Data logging - Requirements

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I. Document overview

Traffic on the CAN bus might include packets for sensor values, errors, synchronization etc. The traffic on the CAN bus is to be monitored locally as well as externally via V2V communication. This paper defines the requirements for data logging and some closely related aspects in the solar sustained vehicle developed by Mälardalen University Solar Team (MUST).

II. Purpose of this document

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III. Requirement specification

The following list contains the requirements for data logging. Requirements regarding the CAN ECUs:

- Each ECU must be able to have an adjustable broadcast rate.
- Every data package must be traceable on its own. (Sender must be known)
- Each ECU must follow a well-defined data format.
- All data formats and definitions needed, to both trace the sender and interpret the data of a package, must be provided by a single dependency.

Local storage unit requirements:

- The storage unit must have low energy consumption.
- The storage unit must capture and store all data transmitted on the CAN.
  The storage unit must be able to write faster than the rate at which the packages are received.
  A package must not be missed even if the storage unit happens to write to the storage at the same time the package is transmitted.
- The data must be able to be recorded for a prolonged period, MINIMUM for a whole day.
- Transferring data and freeing up space from the storage unit, between recording sessions, must be easy and fast.

The data on the storage units has the following requirements:

- Each recording session should be stored as a different log. A log is a complete recording of the CAN bus, having a definite start and end.
- The name of each new log should include the date and time/increment, and whether it contains the data from the CAN bus or the data received from the vehicle to vehicle communication.
- Meta data should be able to be stored in the beginning of each log if necessary.
- The data entries must be in the order they were received and have a timestamp.
- It must also be clear, just from reading the storage unit, what each data entry represents and where it comes from (for example whether it is an error signal and what it represents, or a value from temperature sensor number 2). In other words, every log should contain everything needed to trace and interpret the data.

Furthermore, a supporting car must also be equipped with a storage unit. This external storage unit has the following requirements:

- The external storage unit must have low energy consumption since it must be on during the whole race.
- The external storage unit must at least have enough space to store the same amount of data as the local storage unit.
- The external storage unit must store all received data via the vehicle to vehicle communication.
- It must be easy to make backups of the external storage unit during the race, and should be possible without access to the cloud.

Furthermore, the timestamp of a package should not be included in the CAN package itself. The device should get the time when it writes the data to the storage (for example by having a real-time clock peripheral).