S-I-R-W-E-C

Lars Forslöf, Project manager - Trafikverket

WRIP - Winter Road Intelligence Project

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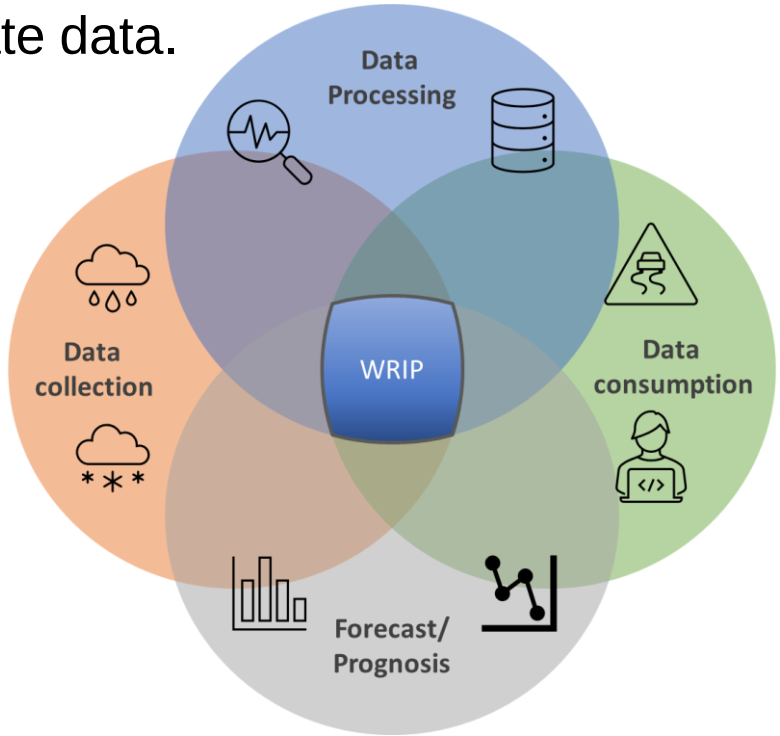
- The project is focusing on providing road network surface state data.
- This mean to assemble and merge data from:
  - mobile systems
  - ordinary RWiS
  - IOT-devices
  - weather and road state forecasts
- and how to best publish them in standardized services.
- facilitate for providers of decision support and traffic information/management systems to consume this data



WRIP - Workpackages

Content	Country responsible	2022	2023	2024	2025
Project management	Sweden	Definition phase Planning phase	Co-ordinate WPs Monthly meetings	Coordinate WPs Present at conferences	Closing phase
WP1: RWIS IOT demo - Test installations - Publish results	Sweden	Study market	Procure Install Test/Demo	Finish tests Analyze results Publish WP report	Summarizing Final report
WP2: Mobile demos - Plan, arrange and follow up mobile survey solutions	Norway Iceland	Preliminiary planning	Detailed planning Market co-ordination Practial arranges	Communicate Execute demos Communicate Concluding tests	
WP3: Data processing - Standards/interfaces	Finland		Plan and initiate Investigate/Clarify	Continue work Gather findings Publish report	
WP4: Data consumption - Decision support - Forecasts/prognosis - Traffic info/management	Denmark		Plan and initiiate	Arrange Workshop Testing excixting MDSS in Nordic countries Publish report	

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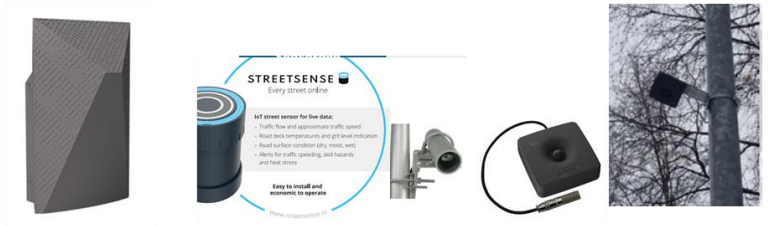
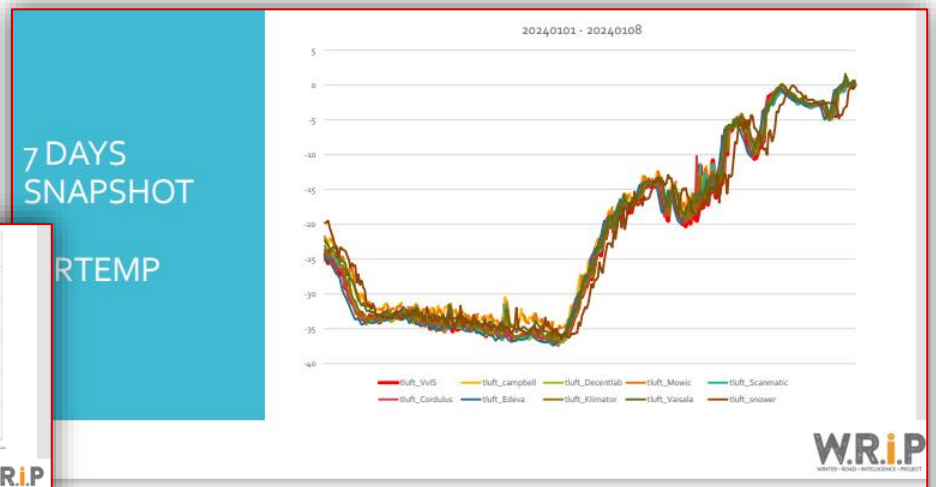
WP1 - 9 companies x 2 test sites - IOT ”weather stations”

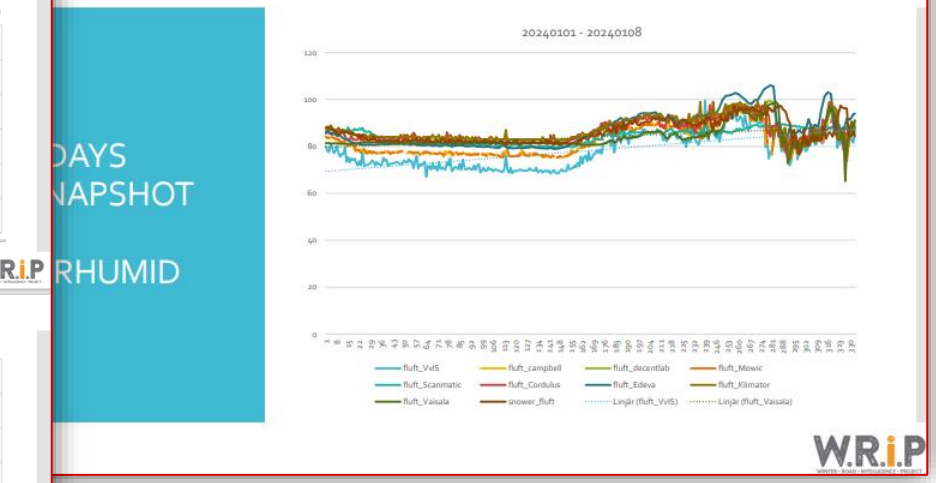
Company	Country
Snower Oy	Finland
Volue	Norway
Campbell Scientific	UK
Decentlab GmbH	Switzerland
Vaisala Oy	Finland
~~Tectal~~	~~Norway~~
Mowic AB	Sweden
Klimator AB	Sweden
Cordulus/Fieldsense	Denmark
Edeva	Sweden



WP1 – Migrate and evaluate data

Report is avaliable!





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Data vs. reference station

KIRUNA	CAMPBELL	DECENTLAB	MOWIC	SCANMATIC	CORDULUS	EDEVA	KLIMATOR	VAISALA	SNOWER
AIR TEMP R^2	0,99	1,00	0,98	0,99	0,98	0,97	0,99	0,99	0,97
HUMIDITY R^2	0,88	0,81	0,76	0,35	0,67	0,67	0,75	0,80	0,52
SURFACE TEMP R^2	0,99	0,87	0,99	0,92	1,00	*	*	0,93	0,86
AVERAGE :	**0,95**	**0,89**	**0,91**	**0,75**	**0,88**	*	*	**0,91**	**0,78**
SAGÅN									
AIR TEMP R^2	0,99	1,00	1,0	0,99	0,99	0,94	1,00	1,00	0,98
HUMIDITY R^2	0,91	0,94	0,97	0,69	0,89	0,66	0,94	0,92	0,84
SURFACE TEMP R^2	0,97	0,96	1,0	0,97	1,0	*	0,99	0,99	0,95
AVERAGE :	**0,96**	**0,97**	**0,99**	**0,88**	**0,96**	*	**0,98**	**0,97**	**0,92**

R^2

* no data

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Data availability, based on all 30 periods over the whole period

KIRUNA	REF. STATION VAISALA MS7	CAMPBELL	DECENTLAB	MOWIC	SCANMATIC	CORDULUS	EDEVA	KLIMATOR	VAISALA	SNOWER
AIR TEMP:	100	95,4	99,8	87,6	96,7	91,5	88,3	99,5	96,6	100
HUMIDITY:	100	95,4	99,8	87,6	97,0	91,5	88,3	99,5	96,6	99,9
SURFACE TEMP:	100	95,5	99,8	95,4	96,7	91,5	*	93,3	93,9	100
AVERAGE :	**100**	**95,4**	**99,8**	**90,2**	**96,8**	**91,5**	**88,3***	**97,4**	**95,7**	**100**
SAGÅN										
AIR TEMP:	100	100	100	96,5	96	77,8	30,5	99,5	95,44	99
HUMIDITY:	100	100	100	96,5	96	77,8	30,5	99,5	95,44	58,5
SURFACE TEMP:	100	100	100	96,5	96	44,7	*	99,5	57,7	73,1
AVERAGE :	**100**	**100**	**100**	**96,5**	**96**	**66,8**	**30,5***	**99,5**	**82,86**	**76,9**

* no data

WP1 – Result

- IOT equipments are here to stay!
  - They can add values – but implementation have concerns…
- General performance
  - Most systems manage *air temperature* in a good way
  - Variation on *air humidity* - an important parameter!
    - Some systems are *acceptable* - some show a *poor performance*
- Formats of data
  - Lots of work to migrate/integrate = clear need to standardize API:s and formats
  - Suppliers like to have client to be kept in their systems
- Data communication is an issue
  - Systems need to operate off grid (they cant require grid powered data communication!)
  - Bad communication drain batteries - fatal on invasive sensors
- Road status and Cameras yet to be analyzed.

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WP2 - 6 companies on 2 test sites, FCD+mobile survey systems

Road Cload µSmart

Road Condition Monitor RCM511

Teconer

Vaisala MD30

Floating Car Data: Klimator, Nira Dynamics, Testnor

Klimator

Nira Dynamics

Testnor

WP2 test sites

Data providers: Nira Dynamics, Vaisala, Teconer

Data delivery from all 6 companies

Test campaign in Bodø

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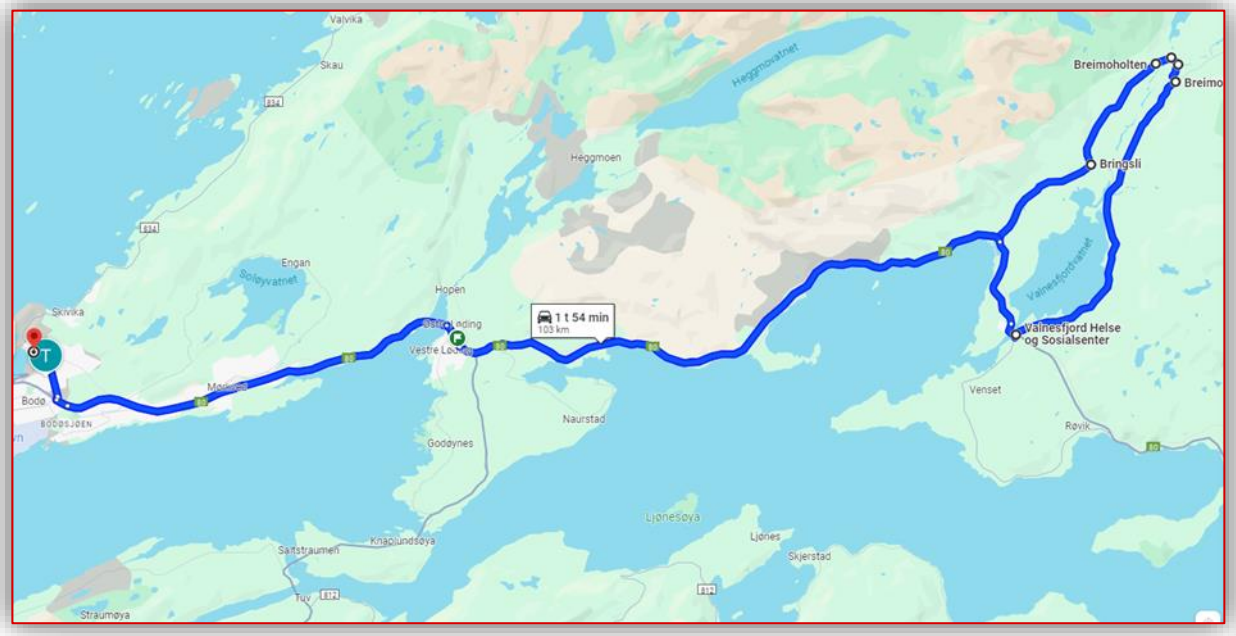
March 1st 2024



Test campaign road state examples

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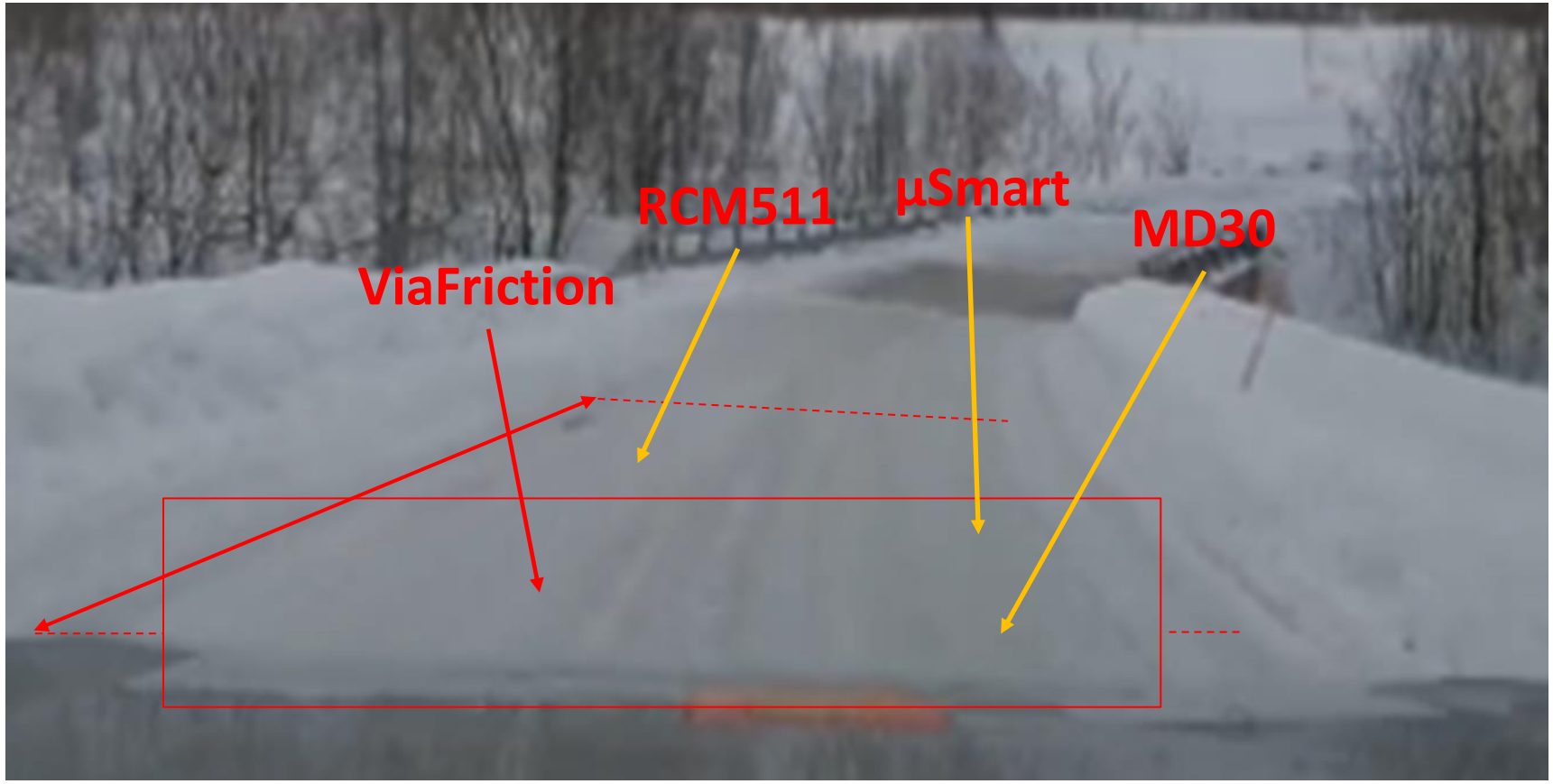
Optical sensors, measuring range marked with orange



ViaFriction value 0.296 within the red *square*

Friction values:

- **ViaFriction** = 0.30
- **µSmart** = 0.36
- **MD30** = 0.62
- **RCM511** = 0.31

Category for road state:

- **µSmart** road state: *Snow*
- **MD30,** road state: *Wet*
- **RCM511,** road state: Snow

WP2 – Summary / preliminary results

- Data collection periods
  - December 2023 – March 2024
  - December 2024 – January 2025
- Floating car data
  - Downloaded data for the first winter period, but not anlyzed yet
  - Proprietary solutions, cumbersome data download routine
  - Need for standardization and specification of requirements for data delivery
  - Preliminary results is that geographically coverage is low in rural areas, but could be satisfying in cities.
  - Dialogue with the industry is important, and there is no goal to choose a winner
- Optical sensors
  - Only three types of optical sensors are included in the pilot
  - Test campaign indicate that there are variations both in relation to the friction estimate and the categorization of driving conditions

Concluding remarks on WRIP

- Valuable Nordic cooperation and knowledge sharing
- Promising part time results
- WP1 is finished
  - *There is a variation in performance for different systems*
  - *Continuous data is an issue for some IoT systems*
  - *Humidity is a challenge*
- WP2, WP3 and WP4 continue
- Data exchange is a general problem. APIs not arranged for automatic data collection
- Need for standardization