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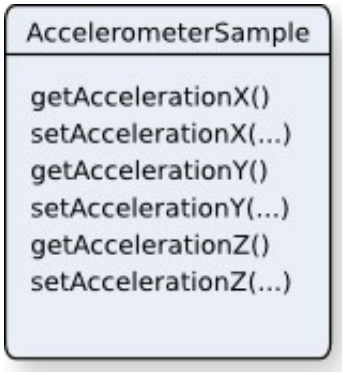
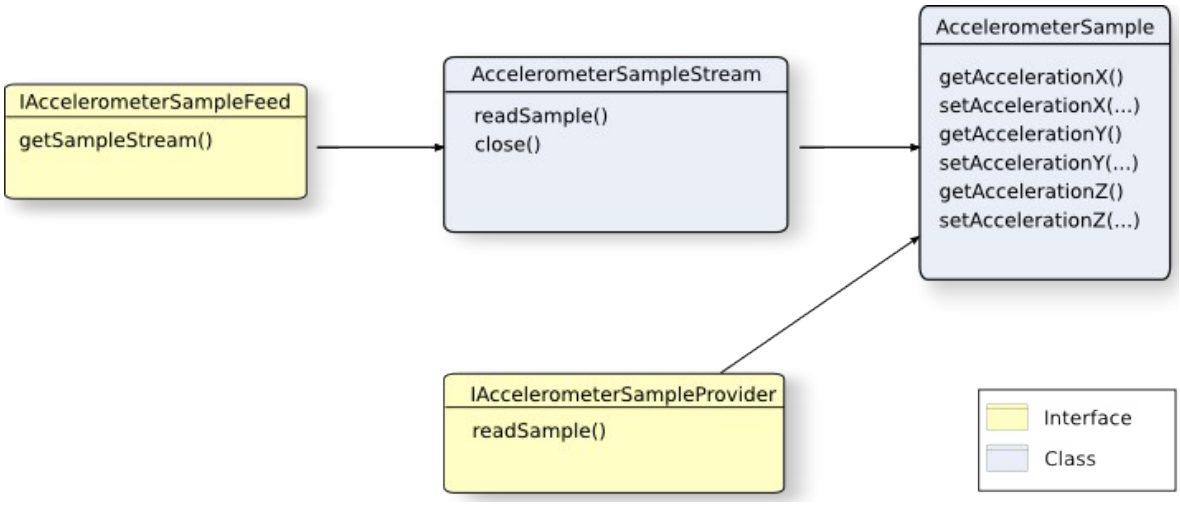
# Accelerometer API

**Description:**
This document provides the necessary information to understand, control and extract data from the accelerometer found in the BUGmotion module. The accelerometer in the BUGmotion module measures acceleration along the x, y and z axes.

**The AccelerometerSample:**
The raw data of the accelerometer is typically provided in some form of unique bit-packed format. Fortunately, the Accelerometer API automatically converts these unique formats into an AccelerometerSample. The AccelerometerSample object is the most important element of the Accelerometer API. It represents the acceleration measured along the x, y and z axes in the unit of g-force at a discrete moment in time.

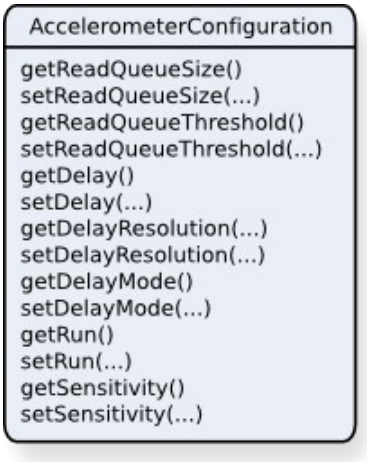



**Obtaining an AccelerometerSample:**
IAccelerometerSampleFeed and IAccelerometerSampleProvider are two OSGi services which provide access to an AccelerometerSample. The IAccelerometerSampleFeed provides the client with an AccelerometerSampleStream to continuously read AccelerometerSamples from the accelerometer. Please note that the accelerometer will be active until this stream is closed. This service is useful for time critical and logging oriented scenarios. The IAccelerometerSampleProvider is useful for one-shot reads of the accelerometer.



**The AccelerometerConfiguration:**

Some applications may require knowledge and control of the sampling rate and the size of the sample queue size. This is done by creating an AccelerometerConfiguration and setting the appropriate parameters.




The ReadQueueSize represents the number of samples to retain in a queue before they are read. For example, assume the sampling rate is 2Hz (2 samples per second) and the client is unable to read the samples until after 2 seconds. Setting the queue size to 5 (2 samples per second * 2 seconds of delay + 1 extra sample for wiggle room) allows the low level code to retain 2.5 seconds of data. This guarantees that if the client reads all the samples within 2 seconds there is no information loss. However, if the client is unable to read within the 2.5 seconds alloted by the ReadQueueSize the oldest samples are thrown away.

The ReadQueueThreshold represents the minimum number of samples that should be available in the queue buffer before allowing the read to complete. Consider the following: A client application needs to calculate the average of every 4 samples and prefers to block the read until all 4 samples are available. By setting the ReadQueueThreshold to 4 and allowing enough space in the ReadQueueSize would allow the client thread to sleep until the 4 samples become available.

The Delay and DelayResolution attributes work in tandem to produce the sample rate.

The following table illustrates the correspondence between the value of DelayResolution and time.

| DelayResolution Value | Time (uSec) |
|---|---|
| 1 | 1 |
| 2 | 8 |
| 3 | 64 |
| 4 | 256 |
| 5 | 1024 |

To establish a delay of ~500ms the client can set the DelayResolution to 5 (1.024 ms) and the Delay to 488 (Delay * DelayResolution = Sampling rate) providing a delay of  499.712 ms which is equivalent to 2 samples per second.

The DelayMode attribute tells the driver whether to calculate the sample rate from the configuration (DelayMode =  1) or use a sample rate of 5ms (DelayMode = 0).

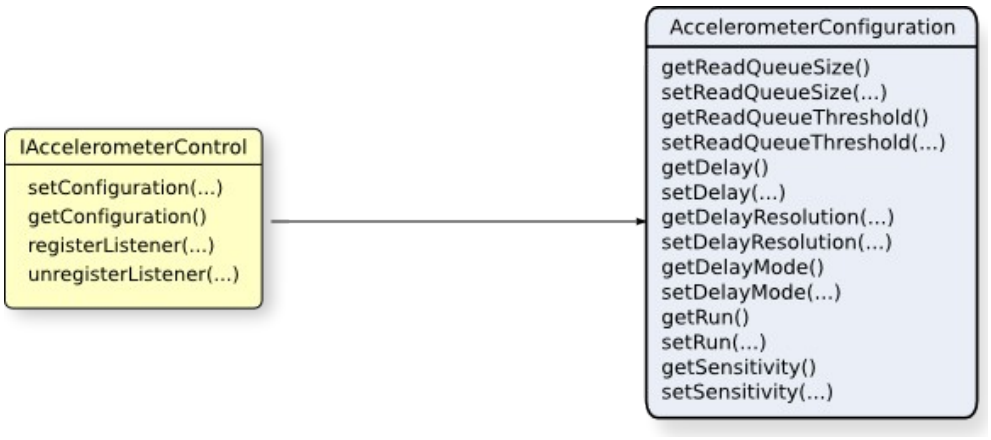
The Run attribute determines whether the accelerometer is currently retrieving samples at the desired sample rate. If Run is set to 0, the accelerometer is disabled. On the other hand, if the value is 1, the accelerometer is enabled.

The Sensitivity attribute corresponds to the maximum number of g's we would like to measure and the accuracy. For example, if the application is intrested in values of 2 g-forces or less an accuracy of 2.5g-force would provide the highest accuracy. However, if the sensitivity of the accelerometer is set to 10g-force then the precision decreases.

The following table illustrates the mapping between Sensitivity values and g-force.

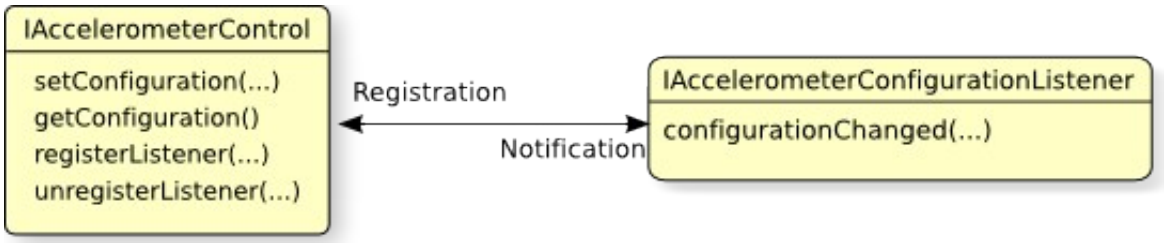
| Sensitivity | g-force |
|---|---|
| 0 | 2.5 |
| 1 | 3.3 |
| 2 | 6.7 |
| 3 | 10 |

**Getting/Setting the current configuration:**




When the BUGmotion module is attached to the BUGbase an IAccelerometerControl OSGi service becomes available within the framework. This allows client to retrieve the current configuration and provide a new one via it's getConfiguration() and setConfiguration(...) methods.

If multiple applications are interested in configuring the accelerometer, the client can register an IAcceleromerConfigurationListener with the IAccelerometerControl service to receive notifications via it's configurationChanged(...) method.



**Revision History**

| **Revision** | **Changes** |
|---|---|
| 1.1 | Fixed delay mode values. Delay mode = 0 means use the default. Delay mode = 1 means use the configuration to determine the delay. |