



Remote Monitoring for Business



(JAVA SDK)  
**Monnit Corporation**

**Version 3.2.0**

## I. INTRODUCTION

[Monnit Mine SDK](#) was created to allow you to easily incorporate Monnit wireless sensors and gateways into your existing applications. The Monnit Mine SDK can be downloaded from [mine.imonnit.com](http://mine.imonnit.com). The sample applications is a Java Swing GUI program that is meant to help the user understand the use of the Mine SDK. By inspecting the code executed from the inputs of the form, you should be getting an understanding of what code, from the Mine Library, was necessary in order to execute the function of inspected input.

If you're wanting to integrate the Mine SDK into an application that allows communication to an external data source, e.g., a SQL Database. You should look at the External Data sample application that we provide. As that example reads and writes from a JSON file, which can be swapped out and modified for a database interface that you have built.

## REGISTRATION

The SDK is provided as a Java Library. There is also a .Net version available. See [mine.imonnit.com](http://mine.imonnit.com) for more info. Your platform will need to be able to host this library. Using a Java runtime version 6 or later.

To use a Monnit Gateway with Mine you will need to purchase an unlock code to be able to point the gateway to the Mine Server you create. You can purchase the unlock code at [www.monnit.com](http://www.monnit.com).

You'll need to include the "bcprov-jdk15to18-164.jar" jar in your project. It can be found in your Java Mine download folder, alongside the "MineLibrary.jar" jar.

Sample projects have been built using Netbeans IDE 8.2.

## OVERVIEW

After purchasing your Monnit sensors, you are provided a free 45 day trial of our online platform, iMonnit ([www.imonnit.com](http://www.imonnit.com)). All sensors and gateways are preconfigured to work with this platform making it easy to get things up and running. We recommend you become familiar with some of the basic use of the hardware using the portal first. After becoming familiar with how the sensors work with the gateways, you'll find it easier to implement your solution.

Many questions can be answered by searching the online knowledge base or visiting our FAQ page: <http://www.monnit.com/support/frequently-asked-questions> Monnit support staff is well versed in use of the sensors with our provided monitoring platforms. For support of sensors and gateways they will ask you to troubleshoot them using the iMonnit platform. A select few members of the support staff are able to respond to questions directly involving the SDK. Your best option for SDK support is to email [support@monnit.com](mailto:support@monnit.com) and your question will be directed to a member of the support staff that will be able to respond. We strive to reply to all questions in a reasonable timeframe however, the response time for SDK questions may take longer than sensor or gateway related questions.

## II. BASIC USAGE

The following will outline the basic use of the SDK to help you get your code running with minimal effort. It will loosely follow the code in the sample application without the specific UI constraints presented in the example.

Start by adding references to bring the Monnit Mine SDK library into your project. Then add any needed Import statements to the top of your code file. Some of the imports we've included may not be needed for your implementation.

### Code Example:

```
import com.monnit.mine.BaseApplication.ExtensionMethods.Extensions;
import com.monnit.mine.MonnitMineAPI.Gateway;
import com.monnit.mine.MonnitMineAPI.MineServer;
import com.monnit.mine.MonnitMineAPI.Sensor;
import com.monnit.mine.MonnitMineAPI.enums.eFirmwareGeneration;
import com.monnit.mine.MonnitMineAPI.enums.eGatewayType;
import com.monnit.mine.MonnitMineAPI.enums.eMineListenerProtocol;
import com.monnit.mine.MonnitMineAPI.enums.eSensorApplication;
```

## INITIALIZING THE SERVER CLASS

After including the library, create an instance of the server class. Each instance can run independently and can be configured to its own IP Address, protocol, and port. The simplest implementation is to use a single instance to bind to all interfaces.

To instantiate a MineServer object, first choose the protocol to use, TCP and/or UDP. The types of gateways you have will determine which protocol is needed. TCP is used for Ethernet and USB Gateways and UDP for Cellular gateways. Second, select the computers IP Address you would like to use. (System.NET.IPAddress.Any will bind to all available IP Addresses on the computer.) Lastly, select the port, documentation will use the default port of 3000.

You'll need to keep a reference to the server instance as you will be interacting with it later in your application.

### Code Example:

```
MineServer _Server = new MineServer(eMineListenerProtocol.TCPAndUDP,
IPAddress.getByName("127.0.0.1"), 3000);
_Server.StartServer();
```

After the server instance is created, you can start the socket listeners using the StartServer method.

## ADDING PROCESSING HANDLERS

The MineServer object will utilize processing handlers when certain things happen. For instance, when a gateway delivers a message, the "GatewayMessageHandler" handler is fired. If the message contains sensor data then additionally the "SensorMessageHandler" handler is fired. There is no need to subscribe to all handlers, just the ones you want to handle.

### Code Example:

```
_Server.addGatewayDataProcessingHandler (new GatewayMessageHandler ());  
_Server.addSensorDataProcessingHandler(new SensorMessageHandler ());  
_Server.addExceptionProcessingHandler(new ExceptionHandler ());  
_Server.addPersistSensorHandler(new PersistMessageHandler ());  
_Server.addUnknownGatewayHandler(new UnknownGatewayHandler ());
```

## REGISTERING GATEWAYS

Now that your server is operating and is ready to deliver your data, you need to register your gateway(s) so that the server knows what type and version of gateway is talking to it. This is so it can properly interpret the data which the gateway will send.

To register a gateway with the server, you need to instantiate an instance of the Gateway class. These values are best stored in a non-volatile data cache. Then it can be retrieved when the server starts and updated while the server is running if you are going to adjust the gateway parameters. This allows the values to be up to date each time the server starts.

If you have stored the rest of the gateway configurations, you can apply them directly using an alternate constructor. Once the gateway object is created, you can register it with the server.

### Code Example:

```
Gateway MineGateway = new Gateway(1234, eGatewayType.USB, "3.3.2.1", "2.3.0.0", "127.0.0.1",  
3000);  
_Server.RegisterGateway(MineGateway);
```

Now you can start interacting with your gateway and receiving messages from it.

## REGISTERING SENSORS

The server will also need to know some information about the sensors in order to properly interact with them. This is done in the same manner as the gateway by instantiating a sensor object then registering it to the server. Like the gateway there is a basic constructor with just the essential information, and a secondary that also configures one or more of the optional parameters. The server then completes a two-step registration. First, the sensor object is registered with the server, and then it is assigned to one of the registered gateways. This tells the server which gateway(s) the sensor is configured to communicate through. If you would like the sensor to be assigned to multiple gateways, you can simply register the same sensor object with additional GatewayIDs. This feature allows you to deploy multiple gateways over a large area and the sensors will be able to communicate with whichever gateway is in range.

### Code Example:

```
Sensor Minesensor = new Sensor(54321, eSensorApplication.Temperature, "2.3.0.0", "GEN1");  
_Server.RegisterSensor(12345, MineSensor);
```

Note: If you are planning on using the SensorPrint feature, please refer to the SensorPrint section on page 9 for additional steps in registering your sensor.

## III. OTHER USAGE NOTES

The basic usage will get you up and running with the Monnit Mine SDK. However, there are more things you may want to be aware of.

### DEVICE BEHAVIOR

Over the course of use, some information in the device can be updated. For instance, when an Ethernet gateway sends in its startup message, it delivers its MAC address and updates the gateway object. One of the handlers you find that the server will fire is "PersistGatewayHandler". After information in the gateway object is updated this handler fires and allows you to store this new information into your non-volatile data store for use, or for you to use with subsequent instantiations. There is a similar handler "PersistSensorHandler" that is used in the same manner. These are optional depending on your level of integration with the system.

### DEVICE LOOKUPS

You can retrieve an instance of your gateway or sensor object by using the servers "Find" methods. If you are observing the "PersistGatewayHandler" handler you will see that it sends the Gateway object. By using the "FindGateway" method you can obtain the instance of the gateway object you registered with the server.

### Code Example:

```
@Override  
public void ProcessPersistGateway(Gateway gateway)  
{  
    GUIListenerFunctions.print("Gateway" + gateway.GatewayID + "has been updated");  
}
```

The lookup will return the same instance of the gateway you registered. If you have overridden the Gateway class for custom functionality then your overridden class will be returned to you.

### STOPPING THE SERVER

The server also has a "StopServer" method which will close and dispose of the sockets. This does not remove the registration of the gateways and sensors. If you would like to remove a gateway or sensor, there are methods on the server class

that enable you to do that. Removing a gateway will also remove the link of assigned sensors but will not remove the sensor object from the server allowing it to remain attached to gateways it has been assigned to. Removing a sensor will remove its assignment link from all gateways it was assigned to.

**Note: Does not affect the gateways flash memory, only the server memory; see Reforming Network on a gateway.**

## REFORMING A NETWORK

Reforming a gateway's network does a couple of things.

First, it tells the gateway to scan for an open channel in the area. This can assist in obtaining optimal range, but by selecting a new channel any sensors that have been linked to the gateway will have to fail out and rescan to find the gateway on its new selected channel. In general, you don't want to reform the gateway very often.

Second, it clears the sensors from the gateway's flash memory and downloads a new sensor list from the server.

This is important because if you had a sensor assign to Gateway\_A, but want to change the Sensor to Communicate through Gateway\_B in the same area, even after removing the sensor from Gateway\_A and assigning it to Gateway\_B, the sensor will still be able to communicate through either gateway. This is because it still exists in the flash memory of both gateways. To force it to no longer communicate with Gateway\_A you will need to reform Gateway\_A so the sensor is no longer allowed to join forcing it to now communicate only through Gateway\_B. Optionally you can just allow it to talk to either gateway by assigning it to both Gateway\_A and Gateway\_B.

## UPDATE SENSOR

To update a sensor you will need to know the sensor's application type by calling `eApplicationBase.GetType(int applicationID)` and passing the sensor's `MonnitApplication` and casting it as an `int` this will bring back the correct class, so that you can call the correct sensor edit function and update page you will want to create. Looking at `TemperatureBase's SensorEdit` function we can see that it contains the following parameters:

1. Sensor sens
2. double? Heartbeat
3. double? AwareStateHeartBeat
4. int? assessmentsPerHeartbeat
5. double? minimumThreshold
6. double?maximumThreshold
7. double?Hysteresis
8. int? failedTransmissionBeforeLinkMode

## Code Example:

```
void button1_click(object sender, EventArgs e)
{
    Sensor sensor = GUIListenerFunctions.FindSensorBySensorID(sensorID);
    double? hb = Double.ParseDouble(hbtxtbx.Text);
    double? ahb = double.ParseDouble(ashtxtbx.Text);
    int? aphb = int.ParseInt(aphtxtbx.Text);
    double? min = double.ParseDouble(minthreshtxtbx.Text);
    double? max = double.ParseDouble(maxthreshtxtbx.Text);
    double? hyst = double.ParseDouble(hysttxtbx.Text);
    int? failedtrans = double.ParseDouble(ftblmtxtbx.Text);

    try
    {
        TemperatureBase.SensorEdit(sensor, hb, ahb, aphb, min, max, hyst, failedtrans);
    }
    catch
    {
        throw new Exception("Update not implemented for " + sensor.MonnitApplication.ToString());
    }
}
```

We allow for nullable fields if you do not wish to update a specific parameter.

In order to update other sensor types, you'll have to find the "eSensorApplication" that correlates with the sensor you're using. So, say you want to use a Button sensor. You'll want to create an "UpdateButtonSensor.cs" file. We recommend copying the "UpdateTemperatureSensor.cs" file. Then modifying it to fit the parameter's requirements of the ButtonLedBase.SensorEdit() method.

## Code Example:

```
void button1_click(object sender, EventArgs e)
{
    Sensor sensor = GUIListenerFunctions.FindSensorBySensorID(sensorID);
    double heartbeat = double.ParseDouble(hbtxtbx.Text);
    double awareHeartBeat = double.ParseDouble(ashtxtbx.Text);
    int enterAwareState = int.ParseInt(easwli.Text);
    int rearmTime = double.ParseInt(rearmTime.Text);
    int failedtrans = double.ParseInt(ftblmtxtbx.Text);

    try
    {
        ButtonLedBase.SensorEdit(sensor, heartbeat, awareHeartBeat, enterAwareState, rearmTime,
            failedtrans);
    }
    catch
    {
        throw new Exception ("Update not implemented for " + sensor.MonnitApplication.ToString());
    }
}
```

## SENSORPRINT

To use the SensorPrint feature with Mine, you will need to purchase SensorPrint credit(s) from [www.monnit.com](http://www.monnit.com) to be able to utilize the feature on your sensor(s). In short, this feature adds a layer of communication security between your sensor and server.

If you have purchased the feature for a sensor, in order to properly use the SensorPrint feature make sure to follow the code example below when registering your sensor.

### Code Example:

```
Monnit.Mine.Sensor MineSensor = new Monnit.Mine.Sensor(SensorID, SensorApplication, "2.3.0.0",  
generation);  
// To apply SensorPrint, you need to manually assign the property.  
// Hex string must be at a length of 64, and Hexadecimal values only (0-9, A-F)  
string sensorPrintHexString = "123412341234123412341234123412341234123412341234";  
byte[] sensorPrintByteArray = ExtensionMethods.StringToByteArray(sensorPrintHexString);  
MineSensor.SensorPrint = sensorPrintByteArray;  
ServerInstance.RegisterSensor(SensorID, MineSensor);
```

Now in your SensorMessage handler the SensorMessage object will have a flag "IsAuthenticated", meaning that the message for the sensor is from the sensor it says it is.



## SUPPORT

For technical support and troubleshooting tips please visit our support library online at [monnit.com/support/](https://monnit.com/support/). If you are unable to solve your issue using our online support, email Monnit support at [support@monnit.com](mailto:support@monnit.com) with your contact information and a description of the problem, and a support representative will call you within one business day.

For error reporting, please email a full description of the error to [support@monnit.com](mailto:support@monnit.com).

## WARRANTY INFORMATION

(a) Monnit warrants that Monnit-branded products (Products) will be free from defects in materials and workmanship for a period of one (1) year from the date of delivery with respect to hardware and will materially conform to their published specifications for a period of one (1) year with respect to software. Monnit may resell sensors manufactured by other entities and are subject to their individual warranties; Monnit will not enhance or extend those warranties. Monnit does not warrant that the software or any portion thereof is error free. Monnit will have no warranty obligation with respect to Products subjected to abuse, misuse, negligence or accident. If any software or firmware incorporated in any Product fails to conform to the warranty set forth in this Section, Monnit shall provide a bug fix or software patch correcting such non-conformance within a reasonable period after Monnit receives from Customer (i) notice of such non-conformance, and (ii) sufficient information regarding such non-conformance so as to permit Monnit to create such bug fix or software patch. If any hardware component of any Product fails to conform to the warranty in this Section, Monnit shall, at its option, refund the purchase price less any discounts, or repair or replace nonconforming Products with conforming Products or Products having substantially identical form, fit, and function and deliver the repaired or replacement Product to a carrier for land shipment to customer within a reasonable period after Monnit receives from Customer (i) notice of such non-conformance, and (ii) the non-conforming Product provided; however, if, in its opinion, Monnit cannot repair or replace on commercially reasonable terms it may choose to refund the purchase price. Repair parts and replacement Products may be reconditioned or new. All replacement Products and parts become the property of Monnit. Repaired or replacement Products shall be subject to the warranty, if any remains, originally applicable to the product repaired or replaced. Customer must obtain from Monnit a Return Material Authorization Number (RMA) prior to returning any Products to Monnit. Products returned under this Warranty must be unmodified.

Customer may return all Products for repair or replacement due to defects in original materials and workmanship if Monnit is notified within one year of customer's receipt of the product. Monnit reserves the right to repair or replace Products at its own and complete discretion. Customer must obtain from Monnit a Return Material Authorization Number (RMA) prior to returning any Products to Monnit.

Products returned under this Warranty must be unmodified and in original packaging. Monnit reserves the right to refuse warranty repairs or replacements for any Products that are damaged or not in original form. For Products outside the one year warranty period repair services are available at Monnit at standard labor rates for a period of one year from the Customer's original date of receipt.

(b) As a condition to Monnit's obligations under the immediately preceding paragraphs, Customer shall return Products to be examined and replaced to Monnit's facilities, in shipping cartons which clearly display a valid RMA number provided by Monnit. Customer acknowledges that replacement Products may be repaired, refurbished or tested and found to be complying. Customer shall bear the risk of loss for such return shipment and shall bear all shipping costs. Monnit shall deliver replacements for Products determined by Monnit to be properly returned, shall bear the risk of loss and such costs of shipment of repaired Products or replacements, and shall credit Customer's reasonable costs of shipping such returned Products against future purchases.

(c) Monnit's sole obligation under the warranty described or set forth here shall be to repair or replace non-conforming products as set forth in the immediately preceding paragraph, or to refund the documented purchase price for non-conforming Products to Customer. Monnit's warranty obligations shall run solely to Customer, and Monnit shall have no obligation to customers of Customer or other users of the Products.

#### Limitation of Warranty and Remedies

THE WARRANTY SET FORTH HEREIN IS THE ONLY WARRANTY APPLICABLE TO PRODUCTS PURCHASED BY CUSTOMER. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. MONNIT'S LIABILITY WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY, IN NEGLIGENCE OR OTHERWISE SHALL NOT EXCEED THE PURCHASE PRICE PAID BY CUSTOMER FOR THE PRODUCT. UNDER NO CIRCUMSTANCES SHALL MONNIT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES. THE PRICE STATED FOR THE PRODUCTS IS A CONSIDERATION IN LIMITING MONNIT'S LIABILITY. NO ACTION, REGARDLESS OF FORM, ARISING OUT OF THIS AGREEMENT MAY BE BROUGHT BY CUSTOMER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.

IN ADDITION TO THE WARRANTIES DISCLAIMED ABOVE, MONNIT SPECIFICALLY DISCLAIMS ANY AND ALL LIABILITY AND WARRANTIES, IMPLIED OR EXPRESSED, FOR USES REQUIRING FAIL-SAFE PERFORMANCE IN WHICH FAILURE OF A PRODUCT COULD LEAD TO DEATH, SERIOUS PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE SUCH AS, BUT NOT LIMITED TO, LIFE SUPPORT OR MEDICAL DEVICES OR NUCLEAR APPLICATIONS. PRODUCTS ARE NOT DESIGNED FOR AND SHOULD NOT BE USED IN ANY OF THESE APPLICATIONS.



**Monnit Corporation**

3400 South West Temple • Salt Lake City, UT 84115 • 801-561-5555  
[www.monnit.com](http://www.monnit.com)

Monnit, iMonnit and all other trademarks are property of Monnit, Corp. © 2020 Monnit Corp. All Rights Reserved.