69570},
            "circRadius": 135},
            "baseCoordinate": {
                "latitude": 40.8654,
                "longitude": -74.7253},
                "circRadius": 143}]
},
"rssiAlarm": {
    "alarmType": 1,
    "holdoff": 30.0,
    "threshold": -100.0,
    "thresholdRange": -100.0,
    "hysterisis": 1
```

```
        }
    }
}'
```

Sample 2

The following request configures a Geopath comprised of 2 circle regions and 3 quadrangle regions, all non-overlapping.

```
{
"deviceConfig":{
    "profileId":2,
        "cfgRefTime":{
        "activationTime":0
},
"device":{
    "opMode":2,
    "compMode":1,
    "ledMode":1,
    "commSynchPeriod":600,
    "commMaxAwakeDuration":90,
    "commMinAwakeDuration":90, "
    commTypeUpdate":"forced",
    "bufferMode":0
},
"accelerometer": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
    "sensitivity":5,
    "scalefactor":8
},
"battery": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"gyro": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"humidity": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
```

```
},
"light": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"location": {
    "monitorPeriod": 240,
    "opMode": 1,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
    "lastUpdt": 0
},
"pressure": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"rfSignal": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2,
    "sensitivity":5,
    "scalefactor":8
},
"temperature": {
    "monitorPeriod": 240,
    "opMode": 1,
    "range": 0,
    "reportOffset": 0,
    "reportPeriod": 240,
    "reportType": 2
},
"wifi": {
    "monitorPeriod": 300,
    "opMode": 1,
    "reportOffset": 0,
    "reportPeriod": 300,
    "reportType": 2,
    "scanDuration": 10,
    "minSigStr": -115
},
"ble": {
    "monitorPeriod": 300,
    "opMode": 1,
```

```
    "reportOffset": 0,
    "reportPeriod": 300,
    "reportType": 2,
    "scanDuration": 15,
    "minSigStr": -115,
    "dataMode": 0,
    "maxNumScan": 20,
    "manufacturerId": 0
},
"acclAlarm": {
    "alarmType":5,
    "enabled":1,
    "setOnlyOnce":0,
    "locationRequired":1,
    "accel_thresh":0.1900,
    "accel_post_thresh":0,
    "detect_period":0,
    "stopped_thresh":0.15,
    "stopped_period":60.0,
    "holdoff":120.0
},
"gyroAlarm": {
    "alarmType": 5,
    "tilt_angle": 5,
    "x_axis": 0,
    "y_axis": 0,
    "z_axis": 1,
    "tilt_duration": 5.0,
    "clear_duration": 5.0,
    "enabled": 1,
    "holdoff": 30.0,
    "locationRequired": 0,
    "setOnlyOnce": 0
},
"locAlarm": {
    "alarmType": 1,
    "motion": 0,
    "geoFenceList": [
        "baseCoordinate": {
            "latitude": 40.918714,
            "longitude": -74.7088049},
        "circRadius": 156},
        "baseCoordinate": {
            "latitude": 40.9316,
            "longitude":    -74.7164},
                "corner2": {
                    "latitude": 40.9316,
                    "longitude":    -74.7204},
                "corner3": {
                    "latitude": 40.9356,
                    "longitude": -74.7204},
                "corner4": {
                    "latitude": 40.9356,
                    "longitude": -74.7164}},
        "baseCoordinate": {
```

```
            "latitude": 40.895029,
            "longitude": -74.703256},
                "corner2": {
                    "latitude": 40.895029,
                    "longitude": -74.706256},
                "corner3": {
                    "latitude": 40.898029,
                    "longitude": -74.706256},
                "corner4": {
                    "latitude": 40.898029,
                    "longitude": -74.703256}},
        "baseCoordinate": {
            "latitude": 40.86840,
            "longitude": -74.69570},
        "circRadius": 135},
        "baseCoordinate": {
            "latitude": 40.8634,
            "longitude": -74.7233},
                "corner2": {
                    "latitude": 40.8634,
                    "longitude": -74.7263},
                "corner3": {
                    "latitude": 40.8664,
                    "longitude": -74.7263},
                "corner4": {
                    "latitude": 40.8664,
                    "longitude": -74.7233}}
            ]
        }
    }
}
```

Alarm Reports

Fields

Some of the choices in terminology are a bit unfortunate. For example, the term "breach" is used to connote that the device has exited any/all configured regions, yet the state reflecting such breach is integer 0, which for boolean states connotes false; so the "polarity" in the meaning of breach states it is a bit counterintuitive,

"**alarmType**" = 1 of { 1 => 1 or more quadrangles, 2 => 1 or more circles, 3 => at least 1 quadrangle & at least 1 circle };

"**breach_id**" = 0-based, integer that identifies the GeoFence Region for which the alarm applies. The identifiers are assigned automatically, based on the array-index of each region's parameters in the configuration ("deviceConfig") Set Request;

"**breach_latitude/longitude**" = (intuitively) coordinates of the device at the time of the alarm;

"**breach_region_state**" = a bit-map (bit-position associated w/region identifier) of the breach states for each of up to the maximum (5, as of Release 2.6.0) configured regions;

"**geoFencList**" = array of up to the maximum (5, as of Release 2.6.0), configured, GeoFence coordinates (center & radius for circles, 4-corners for quadrangle);

"**motion**" = 1 of { 0 => asynchronous, BG96 GeoFence component, periodic position-monitoring, 1 => synchronous, GPS-lock-based, position- monitoring };

"**query_region_state**" = analogous to "breach_region_state", but the aggregated states reported in (synchronous) response to an AT channel request, as opposed to the aggregated states reported in an (asynchronous) indication from the GeoFence component over the AT channel;

"**state**" = the breach state -- 0 => out of region, 1 => within (sum of all) region(s) -- of "breach_id";

NOTE: Unless breaching a region previously inside of, alarm state “0” will reflect "breach_id" 0 (the initial region configured) as long as the device is outside of all regions.

Sample 1 Drive Test

The following are location alarm reports, excerpted from a ThingSpace Staging Portal History page, exported to a CSV spreadsheet, as a device moves in/out of 5, non-overlapping, circle, regions. As these reports are most recent to oldest, start at the bottom of the list to retrace the movement of the GAT device. Each log comprises 3, tab-separated, fields: 1) a (Transaction) ID, that uniquely identifies the log, 2) a "Created On" date/timestamp when the log was generated, 3) "Event Data"; mixed JSON key/value, tuples that constitute the log message.

Inside Region 0:


```
05013d2a-7cb1-69fb-ff78-ddc009b060f7	2021-05-10T19:35:04Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.918643951416
016
,"breach_longitude":-
74.70909118652344,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":1,"state":1}}}
```


Inside Region 0:


```
25e1ee3e-0302-670e-e162-8df9aea9d0b5	2021-05-10T19:31:33Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.917892456054
69, "breach_longitude":-
74.70719909667969,"breach_region_state":1,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":1,"state":1}}}
```

Outside Region 0:

```
85214adf-7f21-67f0-f690-2763297bbe15      2021-05-10T19:31:28Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.917892456054
69, "breach_longitude":-
74.70719909667969,"breach_region_state":1,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":0}}}
```

Inside Region 0:

```
6501b853-8867-6ca0-ea92-eb64fccc5821      2021-05-10T19:31:25Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.917945861816
406
,"breach_longitude":-
74.707275390625,"breach_region_state":1,"geoFenceList":[{"baseCoordinate":{"latitude":40.
918712615 9668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":1}}}
```

Outside all Regions (as indicated by 1st configured Region 0):


```
e551ab5a-76d9-680b-ef9d-8a8ca0b469a5      2021-05-10T19:31:17Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.916423797607
42, "breach_longitude":-
74.7094955444336,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":40
.91871261 59668,"longitude":-
74.7088126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":0}}}
```


Outside all Regions (as indicated by 1st configured Region 0):


```
a5717b0c-260c-68cb-ee28-628ca53573ea      2021-05-10T19:27:36Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.898128509521
484
,"breach_longitude":-
74.7022933959961,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":40
.91871261 59668,"longitude":-
74.7088126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":0}}}
```

Outside Region 1:

```
a5710ca6-761f-6cad-fcc8-c4beae61955b      2021-05-10T18:27:31Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":1,"breach_latitude":40.933181762695
31, "breach_longitude":-
74.71812438964844,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":0}}}
```

Inside Region 1:

```
c5618fb8-7828-6537-ee0e-8c0248e09980      2021-05-10T18:23:34Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":1,"breach_latitude":40.934310913085
94, "breach_longitude":-
74.71903991699219,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":2,"state":1}}}
```

Inside Region 1:

```
85c11a28-f79c-63d4-f1bb-9345f34ef999      2021-05-10T18:19:33Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":1,"breach_latitude":40.934219360351
56, "breach_longitude":-
74.71897888183594,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":2,"state":1}}}
```

Inside Region 1:

```
a5d1d369-fd74-6bf3-eeb3-c6fb69239264      2021-05-10T18:15:04Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":1,"breach_latitude":40.934318542480
47, "breach_longitude":-
74.71896362304688,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":2,"state":1}}}
```

Outside Region 0:

```
c561f3c8-7f8f-6f44-f597-16bf4b616ab3      2021-05-10T18:11:34Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.924957275390
625
,"breach_longitude":-
74.71861267089844,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":0,"state":0}}}
```

Inside Region 0:

```
4581f6f2-f3fb-6c66-f5a7-26c9d81014f1      2021-05-10T18:03:00Z
{"deviceAlarm":{"location":{"alarmType":2,"breach_id":0,"breach_latitude":40.918598175048
83, "breach_longitude":-
74.70896911621094,"breach_region_state":0,"geoFenceList":[{"baseCoordinate":{"latitude":4
0.9187126 159668,"longitude":-
74.70880126953125},"circRadius":156},{"baseCoordinate":{"latitude":40.934600830078125,"lo
ngitude":
-
74.71939849853516},"circRadius":178},{"baseCoordinate":{"latitude":40.897029876708984,"lo
ngitude":
-
74.70525360107422},"circRadius":124},{"baseCoordinate":{"latitude":40.86840057373047,"lon
gitude":-
74.6957015991211},"circRadius":135},{"baseCoordinate":{"latitude":40.86539840698242,"long
itude":-
74.72530364990234},"circRadius":143}],"motion":0,"query_region_state":1,"state":1}}}
```

Sample 2 Drive Test

The following are location alarm reports, excerpted from a ThingSpace Staging Portal History page, exported to a CSV spreadsheet, as a device moves in/out of a Geopath comprised of 4 non-overlapping regions -- 2 circles and 3 quadrangles. As these reports are most recent to oldest, start at the bottom of the list to retrace the movement of the GAT device.

As in the prior sample, each log comprises 3, tab-separated, fields: 1) a (Transaction) ID, that uniquely identifies the log, 2) a "Created On" date/timestamp when the log was generated, 3) "Event Data", i.e. mixed, JSON, key/value, tuples that constitute the log message.

Inside Region 0:


```
45418ccc-6aa3-6b6f-fecd-71e3d6cd20f3      2021-05-13T00:25:49Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9
185 8673095703,""breach_longitude"":-
74.70883178710938,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":1,""state"":1}}}"
```

Outside all Regions, as identified by (1st configured) Region 0):

c5814081-29b3-6583-ec6e-aecb25066f84 2021-05-13T00:21:53Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9198 6083984375,""breach_longitude"":-74.70782470703125,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latitude"":40.9187126159668,""longitude"":-74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.931598663330 08,""longi tude"":-74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.863399505615234,""longi tude"":-74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"

Outside all Regions, as identified by (1st configured) Region 0:

45e12d9e-63be-68ce-ffef-530cbda7bb5c 2021-05-13T00:17:55Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9120 4071044922,""breach_longitude"":-74.71329498291016,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latitude"":40.9187126159668,""longitude"":-74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.931598663330 08,""longi tude"":-74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.863399505615234,""longi tude"":-74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"

Outside all Regions, as identified by (1st configured) Region 0:

```
85c1dcf4-8c6d-6641-ffc1-f4c711cf4697      2021-05-13T00:13:19Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.8
915 63415527344,""breach_longitude"":-
74.71804809570312,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
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Outside all Regions, as identified by (1st configured) Region 0:


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6521f404-d122-64cb-f584-bdc780d2edb9      2021-05-13T00:09:20Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.8
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tude"":40
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74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
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74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
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Outside Region 4:


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05511ab9-c72e-6c9a-e1ca-18c20cf483e6      2021-05-13T00:07:52Z
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"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":4,""breach_latitude"":40.8664 16931152344,""breach_longitude"":-74.72502899169922,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latitude"":40.9187126159668,""longitude"":-74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.931598663330008,""longi tude"":-74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.863399505615234,""longi tude"":-74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"

Inside Region 4:

85d1217a-67ff-6e72-efe0-abeedc89dbb5 2021-05-13T00:05:38Z
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Inside Region 4:

e5418bc6-c37a-6870-eb7b-301f17f4c757 2021-05-13T00:01:53Z

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Inside Region 4:

45a191ff-deec-6022-fa16-6f93e5c53e62 2021-05-12T23:57:20Z

"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":4,""breach_latitude"":40.8663 55895996094,""breach_longitude"":-74.72496795654297,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latitude"":40.9187126159668,""longitude"":-74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.931598663330008,""longi tude"":-74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.863399505615234,""longi tude"":-74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-74.72329711914062}}],""motion"":0,""query_region_state"":16,""state"":1}}}"

Inside Region 4:

a5a18b91-c9d4-655c-fd3d-e5e1fc1b0de6 2021-05-12T23:53:44Z

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tude"":40
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Outside Region 4:

05a14b12-444b-6625-fe33-f4f7d6b9b31d 2021-05-12T23:53:40Z
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74.72501373291016,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
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.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
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74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
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74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":16,""state"":0}}}"

Inside Region 4:

a551db97-654b-651d-f6d2-fc4490b64f70 2021-05-12T23:53:27Z
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74.72564697265625,""breach_region_state"":16,""geoFenceList"":[{""baseCoordinate"":{""lat
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74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
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74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
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74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":1}}}"

Outside all Regions, as identified by (1st configured) Region 0:

c551deaa-3ae4-6d93-ed64-c771b264205c 2021-05-12T23:53:21Z
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672 10388183594,""breach_longitude"":-
74.72541046142578,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
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74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
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74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
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74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
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Outside Region 3:


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74.69609069824219,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
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74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
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Inside Region 3:


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e591bcac-df65-6203-ff75-ba0d59ecf842      2021-05-12T23:49:54Z
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680 72509765625,""breach_longitude"":-
74.69599914550781,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
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74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
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74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
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74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
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74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":8,""state"":1}}}"
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Inside Region 3:

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05711af2-ca63-6843-ec57-1794e0f475aa      2021-05-12T23:45:54Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":3,""breach_latitude"":40.8
680 419921875,""breach_longitude"":-
74.69598388671875,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":8,""state"":1}}}"
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Inside Region 0:


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25215f0c-c844-63c4-fa28-81558ace60b3      2021-05-12T23:41:54Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.8
719 9783325195,""breach_longitude"":-
74.69485473632812,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":8,""state"":1}}}"
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Outside Region 2:


```
65d12db9-a491-69ba-f274-03875a439ce0      2021-05-12T23:38:39Z
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"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":2,""breach_latitude"":40.8
972 20611572266,""breach_longitude"":-
74.7032241821289,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latit
ude"":40. 9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"

Inside Region 2:

85a1cdd4-6fd0-6cf8-e95c-597d809a69d5 2021-05-12T23:33:18Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":2,""breach_latitude"":40.8
973 08349609375,""breach_longitude"":-
74.70509338378906,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":4,""state"":1}}}"

Inside Region 2:


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05f1b107-8579-6929-fd8e-9c532f88fa74      2021-05-12T23:28:45Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":2,""breach_latitude"":40.8
973 1979370117,""breach_longitude"":-
74.70329284667969,""breach_region_state"":4,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":1}}}"
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Outside all Regions, as identified by (1st configured) Region 0:


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25c1b5b2-af03-64ff-f95e-e38018412697      2021-05-12T23:25:18Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9
225 42572021484,""breach_longitude"":-
74.71867370605469,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"
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Inside Region 1:

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e501145e-1c69-62b6-e7d9-122fc2ca13f9      2021-05-12T23:21:51Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":1,""breach_latitude"":40.9
347 1908569336,""breach_longitude"":-
74.71917724609375,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":2,""state"":1}}}"
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Inside Region 1:


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856156df-cb9f-69d7-fa41-a913113165f6      2021-05-12T23:17:52Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":1,""breach_latitude"":40.9
347 6104736328,""breach_longitude"":-
74.71916198730469,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":2,""state"":1}}}"
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Inside Region 1:


```
05714714-1adb-67a1-e84a-f661252c7c43      2021-05-12T23:14:43Z
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"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":1,""breach_latitude"":40.9
351 6159057617,""breach_longitude"":-
74.72034454345703,""breach_region_state"":2,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":1}}}"

Outside Region 1:

6571a4ad-54ce-60b1-ff60-05f7677218a6 2021-05-12T23:14:31Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":1,""breach_latitude"":40.9
346 1990356445,""breach_longitude"":-
74.72052001953125,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":0}}}"

Inside Region 1:

6571233b-dab8-6a15-f9de-bf95ddc92d7e 2021-05-12T23:14:10Z

"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":1,""breach_latitude"":40.9316 8640136719,""breach_longitude"":-74.71854400634766,""breach_region_state"":2,""geoFenceList""
[{""baseCoordinate"":{""latitude"":40.9187126159668,""longitude"":-74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.93159866333008,""longi tude"":-74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.863399505615234,""longi tude"":-74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-74.72329711914062}}],""motion"":0,""query_region_state"":0,""state"":1}}}"

Inside Region 0:

0521af02-b018-6660-f3fc-2b3e499fee04 2021-05-12T23:09:19Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9190 3305053711,""breach_longitude"":-74.70886993408203,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""latitude"":40
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Inside Region 0:


```
a581bf28-13e5-60a5-e003-340de22fb992      2021-05-12T23:05:18Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9
185 791015625,""breach_longitude"":-
74.70907592773438,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
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74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":1,""state"":1}}}"
```


Inside Region 0:


```
25f1bb74-7807-62cf-eb6e-131d1d90f979      2021-05-12T23:01:27Z
"{""deviceAlarm"":{""location"":{""alarmType"":1,""breach_id"":0,""breach_latitude"":40.9
186 5158081055,""breach_longitude"":-
74.70905303955078,""breach_region_state"":0,""geoFenceList"":[{""baseCoordinate"":{""lati
tude"":40
.9187126159668,""longitude"":-
74.70880126953125},""circRadius"":156},{""baseCoordinate"":{""latitude"":40.9315986633300
8,""longi tude"":-
74.71640014648438},""corner2"":{""latitude"":40.93159866333008,""longitude"":-
74.72039794921875},""corner3"":{""latitude"":40.93560028076172,""longitude"":-
74.72039794921875},""corner4"":{""latitude"":40.93560028076172,""longitude"":-
74.71640014648438}},{""baseCoordinate"":{""latitude"":40.89502716064453,""longitude"":-
74.70325469970703},""corner2"":{""latitude"":40.89502716064453,""longitude"":-
74.70625305175781},""corner3"":{""latitude"":40.89802932739258,""longitude"":-
74.70625305175781},""corner4"":{""latitude"":40.89802932739258,""longitude"":-
74.70325469970703}},{""baseCoordinate"":{""latitude"":40.86840057373047,""longitude"":-
74.6957015991211},""circRadius"":135},{""baseCoordinate"":{""latitude"":40.86339950561523
4,""longi tude"":-
74.72329711914062},""corner2"":{""latitude"":40.863399505615234,""longitude"":-
74.72630310058594},""corner3"":{""latitude"":40.86640167236328,""longitude"":-
74.72630310058594},""corner4"":{""latitude"":40.86640167236328,""longitude"":-
74.72329711914062}}],""motion"":0,""query_region_state"":1,""state"":1}}}"
```

Multiple Configuration Profiles

Overview

This chapter describes the implementation of the requirements for a user to configure up to eight (8) sets of complete Sensor Reading, Sensor Alarm, and System configuration parameters of the Global Asset Tracker ("GAT").

Creation of a new Profile minimally requires a unique, non-existent, identifier from 1-7 (“Profile ID”). Identifier 0 is reserved for the pre-existing configuration at the time of firmware upgrade. Absent any parameters beyond the Profile ID, the entire set of parameters prescribed for a deactivated/released device shall be the starting point for the new profile. Additional parameters, provided by the server at the time of Profile ID creation or modification will overwrite the prescribed parameters when adhering to the same consistency checks enforced in previous releases.

This section describes the feature benefits, as well as how the system will act for various usage scenarios.

Profiles

This section describes a configuration Profile, which is a complete set of Sensor Reading, Sensor Alarm, System (“device”), and Profile Activation parameters, all identifiable by a unique, Profile ID:

- A set of parameters uniquely identifiable by Profile ID from 0-7.
- All of the (up to) eight (8) sets of configuration parameters persist on the file-system in individual files at, “./datatx/profiles/profile_<0- 7>.ini”.
- Each “profile_<0-7>.ini” contain only configuration parameter settings. They do not include the so-called “header” section – i.e. unit name, serial #, MQTT URL, (deprecated) sensor indices, configuration version -- nor the (deprecated) last, cached, Sensor Reading values that exist in the “./datatx/config.ini”.
- Only a single instance of Profile ID 0-7 may be activated/active (i.e. functionally operational) on the device at any time, and this instance is also persisted on the file-system at “./datatx/config.ini”, for restoral on the next PSM cycle or BG96 reset/reboot.
- All Profile IDs 0-7 are user-configurable.
- Profile ID 0 is also used for the following (existing) internal, DAM application purposes:
- Current (2.4.0 or prior) configuration (excluding device header and last Sensor Reading data) from config.ini immediately after upgrade to the new release.
- Unalterable/prescribed configuration parameters, referred to as the “default” (14-day Profile) configuration. They are copied to config.ini and activated when the device exits Factory mode or when ThingSpace (re)activates the device.

Profile ID 65535 (unsigned, 16-bit, -1) is used for the following internal Downloadable Application Module (DAM) application purpose(s):

- Unalterable/prescribed configuration parameters, referred to as the “deactive” configuration. They are copied to config.ini and activated when the device enters Factory mode, or when ThingSpace releases/deactivates the device.

- The entire "./datatx/profiles" directory shall be deleted, as the device is (essentially) being returned to its pre-provisioned state. As such, previously existing Profile Id(s) 0-7 cannot be (re)activated. Only the compile-time, prescribed, default (14-day) Profile Id 0 can be reactivated via ThingSpace.

User Configuration

While in released/deactivated state, the device shall respond to any ThingSpace "**deviceConfig**" get/set request with an error response of "status" field (decimal) 400 and "error" field 0.

If the user changes a parameter for an inactive Profile ID, and omits activation time (value 0, meaning immediate activation, is the only supported value in the initial release), then the profile_<0-7>.ini (only) will be updated.

If the user changes the activation time for an inactive Profile ID to a non-zero value (future release), then the profile_<0-7>.ini (only) will be updated and the activation time monitored by the system. Upon reaching the activation time for that particular Profile ID, the set will (automatically) overwrite config.ini and become active/effective.

User request to change a parameter for the active Profile ID changes the associated profile_<0-7>.ini file, the config.ini file, and the changes immediately become effective.

User request to change a parameter w/o specifying Profile ID changes the Profile ID 0 configuration, i.e. profile_0.ini. If Profile ID 0 is currently active, then config.ini will likewise reflect the change and the changes will immediately become effective.

Any Set Request for a (valid) Profile ID that does not exist, requires the following, minimum set of configuration parameters

be provided: All "device" (System) configuration parameters must be included in the "**deviceConfig** : {...}" map

Any Sensor Alarm configuration specified in the "**deviceConfig** : {...}" map, must include a valid (non-zero) "**alarmType**" value.

Any Sensor Alarm configuration parameter(s) specified in the "**deviceConfig** : {...}" map, must include a valid (non-zero) "**opMode**" setting for the Sensor Reading with the equivalent Sensor Id type. For example, "**temperature**" and "**tempAlarm**" share the same, enumerated, Sensor Id type of 1.

Parameters

Profile Id

The Profile Id is a unique identifier, from 0-7 that the user can select to (re)configure the device for a specific set of Sensor Reading and Sensor Alarm operation.

Parameter	Value	Description
profileId	0-7	Uniquely identifies a complete set of Sensor Reading & Sensor Alarm operational parameters

Activation Time

The Activation Time is a time reference (e.g. seconds since epoch) when the "**profileId**" is to become activated (i.e. operational effective) on the device. Currently, only the time reference 0 is allowed, which means the set of parameters becomes effective immediately.

Parameter	Value	Description
cfgRefTime:{activationTime}	0	Sensor Reading and Sensor Alarm operational parameters become effective immediately

Sample

Here is an example of setting all sensors with profile Id = 0:

```
curl --location --request POST
'https://thingspace.verizon.com/api/cc/v1/devices/actions/set' \
--header 'Content-Type: application/json' \
--header 'VZ-M2M-Token:"value"' \
--header 'Authorization: Bearer "value" \
--data-raw '{
    "accountidentifier": {
        "billingaccountid": "value"
    },
    "resourceidentifier": {
        "imei": "value"
    },
"deviceConfig": {
    "profileId": 0,
    "cfgRefTime": {
        "activationTime": 0
    },
    "device": {
```

```
        "opMode": 2,
        "ledMode": 2,
        "commSynchPeriod": "900",
        "commMinAwakeDuration": "40",
        "commMaxAwakeDuration": "80",
        "commTypeUpdate": "forced",
        "bufferMode": 1
    },
    "temperature": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "battery": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "location": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "pressure": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "rfSignal": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "accelerometer": {
```

```
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "gyro": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "light": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "humidity": {
        "monitorPeriod": 300,
        "opMode": 1,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2
    },
    "wifi": {
        "monitorPeriod": 300,
        "opMode": 0,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2,
        "scanDuration": 10,
        "minSigStr": -180
    },
    "ble": {
        "monitorPeriod": 300,
        "opMode": 0,
        "reportOffset": 0,
        "reportPeriod": 900,
        "reportType": 2,
    }
}
```

Personality Alarms

Overview

This section describes the ability for a user to configure a GAT device's personality **(** behavior) to automatically change its complete set of Sensor Reading/Alarm/Personality configuration settings in response to (either) an "AnyMotion" (device in motion) or "NoMotion" (device at rest) alarm. Both of these alarms are signaled by the "Inertial Measurement Unit **(IMU**)", and forwarded by the Sensor Processor to the BG96 for propagation to the ThingSpace Provider. As such, this feature is tightly coupled with the configuration of the IMU, and with the BG96's detection of the alarm event(s) from the SP.

Personality Alarm(s)

At the heart of this feature is the ability to activate a complete set of Sensor Reading/Alarm configuration parameters when any of the (supported) Sensor Alarms are raised or cleared. For example, a common use case might be that when a battery charge (level) has fallen below a configured threshold, a new configuration could be activated to extend the Power Saving Mode to conserve battery. Then, upon battery charging to go above the threshold, and clearing of the alarm, the original configuration could be reinstated.

User Configuration

The Personality Alarm feature comprises the following Use Cases). Note that only items 1-4 are supported as of Release 2.9.0.

A Personality Alarm is identified by a unique name. This name parallels, i.e. relates to, the Sensor Alarm name that identifies a Sensor Alarm Report, which indicates the associated, sensor reading is outside configured constraints:

- "anyMo" ~ "AnyMotion" sub-type of the "acclAlarm"
- "noMot" ~ "NoMotion" sub-type of the "acclAlarm"
- "temp1" ~ "tempAlarm", suffix for concurrent below/exceed/out-of-range constraints (future)
- "humi1" ~ "humiAlarm"
- "pres1" ~ "presAlarm"
- "lite1" ~ "liteAlarm"
- "batt1" ~ "battAlarm"
- "rssi1" ~ "rssiAlarm"
- "gyro2" ~ "gyroAlarm", suffix for concurrent rotation/tilt constraints (future)
- User shall be able to configure up to eight (8) Personality Alarms (coexist) on a single device
- User shall be able to delete any or all Personality Alarms
- User shall be able to specify a configuration Profile ID to be activated upon alarm raising
- User shall be able to specify a configuration Profile ID to be activated upon alarm clearing
- User shall be able to specify a configuration Profile ID to be activated on date/time
- An Alarm Report (sent to TS Provider) shall identify any configuration Profile ID activated

- User shall be able to specify whether a raised alarm should be reset during Profile ID activation (as of Release 2.9.0, the “**anyMo**” or “**noMot**” alarms are always cleared during Profile ID activation).

Parameters

To avoid any order-precedence, the "(trigger/clear)Profile" Ids need not be configured. In such cases the specified alarm does not change configuration. You may also omit the "**clearProfile**" parameter, as it defaults to the currently, active Profile Id.

Profile Alarm

The Profile Alarm parameter is a prescribed/reserved (key) name that identifies a set of (up to 8) Personality Alarm configuration parameters controlling automatic, configuration Profile ID activation upon alarm raising/clearing.

Parameter	Value	Description
profileAlarm	array	Array of (up to 8) map entries

Alarm Name

The Alarm Name identifies a map entry within the encompassing, Profile Alarm array in the configuration Request. The map comprises the set of parameters controlling automatic, Profile ID activation when the associated alarm is raised/cleared.

Parameter	Value	Description
alarmName	map	Map of parameters controlling Profile ID activation upon a specific alarm raising/clearing

Trigger Profile

The Trigger Profile identifies the configuration Profile ID that is automatically activated when the associated Alarm

Name is raised. To avoid order-precedence, the Profile ID need not exist, in which case alarm raising has no effect.

This parameter must be specified in the configuration Request, else an error is returned.

Parameter	Value	Description
triggerProfile	0 to 7	The configuration Profile ID to activate when the associated alarm is raised

Clear Profile

The Trigger Profile identifies the configuration Profile ID that is automatically activated when the associated Alarm Name is cleared. Clearing the profile resets the alarms for that profile ID.

If unspecified in the configuration Request, this parameter defaults to the currently active Profile ID.

Parameter	Value	Description
clearProfile	0 to 7	The active configuration Profile ID to clear.

Sample

User Configuration

```
{"deviceConfig": {
      "profileAlarm": [
            { "alarmName":
                  "anyMo",
                  "triggerProfile":1,
                  "clearProfile":0
},
            { "alarmName":
                  "noMot",
                  "triggerProfile":0,
                  "clearProfile":1
                  }
            ]
      }
}
```

To delete all existing Personality Alarms, use this API (a null-array):

```
{"deviceConfig": {
      "profileAlarm": [
            ]
      }
```

NOTE: To delete 1 of multiple Personality Alarms, you must re-write the complete array of entries, omitting the one to be removed.