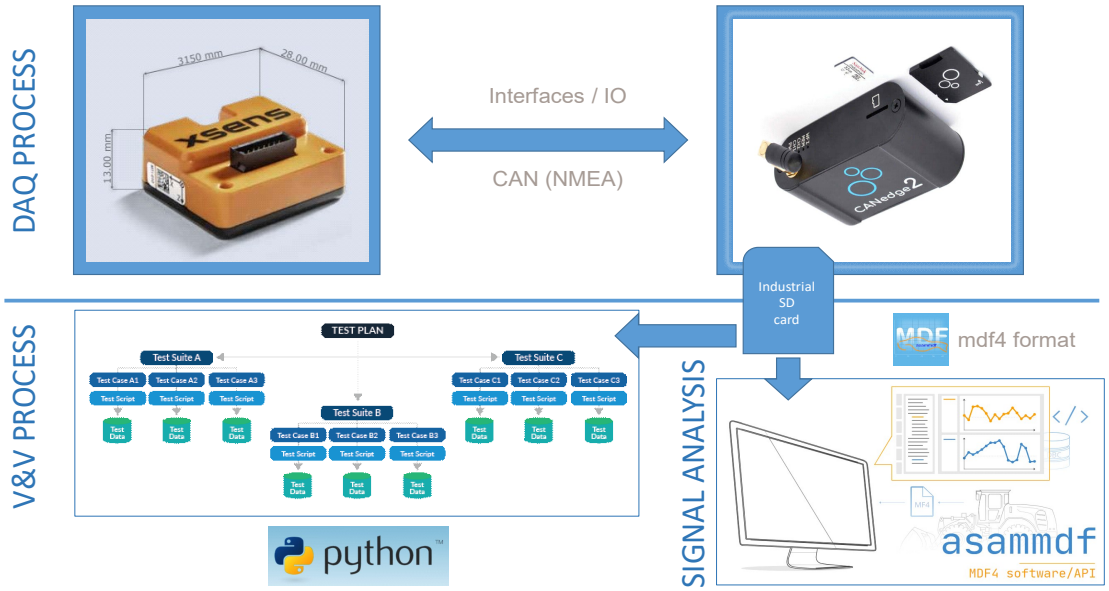
1 Element 14 Road Test

1.1 Test plan (How)

Elaborate testing can have many stages to effectively ship the source at the development stages Software-in-loop, Hardware-in-loop, But we will be sticking to the black box testing to have greater insights on usability and KPIs proportional to quality thereby ignoring Technical aspects like Software architecture etc. from Tester perspective

1.1.1 Test process



1.1.1.1 DAQ Process

The data acquisition process is taken care using Can Edge2 to log the CAN (NMEA) data to SD cards as mdf4 format. High speed CAN signal streams are recorded to SD cards with timestamps in industrial standard mdf4 format.

1.1.1.2 Signal Analysis

The signals recorded in the industrial grade SD card is imported and analysed using the asammdf tool which is a fast parser and editor for ASAM (Association for Standardization of Automation and Measuring Systems) MDF (Measurement Data Format)

1.1.1.3 V&V Process

Once the Scenarios are defined in Test Procedure, data will be collected for those Tests for visualization and automation testing, the test data will be tested using test script (in python using asammdf 7.1.0) for a test case specification to make sure that the outcomes are expected. Testing automation is an integral part of regression testing.

1.1.2 Resources required

System under Test - Xsens Position and Orientation Sensing GNSS/INS Development Kit (MTi-680-DK)

CAN edge2 – CAN data logger for measurement recording & other connectors needed

Industrial SD card – SD card supported with CAN edge2 (up to 32 GB)

1.2 Test procedure (what)

1.2.1 Testing Timestamp

Timestamp should be increased in such a way that the Δt should be almost constant

1.2.2 Testing Position & Velocity

Sample test case illustrating the scenario,

Test Case ID	Test Description	Steps to be Executed	Expected Result	Metrics Tested	Pass/Fail
RT-1	Ride on a 1 km straight road with constant speed	start the vehicle	delta position & delta velocity will be steadily increasing	ΔPx(t) < ΔPx(t+1), ΔVx(t) < ΔVx(t+1)	
		increase the speed to 30kmph before 300m	delta position & delta velocity will be steadily increasing	ΔPx(t) < ΔPx(t+1), ΔV(t) < ΔVx(t+1)	
		maintain the same speed from 300m till 700m	delta position & delta velocity will become almost constant	ΔPx(t) ~= ΔPx(t+1), ΔVx(t) ~= ΔVx(t+1)	
		decrease the speed to 30kmph after 700m	delta position & delta velocity will be steadily decreasing	ΔPx(t) > ΔPx(t+1), ΔVx(t) > ΔVx(n+1)	
		stop the vehicle	delta position & delta velocity will become almost zero	ΔPx(t), ΔPx(t+1) ~= 0, ΔVx(t), ΔVx(t+1) ~= 0	

1.2.3 Testing Velocity & Pitch

Sample test case illustrating the scenario,

Test Case ID	Test Description	Steps to be Executed	Expected Result	Metrics Tested	Pass/Fail
RT-2	Ride on a 1 km straight road with bridge / flyover	drive up the flyover at 300m	delta velocity will be steadily increasing, Pitch(Oz) will be increasing	ΔPx(t) ~= ΔPx(t+1), ΔVx(t) < ΔVx(t+1), Oz(t) < Oz(t+1), ΔPz and ΔVz	
		drive on the same flyover from 300m till 700m	delta position & delta velocity will become almost constant, Pitch(Oz) will be constant	ΔPx(t) ~= ΔPx(t+1), ΔVx(t) ~= ΔVx(t+1), Oz(t) ~= 0	
		drive down the flyover at 700m	Pitch(Oz) will be decreasing	Oz(t) > Oz(t+1) ΔPz and ΔVz	

1.2.4 Testing Roll & Yaw

Sample test case illustrating the scenario,

Test Case ID	Test Description	Steps to be Executed	Expected Result	Metrics Tested	Pass/Fail
RT-3	Ride on a 1 km curved road	turn right at 200m	change in yaw(Ox) based on right turn and change in roll(Oy) because of leaning	Ox increases and Oy decreases, ΔPy and ΔVy	
		turn left at 400m	change in yaw(Ox) based on left turn and change in roll(Oy) because of leaning	Ox decreases and Oy increases, ΔPy and ΔVy	