



Schweizerische Eidgenossenschaft
Confédération suisse
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Eidgenössisches Departement des Innern EDI
Bundesamt für Meteorologie und Klimatologie MeteoSchweiz

Seamless Weather Project

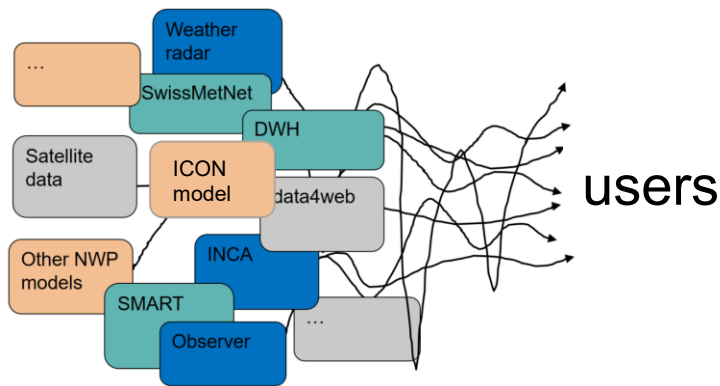
V. Bessenbacher, L. Beusch, J. Bhend, M. Buzzi, H. de Larousilhe, U. Hamman, A.
Immamovic, L. Knirsch, O. Miralles, D. Nerini, C. Osuna, A. Pauling, A. Pennino,
R. Radev, C. Siegenthaler, C. Spirig, F. Zanetta

L. Moret et al. EMS 2025 Ljubljana

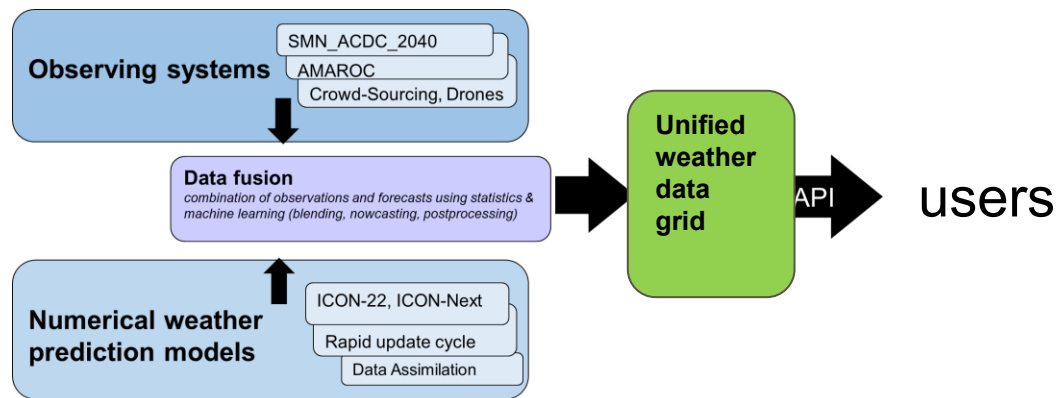


Motivation Unified weather forecasts

present:



vision:





Key objectives Seamless Weather Project

Seamless
gridded
forecast

Increasing
automation

Consolidation and
modernisation
nowcasting and
postprocessing
systems

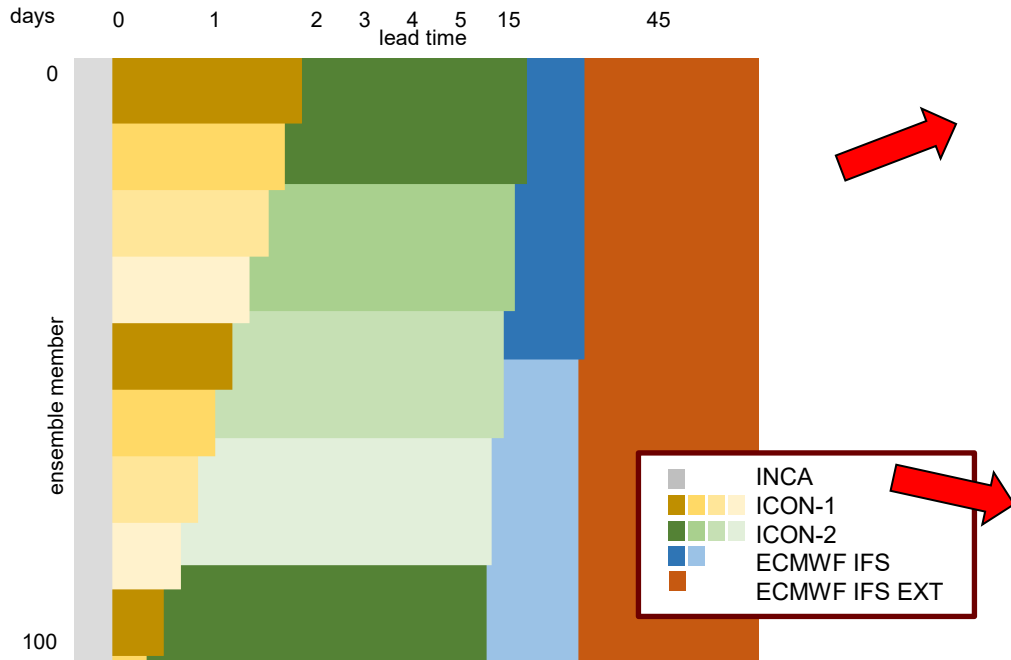
ML
platform

ML
revolution

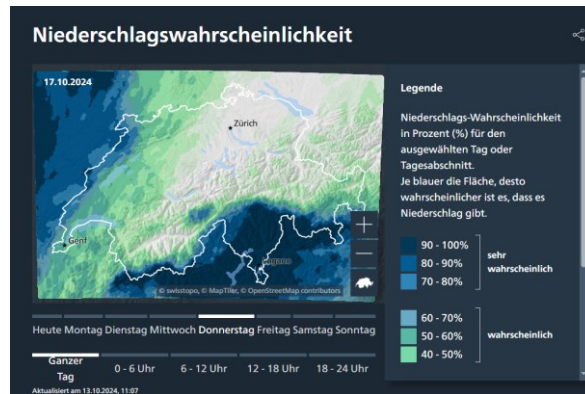
Data-driven
weather forecast
system



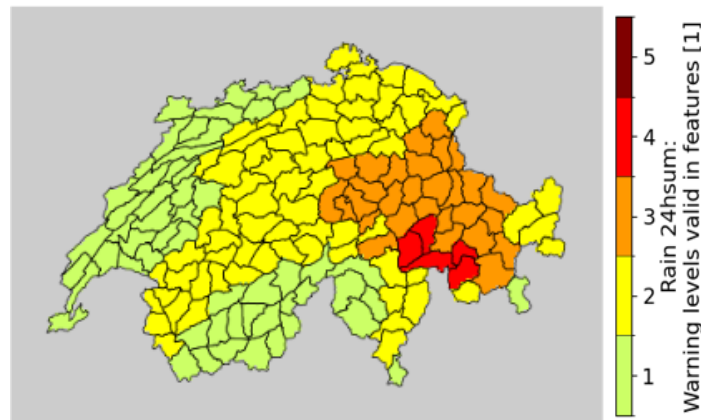
First use cases



Ensemble forecasts automatically created from different (lagged) model sources



Probability of precipitation



24h rain warning proposal



Base grids



To be considered: maintenance effort, scalability, computational efficiency, data transfer, ...

Chosen option for first **Minimal Viable Product**:

	Lead time	# of members	Spatial resolution	Time resolution	Update frequency
S	0-24h	11	1 km	10'	10'
M	0-10 days	51	2 km	1 hour	3 hours
L	0-46 days	101	9 km	1 day	12 hours



Consolidation & Modernisation

Automation increases the amount of system in operation and calls for higher quality software.

- Modernise and migrate to AWS.
- Consolidate to keep space for innovation:
 - technical
 - methodical
 - products



Automatic thunderstorm warning on AWS

Probabilities:

Rain



Hail

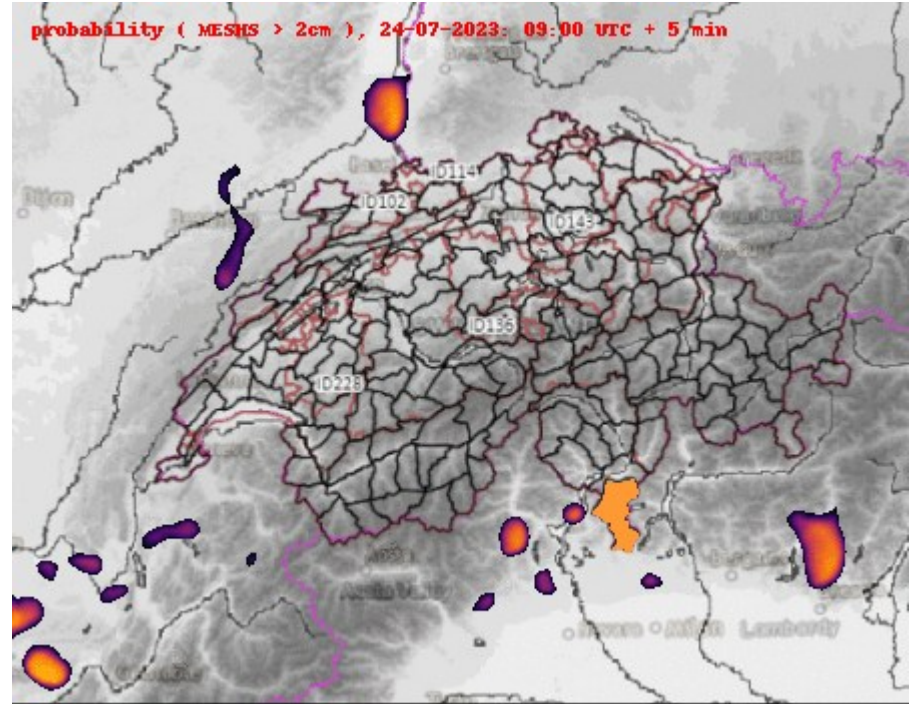


Lightning



- 12 time steps
- up to 60 min lead time

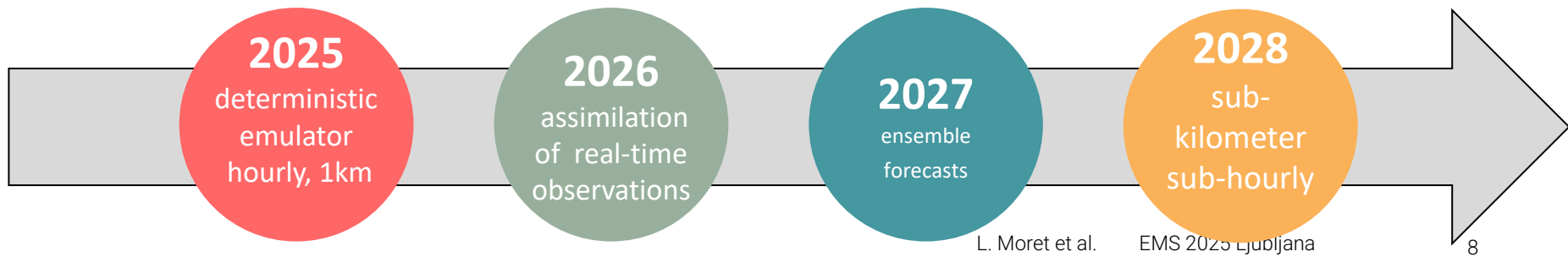
AWS





Data-driven weather forecast

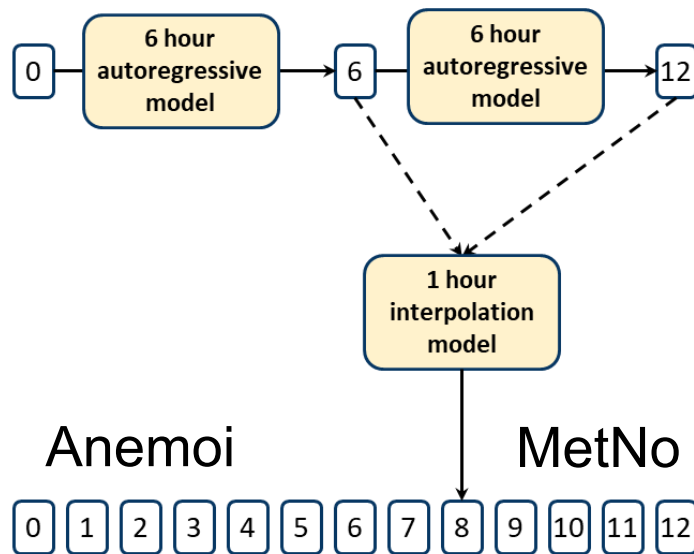
- AI models offer fast and high-quality global weather forecasts but lack the resolution needed for Switzerland complex terrain
- AI models could in one go do general weather forecasts, nowcasting and postprocessing.
- Inference is cheap compared to physics-based models
- The result will be open-source and developed with partners including ETH Zurich, SDSC, CSCS, ECMWF, ANEMOI community





Architecture: Forecaster + Interpolator

We train a dedicated model to reconstruct high-frequency output from a low-frequency forecaster without error accumulation, supporting short-term forecasting applications.

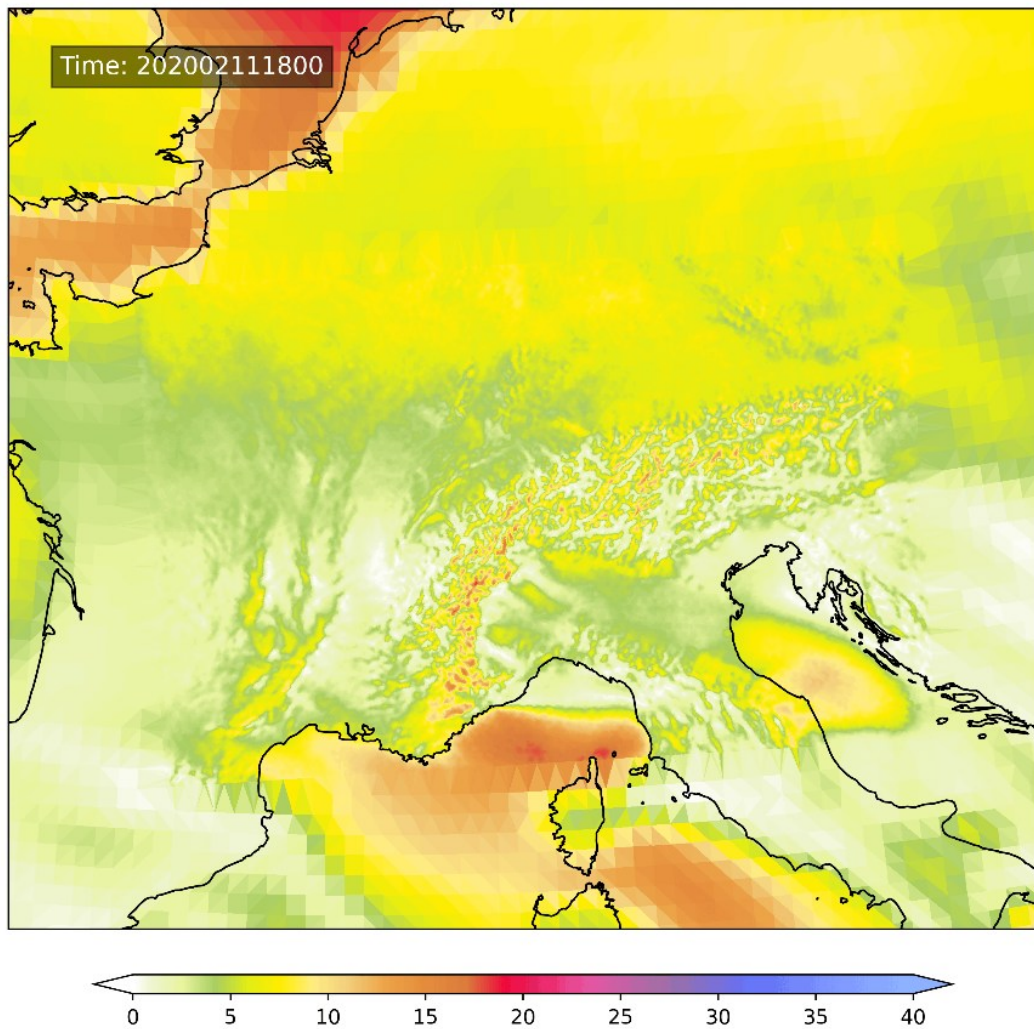




First simulations

- Wind & Temperature
- 2 km resolution over the Alps
- One day better than COSMO-2

Enabling Efficient MLOps in
Weather and Climate
Services at MeteoSwiss ,
Gabriela Aznar Siguan,
Wed, 10 Sep, 17:00–17:15





Conclusion and next steps

Achieved so far

- Seamless grids in operation and delivered to users
- COALITION-4 running on AWS
- Prototype data-driven weather forecast at 2 km resolution over the Alps.

Coming next

- Migrate new users (and their requirements) on the seamless grids.
- Further consolidate postprocessing and nowcasting applications to reduce maintenance effort.
- Introduce high frequency assimilation in the data-driven forecast model.



- Questions?
- Remarks?
- Advices?



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Seamless gridded forecast

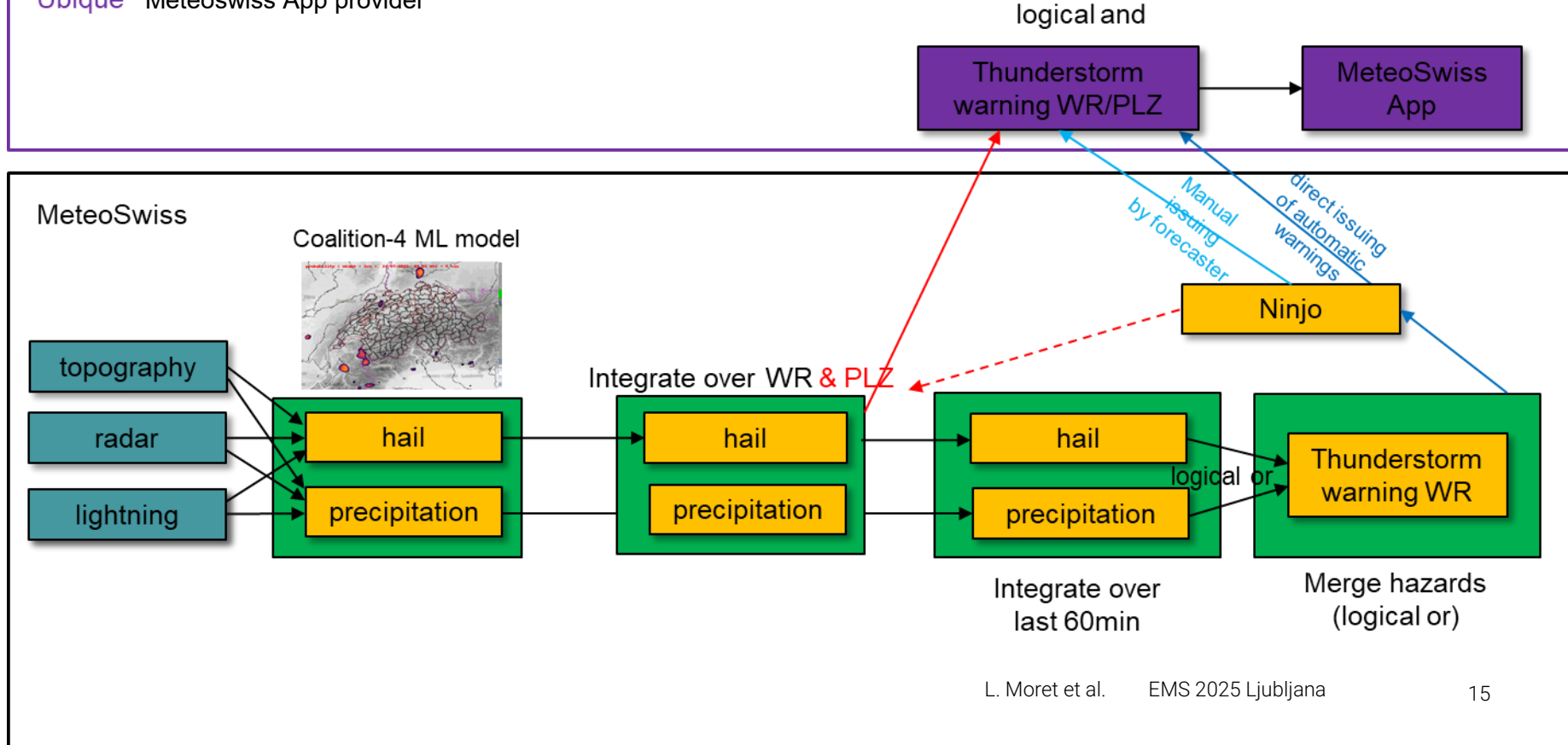
Requirements:

- Ease of access
- Integrates latest gridded forecast from MeteoSwiss
- At least as good as feeding grids.
- Avoids significant breaks with increasing lead time.
- Resilient to missing sources.



Implementation

Ubique Meteoswiss App provider





Solution overview

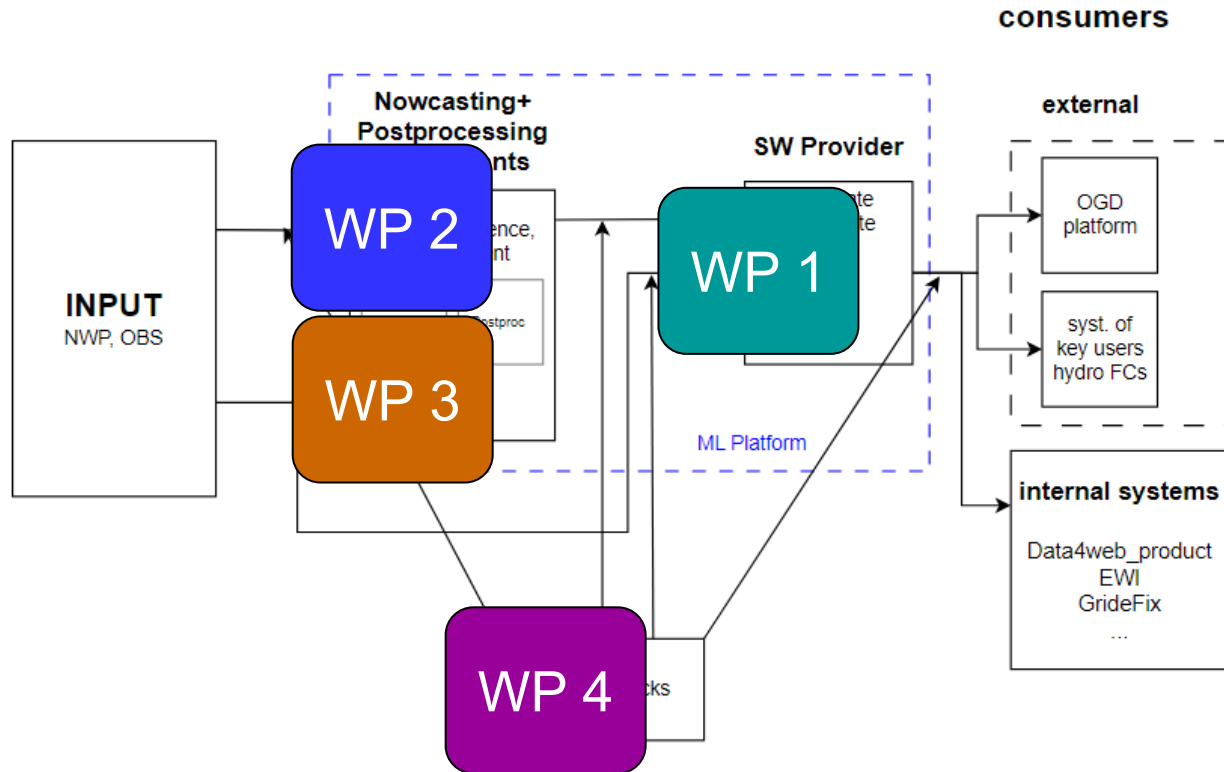


Figure: Solution overview