Arrowhead TOOLS

The Norwegian Experiment

ARROWHEAD TOOLS

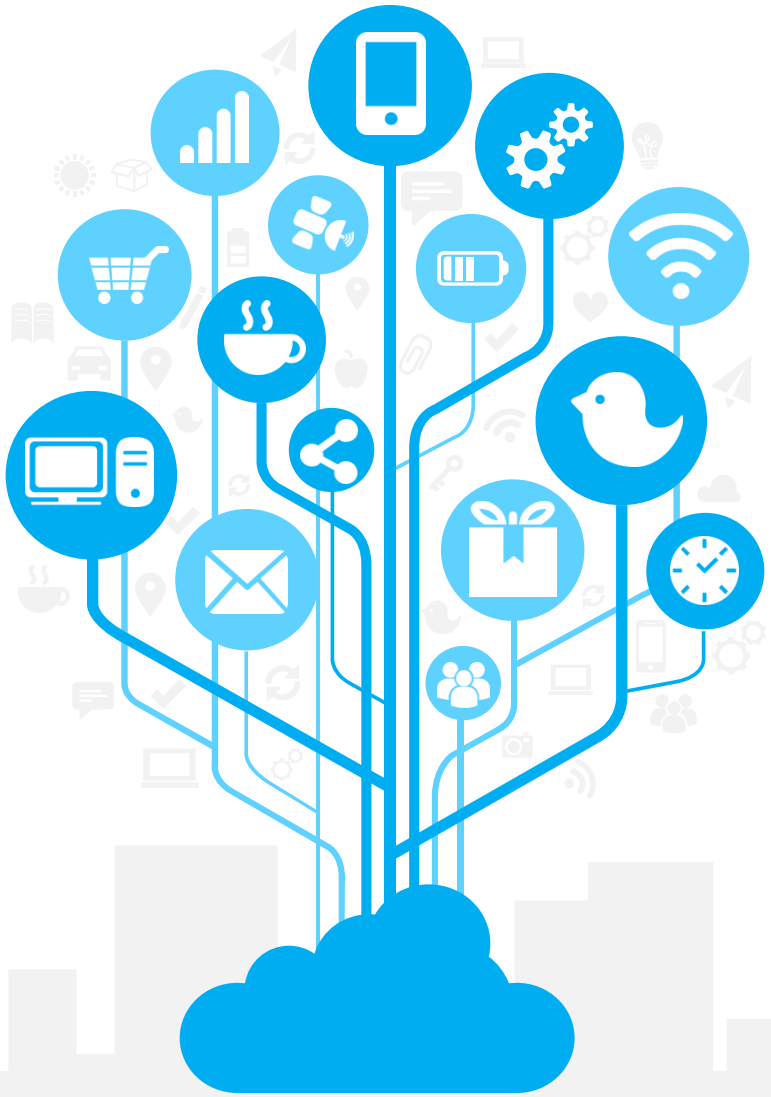
The Bike Experiment

How to connect ISO 10303 (STEP) to the Arrowhead IoT Framework?

- Jotne, now part of the Arrowhead Tools project, is new to all the capabilities available in the Arrowhead Framework software applications.
- We needed to have a flying start in to the understanding allowing us to have the best possible support for the Norwegian use case.
- Everything should be made as simple as possible, but not simpler.
- All data should be accessible from a ISO 10303 repository

ARROWHEAD TOOLS

Expected integrations



PLM DATA

GATEWAY (Mobile) and CLOUD

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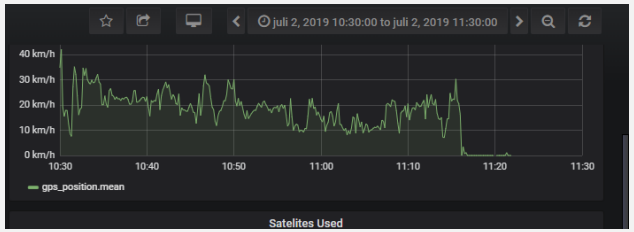
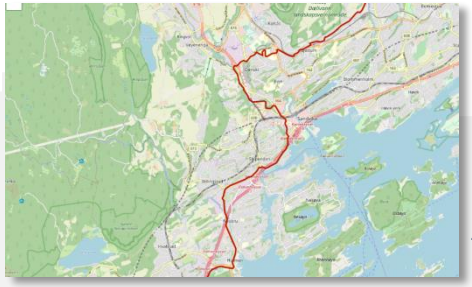
INTEGRATION WORK

SENSOR DATA





ARROWHEAD TOOLS

SENSORS

GATEWAY

TELLUCLOUD

THE PROBLEM/ FINAL OUTCOME

AH FRAMEWORK

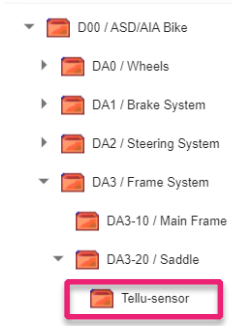
REST SERVICS

PLM STANDARDS

ARROWHEAD TOOLS

Read: GET

Read: GET
Create: POST
Update: PUT
Delete: DELETE



ISO®

ARROWHEAD TOOLS

GAP ANALYSIS CHART

The experiment needed to connect the databases to perform validations using ISO 10303

ACTION 1

Mount sensors

ACTION 2

Activate Mobile Gateway, Establish Cloud Solution

ACTION 3

Perform testing and collect test data

RESULT

The sensor data is now available in a PLM Repository using ISO 10303 for data exchange, sharing and archiving

ARROWHEAD TOOLS

LESSON LEARNED

- Ability to store aggregate of entities (objects) in TruePLM
- Ability to show the above in TruePLM.

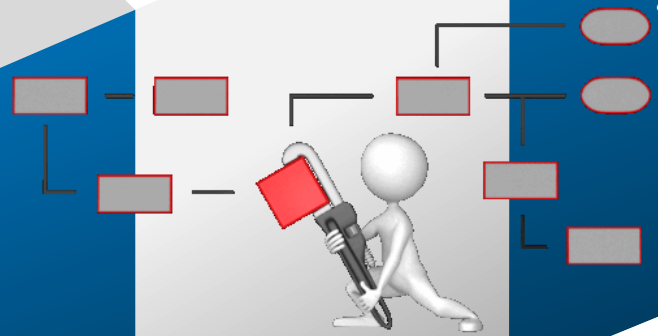
ACTION LIST

- Update PLCS templates to handle aggregate of entities
- Update the reference data
- Update TruePLM queries to use the above features
- Update the Client

CURRENT STATE

NEED TO IMPROVE

- Arrowhead configuration is not simple
- There are a lot of undocumented steps that needs to be done in order to use the provider and consumer.



THE RESULT

ACTION LIST

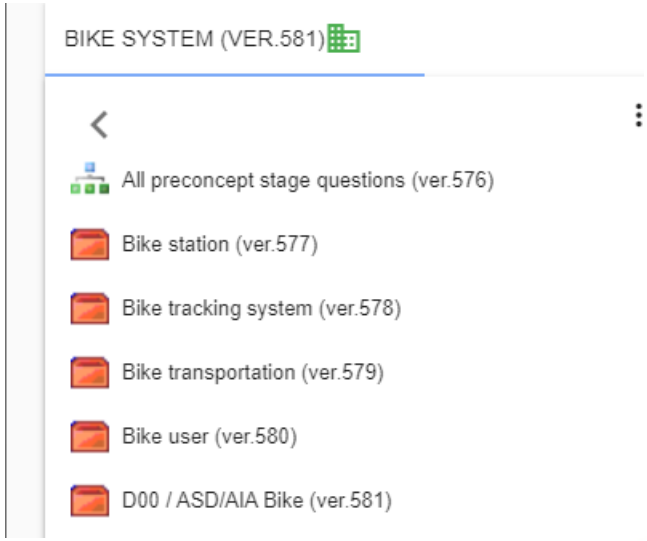
- Add new provider and consumer to arrowhead client
- Use the provider to get relevant data from TruePLM
- Use consumer to show the data

ARROWHEAD TOOLS

Concept of operations

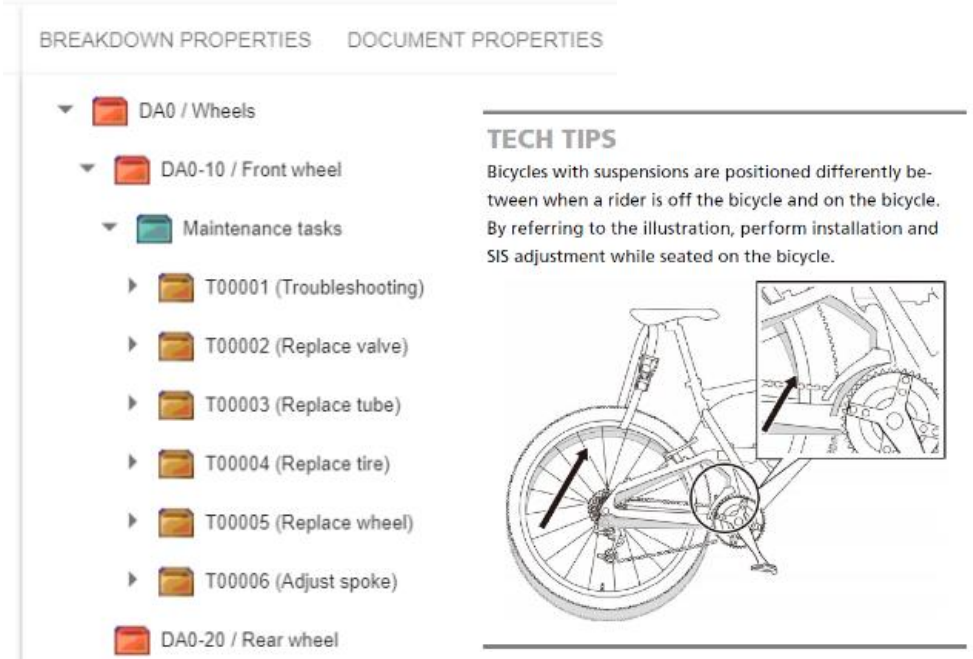
1. We connect sensors to a mountain bike, to illustrate an advanced “Systems of Systems” concepts.

2. All product data and user data is available in the ISO 10303 repository.



Complete ISO product repository

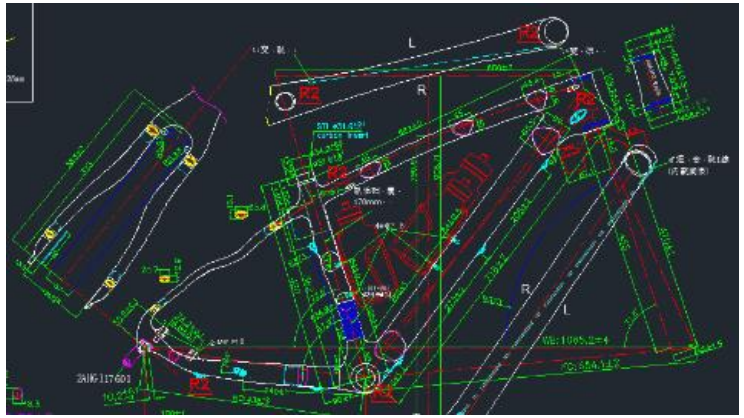
- Maintenance tasks and task break down



Check visually the condition of the tire to identify any damage on it.

3D CAD/CAE Models

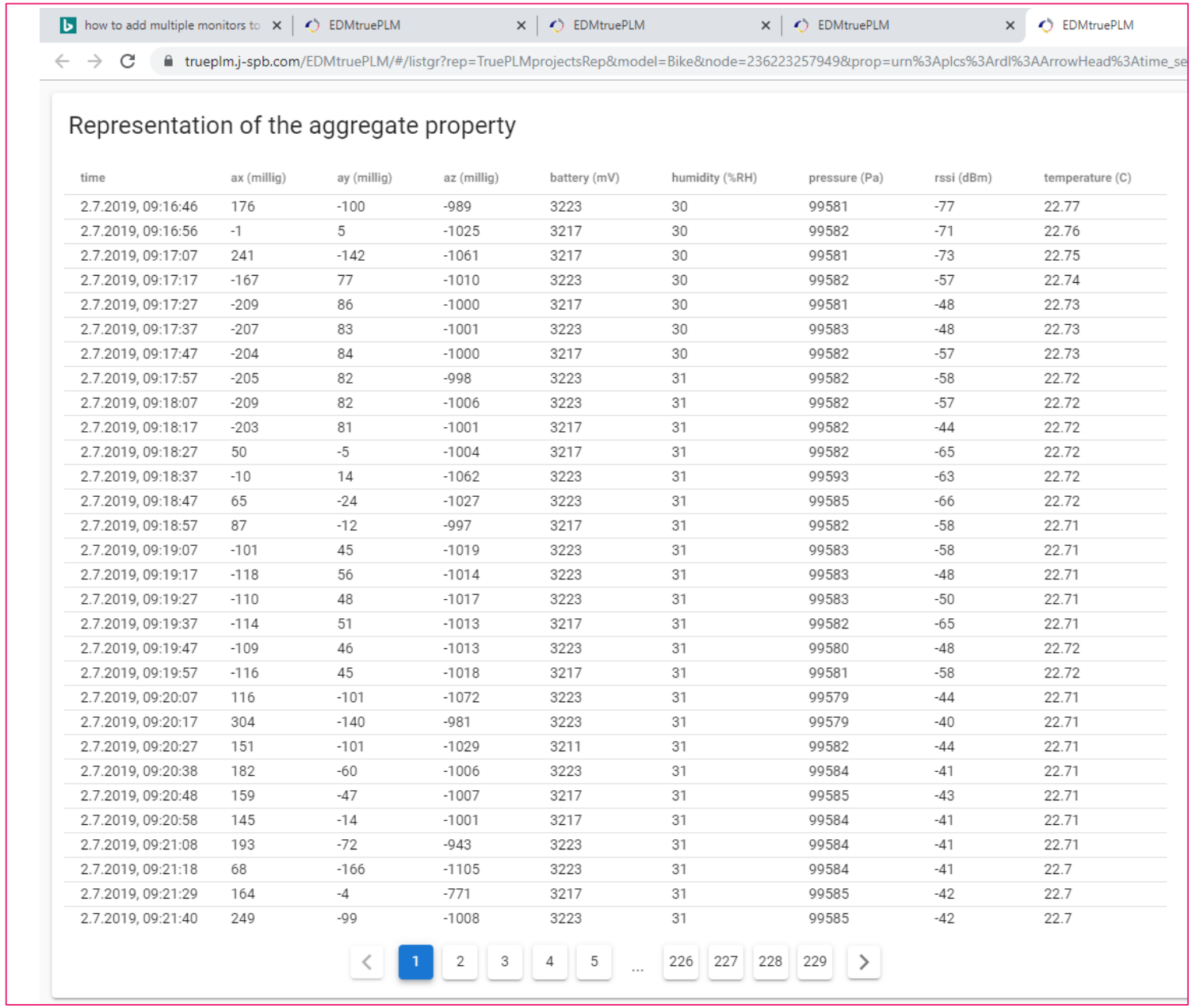
Drawings



Performance

EXPRESS Data Manager
TruePLM ™

Time series in the ISO 10303 repository



Representation of the aggregate property

time	ax (millig)	ay (millig)	az (millig)	battery (mV)	humidity (%RH)	pressure (Pa)	rssi (dBm)	temperature (C)
2.7.2019, 09:16:46	176	-100	-989	3223	30	99581	-77	22.77
2.7.2019, 09:16:56	-1	5	-1025	3217	30	99582	-71	22.76
2.7.2019, 09:17:07	241	-142	-1061	3217	30	99581	-73	22.75
2.7.2019, 09:17:17	-167	77	-1010	3223	30	99582	-57	22.74
2.7.2019, 09:17:27	-209	86	-1000	3217	30	99581	-48	22.73
2.7.2019, 09:17:37	-207	83	-1001	3223	30	99583	-48	22.73
2.7.2019, 09:17:47	-204	84	-1000	3217	30	99582	-57	22.73
2.7.2019, 09:17:57	-205	82	-998	3223	31	99582	-58	22.72
2.7.2019, 09:18:07	-209	82	-1006	3223	31	99582	-57	22.72
2.7.2019, 09:18:17	-203	81	-1001	3217	31	99582	-44	22.72
2.7.2019, 09:18:27	50	-5	-1004	3217	31	99582	-65	22.72
2.7.2019, 09:18:37	-10	14	-1062	3223	31	99593	-63	22.72
2.7.2019, 09:18:47	65	-24	-1027	3223	31	99585	-66	22.72
2.7.2019, 09:18:57	87	-12	-997	3217	31	99582	-58	22.71
2.7.2019, 09:19:07	-101	45	-1019	3223	31	99583	-58	22.71
2.7.2019, 09:19:17	-118	56	-1014	3223	31	99583	-48	22.71
2.7.2019, 09:19:27	-110	48	-1017	3223	31	99583	-50	22.71
2.7.2019, 09:19:37	-114	51	-1013	3217	31	99582	-65	22.71
2.7.2019, 09:19:47	-109	46	-1013	3223	31	99580	-48	22.72
2.7.2019, 09:19:57	-116	45	-1018	3217	31	99581	-58	22.72
2.7.2019, 09:20:07	116	-101	-1072	3223	31	99579	-44	22.71
2.7.2019, 09:20:17	304	-140	-981	3223	31	99579	-40	22.71
2.7.2019, 09:20:27	151	-101	-1029	3211	31	99582	-44	22.71
2.7.2019, 09:20:38	182	-60	-1006	3223	31	99584	-41	22.71
2.7.2019, 09:20:48	159	-47	-1007	3217	31	99585	-43	22.71
2.7.2019, 09:20:58	145	-14	-1001	3217	31	99584	-41	22.71
2.7.2019, 09:21:08	193	-72	-943	3223	31	99584	-41	22.71
2.7.2019, 09:21:18	68	-166	-1105	3223	31	99584	-41	22.7
2.7.2019, 09:21:29	164	-4	-771	3217	31	99585	-42	22.7
2.7.2019, 09:21:40	249	-99	-1008	3223	31	99585	-42	22.7