



MEVE (Monitoring Electric Vehicles for Enterprises)

Ryerson EDP 2012-2013

Members:

Ariel Fertman – SW architect, android/client-side developer

Daniel Balilti –HW simulation and μ Controller developer

Yudistir Narine – Statistical analysis, server side developer



The Goal

Software:

To statistically analyze the non-linear behavior of an Electric Car battery using modern software architecture and cloud information.

Hardware:

To emulate the microcontroller function of monitoring a 4 cell module and route the information through common protocols.

Our Tools

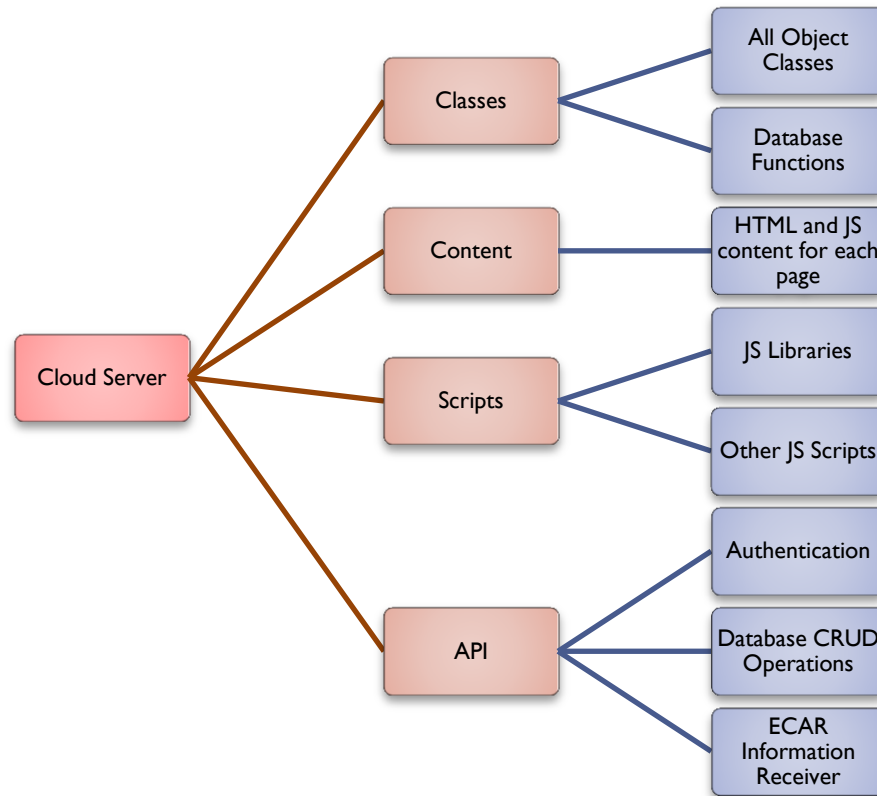
- PHP (Server side scripting language)
- JavaScript (along with jQuery & other libraries)
- HTML/CSS
- Java (Android SDK)
- C in MPLabs
- MicroChip Pic Explorer Board/Can Daughter Board
- ArcX Morpheus Processor Board

Workload Plan

- The software will pull information from a real E-Car provided by Toronto Electric
- The hardware will emulate a small scale 4 cell module using microcontrollers
- Both designs will run parallel and have no interdependency

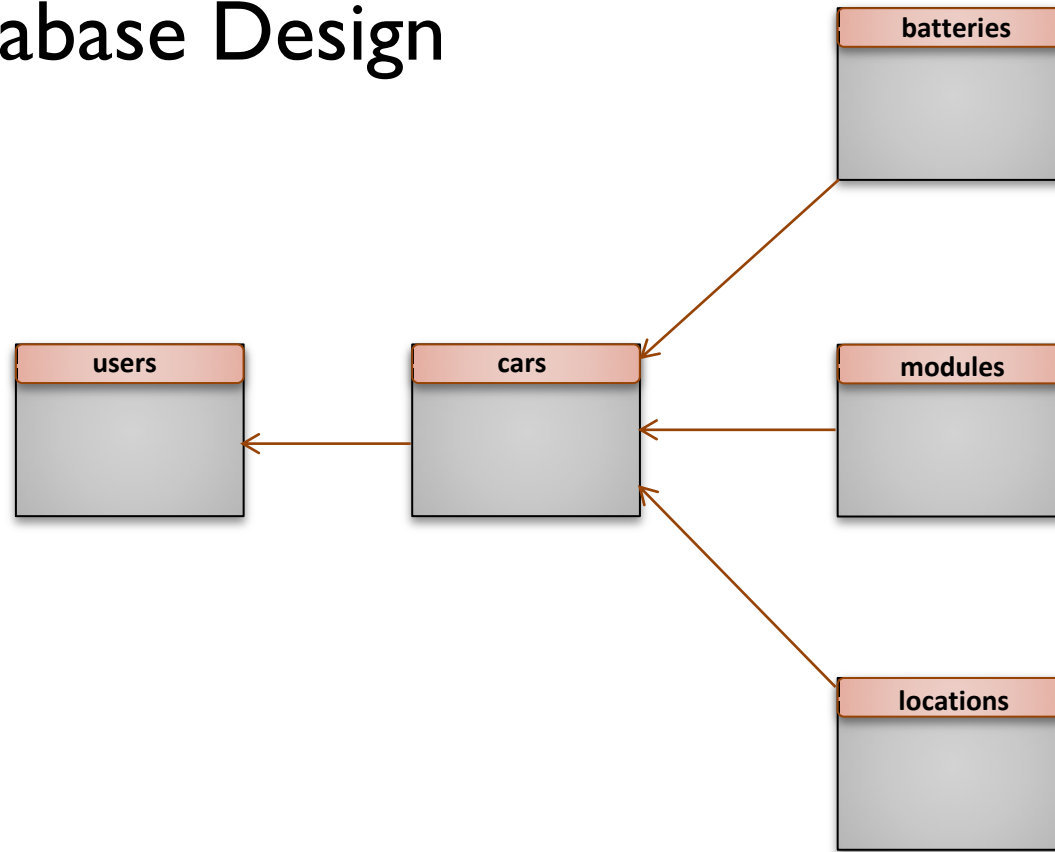
Software Architecture

- Server Design



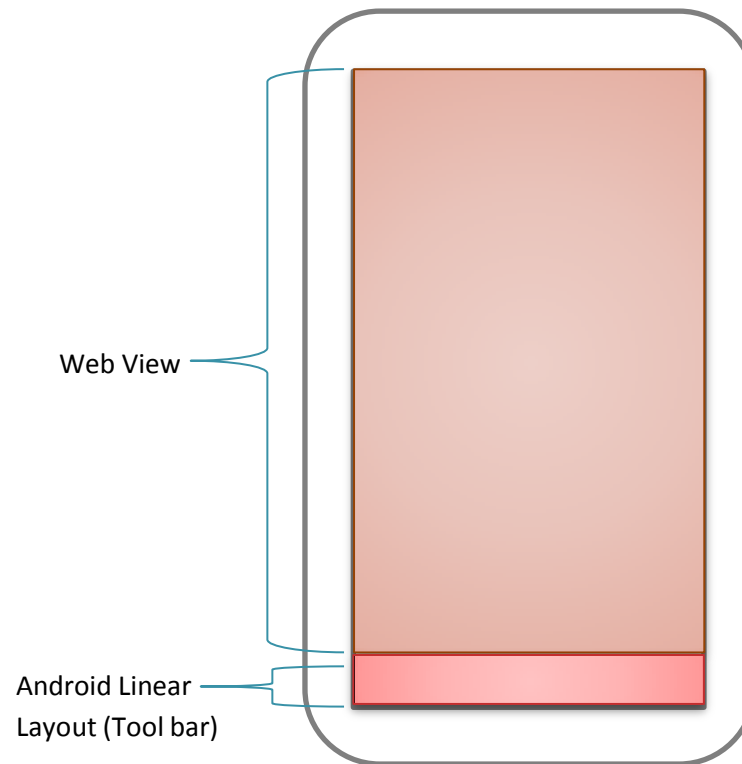
Software Architecture

- Database Design



Software Architecture

- Android App Design



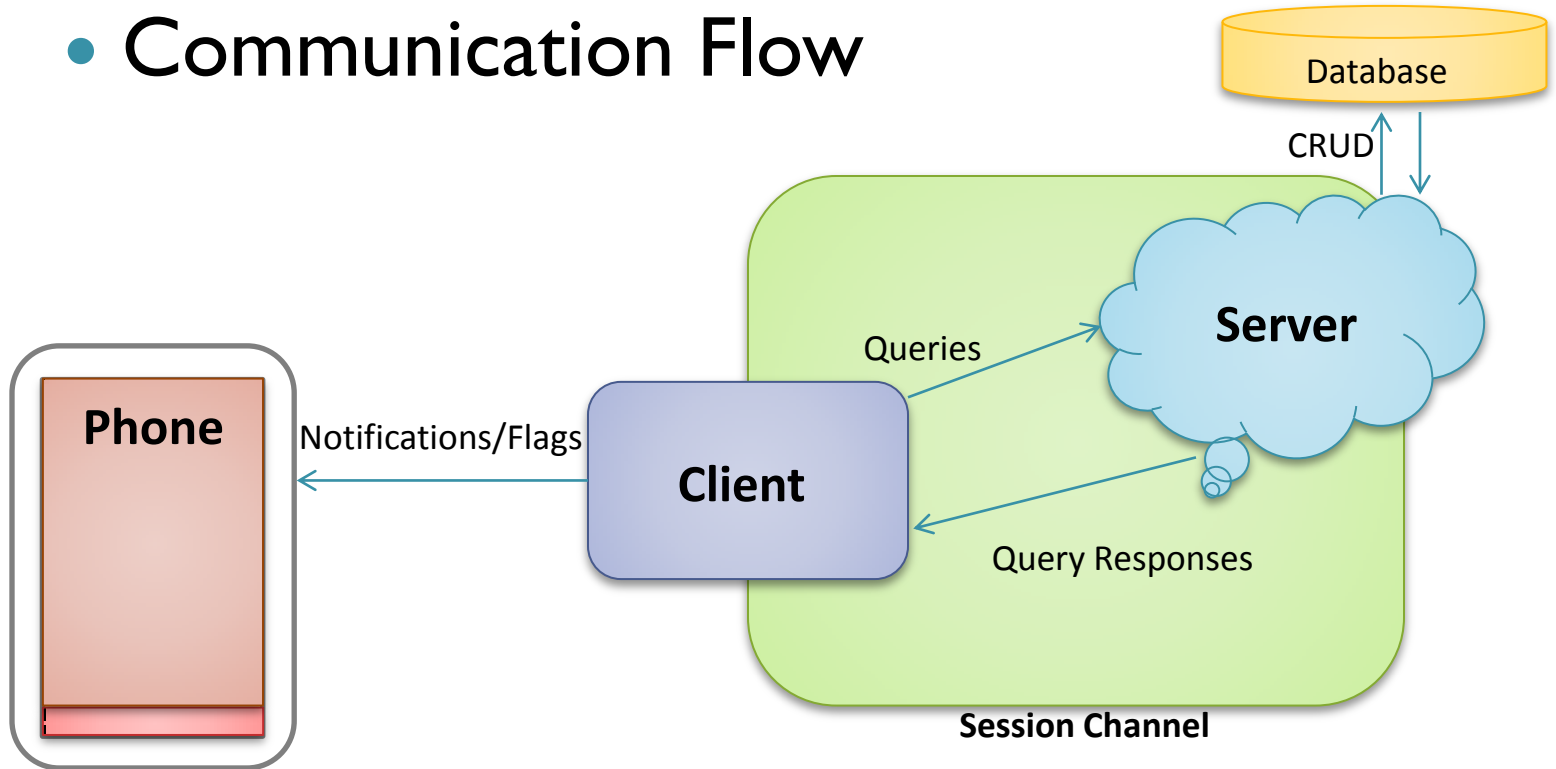
Software Architecture

- Web App Design



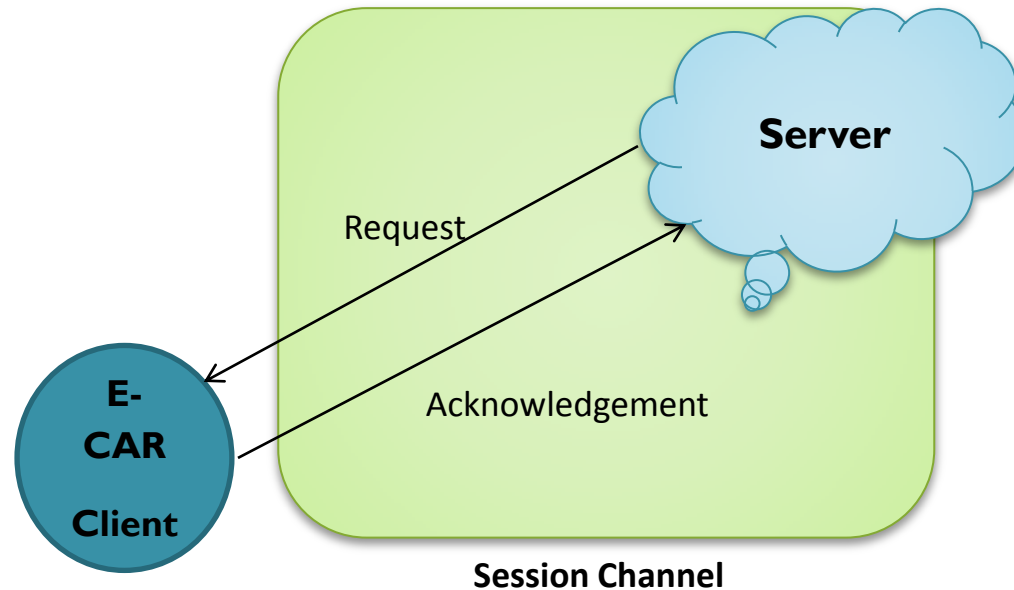
Software Architecture

- Communication Flow



Software Communication

- Communication between E-Car and Server



Software Statistical Analysis

Locations: Car locations at different times.

Column	Data Type	Notes
ECAR_ID	Integer(11)	FK-Locations to ECAR_ID
longitude	double	
latitude	double	
outdoor_temp	Int	
w_condition	varchar(50)	Weather condition as a string
speed	Int	Speed at which car was going
work_location	bool	
home_location	bool	
post_time	datetime	

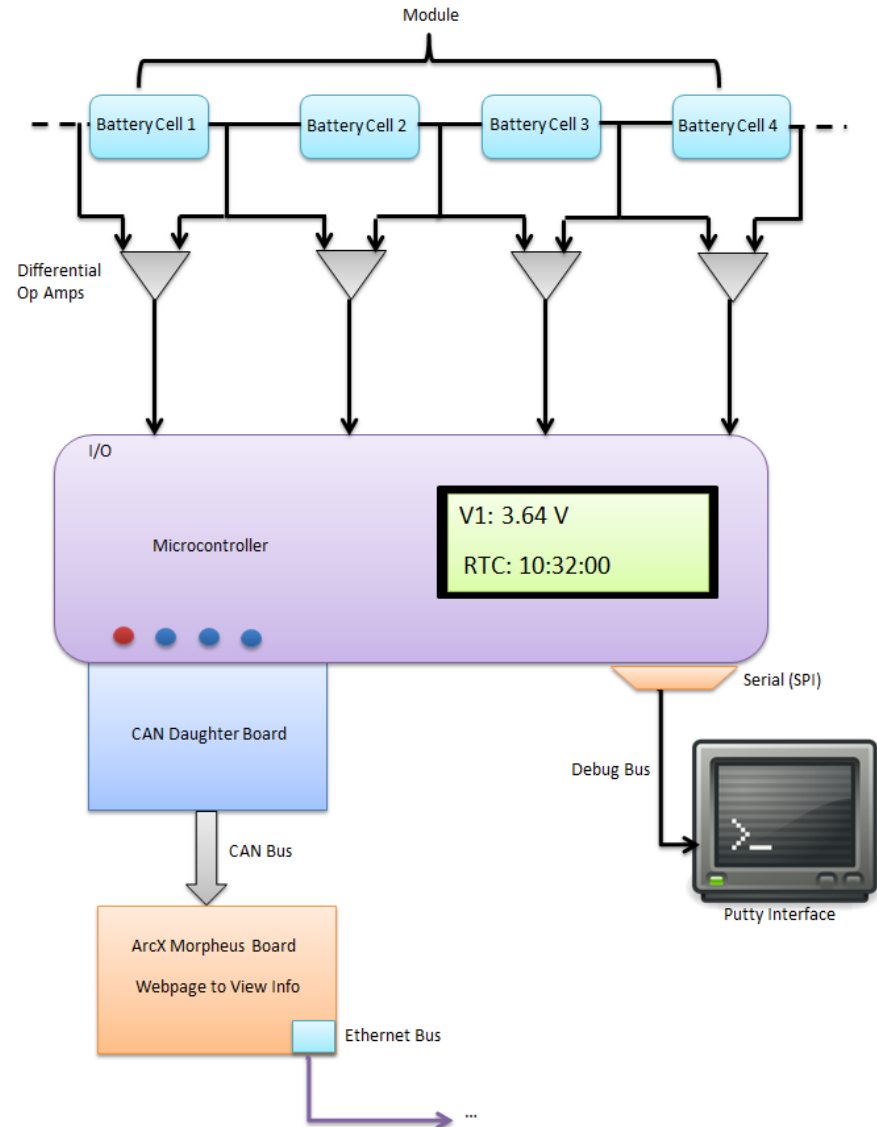
Software Statistical Analysis

Batteries: the battery of the car. Each battery contains 24 modules with 4 cells each.
The battery table uses the ECAR_ID as a foreign key to for data requests.

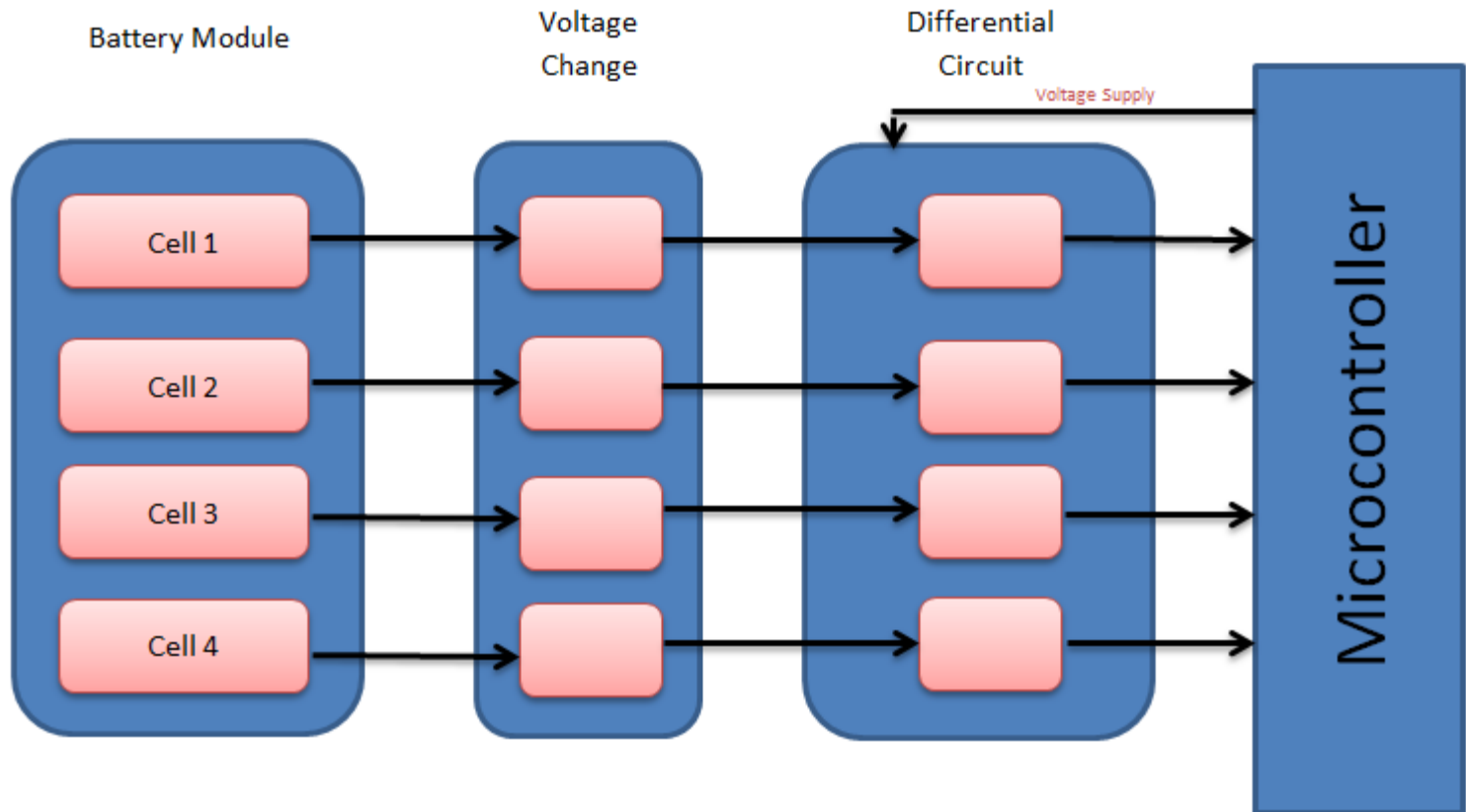
Column	Data Type	Notes
BATTERY_ID	Integer(11)	Primary key
ECAR_ID	Integer(11)	FK-Cars to ECAR_ID
soc	double	
mode	INT	
state	INT	
faultmap	INT	
Vstate	INT	
voltage	double	
vCellMin	double	
vCellMax	double	
ctMap	INT	
Balancing	Bool	
Current	double	
maxCurrentOut	double	
maxCurrentIn	double	
tState	INT	
cTempMin	double	
cTempMax	double	
pTempMin	double	
pTempMax	double	
discharge	INT	
sensors	INT	

Hardware Overview

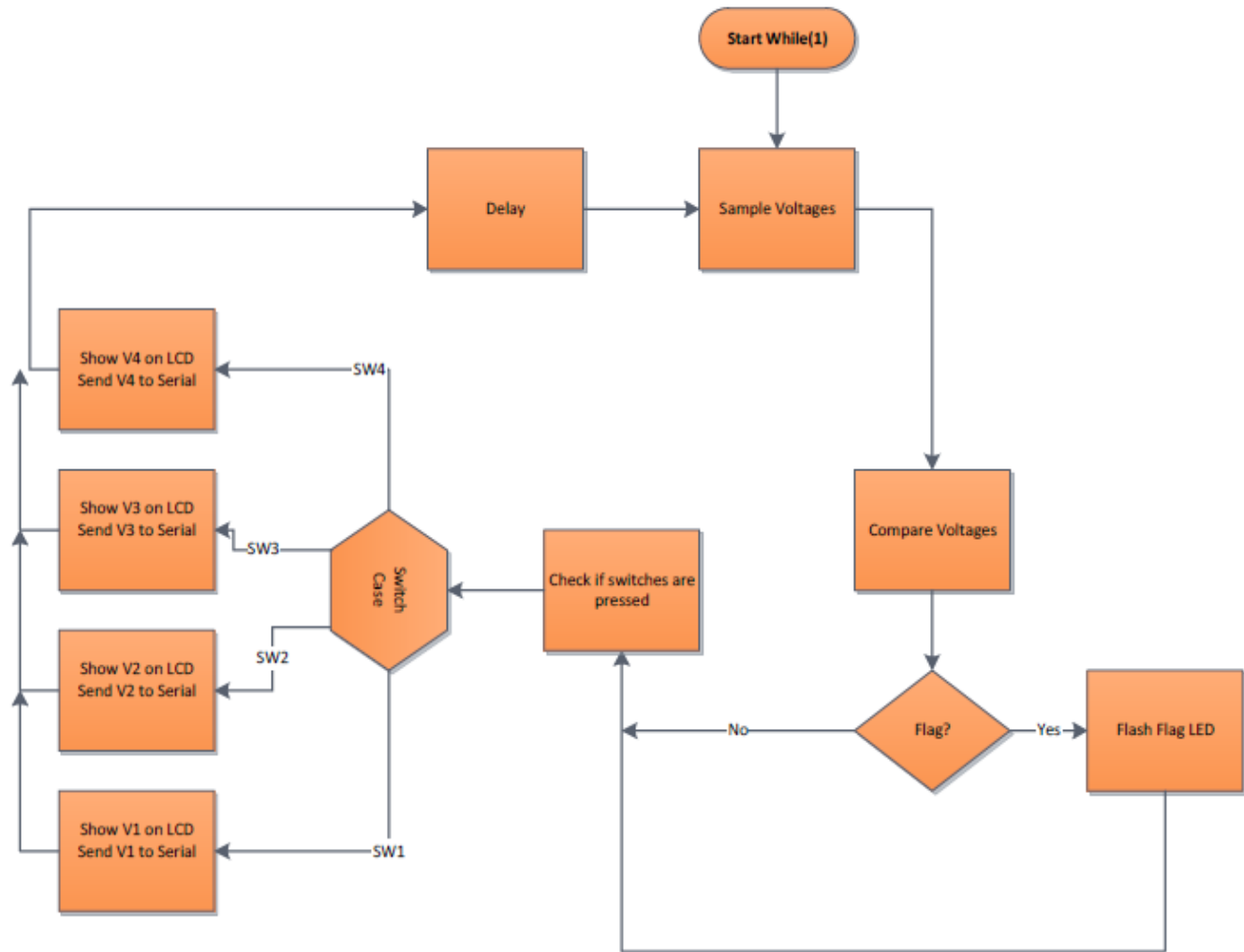
- Hardware Diagram



Battery Simulation



Microcontroller



Communication



- **SPI & CAN Interface**