Requirements

As discussed through previous meetings and emails, the telemetry module has the following hard requirements:

- Reliable wireless communication between solar car and support vehicle (Estimated to be 120 meters distance, 5 sec according to regulations)
- Receive and pass on Wireless Tyre pressure monitoring system data (TPMS)

Additionally the following ideas were discussed:

- The possibility to store sensor data to physical storage in case of an accident
- Software discussed the possibility to use the telemetry module to transmit data to nearby wireless devices for a smartphone application

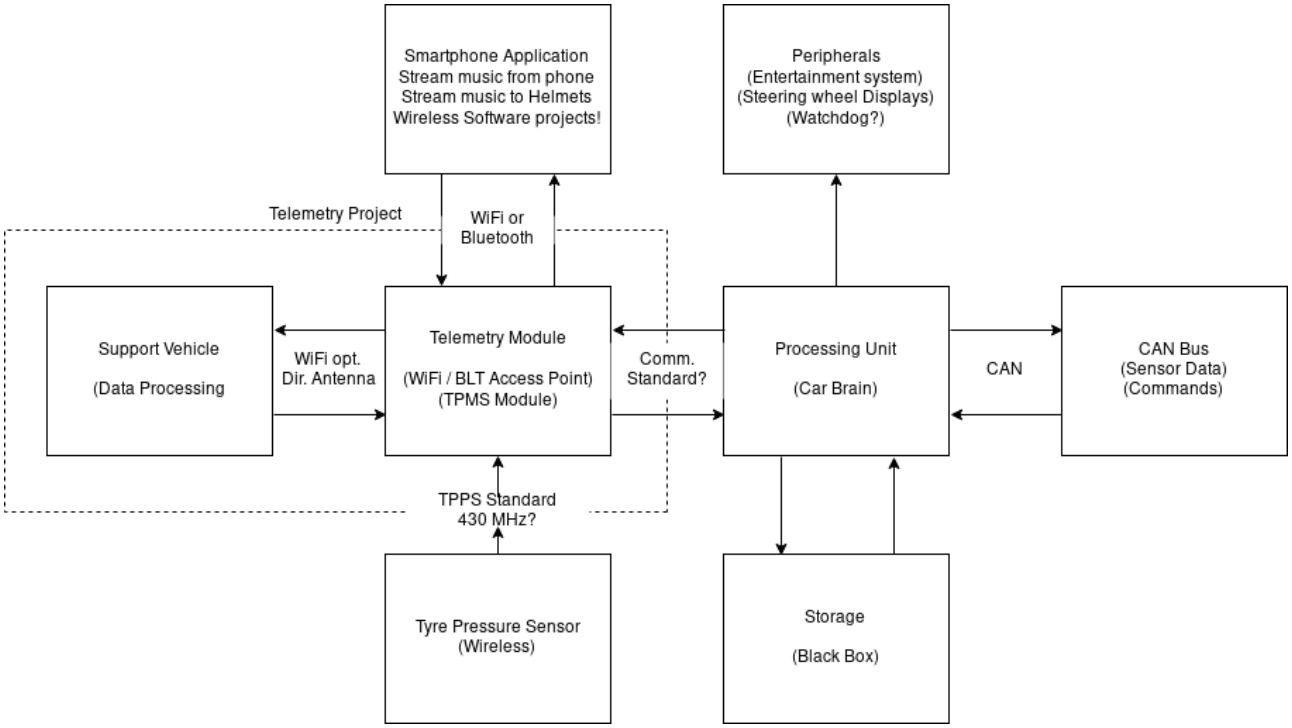

Figure 1: Possible implementation using ESP32 and a microprocessor

Design 1: Versatile vehicle access point

The core concept is to use a low cost, low power ESP32 WiFi / BLT IC as the core for the telemetry module, and an additional reciever (ATA5724?) for the TPMS frequency. The ESP32 is programmable and can be set as an access point for the microcontroller. This allows the software team more flexibility as mobile phones, support vehicle and any other device are given a local network to communicate. This is primarily a quality of life function, with the intention that a passenger can stream music from their phone to vehicle speakers, send/receive phone calls, etc as is expected of a modern car.

The issue with this design is uncertainty how we'll ensure a reliable transmission between support vehicle and solar car. We'll have to do some field test to see how far the ESP32 can reliably transmit as outdoor conditions line of sight is estimated at 80 meters. There are plenty of tweaks and hacks that can be applied to increase range at the cost of a directional antenna, lower bandwidth, etc.

Pros	Cons
Easy to expand in software	Uncertainty about range
High bandwidth	Tries too many things?
WiFi / BLT standard	Possibly not do able before deadline

Design 2: Telemetry & support Vehicle comm only

This design is more simple. A directional antenna and a transceiver at the back of the vehicle ensures a reliable low bandwidth communication between support vehicle and car. Another receiver for the TPMS. The data is read and sent to the CAN network only. There is little room for expansion, and it is more a wireless CAN port for the support vehicle, that occasionally transmits tyre pressure data as well.

In theory it should be easy to implement, and the focus of the design is to do little but do it well. Low cost, low power consumption. One could still allow for the software teams desire for a smartphone app by using a solution with built in WiFi (Raspberry Pi and similar). It depends on how much data we expect to compute in the support car, and how much should be done on the solar car itself.

Pros	Cons
Easy to implement in hardware	Little to no software involved
Reliable	Low bandwidth (?)
Long range(?)	
100% do able before deadline	

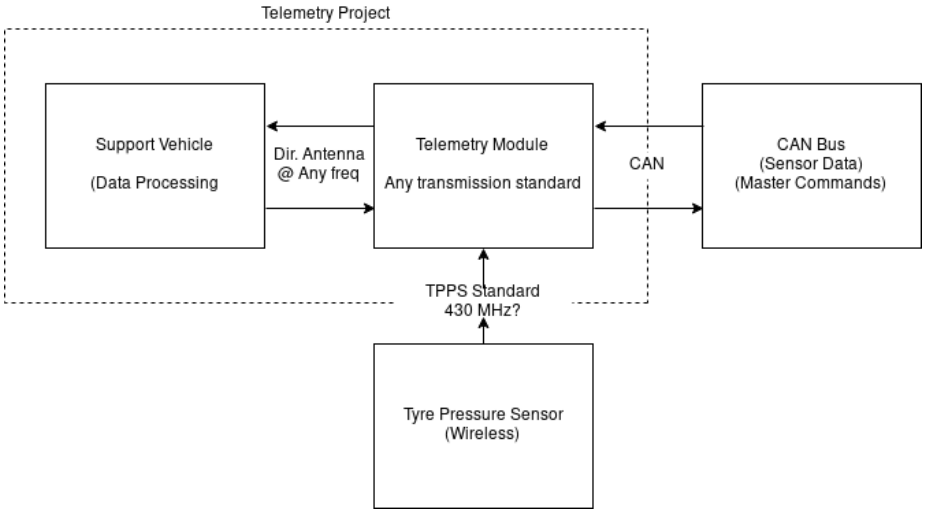

Figure 2: Simple design without data Storage

Important Questions

Data storage

It is unsure how big a role the microcontroller has, although if software is looking to implement a smartphone app to visualize data, they require a backup of all data of the car to transmit to devices that request it. The telemetry module does not require more than a few seconds of data in between transmissions and data storage only complicates the design. I'd we move this task to the processor unit.

Costs & Production

We cannot finalize the design before we get a prototype and do some field tests. Design 1 requires us to purchase 1-2 EPS32 Development boards (130 kr a piece), Design 2 requires access to electrical labs to manufacture some quick PCB's. We'd like to know:

- **What do we do if we need to order something?**
- **Is there anywhere on campus that we can produce our own PCB's and get access to components?**

Tyre pressure sensors

The telemetry module will support all standard tyre pressure sensors on the market. We'd like it if you can purchase a set so we can purchase the according IC (TA5723/ATA5724/ATA5728) that supports the frequency range.