

AGSC (Amateur Ground Station Control)

User Manual

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April 2024

I. Overview

AGSC is a command line utility to automate the tracking, recording, demodulation, and storage of data from satellites operating in the 70cm and 2m amateur radio bands.

I.A.1. Features

- Satellite pass prediction using Predict4Java.
- Transceiver and rotator control.
- Live data demodulation with the Dire Wolf packet radio modem.
- Transmission recorded directly from transceiver.
- Operation customizable via configuration files.
- Ability to specify non-uniform rotator alignment issues in azimuth.
- Organized data storage.

II. Setup

II.A. User Setup

II.A.1. Dependencies

Install JDK

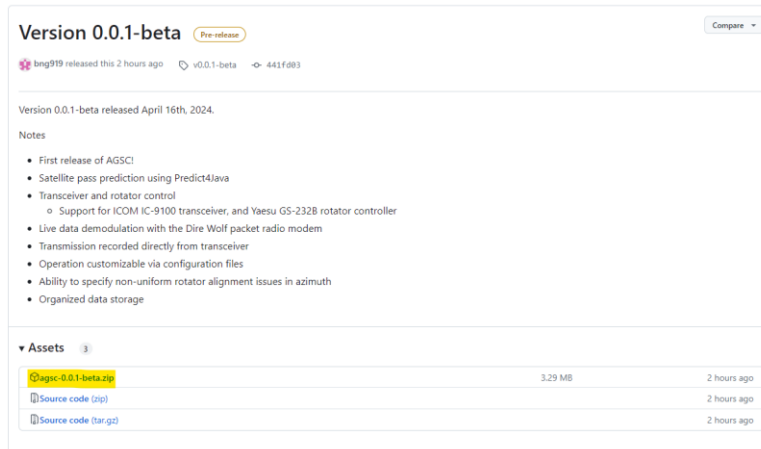
1. Download and install JDK21: <https://www.oracle.com/ca-en/java/technologies/downloads/#jdk21-windows>
2. Add the bin folder to the system path:
 - a. From Window search “Edit the system environment variables”
 - b. Under the Advanced tab, select “Environment Variables”
 - c. Select “Path” and click edit.
 - d. Click new and enter the full path (starting from C:/) to the bin folder in the jdk folder downloaded in step 1. Ex: C:\Users\{user}\.jdk\openjdk-21.0.1\bin
 - e. Restart the PC
3. Verify install is correct by opening the command prompt and running ‘java -version’

Install Dire Wolf

1. Download zip for latest release from GitHub: <https://github.com/wb2osz/direwolf/releases>.
2. Unzip and store to desired directory.
3. Open direwolf.conf and ensure at minimum the following parameters are set:
ADEVICE 0
CHANNEL 0
MYCALL NOCALL
KISSPORT 8001

II.A.2. Setup AGSC

1. Download zip file for latest release from GitHub: <https://github.com/bng919/agsc/releases>



2. Unzip and store to folder to the desired directory.
3. Folder contains the following:
 - a. JAR file
 - i. Archive of the program code.
 - b. Batch file
 - i. Script to run the program (double click to execute)
 - c. Config directory
 - i. Contains configuration files for the program.
 - d. Docs directory
 - i. Contains the release notes and Java Docs for the code (primarily used for reference during development).
 - ii. Java Docs can be opened in the browser by double clicking index.html.
4. Update config files.
 - a. Verify all settings in config.properties are correct. All paths require double back slashes!
 - i. Set ground station location and call sign.
 - ii. Set frequency and baud rate of satellite of interest.
 - iii. Set DECODER_PATH to the absolute path to the Dire Wolf directory created when Dire Wolf was installed in Section II.A.1.
 - iv. Set each MODEL for external hardware and software being used (defaults ok in most cases)
 1. Use StubRotator and StubTransceiver if instruments not connected.
 - b. Update tle.txt for the satellite of interest.
 - i. Note: this file must contain EXACTLY 3 lines: Name of satellite, TLE line 1, TLE line 2.
 - c. Update rotatorCalibration.txt if required.
 - i. By default, no adjustments are made. If there are known offsets in the rotator's azimuth they can be specified in this file. This file must contain exactly 360 lines with one integer value on each line. The value on the line is the direction the rotator controller reports on its readout when the antennas main lobe is pointed towards the angle defined by the line number, indexed from zero.

5. Run the program by double clicking agsc.bat.
6. On first execution, the program will create a logs folder where all data is from each run is stored.

II.B. Development Setup

II.B.1. Install Development Dependencies

Git

1. Install git from <https://git-scm.com/downloads>.
2. Brush up on git commands (as necessary): <https://git-scm.com/docs/gittutorial>

Development Environment (IntelliJ IDEA recommended)

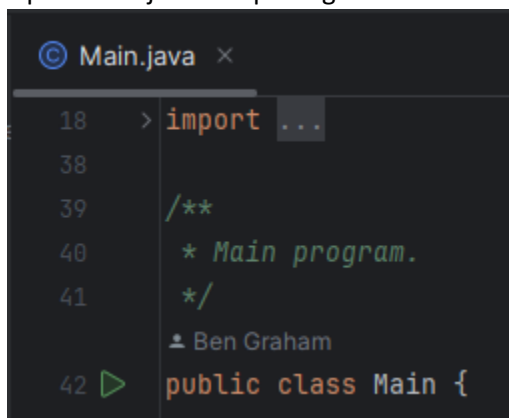
1. Install community edition from <https://www.jetbrains.com/idea/download/?section=windows>.
2. Follow instructions to setup IntelliJ, verify the 'Hello World' project runs successfully:
<https://www.jetbrains.com/help/idea/creating-and-running-your-first-java-application.html>

II.B.2. Clone Source Repository

1. Open Git Bash installed in Section II.B.1.
2. Navigate to directory to store repository.
3. Run 'git clone https://github.com/bng919/agsc.git'
4. This will create a new folder called agsc, with the code inside.
5. Open this folder as a project in the IDE of choice (IntelliJ).
6. Right click on pom.xml file and under Maven select Reload Project to ensure all dependencies are updated.

II.B.3. Run Program in IntelliJ

1. Open Main.java and press green arrow next to Main



2. Program will run as normal. Logs will be stored in the logs directory of the repository.

II.B.4. Build JAR file in IntelliJ

1. Press Ctrl twice rapidly to open "Run Anything" menu.
2. Type 'mvn clean package'.

3. A target directory will be created, and agsc-*-jar-with-dependencies.jar file will be created. This can be run using agsc.bat file in the root of the repository, or directly from the command line using 'java -jar agsc-*-jar-with-dependencies.jar'

II.B.5. Generate Updated JavaDocs

1. From the IntelliJ Tools menu, select Generate JavaDoc.
2. Select whole project, unselect 'Include test sources'.
3. Select the output directory, then click generate.

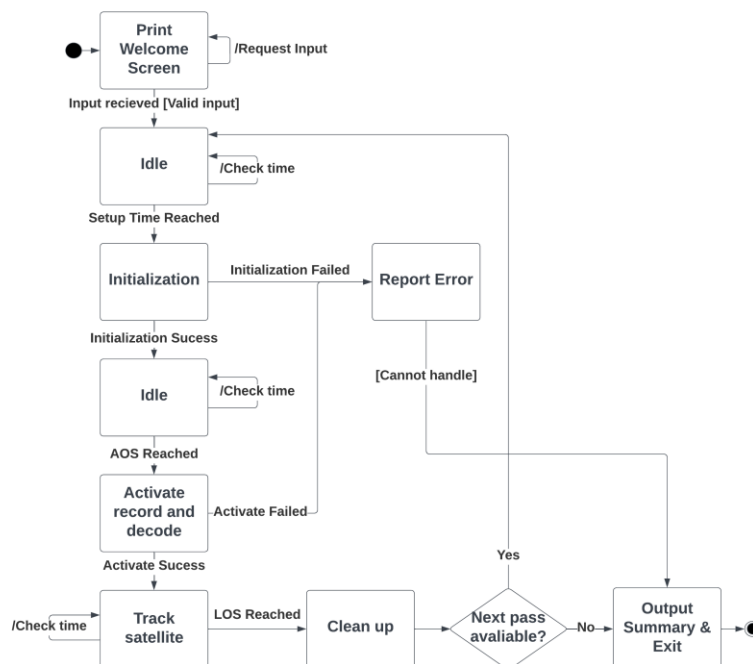
III. Usage

1. Set all desired parameters in configuration files (satellite TLE and frequency).
2. Start the program execution either using the batch file or the IntelliJ IDE.
3. Select one or more upcoming passes to record using the ID numbers as a comma separated list.

Ex:

```
=====
ID (1)
Satellite: TEST
Start time 2024-04-17T06:33:25.471Z[UTC]
End time   2024-04-17T06:44:05.471Z[UTC]
Start Az: 169.1933553955074, End Az: 346.6618181013367
Max El: 76.8118761167431
=====
ID (0)
Satellite: TEST
Start time 2024-04-17T05:03:10.471Z[UTC]
End time   2024-04-17T05:10:40.471Z[UTC]
Start Az: 105.85377592946854, End Az: 12.336738362962162
Max El: 7.099926367495952
=====
Enter ID number of pass to record (comma separated to select multiple):
0,1,2
```

4. Press enter and program will record the requested passes, operating based on the following flow chart:



5. View collected data in logs folder.

IV. Troubleshooting

Problem	Solution
Cannot connect to instrument. Ex: <ul style="list-style-type: none">- RotatorGS232B connection test failed! Could not connect using port COM4 with baud 2400- ERROR: TransceiverIC9100 connection test failed! Could not connect using port COM5 with baud 19200	<ul style="list-style-type: none">- Verify the instrument is connected and powered on.- Verify port and baud rate are correct on config.properties.- Ensure another program is not using the serial port.- Physically disconnect and reconnect instrument.
Cannot start Dire Wolf. Ex: <ul style="list-style-type: none">- ERROR: DireWolf failed to start.- ERROR: Could not connect to DireWolf KISS on port 8002. Is the port number correct?	<ul style="list-style-type: none">- Verify Dire Wolf is installed correctly by manually running direwolf.exe.- Verify config.properties points to the correct folder containing the executable.- Verify the KISS port in the direwolf.conf and config.properties files matches.

V. Support

Create issue on [GitHub](#) or contact me at ben.n.graham@icloud.com.