

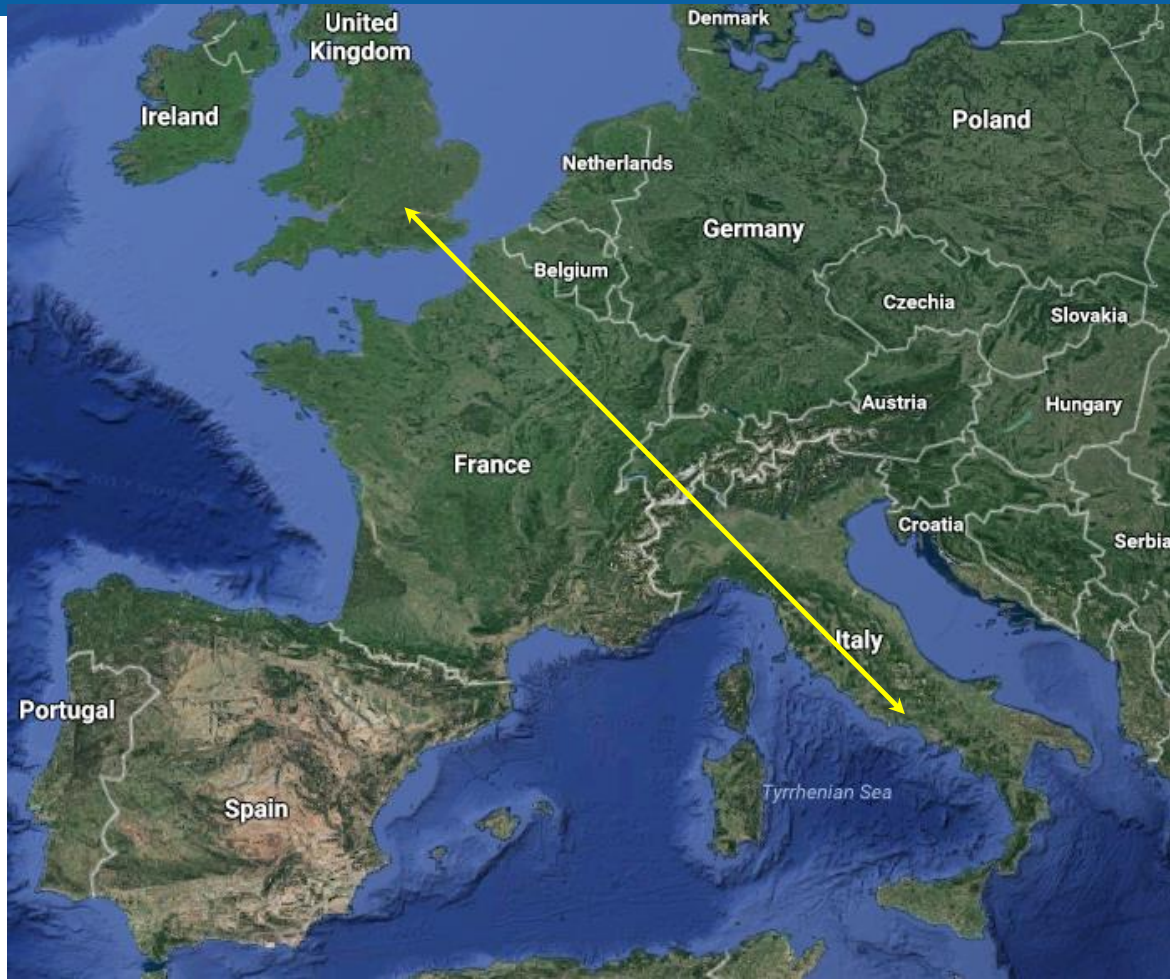


The logo for NIDays Engineer Next is centered on a blue gradient background. It features the text "NIDays" in white, enclosed within a white rectangular border. To the right of this, the words "ENGINEER" and "NEXT" are stacked vertically in a large, bold, white sans-serif font. A yellow graphic element, consisting of three parallel lines forming a stylized arrow or chevron shape, is positioned between the two words. The background is decorated with several diagonal stripes: a wide green stripe, an orange stripe, and a red stripe on the left side; and multiple shades of blue stripes on the right side.

NIDays **ENGINEER**
NEXT



How to Get
from London
to Rome and
Back with just
1 Liter of Gas





To provide Embedded-Platforms so that LabVIEW Users can Leverage Graphical Programming on Custom Hardware and in Series Products

Marco Schmid

Schmid Elektronik AG

Embedded-Specialty Alliance member

marco.schmid@schmid-elektronik.ch



Silver
Alliance
Partner

Embedded Specialty



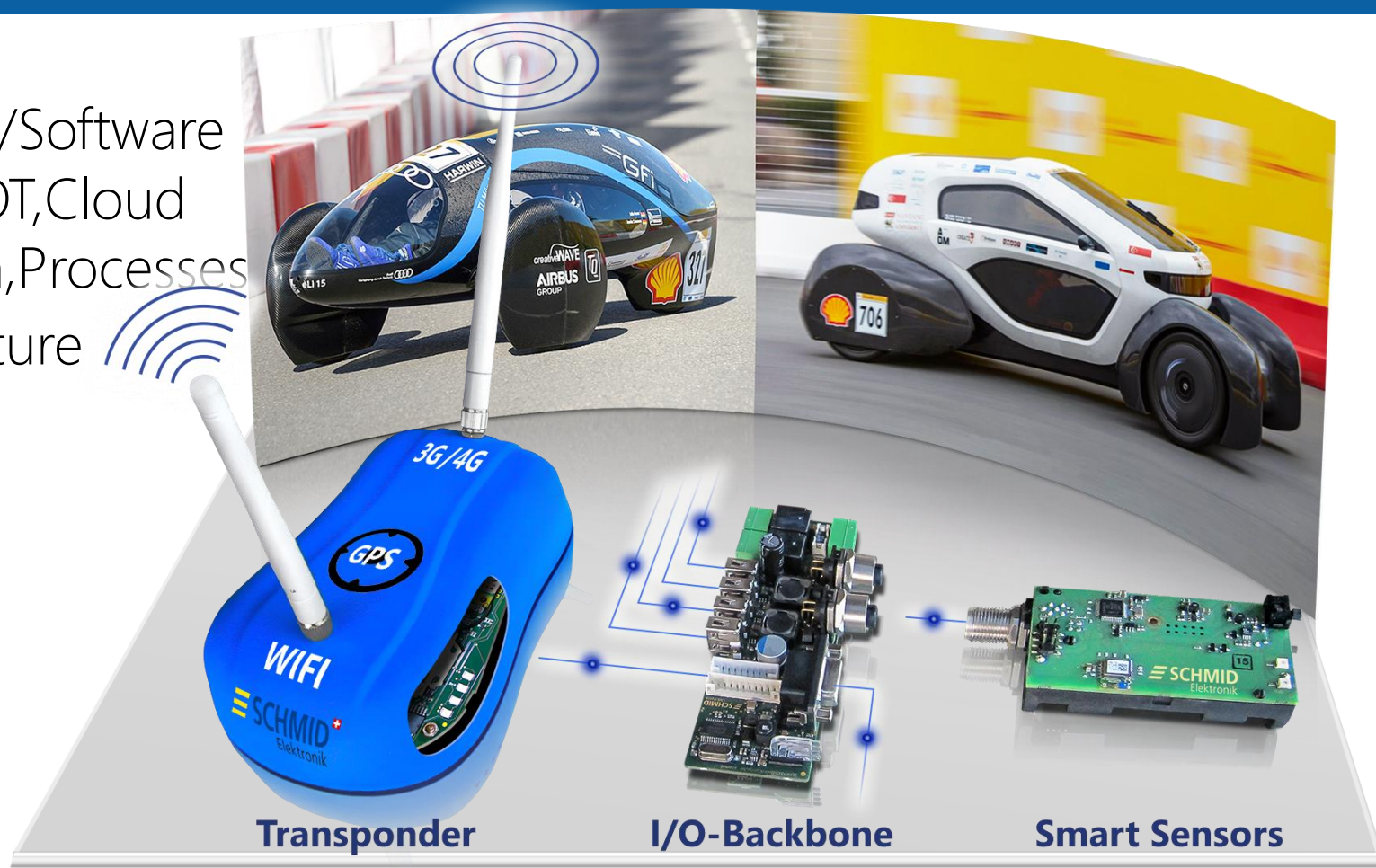
Cool Energy

Hardware/Software

4G, GPS, IOT, Cloud

Tools, Data, Processes

Make the Future



Transponder

I/O-Backbone

Smart Sensors

Cool Energy

Hardware/Software

4G,GPS,IOT,Cloud

Tools,Data,Processes

Make the Future

1



Cool Energy

The **Shell Eco Marathon** at the NIWeek Keynote 2016



from London to Rome and back...(≈ 3700 km)



Or: 20km with a single
tea spoon of fuel

11`000km with **1 Liter** of Gasoline !



drive around
the world for
euro 10.00 ...



Shell
Global

Inside Energy
stories

Careers

Media

Investors



Motorists

Business customers

Energy and innovation

Sustainability

About us

You are in: [Shell Global](#) > [Energy and innovation](#) > [Shell Eco-marathon](#)



SHELL ECO-MARATHON

Shell Eco-marathon challenges student teams around the world to design, build, test and drive ultra-energy-efficient vehicles. Find out more!

SHELL ECO-MARATHON 2018



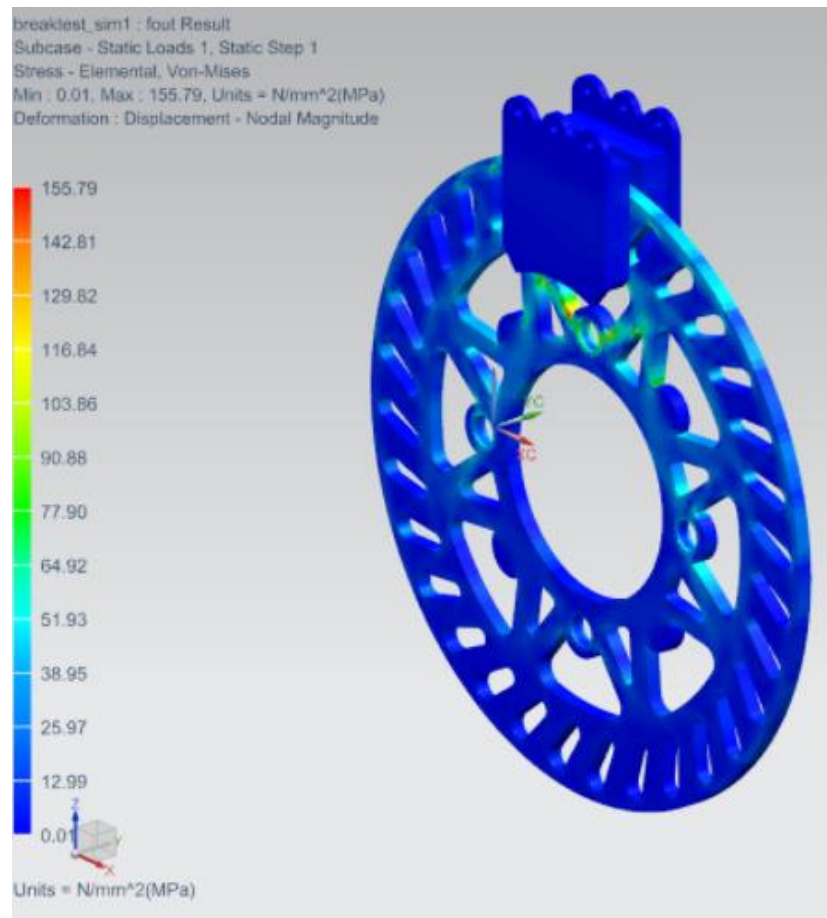
Download: [Shell Eco-marathon 2018
Global Rules Chapter I \(PDF, 1 MB\)](#)



Eco-marathon
JAMES B. DUDLEY HIGH SCHOOL

1-NN7

521





Different Energy types

- **ICE** : Internal Combustion
Petrol, Diesel, Liquid Fuel from Gas/Ethanol
- **BE** : Battery Electric
- **H2** : Hydrogen powered fuel cells

Urban Concept

Prototypes





SOLARCARSOLUTIONS /
ISEN TOULON
FRANCE

701

Shell
Eco-marathon

DRIVERS'
WORLD
CHAMPIONSHIP









Shell
Eco-marathon

DRIVERS'
WORLD
CHAMPIONSHIP

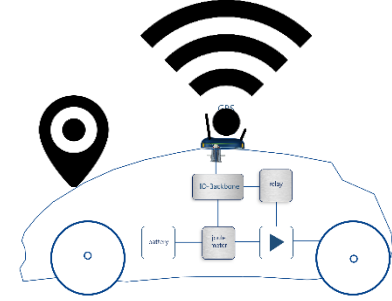
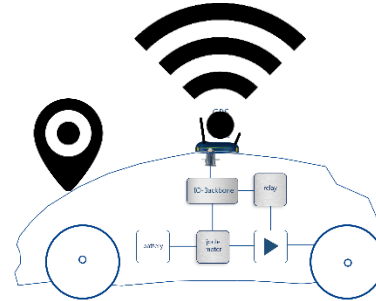
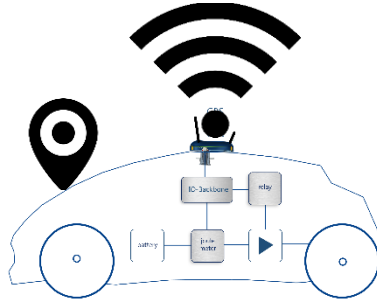
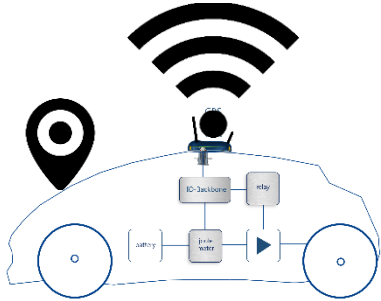
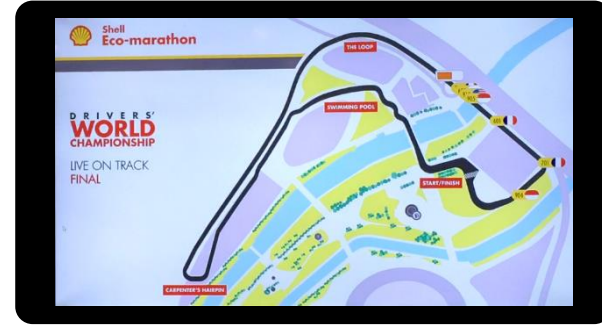
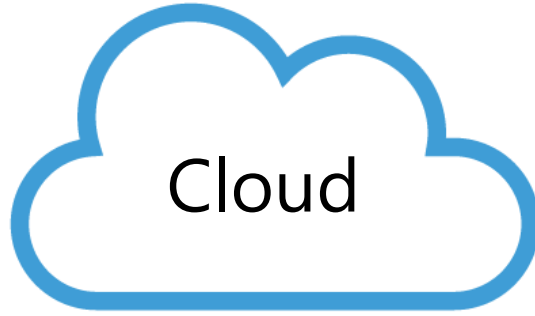


Shell
Eco-marathon

DRIVERS'
WORLD
CHAMPIONSHIP



Tablet

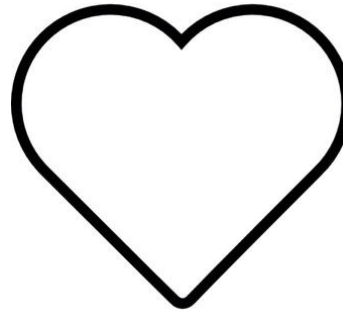




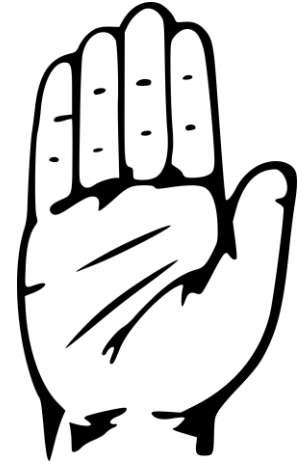
SHELL ECO MARATHON



Competence
Leadership



Motivation
Spirit



High-Tech
Platforms

Cool Energy

Hardware/Software

4G,GPS,IOT,Cloud

Tools,Data,Processes

Make the Future

2

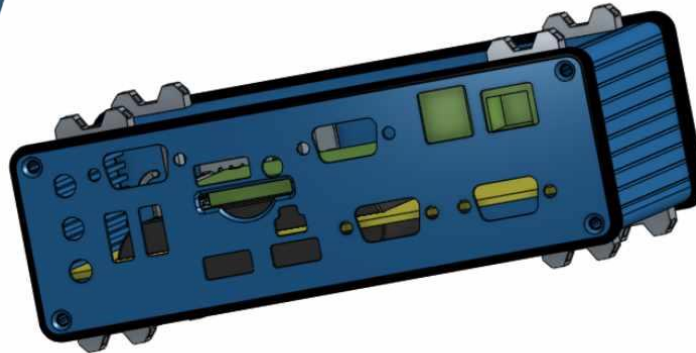
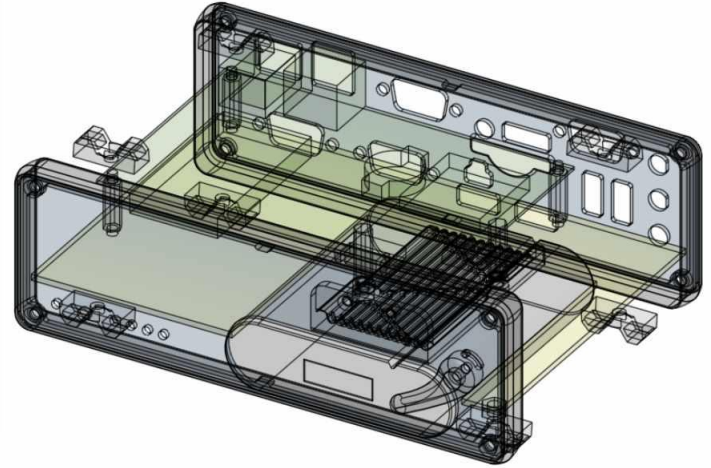
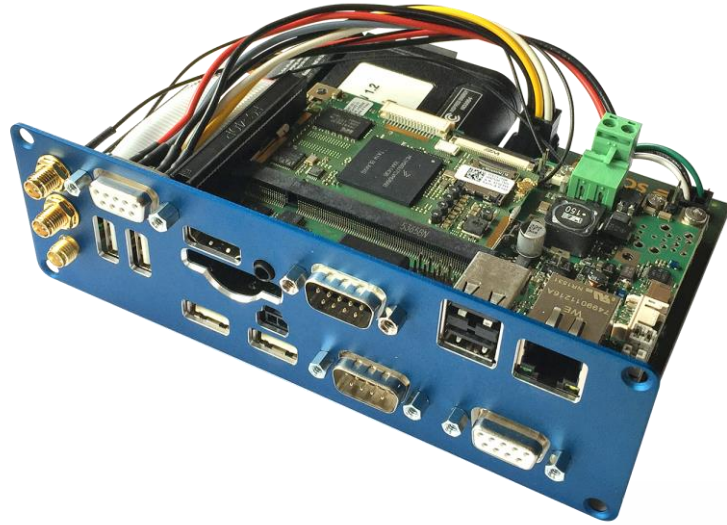
Hardware/Software
4G,GPS,IOT,Cloud
Tools,Data,Processes



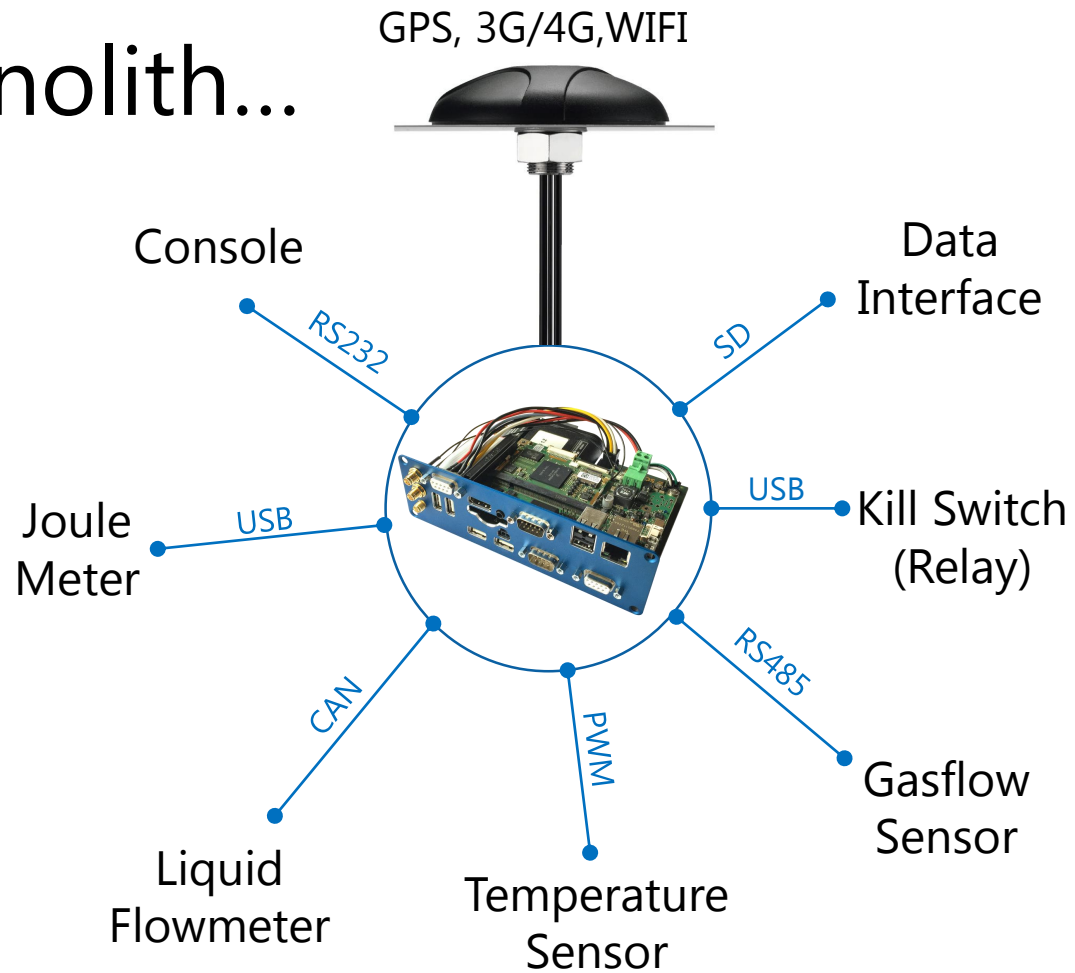
1st Generation



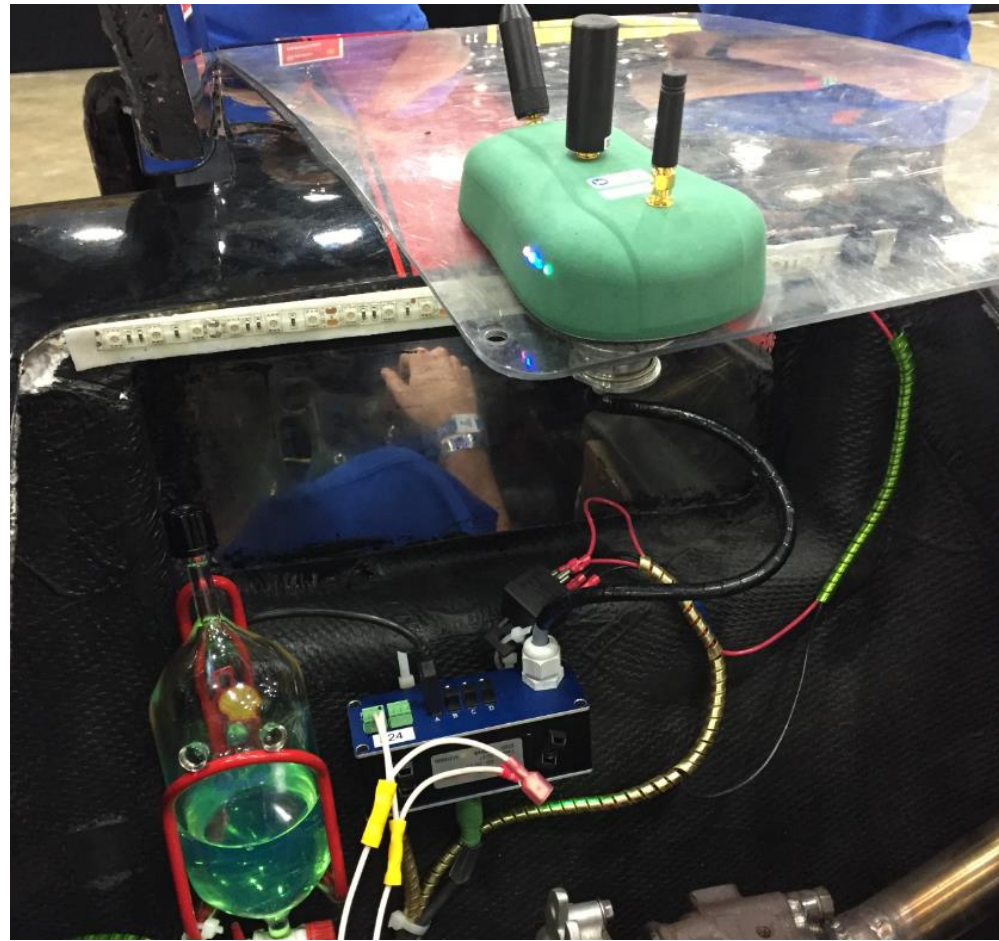
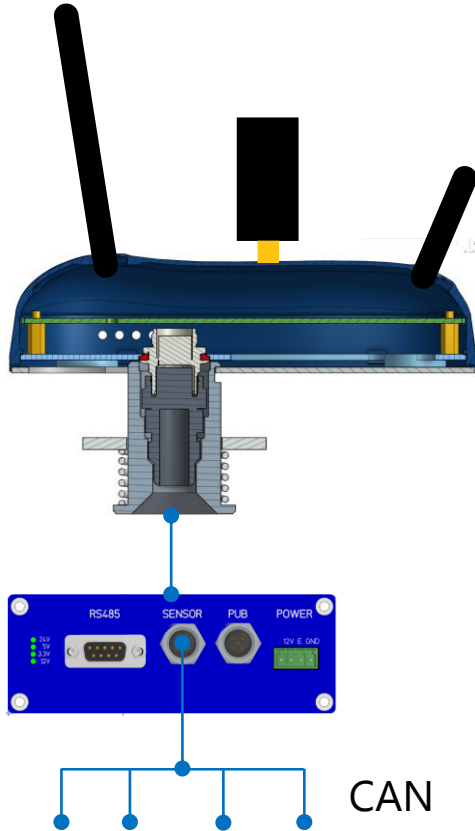
2nd Generation

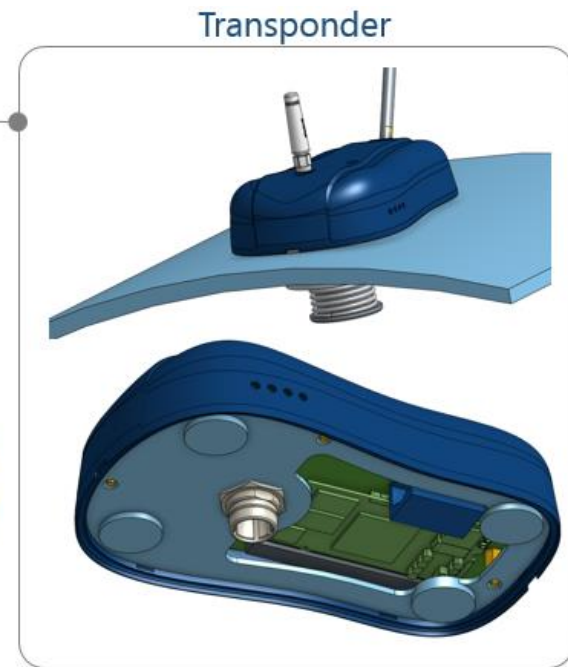
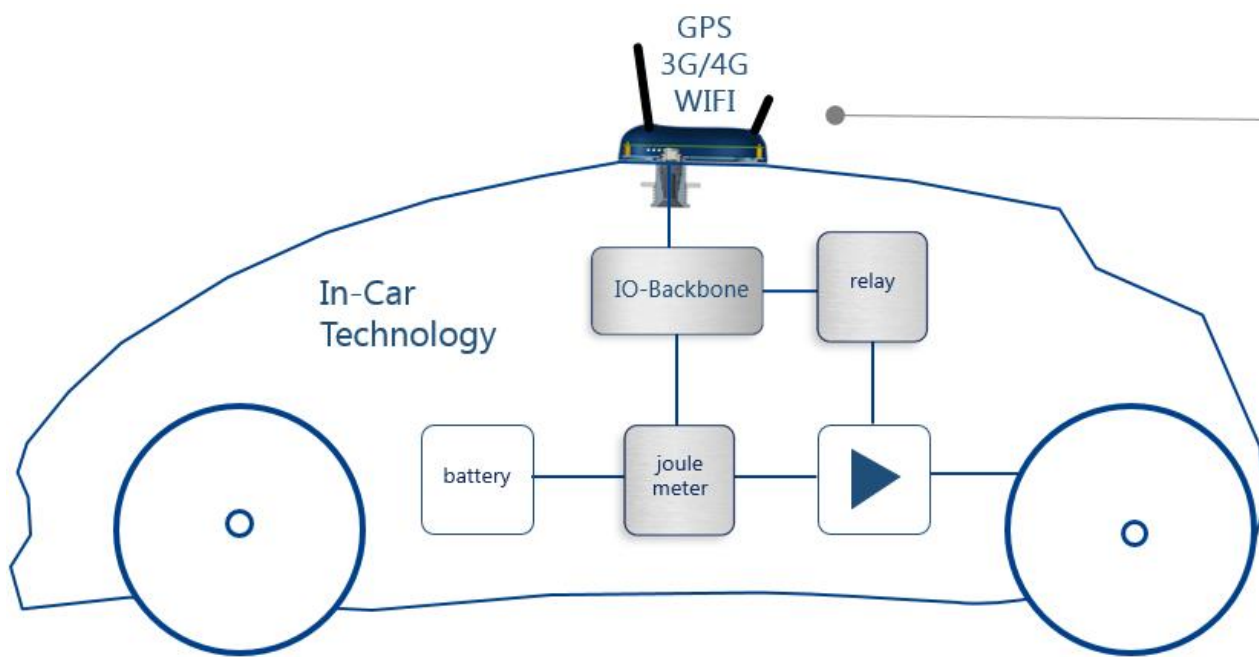


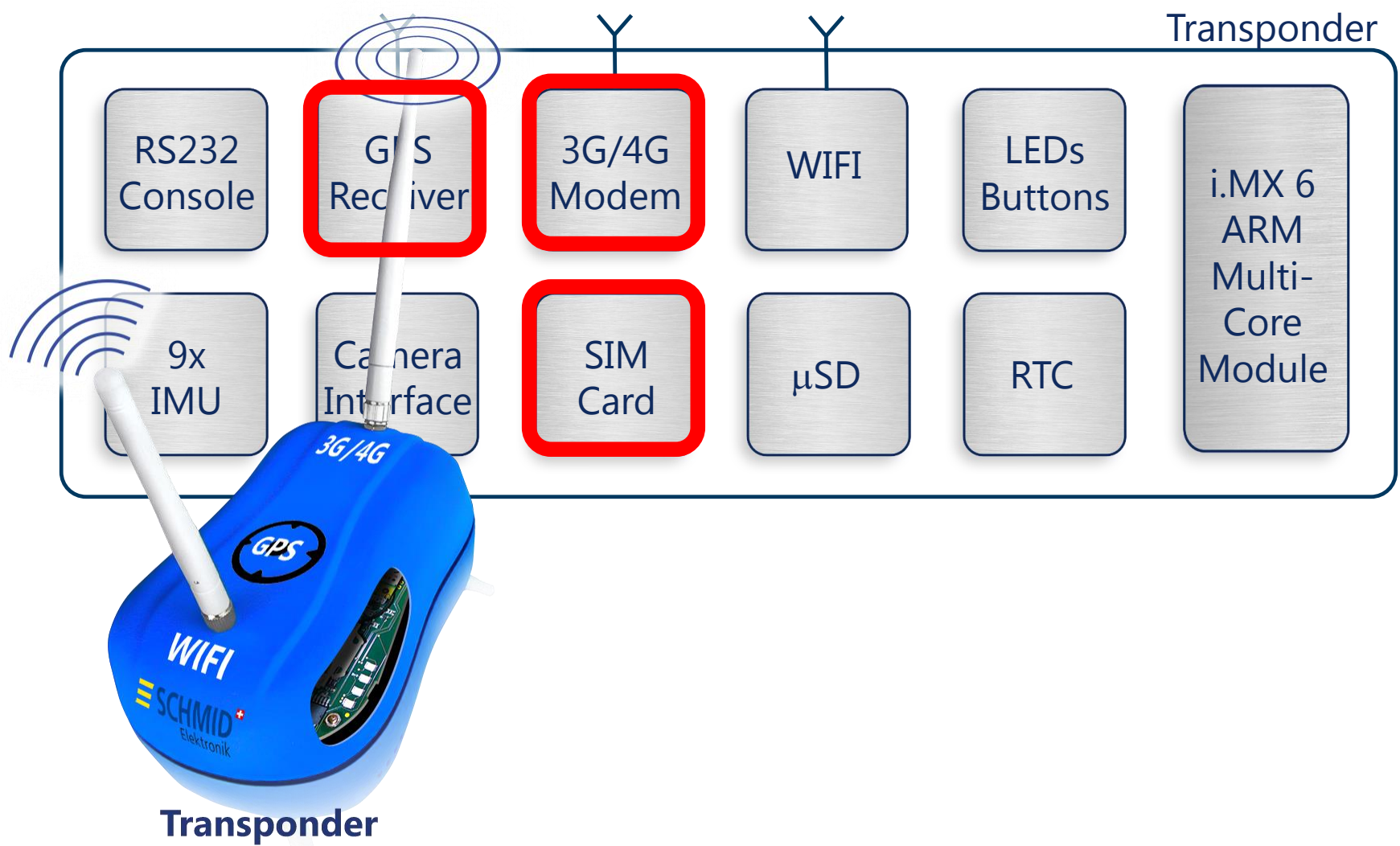
2nd Generation Monolith...

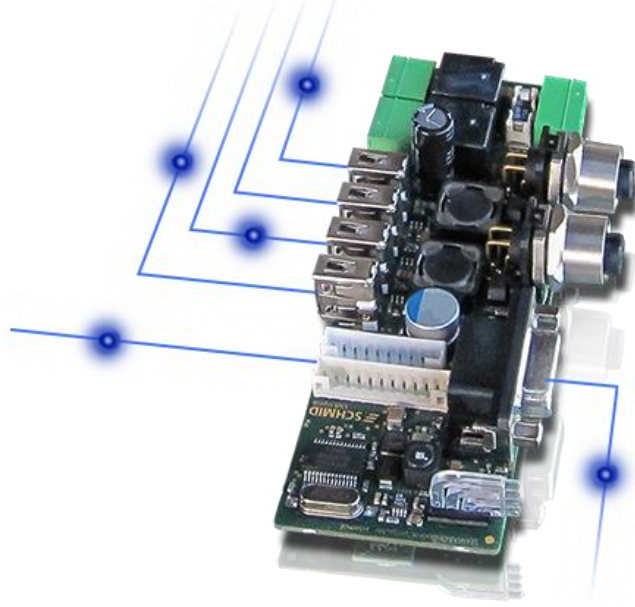


3rd Generation









I/O-Backbone

EEPROM

Relays

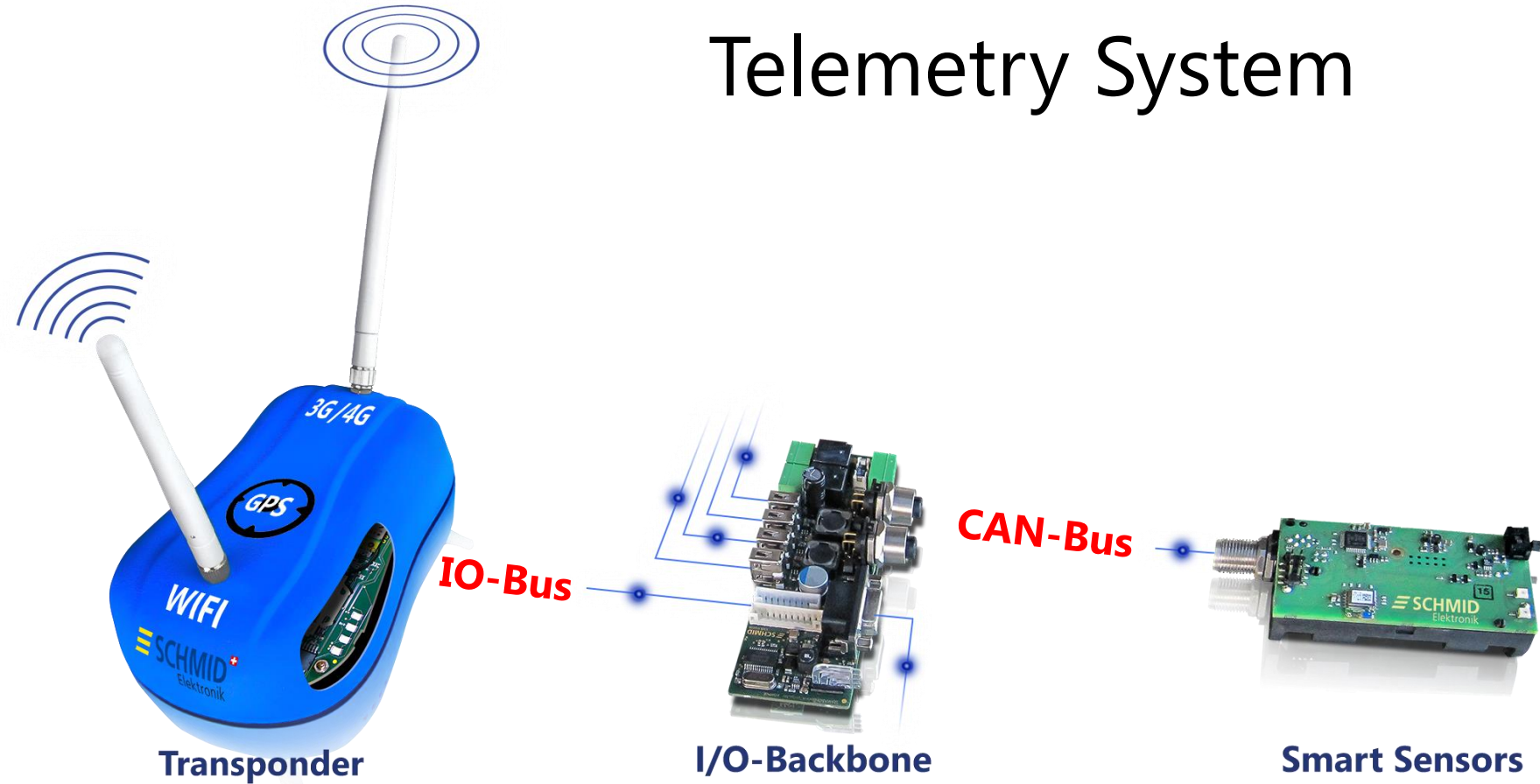
Power
Switches
+Energy
meter

USB

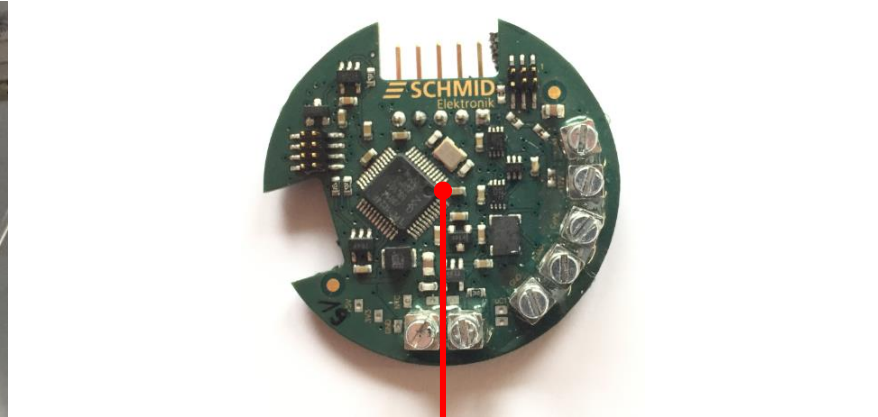
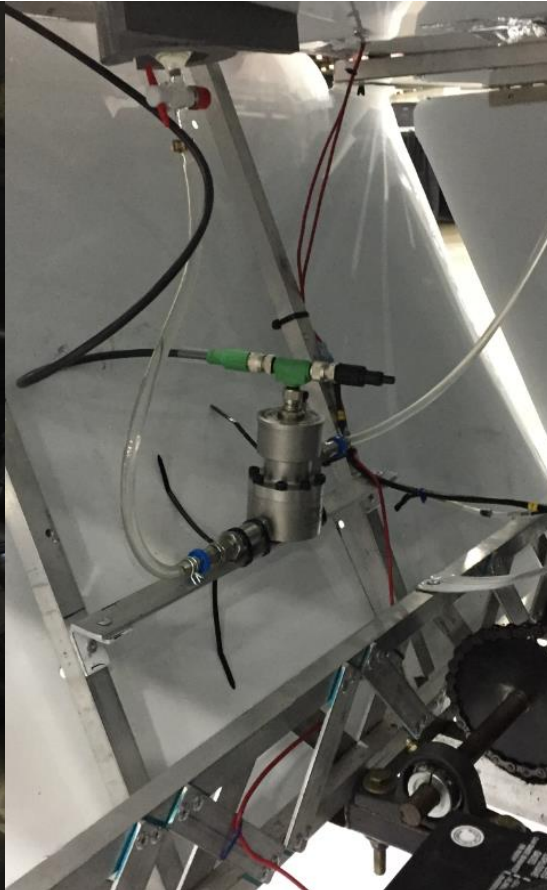
CAN

RS485

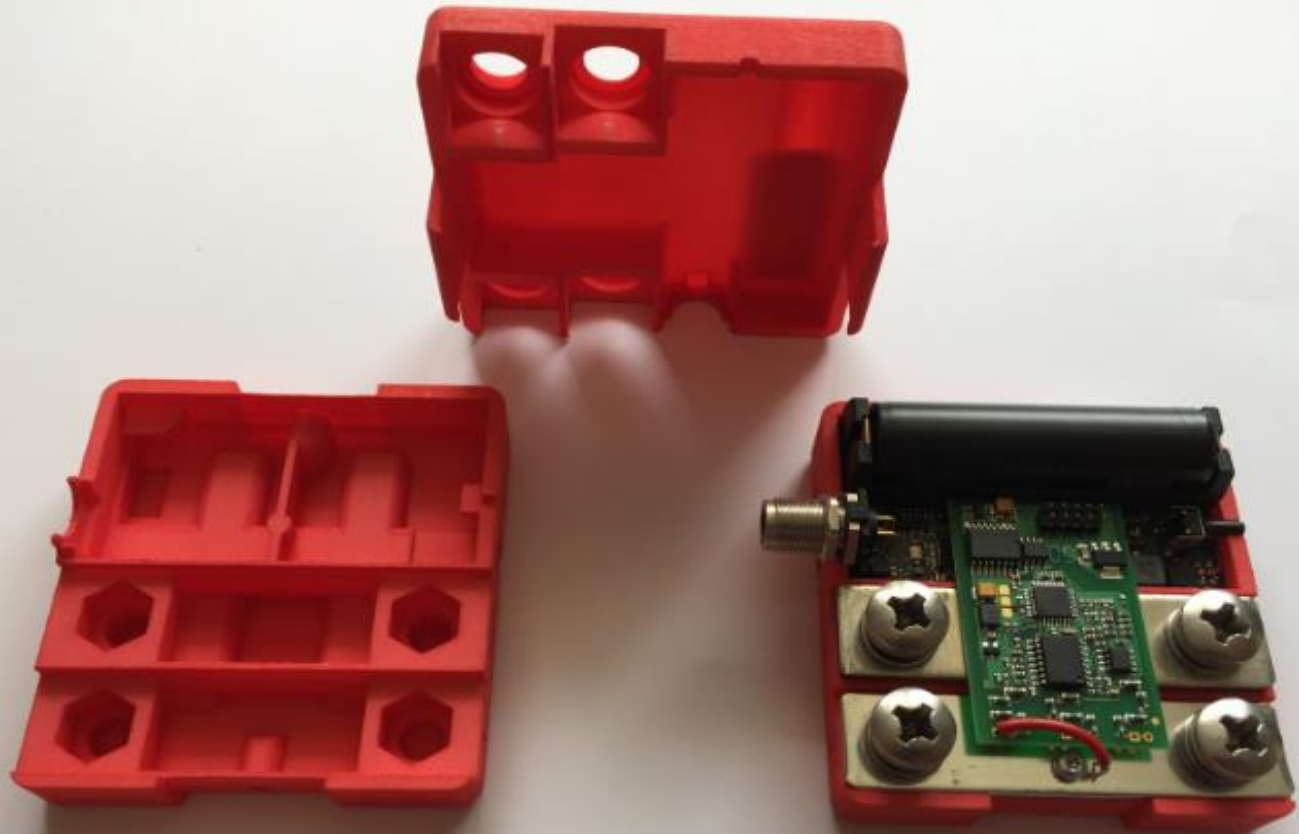
Telemetry System



Smart Sensor Nr. 1 : **Liquid Flowmeter** (ICE Cars)



Smart Sensor Nr. 2 : **Joulemeter** (BE-Cars)





1 ...the mounting hole is drilled for OBC to have 90° Field of View to the sky





Kit Mounting





Troubleshooting





Tech Inspection

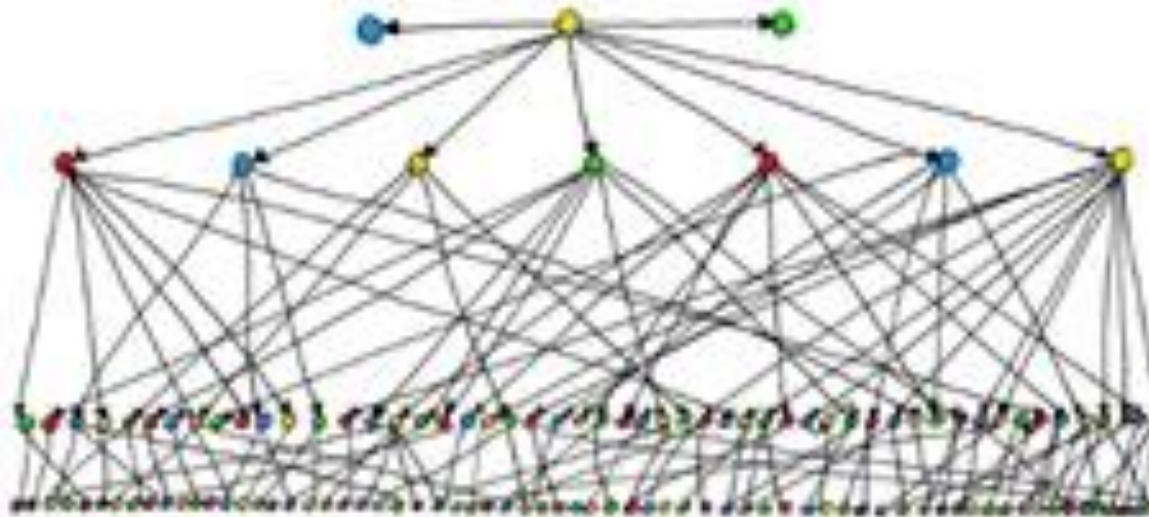


Software: Conways Law

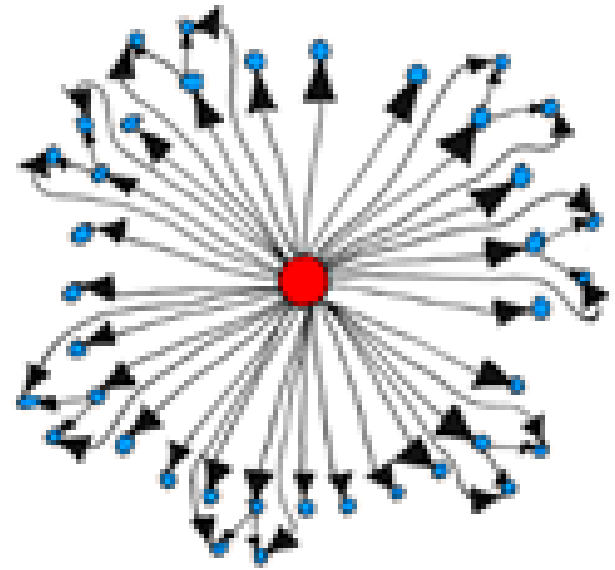
"Any organization that designs a system will inevitably produce a design whose structure is a copy of the organization's communication structure."
Melvin E. Conway



GOOGLE



APPLE





London Amsterdam

Grenoble

India

1990



Spaghetti

2000



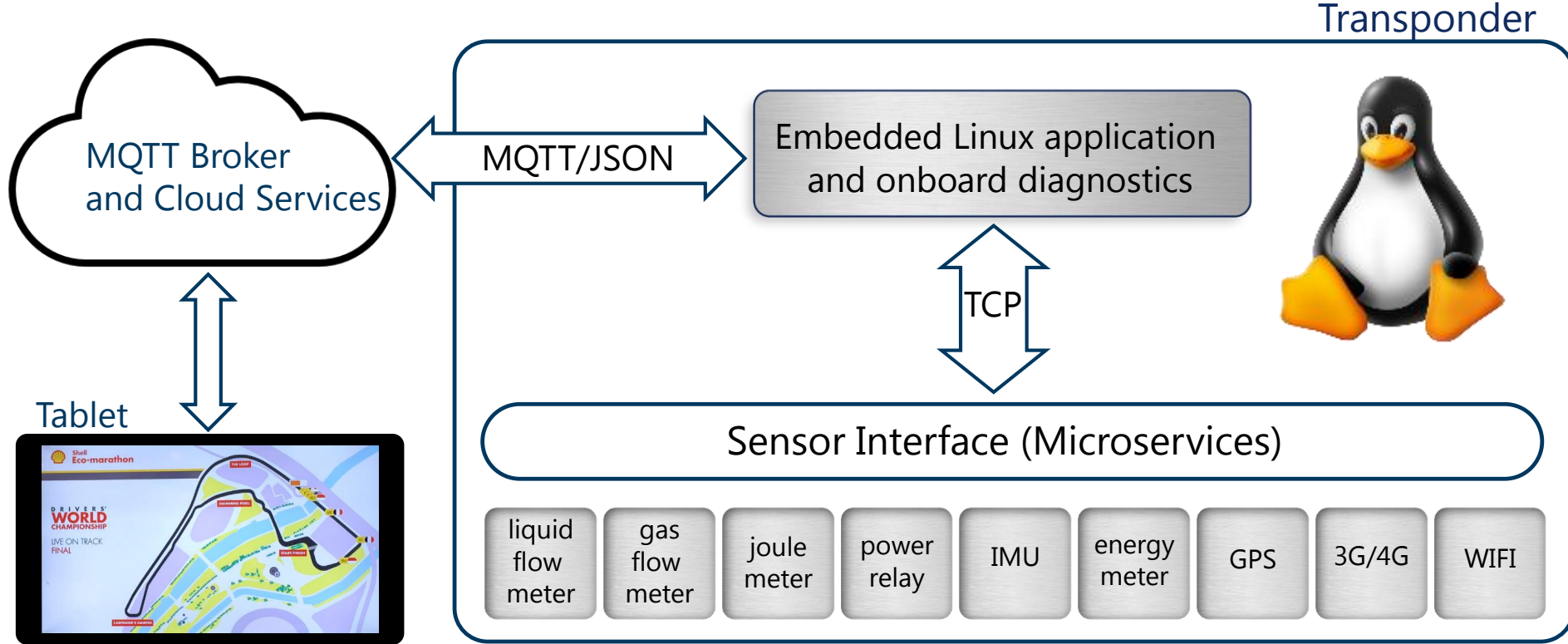
Lasagne

2015

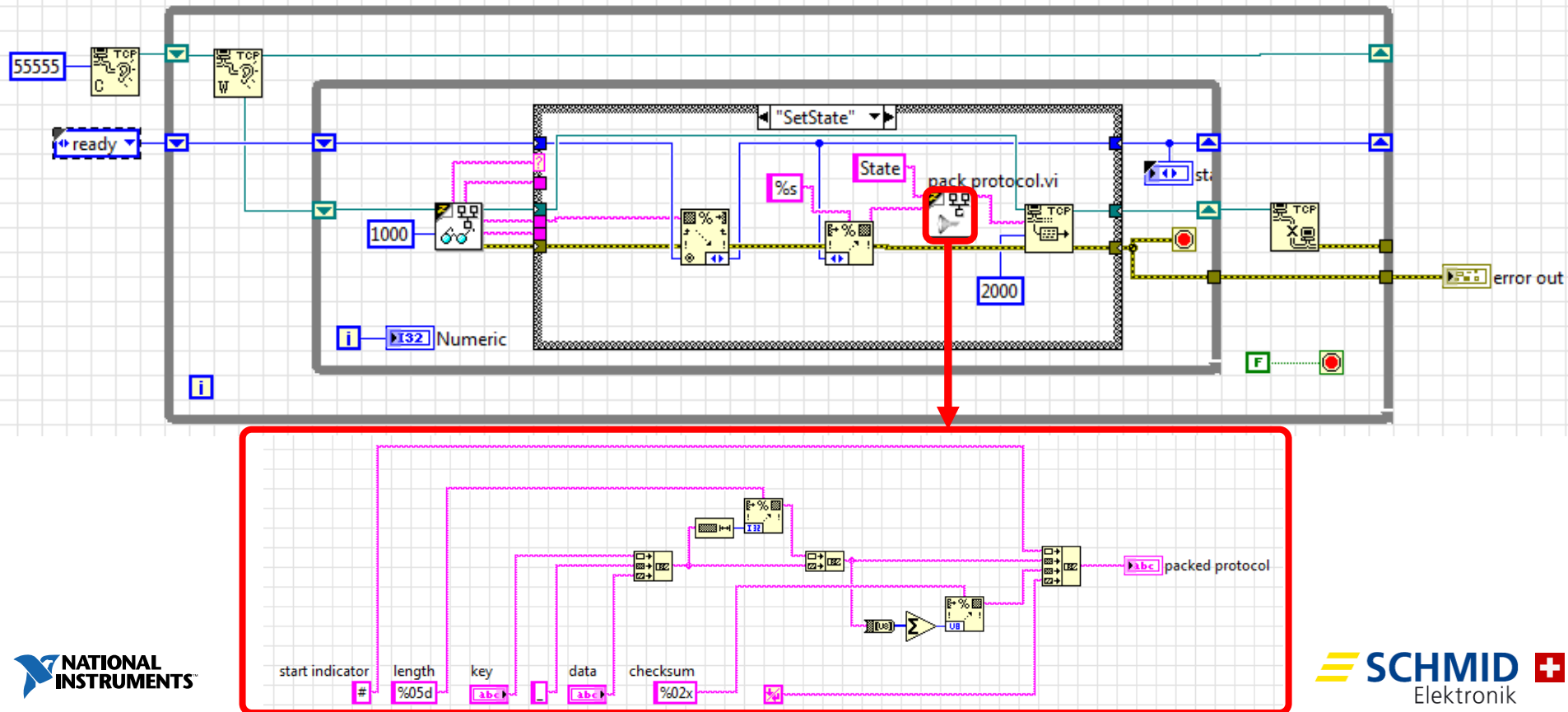


Ravioli

Software Architecture

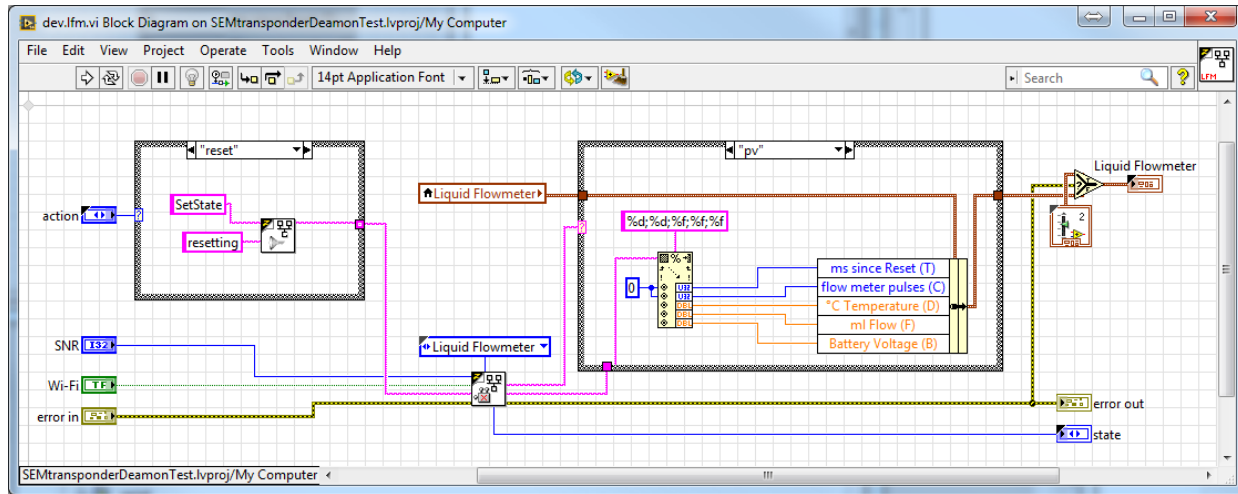
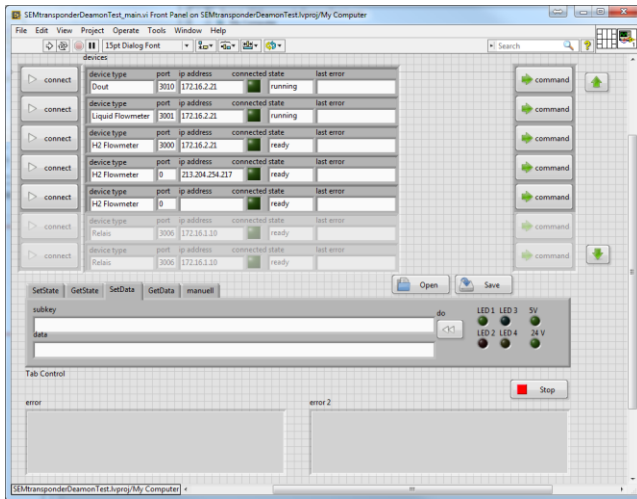


Simulating the sensor Services

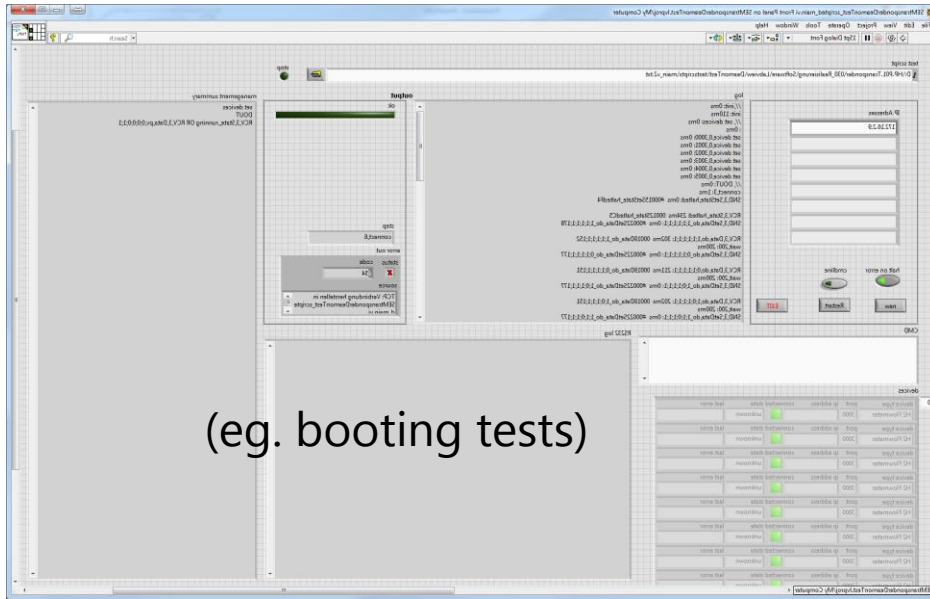


Debugging the Sensor Services

Simulating the Application:



Regression Testing for the sensor services and the whole system



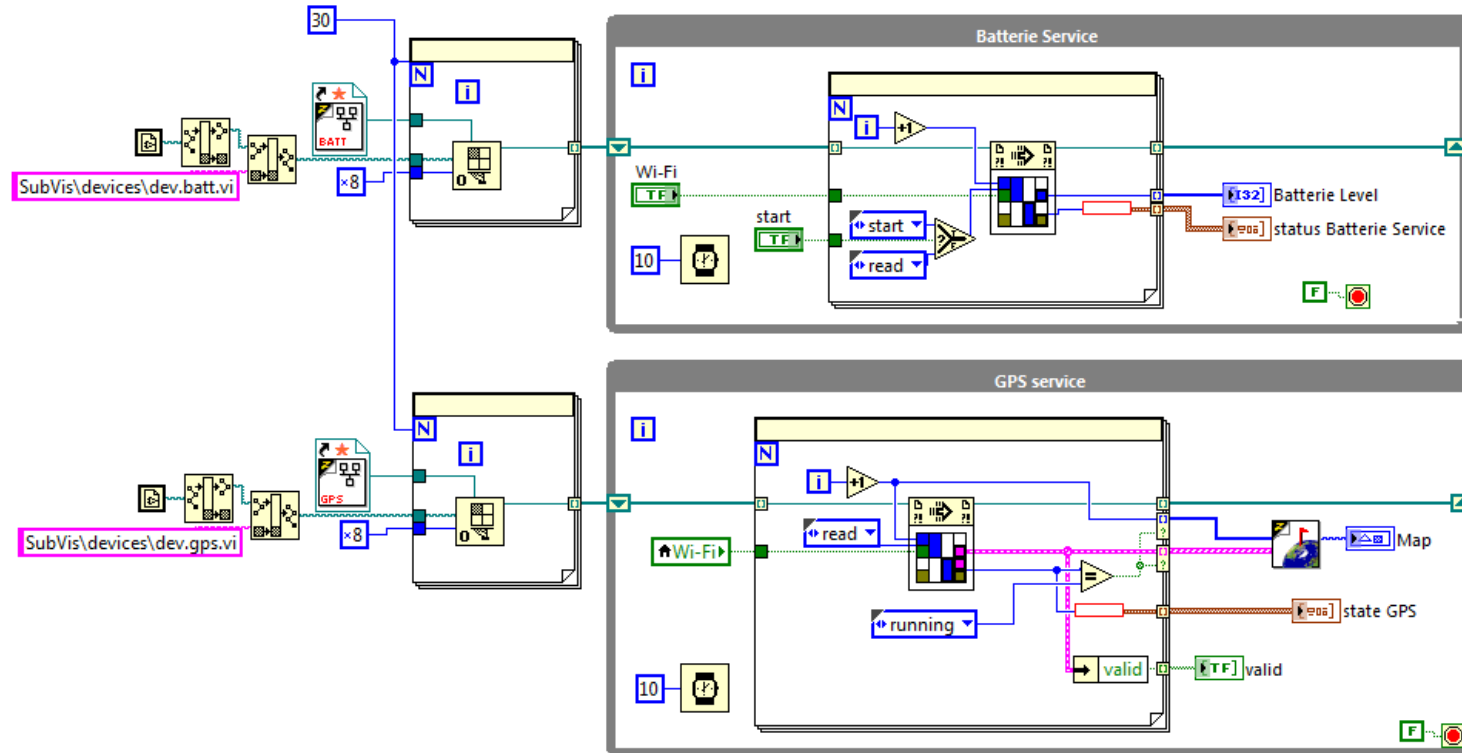
(eg. booting tests)

Scripted test step execution with loops, jumps etc

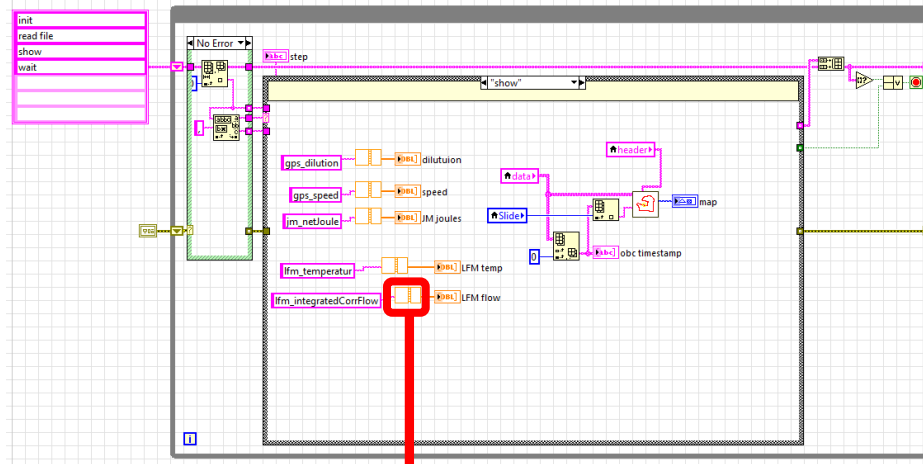
```
//, =====  
//, ===== SEM Regression Test =====  
//, =====  
init  
#LOOP_2#7#  
    set device,0,300#I_2#  
#LOOP_2#  
  
#LOOP_1#1#  
    //, = Test No #I_1# =  
    //, RELAIS,LJ,,Power,0  
    serial open,COM1,115200  
    wait,1000  
    //, RELAIS,LJ,,Power,1  
    //, wait,60000  
  
    //, * Login  
#LOOP_3#2#  
    serial write,COM1,imx6  
    wait,2000  
#LOOP_3#  
    serial write,COM1,cd Services  
    wait,40  
  
//, == Basic Tests  
#include#inc\H2FlowService.inc#  
#include#inc\LiquidFlowService.inc#  
#include#inc\DoutService.inc
```

...

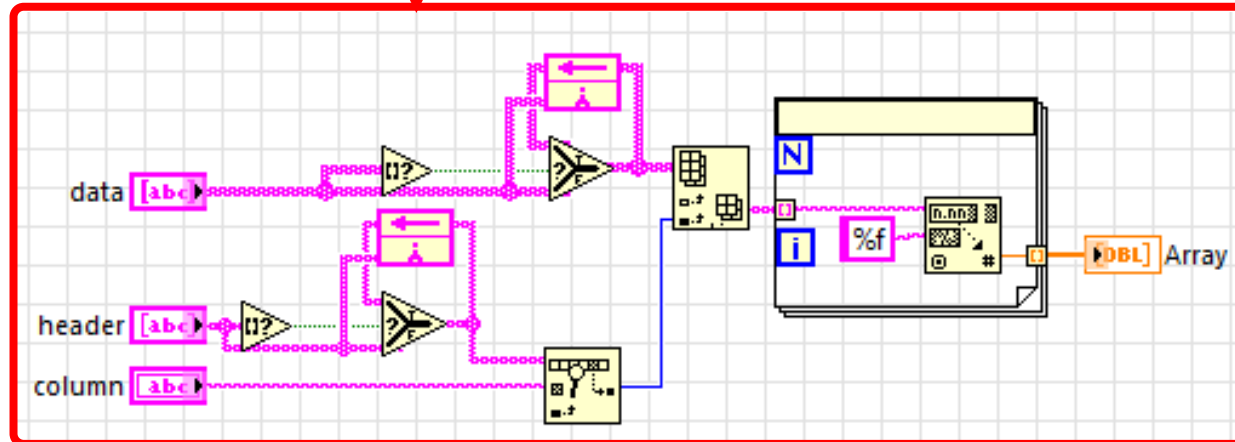
Scanning the GPS-Location + Battery Status

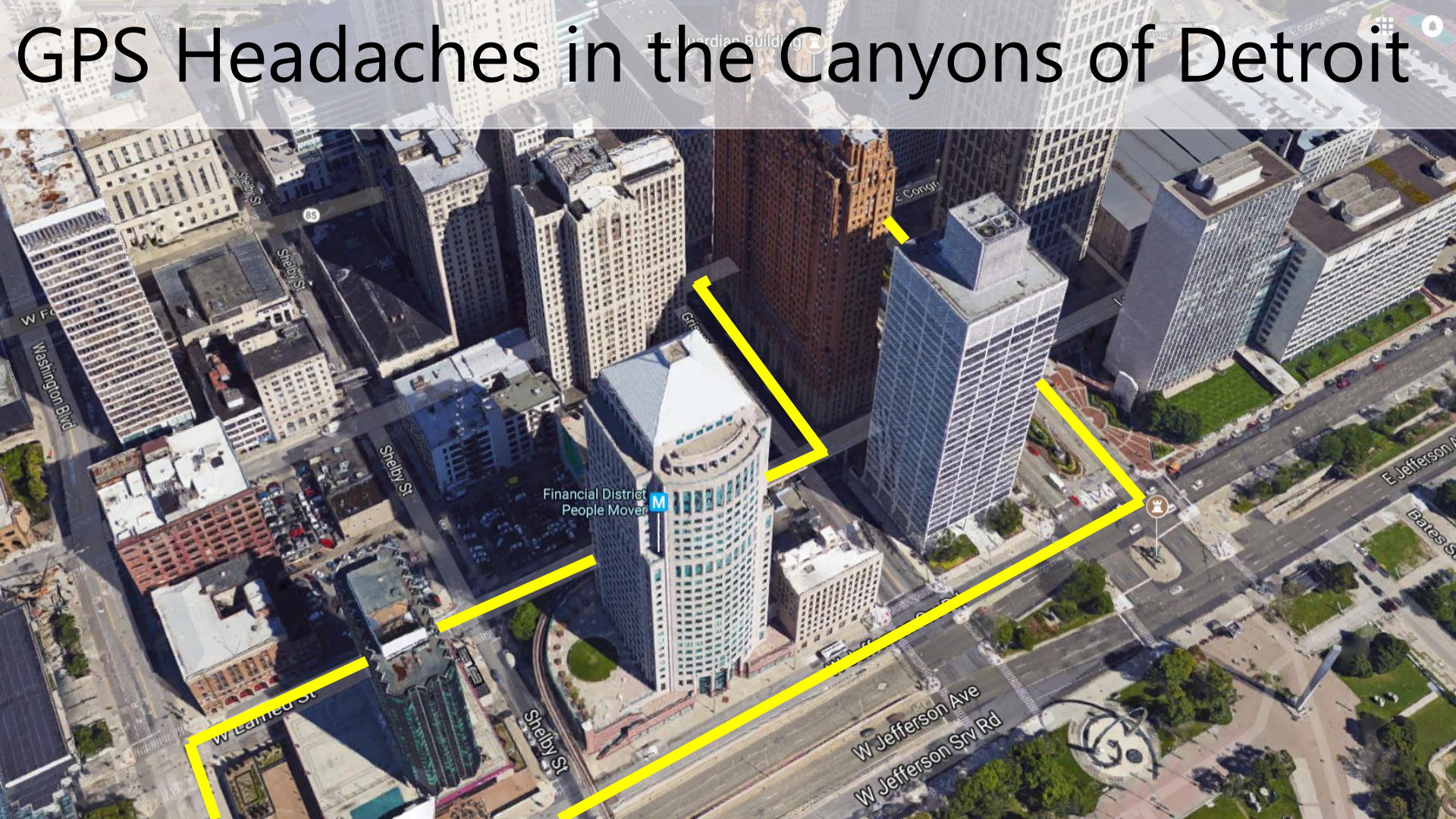


Queued State Machine

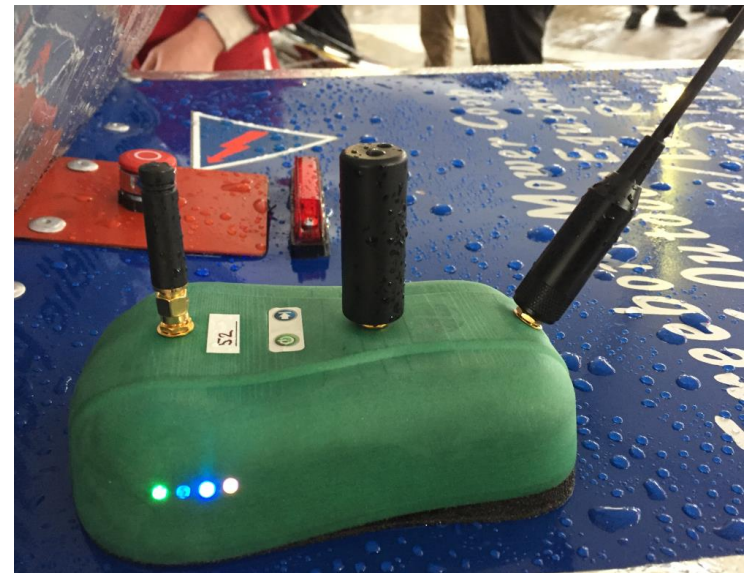


+Functional Global

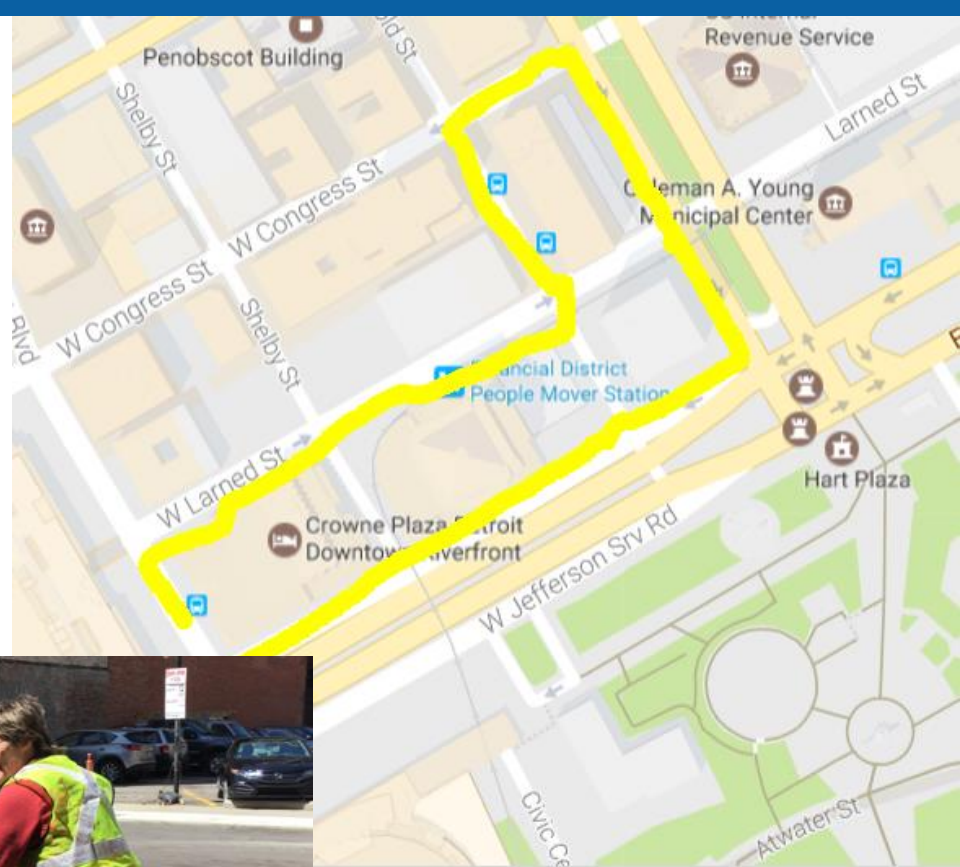




GPS Headaches in the Canyons of Detroit



BAD 😞

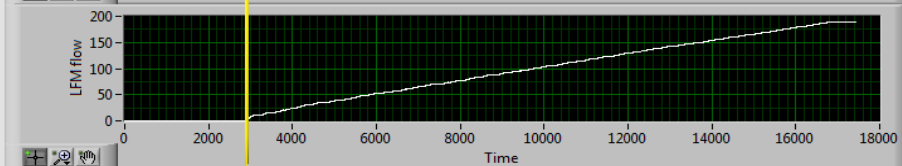
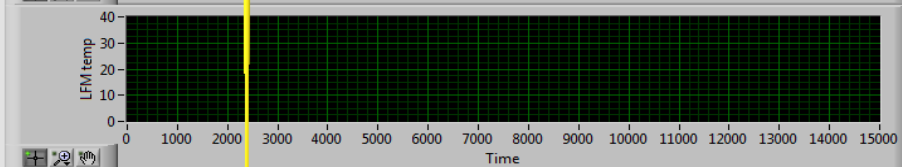
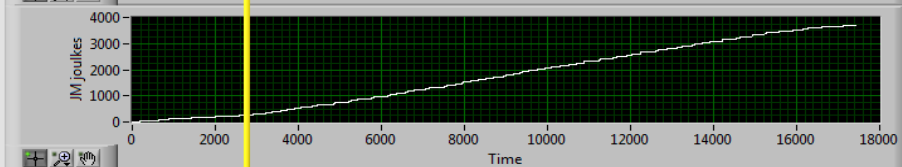
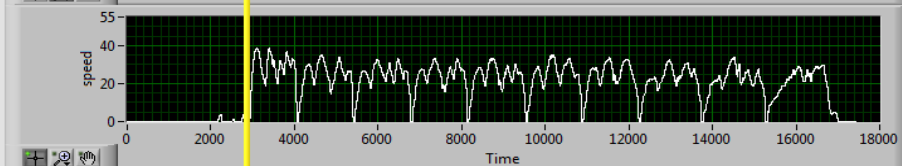
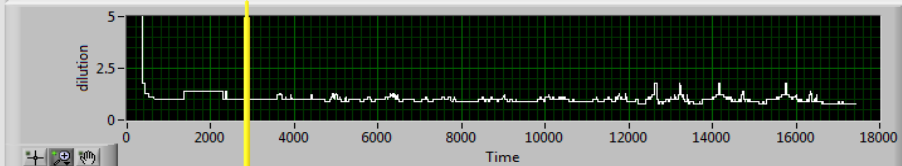


GOOD 

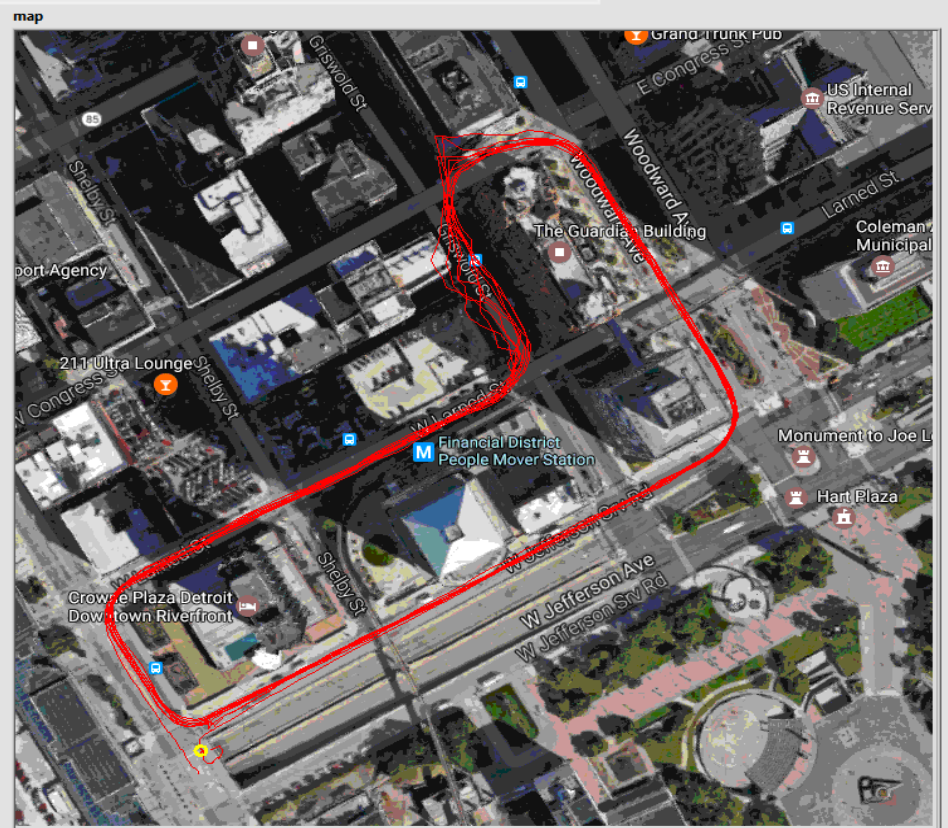
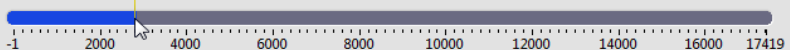




P:\Kundenprojekte\SH.Shell\logs\201704Detroit\20170430_milage3\entzipped\logd_504_20170430_1304\obd_504_201704_30_1234_19.log



Slide



Onsite Optimizing the Smoothing Algorithm

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Northwest corner reference:													
2	Lat	Long												
3	42.330326	-83.048921												
4														
5	Lat	Long	X	Y	Distance to next reference point									
6	42.327431	-83.04805	71.59589854	321.8938253	4.951975812									
7	42.32744	-83.047991	76.44570798	320.8931191	94.15680838									
8	42.327871	-83.047005	157.4945738	272.9704114	125.1178556									
9	42.328444	-83.045695	265.1760778	209.2587838	22.32166974									
10	42.328542	-83.045458	284.6573898	198.3622053	48.7056936									
11	42.328765	-83.044948	326.5792086	173.5669296	4.288261913									
12	42.328798	-83.044921	328.7986118	169.8976736	7.596999821									
13	42.328866	-83.04493	328.0587942	162.3367824	156.6666341									
14	42.330078	-83.045902	248.1607322	27.57501508	3.271091957									
15	42.330092	-83.045937	245.2837771	26.018361	7.904752643									
16	42.330077	-83.046031	237.5569788	27.68620461	47.57201134									
17	42.329847	-83.046519	197.4435508	53.25980738	3.229479188									
18	42.329822	-83.046539	195.7995969	56.03954682	7.411934592									
19	42.329757	-83.046519	197.4435508	63.26686928	79.82191719									
20	42.329084	-83.046181	225.2270345	138.0974546	4.276065344									
21	42.329046	-83.046189	224.5694733	142.3226585	6.617768482									
22	42.329013	-83.046256	219.0620765	145.9919145	212.9733507									
23	42.327993	-83.048449	38.79822558	259.405283	3.780063743									
24	42.327964	-83.048473	36.825538	262.6297808	9.874767079									
25	42.32788	-83.048434	40.03128842	271.9697052	55.98165952									
26	42.327454	-83.048071	69.86979157	319.336465	3.085374669									
27														
28														
29														

	Lat	Long	X	Y	Closest node ID
Start line	42.32751263	-83.04783362	89.48646	313.1824	4
Finish line	42.32760467	-83.04819752	59.53908	302.9371	176
Lap line	42.32751263	-83.04783362	89.48646	313.1824	4
	42.3271819	-83.04466804	350	350	

P > 504



OK

QUAL MODE

MAP

ALLOWANCE: ☐

LEVEL:

GPS

VALIDITY:

UTC TIME:

LATITUDE:

LONGITUDE:

FIX QUALITY:

DILUTION:

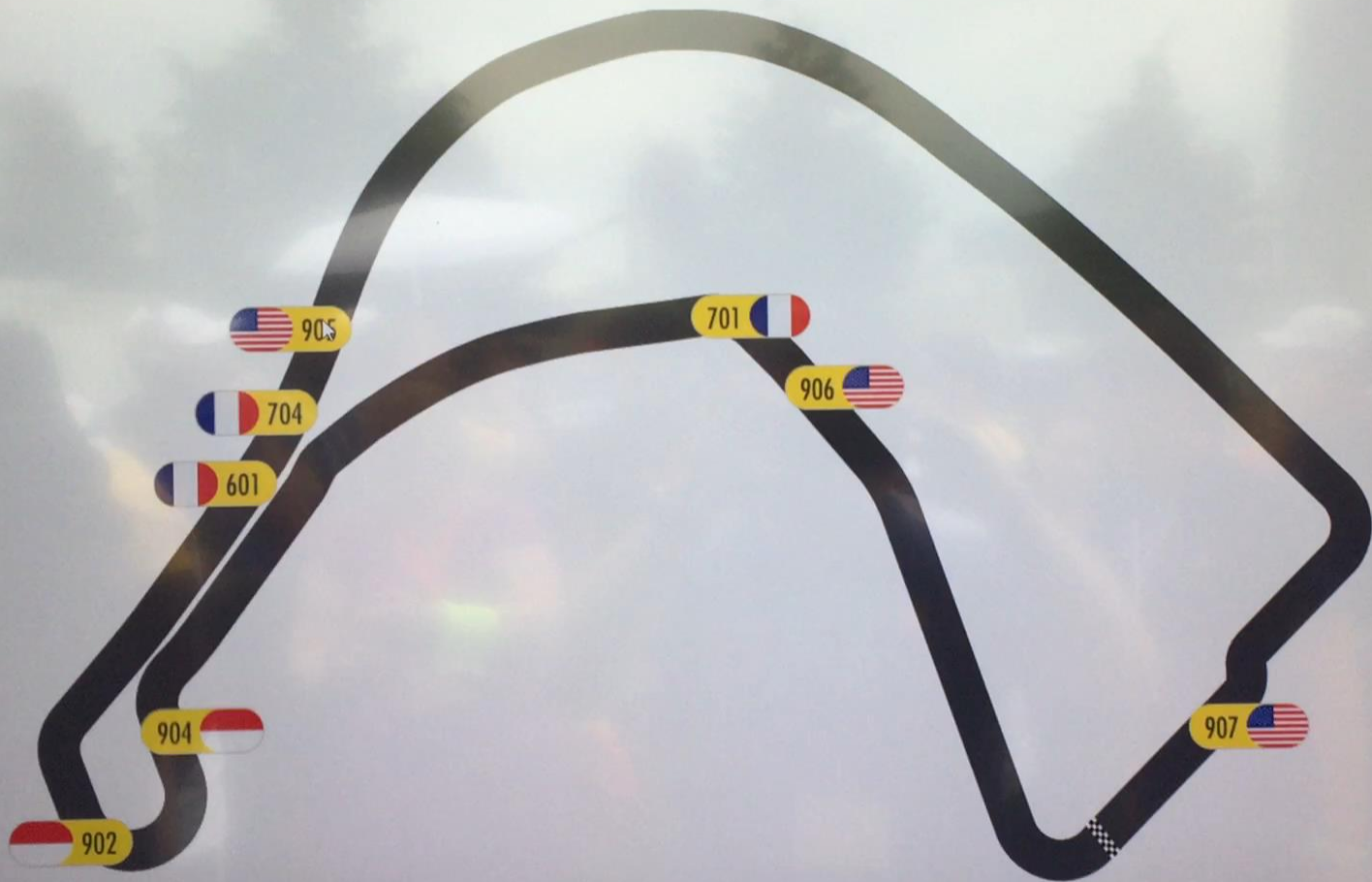
SPEED:

JOULE METER

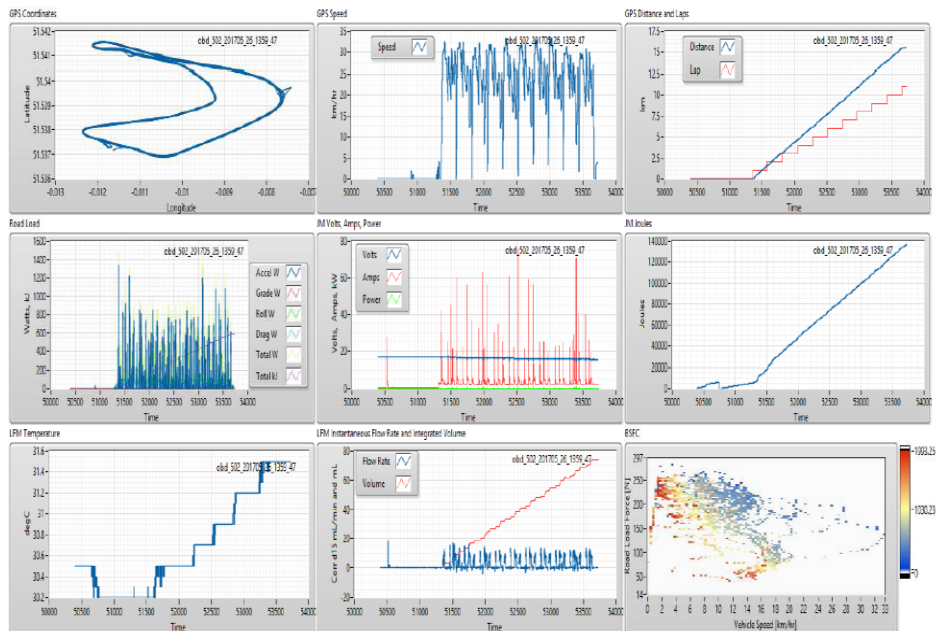
Live Data at the Driver's World Championship





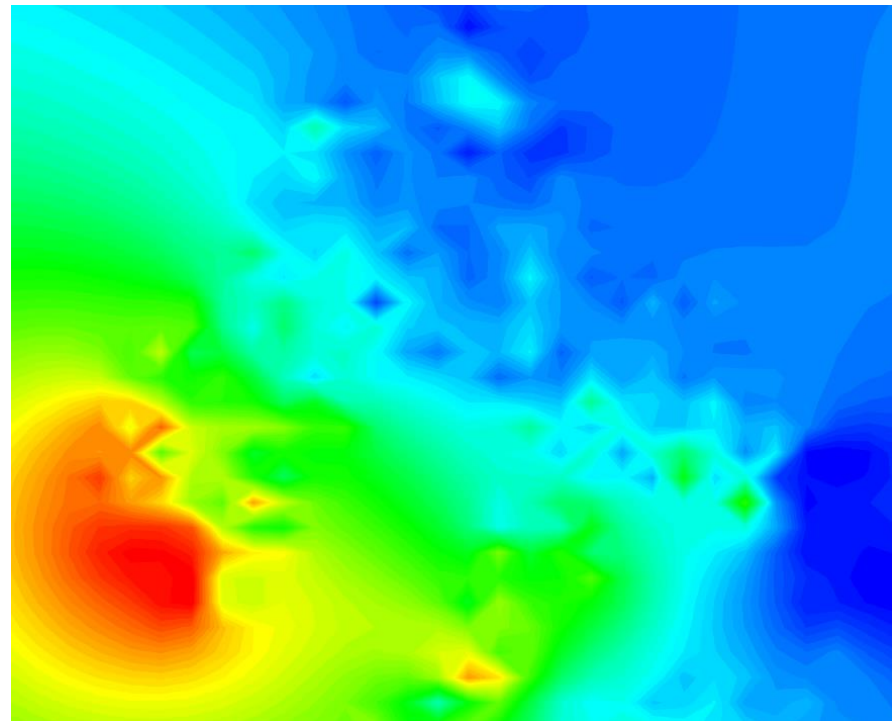


Aggregating the Data to help the Teams



chd_502_201705_26_1359_47 Endhaul rtds

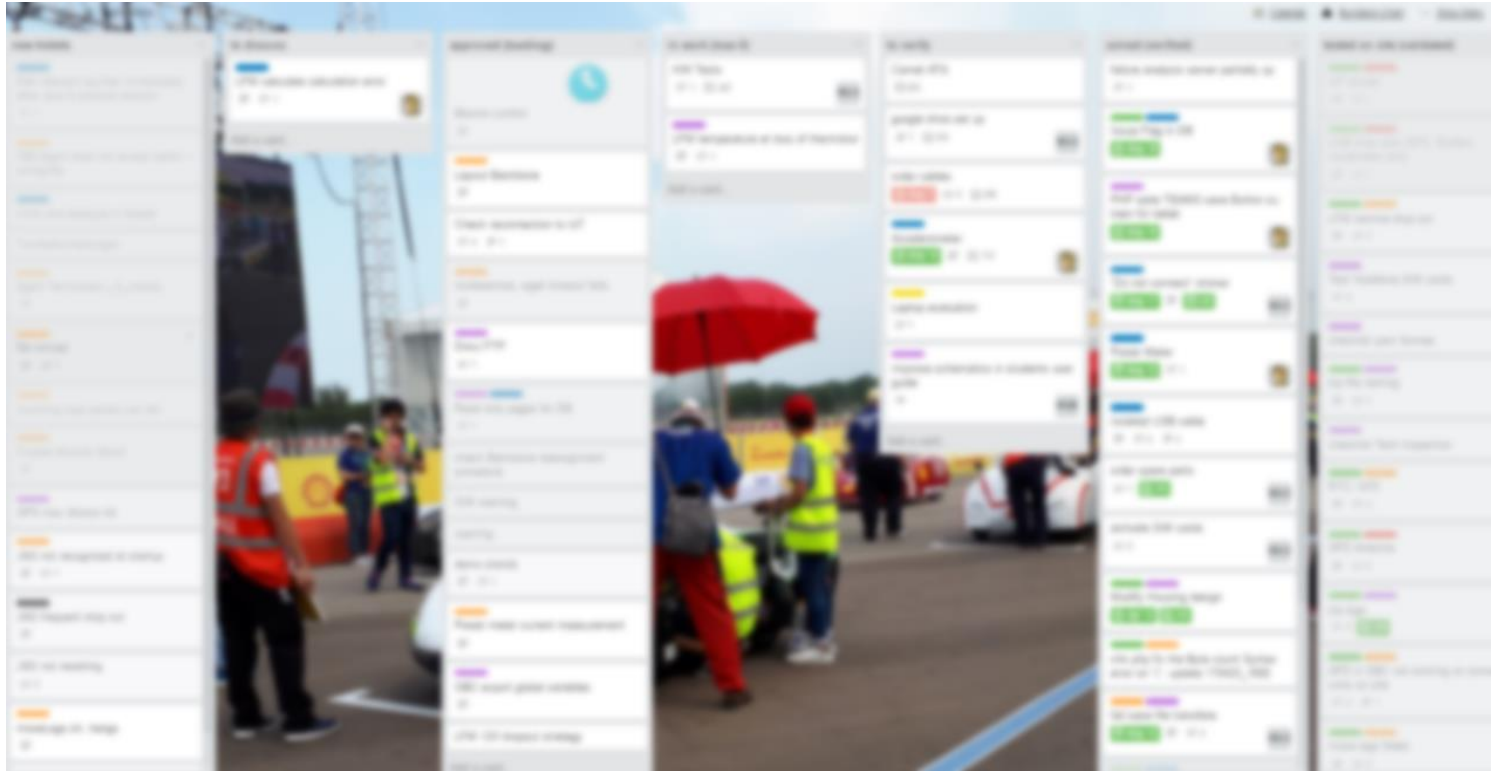
Sample Count	Total Time sec	Total Distance km	Average Speed km/hr	netCounts Begin	netCounts End	Integrated Volume d15 mL	Overall Fuel Economy d15 km/L	LPM Integrated Con Vol	netJoules Begin	netJoules End	Max Observed Speed km/h
82485	63730.000000	15.543514	14.1441	0	351901	74.024965	209.976647	74.039400	365.000000	336848.000000	33.600000



Optimizing Processes and Procedures



Team Collaboration at ist finest



Daily Review: What did we **learn** today?



Developing new Processes and Procedures overnight with Google Sheets

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Team	TX	Primary energy	State		issues	set up test	install test	HW	Base SW	Update	LFM SW	Agent Version	Paddock	SIM Card	IMEI	remarks
612	1-R	Hydrogen	installing	r		ok		Le Mans	10061601	180823_1830	v7	1.5.5		three 12GB		
	2	Hydrogen cable!	just for ifm!	r	GPS	ok	dont want to do m	Le Mans	10061601	180702_1700	v7	1.5.5		three 3GB		Pass
Simulator	3-		Switzerland	r				Le Mans	10061601		v7					
605	4	Hydrogen	installing	r	was 917	ok	ok rel jm gfs	Le Mans	10061601	180823_1830	v7	1.5.5		three 3GB		Pass
704	5	Hydrogen	ready	r	new hw 222	nok: gps		Le Mans	10061601	180823_1830	v7					
602	6	Hydrogen	installed	r		ok		Le Mans	10061601	180702_1700	v7	1.5.5		three 3GB		Not Yet Pass
601	7	Hydrogen	installed gets un	r	was 603	ok	ok jm h2 rel	Le Mans	10061601	180702_1700	v7	1.5.5		three 3GB		Not Yet Pass
706	8	Battery Electric	installing modify	r	was 604	ok		Le Mans	10061601	180823_1830	v7	1.5.5		three 3GB		In Progress
608	9	Hydrogen	installing	r		ok		Le Mans	10061601	180702_1700	v7	1.5.5		three 3GB		
505	10	Ethanol	installing	r	was 607	ok	ok rel jm gfs	London QC	10061601 Q	180823_1830	v7	1.5.5		three 3GB	88048102453 1199	Pass
904	11	Battery Electric	installed	r		ok	ok rel jm	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 3625	Pass
905	12	Battery Electric	installed	r		ok	ok rel jm	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 2858	Pass
906	13	Battery Electric	installed	r	GPS ?	ok	ok rel jm	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 8495	In Progress
915	14	Battery Electric	installed	r		ok	ok rel jm	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 3427	Pass
703	15	Battery Electric	ready	r	was 916	ok	ok rel jm	London	10061601	180823_1830	v7	1.5.5		three 3GB	88048102453 2627	Not Yet Pass
16-		defect		r		nok: ifm		London	10061601	180823_1830	not flashed				88048102453 1686	
502	17	Gasoline	installed	r		ok	ok ifm rel	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 2577	Not on list
509	18	Gasoline	installing	r	was 703	ok	decide after trial t	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 1496	Pass
701	19	Battery Electric	installed	r		ok	ok jm rel	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 1306	Pass
	20	Battery Electric	installed REPLAC	r	LOST CONN	ok	ok jm	London	10061601	180823_1830	v7	1.5.5		three 3GB	88048102453 2031	Pass
media car	21	Gasoline	installed	r		ok	ok ifm	London	10061601	180823_1830	v7	1.5.5		three 3GB	88048102453 3252	energy allowan
	22	Battery Electric	installed	r	was 704	ok	ok jm rel	London	10061601	180823_1830	v7	1.5.5		three 3GB	88048102453 173	Pass
912	23	Gasoline	installed	r		ok	ok ifm rel	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 1738	Pass
914	24	Gasoline	installed	r		ok	ok rel ifm	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 1579	Pass - Mater Del
501	25	Ethanol	installed	r		ok	ifm rel	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 2296	Pass
	26-	interruptions	defect (unstable)	r	COMM INTE	ok	ok rel ifm	London	10061601	180823_1830	v7	1.5.5		three 3GB	88048102453 1702	Pass
503	27	Gasoline	installed	r		ok	ok ifm rel	London	10061601	180702_1700	v7	1.5.5		three 3GB	88048102453 2999	Pass
515	28	Gasoline	installed	r		ok	ok rel ifm	London	10061601	180702_1700	v7	1.5.5		three 12GB	88048102453 0845	Pass
504	29	Gasoline	installing	r	was 903	ok	Ok rel ifm	London	10061601	180823_1830	v7	1.5.5		three 12GB	88048102453 4037	
902	30	Gasoline	installed	r		ok	ok ifm rel	London	10061601	180702_1700	v7	1.5.5		three 12GB	88048102453 5019	Pass
Beni	31		reserved	r		24V dead		London	10061601		v7				88048102453 2288	24V dead

From Development to Executable Results

Race number		DWC Race Inspection
Inspector initials		



Safety and Energy

	Pass	Fail
Helmet with visor		
FRC Race suit		
Gloves and Shoes		
Hands free communications		
Driver weight		

Vehicle safety

	Pass	Fail
Vehicle weight		
Brake test		
Seat belts		
Brake indicator		
Mirrors		
Horn		

Energy

	Pass	Fail
E-Stop, vehicle shuts down, OBC still powered		
Dead-man switch, vehicle shuts down, OBC still powered		
Propulsion system validated by expert		

Hydrogen

	Pass	Fail
Check for leaks		
Flowmeter correct function		

JM

Battery

	Pass	Fail
Battery at least 3.7 V		
Battery isolation		

LFM

ICE Energy

	Pass	Fail
LFM securely mounted inside vehicle		
No bubbles present in fuel line		
No leaks in fuel line		

OBC Installation

Mounting

	Pass	Fail
OBC Antennas fastened		
Backbone properly mounted and secured		

Cables

	Pass	Fail
All screws and connectors tightly fastened		
cable are safely routed		

OBC Communications and Commands

Operation

	Pass	Fail
LEDs after 1 min = Green, Off, Blue, Yellow		
LEDs remaining ON when starting Engine		

OBC state

	Pass	Fail
Status OK on sem/check.php		

End to End Communication / Allowance

	Pass	Fail
Reset Sensors		
Start energy source, check Sensor readings		
Set low Allowance Threshold (ICE 2.5, BE: 500-1000)		
Reset Sensors and Activate Energy Allowance		
Propulsion must stop and not be able to restart		
Turn Allowance mode off		
Set Allowance Threshold to 0 (Zero)		
Reset Sensors, now the Propulsion must work		

Handling the **daily changing** Manuals



SHELL ECO-MARATHON

IN-VEHICLE TELEMETRY SYSTEM

Internal Combustion Engines (LIQUID FUELS) –
Pre-event installation instructions

Version 6

Shell
Eco-marathon



Cool Energy

Hardware/Software

4G,GPS,IOT,Cloud

Tools,Data,Processes

#Make the Future

3

What if your Idea
could change the World ?

#MakeTheFuture

→ Check on Youtube

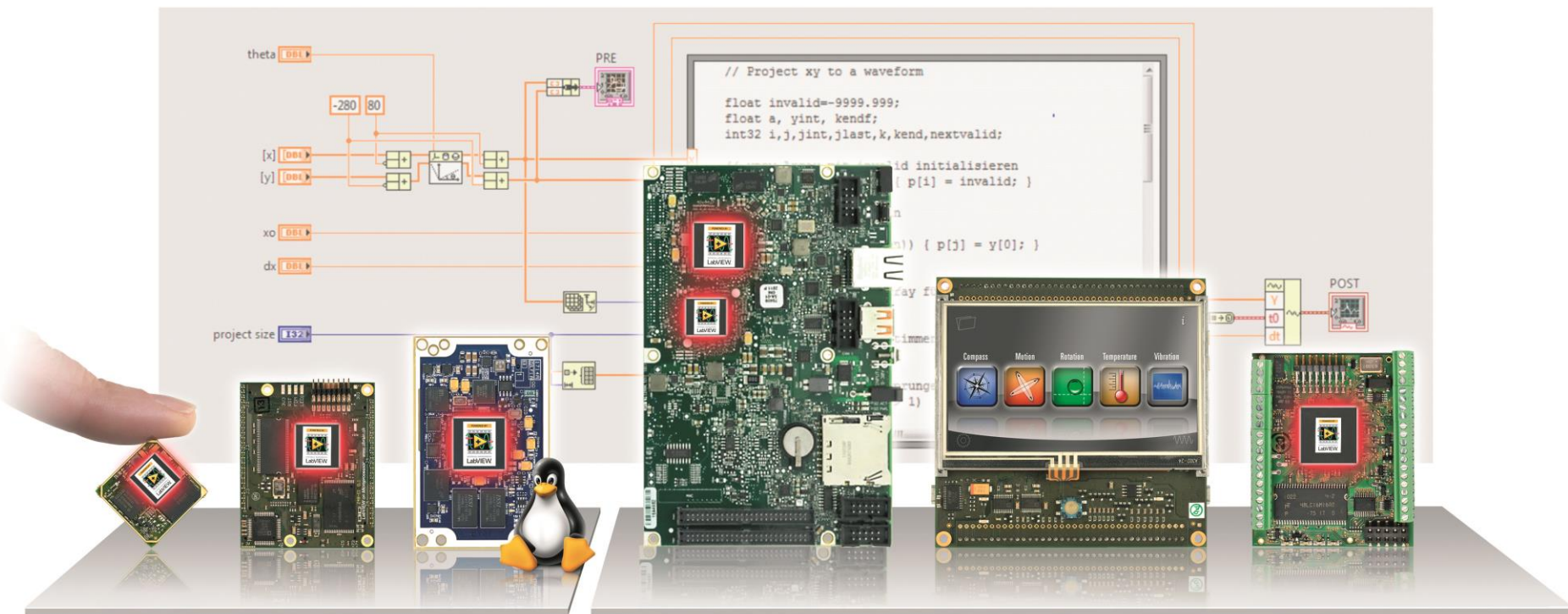
Focus on Emotion, Enjoyment and more...



New Category: **Autonomous** Vehicles



Leverage Graphical Programming to the SEM





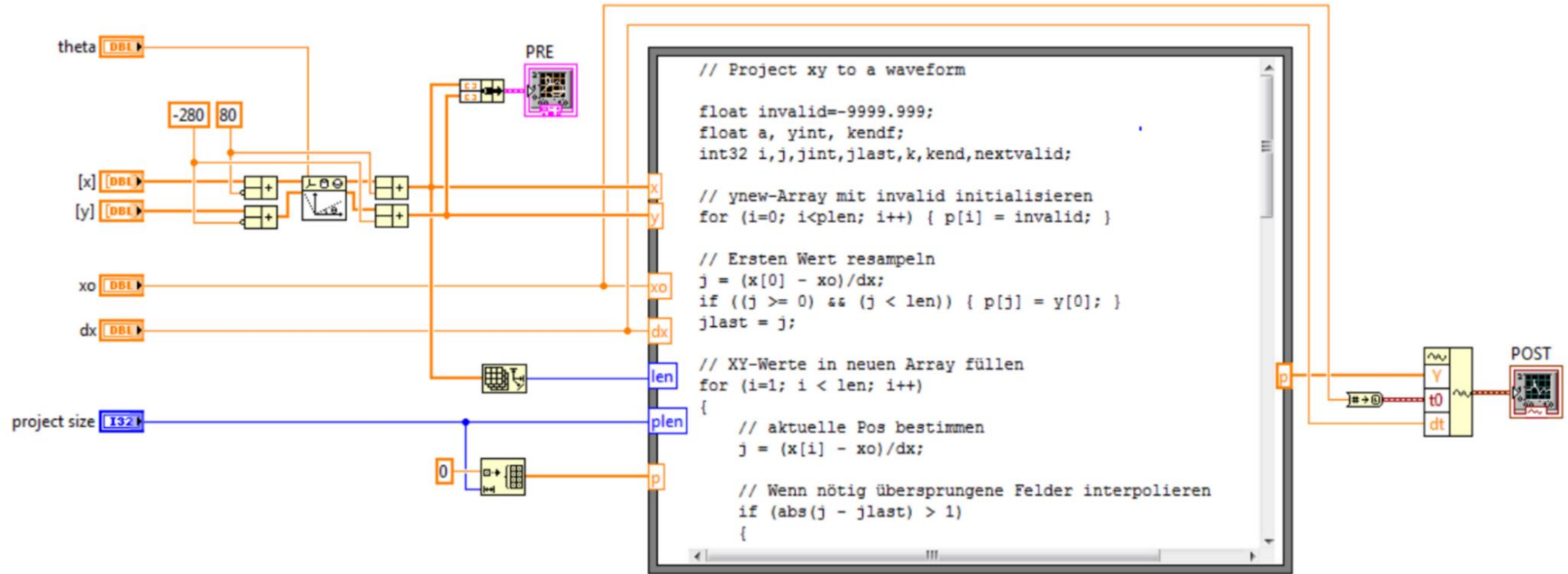
Linux



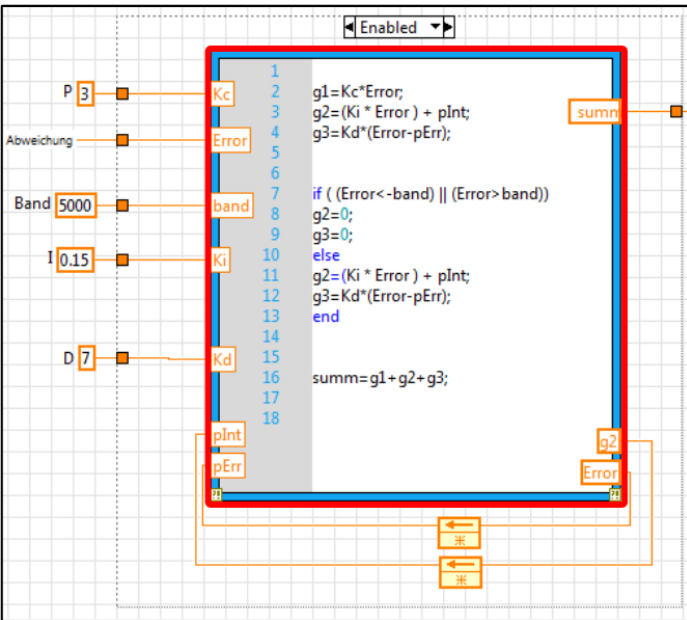
Linux+LabVIEW



Use the powerful Programming Models



Use the powerful Programming Models



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Profile



Schmid Elektronik AG is an internationally active solution provider of electronics, services for development, production and system integration, graphically programmable embedded computing solutions with LabVIEW and measurement devices for rail maintenance. The independant SME is specialized for small and medium sized series and prototypes and stands for speed, flexibility, creativity and industrial grade quality (ISO9001:2008). From stationary power electronic equipment to mobile low-power and standby applications. From computer boards and OEM modules to complete turn key solutions. From electronics/mechatronics, automation/robotics and transportation/railway, building and security technology to medical/MIL/avionics.

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