01 - RouteTrack Pi — Initial Setup & Networking

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Category: Raspberry Pi / Linux / Networking

Backlink: RouteTrack Pi Overview

Project Overview

This page documents the **initial setup and networking foundation** for a Raspberry Pi–based GPS logging and mapping project designed for in-vehicle use.

The long-term goal of this project is to build a reliable, headless system capable of:

- GPS route logging
- Automatic stop detection
- Time-on-site tracking
- Mileage calculation
- Syncing data to a VPS for web-based visualization

This entry focuses on **hardware bring-up, OS selection, headless access, and resilient Wi-Fi configuration**.

Hardware Used (Initial Phase)

- **Raspberry Pi 3 B+**
- **128 GB microSD card**
- Active **cooling fan** (wired directly to 5 V)
- Phone hotspot (temporary network access)
- Home Wi-Fi (persistent network access)

Cooling & Power Verification

The cooling fan was wired directly to the Raspberry Pi’s 5 V rail:

- **Pin 4** → 5 V (red wire)
- **Pin 6** → Ground (black wire)

Results:

- Fan spins immediately on power-up
- No GPIO or software control required
- Consistent airflow suitable for a vehicle environment

An always-on fan was chosen for simplicity and reliability.

Operating System Selection

Installed OS:

- **Raspberry Pi OS Lite (64-bit)**

Reasoning:

- Lower memory overhead (ideal for Pi 3 B+ with 1 GB RAM)
- Headless by design (no desktop services running)
- Best compatibility with:
  - `gpsd`
  - Python and Node.js tooling
  - systemd services
  - Networking utilities
- Proven stability for long-running deployments

The OS was written using **Raspberry Pi Imager** with Advanced Options enabled:

- SSH enabled
- Username and password set
- Wi-Fi configured for initial hotspot access
- Custom hostname configured (`pi-gps`)

Headless SSH Access

After first boot:

- The Pi appeared on the phone hotspot

- SSH access was established using **JuiceSSH (Android)**
- No monitor or keyboard was required

This confirmed:

- OS integrity
- Network stack functionality
- Full remote administration capability

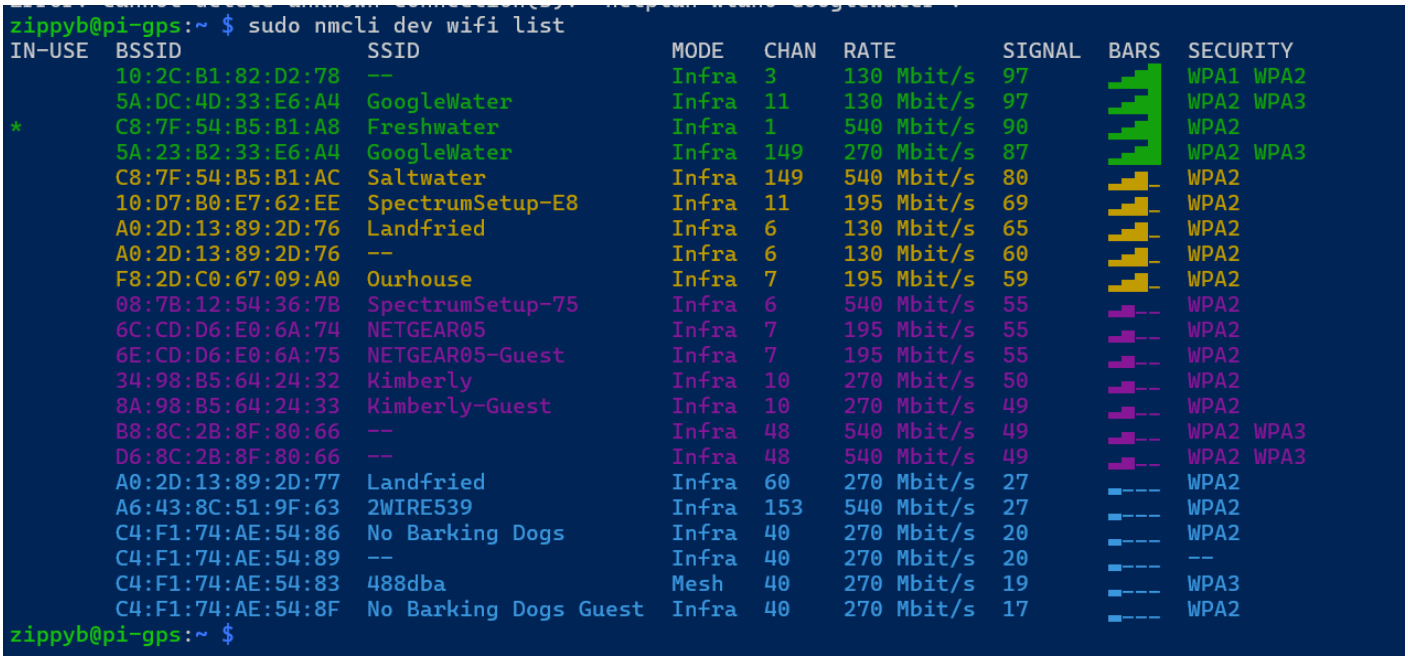
Wi-Fi Management (Scanning, Adding, Deleting)

This project uses **NetworkManager** on Raspberry Pi OS, so Wi-Fi is managed using the `nmcli` command-line tool.

Scan for available Wi-Fi networks

```
sudo nmcli connection show
```

```
sudo nmcli dev wifi rescan
sudo nmcli dev wifi list
```



Check current network status

```
sudo nmcli device status
sudo nmcli -f GENERAL.CONNECTION,GENERAL.STATE dev show wlan0
```

Add / connect to a Wi-Fi network

(This also saves the network for future use.)

```
sudo nmcli dev wifi connect "SSID" password "PASSWORD"
```

If the SSID is hidden:

```
sudo nmcli dev wifi connect "SSID" password "PASSWORD" hidden yes
```

List saved Wi-Fi connections

```
sudo nmcli -f NAME,TYPE,DEVICE connection show
```

Switch networks manually (useful for testing)

```
sudo nmcli connection up "HomeWiFi"
# or
sudo nmcli connection up "PhoneHotspot"
```

Rename a saved connection

(Helps keep connection names readable.)

```
sudo nmcli connection modify "OldName" connection.id "NewName"
```

Delete a saved Wi-Fi connection

Delete by **connection NAME** (from `nmcli connection show`), not necessarily the SSID.

```
sudo nmcli connection delete "ConnectionName"
```

Set auto-connect priorities

(Higher number = preferred when multiple known networks are available.)

```
sudo nmcli connection modify "HomeWiFi" connection.autoconnect yes
sudo nmcli connection modify "HomeWiFi" connection.autoconnect-priority 10

sudo nmcli connection modify "PhoneHotspot" connection.autoconnect yes
sudo nmcli connection modify "PhoneHotspot" connection.autoconnect-priority 1
```

```
zippyb@pi-gps:~ $ sudo nmcli connection modify HomeWifi connection.autoconnect-priority 10
zippyb@pi-gps:~ $ sudo nmcli connection modify PhoneHotspot connection.autoconnect-priority 1
zippyb@pi-gps:~ $ sudo nmcli connection modify HomeWifi connection.autoconnect yes
zippyb@pi-gps:~ $ sudo nmcli connection modify PhoneHotspot connection.autoconnect yes
zippyb@pi-gps:~ $ nmcli -f NAME,AUTOCONNECT,AUTOCONNECT-PRIORITY,DEVICE connection show
NAME                AUTOCONNECT  AUTOCONNECT-PRIORITY  DEVICE
HomeWifi            yes          10                    wlan0
lo                  no           0                     lo
PhoneHotspot        yes          1                     --
Wired connection 1  yes          -999                  --
zippyb@pi-gps:~ $
```

Restart networking (if things get weird)

```
sudo systemctl restart NetworkManager
```

Multi-Wi-Fi Configuration

The Pi is intended to operate across **multiple networks**:

- Home Wi-Fi when taken home
- Phone hotspot while mobile

Wi-Fi management is handled by **NetworkManager**, allowing:

- Multiple saved Wi-Fi profiles
- Automatic reconnection
- Priority-based network selection

Saved connections:

- **HomeWiFi**
- **PhoneHotspot**

Verified using:

```
sudo nmcli connection show
```

Automatic Network Failover

Network priorities were configured to prefer home Wi-Fi:

```
sudo nmcli connection modify HomeWiFi connection.autoconnect-priority 10
sudo nmcli connection modify PhoneHotspot connection.autoconnect-priority 1
```

Behavior:

- Home Wi-Fi is preferred when available
- Phone hotspot is used automatically when mobile
- Switching occurs without reboot or manual intervention

Failover was verified by disabling the hotspot and confirming the Pi automatically connected to the home network.

Wi-Fi Band Notes (Pi 3 B+)

- The Pi 3 B+ supports **dual-band Wi-Fi (2.4 GHz and 5 GHz)**
- 5 GHz networks require:
  - Correct WLAN country configuration
  - Non-DFS channels (36–48)
- 2.4 GHz is preferred for mobile hotspot reliability
- Both bands were successfully tested during setup

Current Status

At this stage, the system has a solid foundation:

- OS installed and verified
- SSH access confirmed
- Cooling operational
- Multiple Wi-Fi networks configured
- Automatic failover tested and working
- Network behavior stable for mobile use

The Raspberry Pi is now **ready for GPS hardware integration**.

Next Steps

Upcoming phases will document:

- GPS hardware installation
- `gpsd` configuration and testing
- Route and stop logging
- Mileage calculation
- Local web UI
- VPS synchronization and map visualization

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