Design Basis for AllStar based APRS Appliance

Ver 0.1

Dec. 5, 2021

The AllStar interface APRS appliance design is based on the following assumptions:

- The focus will be on software-based Terminal Node Controller (TNC) designs
- The focus will be on the Raspberry PI computing platform
- The focus will be on the traditional audio signal-based interface approach

There is a desire to:

- Ensure that there is a specific push to talk signal (it is desired to avoid VOX approaches)
- The primary interface to the radio will be via the 6 pin mini-din interface
  - This supports 9600 baud transmission rates
  - This provides approximately standard signal levels across radios
  - Cables are available to interface the 6 pin mini-din to many other interfaces
    - See perhaps ham made parts: https://hammadeparts.com/shop-for-cables/ols/categories/amateur-radio-tnc-cables

This has led to the following design approach:

- We will use the AllStar design interface which includes a specific PTT signal based a GPIO signal from the CMedia CM108/CM119 audio chip
  - The DINAH version of the design was selected since it has a nice form factor
- The design will be a flexible high level design supporting the PI Zero W, PI Zero 2 W, PI 3B+ and PI 4 processors with details of the configuration at the optic of the builder and their specific needs

As part of the development effort we have developed three basic configurations:

The Mark 1 design:

Based on

- PI 3B+
- Standard DINAH interface
- USB based GPS, perhaps a USB GPS puck
- Small USB WIFI fob to simplify networking

This is a basic pure purchase project with minimal construction. This is expected o be one of the standard deployed designs. It was intended to demonstrate the basic feasibility and functionality of the AllStar interface based design.

The Mark 2 design:

Based on:

- PI Zero W or PI Zero 2 W
- Standard DINAH interface
- Makerspot stackable USB hub
- USB based GPS, perhaps the USB puck
- Small USB WIFI fob to simplify networking

This effort was intended to understand the feasibility of a PI Zero approach. It is a straightforward construction project, but does require assembly of the PI Zero/USB hub stack, and the 3D printing of an appropriate case. This is not expected to be a standard deployed configuration.

The Mark 3 design:

This is an extension of the Mark 2 and is based on:

- PI Zero W or PI Zero 2 W
- A PI Zero form factor stackable DINAH interface
- Makerspot stackable USB hub
- Small USB WIFI fob

and either:

- A stackable GPS module

or

- A USB based GPS puck

There are three variants of the Mark 3 design:

- Variant 1: simple static APRS appliance
  - PI Zero W or PI Zero 2 W
  - PI Zero form factor stackable DINAH interface

- Variant 2: configuration suitable for mobile operation or use cases where the external GPS is not an issue

- PI Zero W or PI Zero 2 W
- A PI Zero form factor stackable DINAH interface
- Makerspot USB hub
- Small USB WIFI fob
- USB based GPS puck

- Variant 3: integrated stack: minimizes external cables perhaps for use with a handheld transceiver
  - PI Zero W or PI Zero 2 W
  - A PI Zero form factor stackable DINAH interface
  - Makerspot USB hub
  - Small USB WIFI fob
  - Stackable USB GPS board

It is believed that a single case can support either variant 2 or 3 which are envisioned to be the most commonly deployed variant. It is anticipated that the Mark 3 will be the primary integrated design approach using the PI Zero form factor.

Variant 1 and 2 have been tested and appear to be production ready. The GPS module in variant 3 is presently under test to confirm operational stability.