In2Rail

WP7, (WP8), WP9
"Intelligent mobility management- I2M"
Trafikverket, RISE SICS och JVTC

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Syfte

- WP2 – WP5 infrastruktur, mätmetoder, etc...
- WP6 – underhållsmetoder

- **WP 7 – framtidens system för traffic management trafikledning**
- **WP8 – (standard operators workstation)**
- **WP9 – Scenarios nowcasting och forecasting**

- Kravställande framtidens system för tågplanering och trafikstyrning, samt att ta in underhållsperspektivet med nowcasting och forecasting om infrastrukturens status

WP7

D 7.1 state-of-art and highlevel requirements (M6)

- TMS/Dispatching system
    - ON-TIME, Capacity4Rail => input
    - NTL project => input

D7.2 Use cases

- Framtagen rapport med krav på framtida simulator med scenarios och funktioner

D7.3 - Specifications of the Standard Operator Workstation (Month 16)
Requirements, workload analysis methodologies, security guidelines and conceptual design, including considerations for persons with special needs.
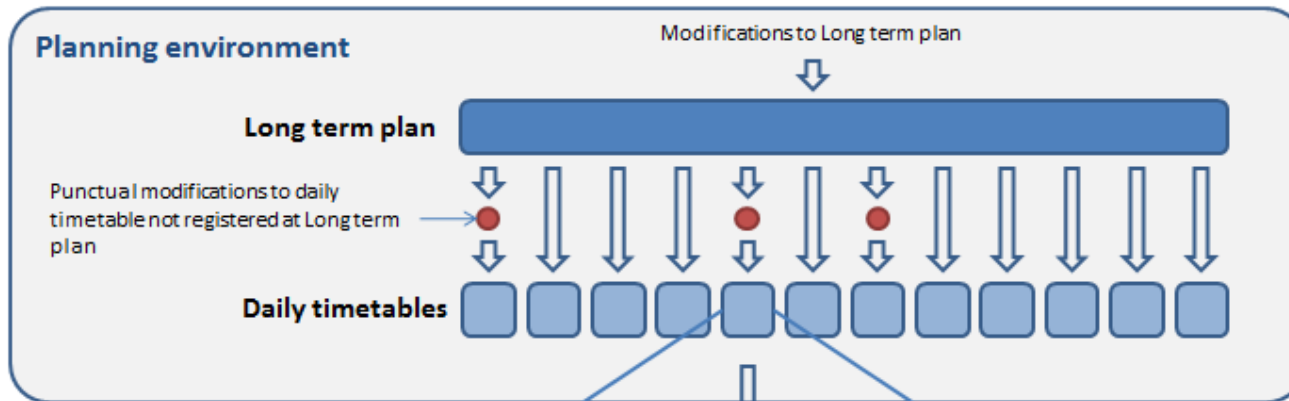
D7.4 - Definition of the Proof-of-concept (Month 24)

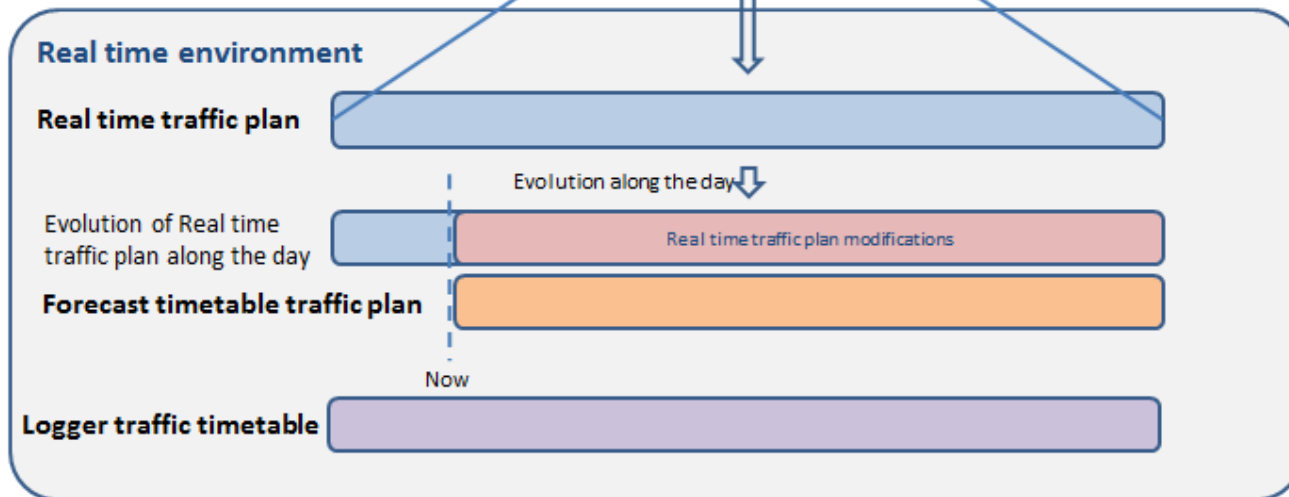**D7.5 - Evaluation of the proof of concept (Month 36)**

§6.1 TMS operation context

Process description from capacity allocation to traffic management including responsibility of the actors is required. The following schematic describe the different step, and timetables used, from planning to real time environment.

Successiv planering

Styra genom planering

Planning environment

Modifications to Long term plan

Long term plan

Punctual modifications to daily timetable not registered at Long term plan

Daily timetables

Real time environment

Real time traffic plan

Evolution along the day

Evolution of Real time traffic plan along the day

Real time traffic plan modifications

Forecast timetable traffic plan

Now

Logger traffic timetable

WP9- Nowcasting and Forecasting

Description of WP9

- Nowcast and forecast network asset statuses with the associated uncertainties from heterogeneous data sources.

- Objectives:
  - Design a data/information management layer for heterogeneous sources of information;

  - Asset status nowcasting for TMS/dispatching system to provide alarms;

  - Asset status forecasting to the TMS/dispatching system to allow risk-aware decisions;
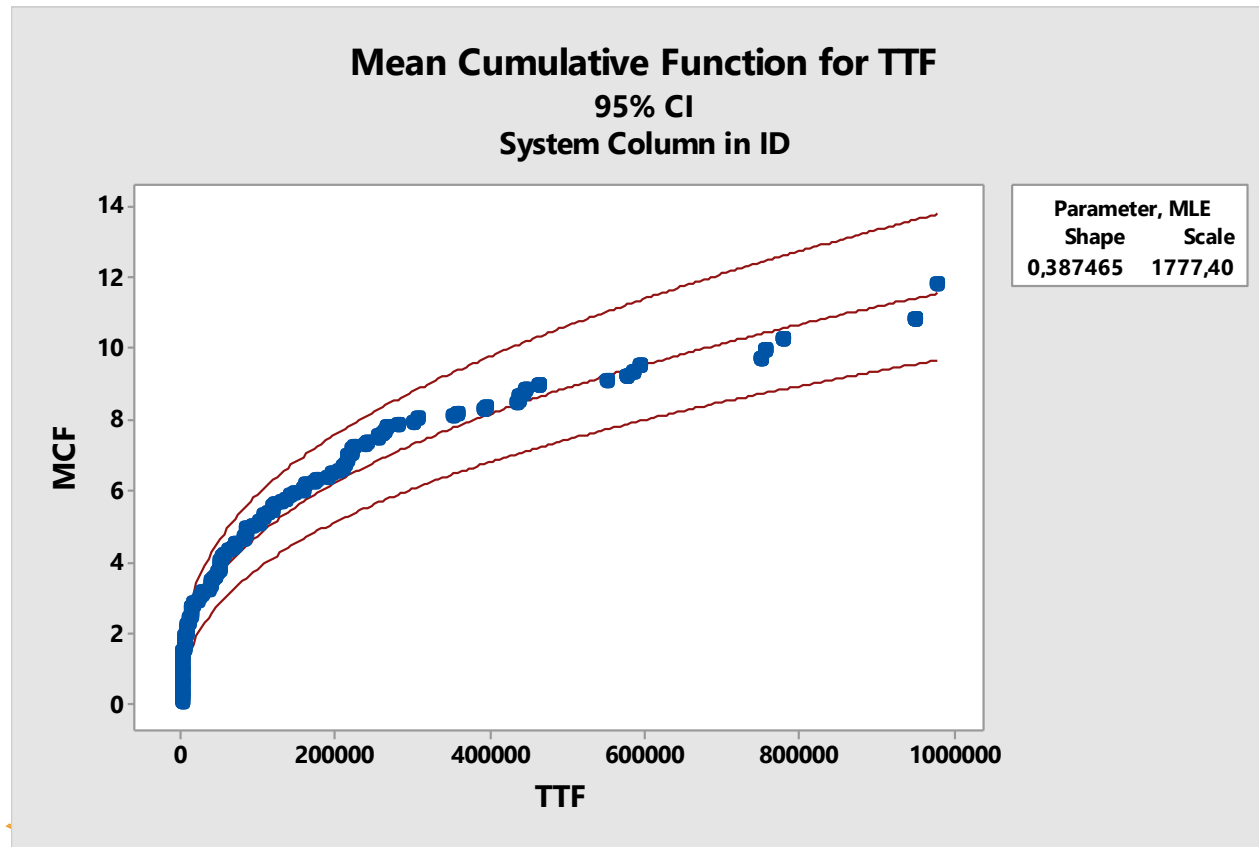
- Utilize data-drive models ("big data") (no physical modelling)

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Nowcasting and Forecasting Scenarios

- RFI – Train Delays based on the railway network status and on weather conditions
- NR – Delay Attribution by looking at past and current states of train delays
- UPORTO/EVELEO/IP – Lateral and Vertical forces to identify derailment risk
- TRV/LTU – Track geometry of S&C to estimate probability of failure
- SR & DLR – Detect anomalies of switch movements by studying power consumption
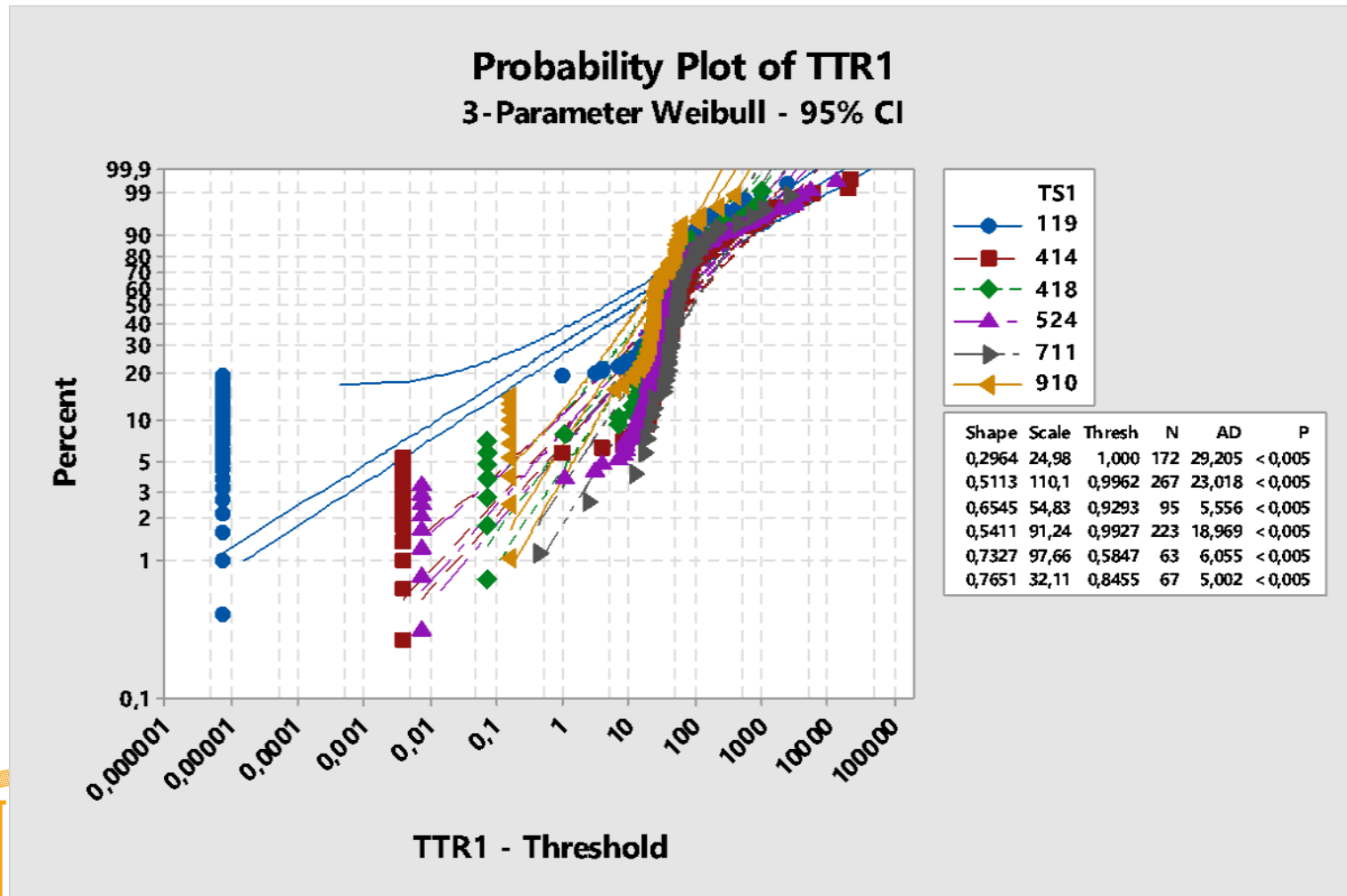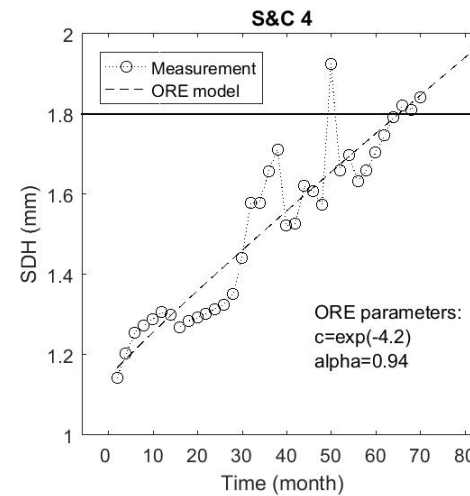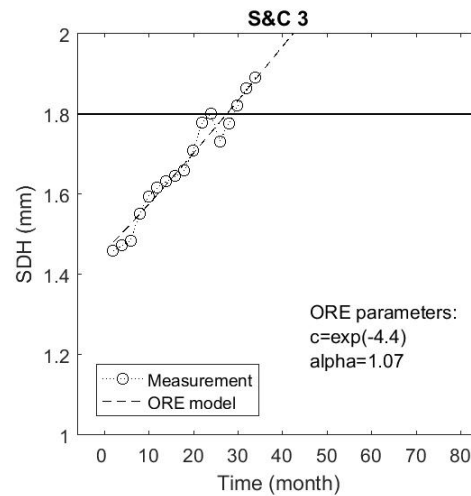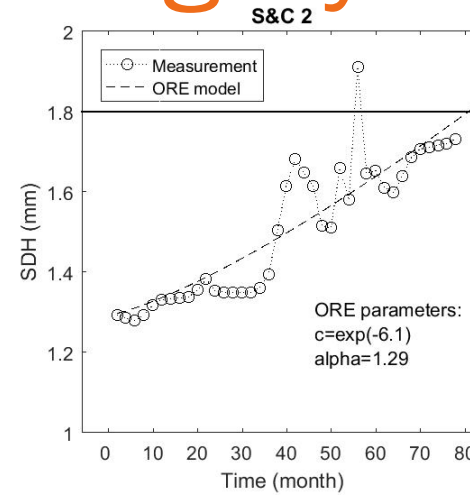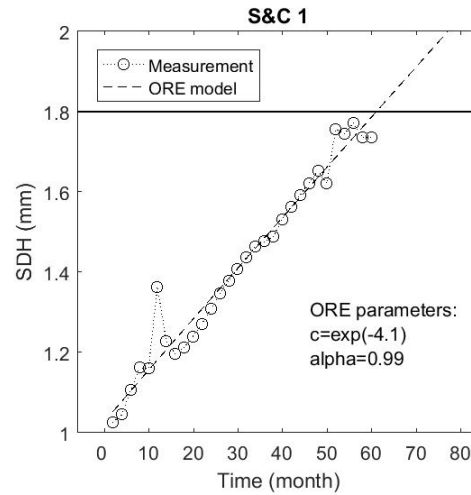- SR & UNIGE – Forecast S&C failures based on the correlation of past asset failures and past weather

Nowcasting Probability of Failure

Mean Cumulative Function for TTF
95% CI
System Column in ID

Parameter, MLE	
Shape	**Scale**
0,387465	1777,40

Nowcasting Time to restoration

Probability Plot of TTR1
3-Parameter Weibull - 95% CI

Shape	Scale	Thresh	N	AD	P
0,2964	24,98	1,000	172	29,205	< 0,005
0,5113	110,1	0,9962	267	23,018	< 0,005
0,6545	54,83	0,9293	95	5,556	< 0,005
0,5411	91,24	0,9927	223	18,969	< 0,005
0,7327	97,66	0,5847	63	6,055	< 0,005
0,7651	32,11	0,8455	67	5,002	< 0,005

TS1
- 119
- 414
- 418
- 524
- 711
- 910
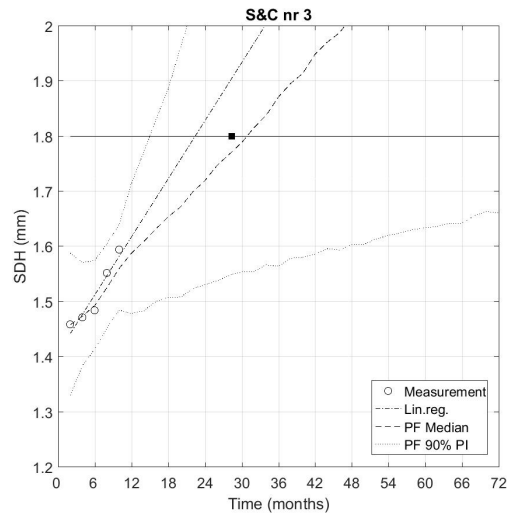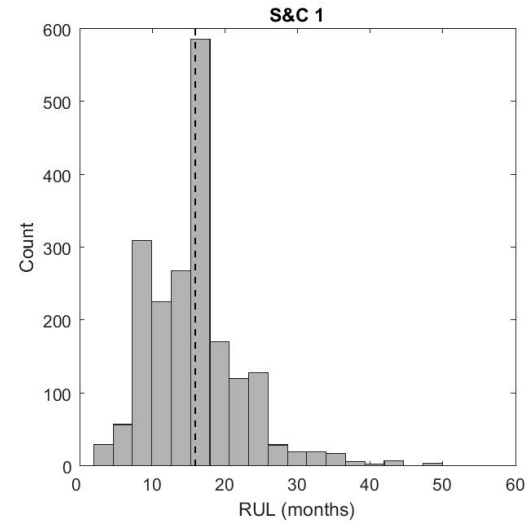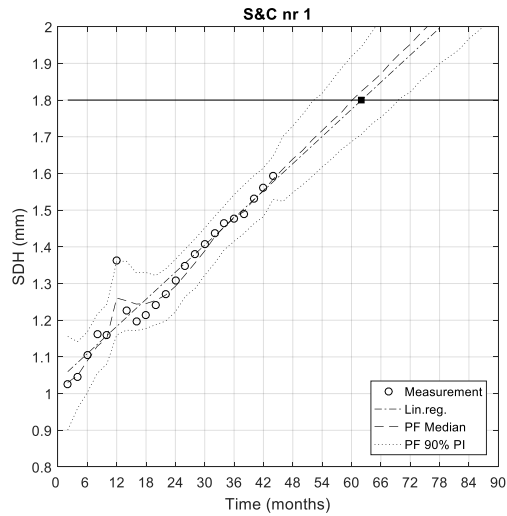
Forecasting Hybrid Model

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Forecasting Hybrid Model
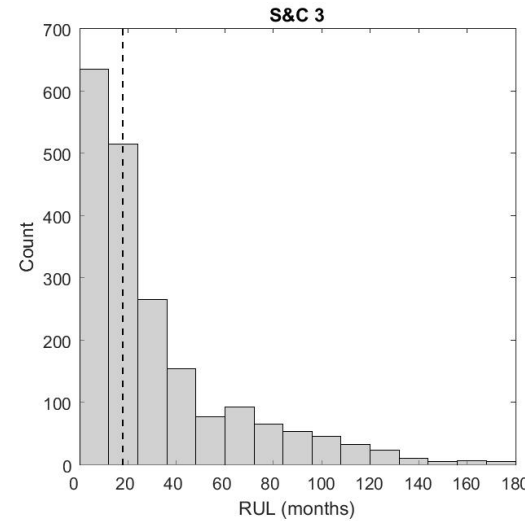
Delivery 9.5:
Forecasting algorithms verification, evaluation and assessment report

Output from T9.3.2:
Consequences assessment from forecasting

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