# Session II: Technical Details and Demonstration Results

**Technical development: Overview and approach**
Prajwal Shiva Prakasha (DLR) and Thierry Lefebvre (ONERA)

**Framework: Development & implementation of a collaborative framework for aviation impact assessment**
Marko Alder et al. (DLR)

**Use Case 1: Assessing advanced propulsion systems using the Impact Monitor Framework**
Atif Riaz et al. (CU)

**Use Case 2: Assessing continuous descent operations using the Impact Monitor Framework**
Jordi Pons-Prats et al. (UPC)

**Use Case 3: Assessing policies for the uptake of sustainable aviation fuels using the Impact Monitor Framework**
Inge Mayeres et al. (TML)

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# Use Case 2:

## *Assessing continuous descent operations using the Impact Monitor Framework*

Jordi Pons-Prats, Xavier Prats, David de la Torre, Eric Soler, Peter Hoogers, Michel van Eenige, Sreyoshi Chatterjee, Prajwal Prakasha, Patrick Ratei, Marko Alder, Thierry Lefebvre, Saskia van der Loo, Emanuela Peduzzi

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# Use Case 2 – Overview

**Motivation**

- Impact monitor
- Continuous Descent Operations

**Methodology:**

- Workflow
- Tools
- Integration

**Results**

**Final remarks**

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# Use Case 2 – Introduction


**Objectives (Project):**

- Desicion-support tool focusing airport level
- Connection Aircraft and ATS
- Validate IM approach with a large number of tools

**Objective (Use case):**

- Investigate the implementation of continuous descent operations at airports

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# Use Case 2 – Introduction


## Scenario:

- Continuous descent operations for a reference and future scenario at an example airport

## Main Models:

- Fleet and schedule forecast model
- Airport and airspace simulation
- Noise and emissions model
- Risk assessment model

## Metrics:

- Punctuality, Capacity
- Fuel burn, Emissions and Noise, Risk
- Social cost benefit analysis

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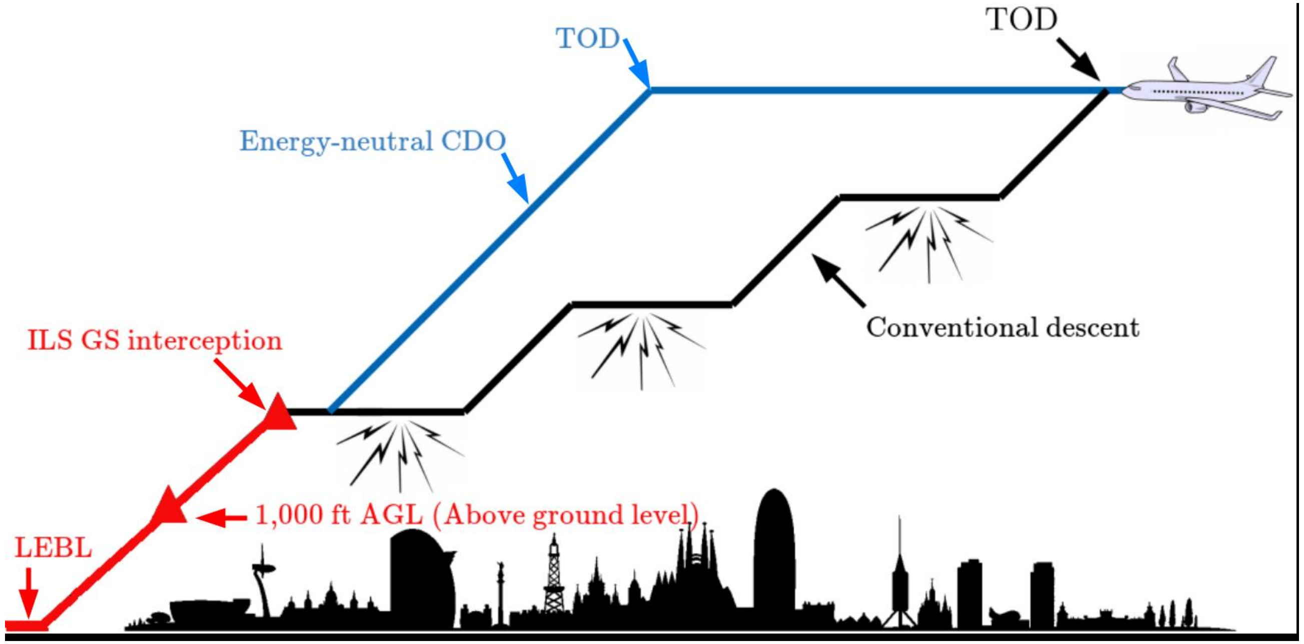
# UC2: Continuous Descent Operation

CDO allows aircraft to follow an **optimum flight path** that delivers **major environmental and economic benefits**, giving as a result engine-idle continuous descents that **reduce fuel consumption, pollutant emissions and noise nuisance** (Erkelens, 2000; Warren & Tong, 2002; Clarke et al., 2004)




Illustrative comparison of a CDO and a conventional descent operation (Sáez, 2021)

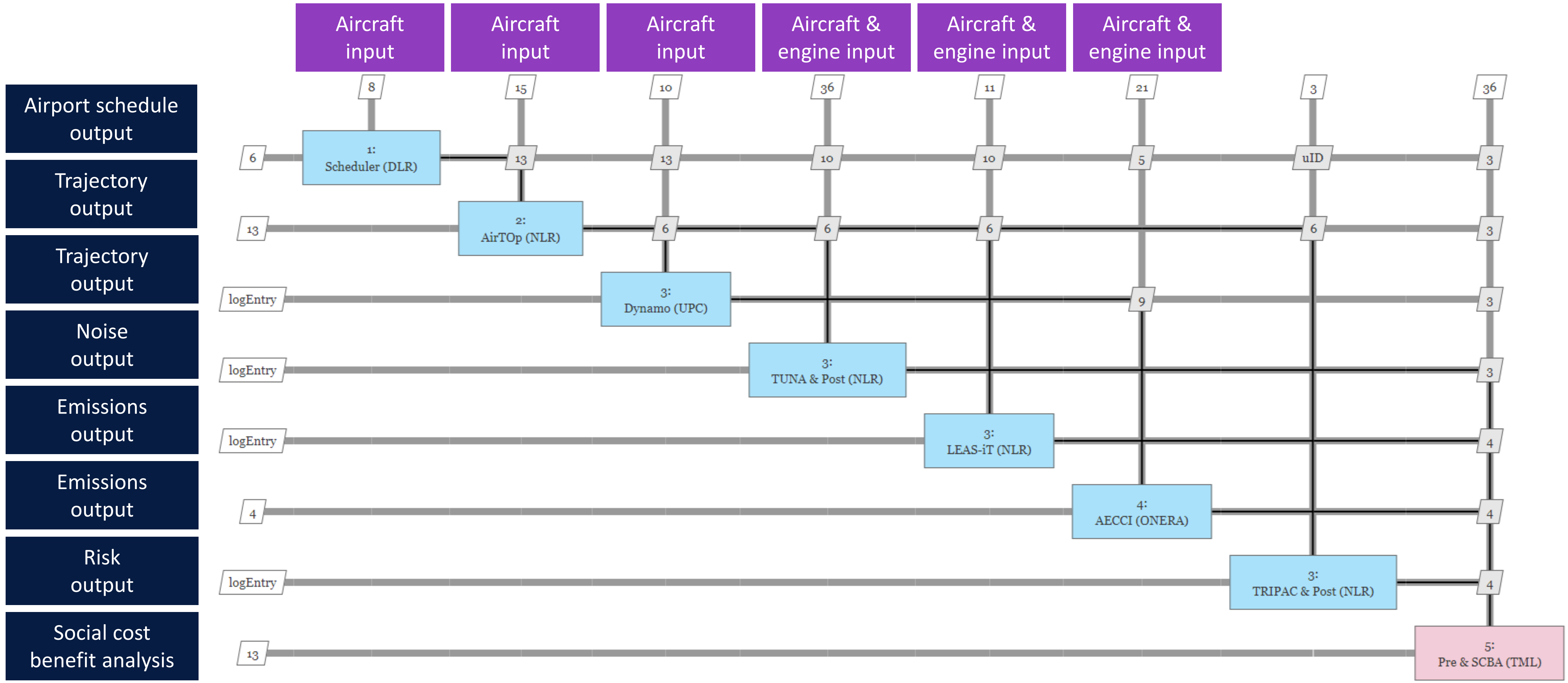

ERKELENS, L. 2000. Research into new noise abatement procedures for the 21st century. In: AIAA Guidance, Navigation, and Control Conference and Exhibit. Denver, CO, USA: AIAA.

WARREN, A., & TONG, K.-O. 2002. Development of continuous descent approach concepts for noise abatement. In: IEEE/AIAA 21st Digital Avionics Systems Conference (DASC). USA: IEEE.

CLARKE, J.-P.B., HO, N.T., REN, L., BROWN, J.A., ELMER, K.R., ZOU, K.F., HUNTING, C., MCGREGOR, D.L., SHIVASHANKARA, B.N., TONG, K.-O., WARREN, A.W., & WAT, J.K. 2004. Continuous descent approach: Design and flight test for Louisville international airport. Journal of aircraft, 41(5), 1054–1066.

Sáez García, R. 2021 Traffic synchronization with controlled time of arrival for cost-efficient trajectories in high-density terminal airspace. PhD Thesis, UPC.

# Use Case 2 – CDO Workflow

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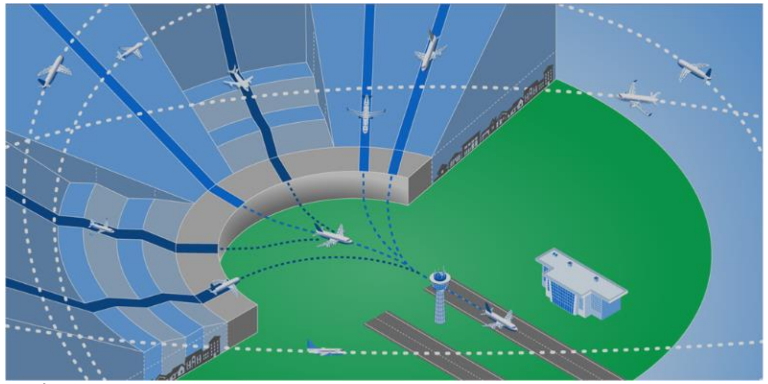
# UC2: CDO – Tool Integration

Scheduler
DLR, in-house
Flight Schedule

Airtop
NLR, Transoft
Fast-time simulation

DYNAMO
UPC, in-house
Trajectory prediction


Fabec.eu

cpacs
data schema for system of interest representation

RCE
Executing simulation workflows

AECCI
ONERA, in-house
Emissions and contrails

TUNA, LEAS-it, TRIPAC
NLR, in-house
Emissions, Noise and Risk

SCBA
TML, in-house
Social Impact

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# UC2: CDO – Tool Integration

- CPACS; the common language
  - Implementation of specific nodes and structure
    - Flight data
    - Emissions, noise and Risk
    - Point-to-point and aggregated data
- MDAX; the workflow definition
- RCE; full operative integration
  - Remote connectivity using Uplink and BRICS
- IM Dashboard
  - IM development
  - UC2 specific plots and results visualization

cpacs A Common Language for Aircraft Design

data schema for system of interest representation

MDAx MDO Workflow Design Accelerator

MDO system formulation environments

RCE

Executing simulation workflows

RCE Uplink

BRICS

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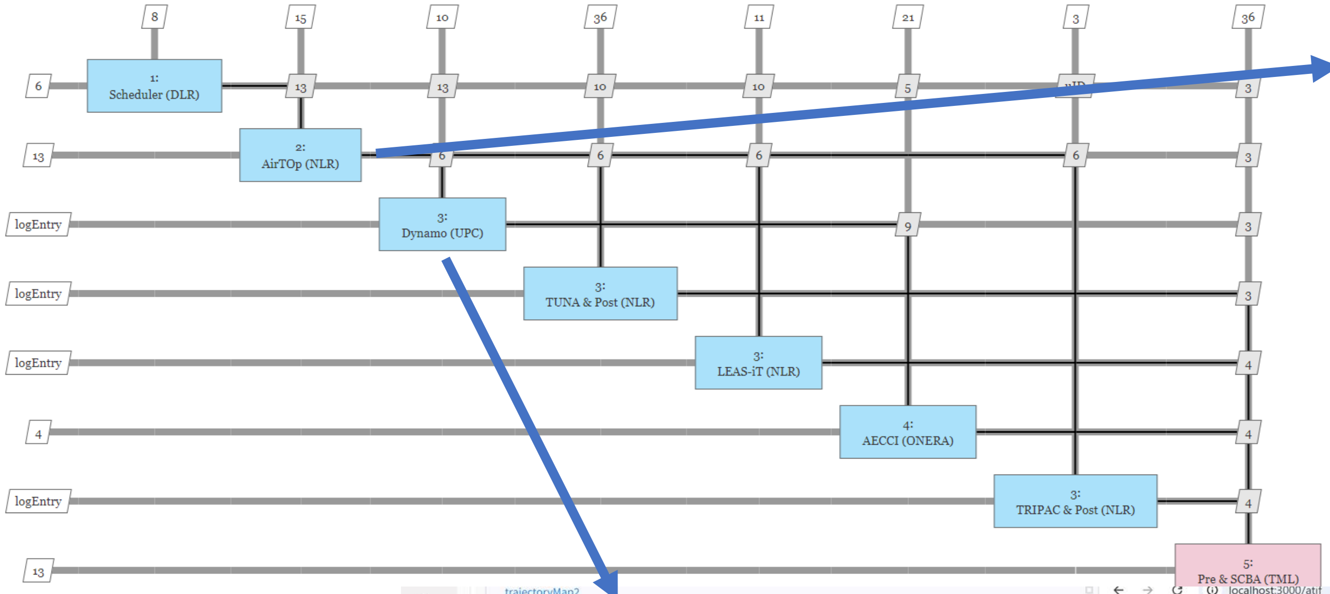
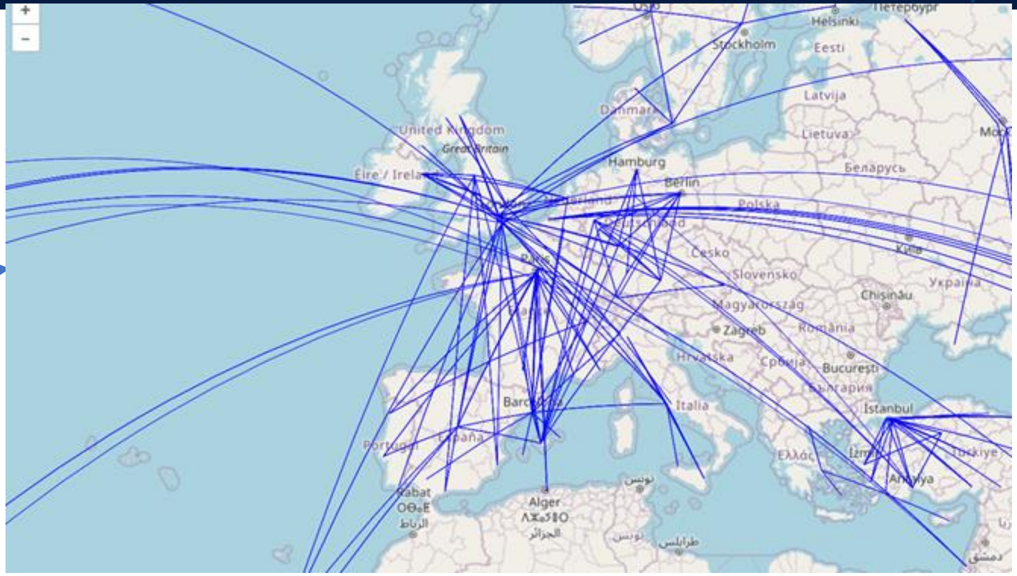
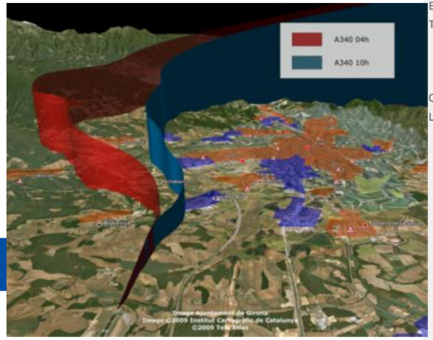
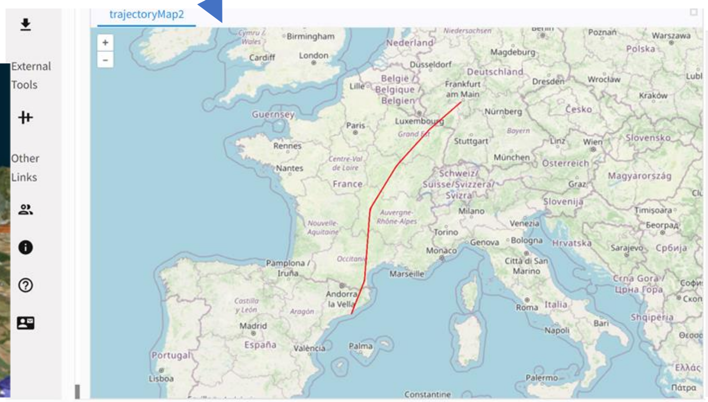
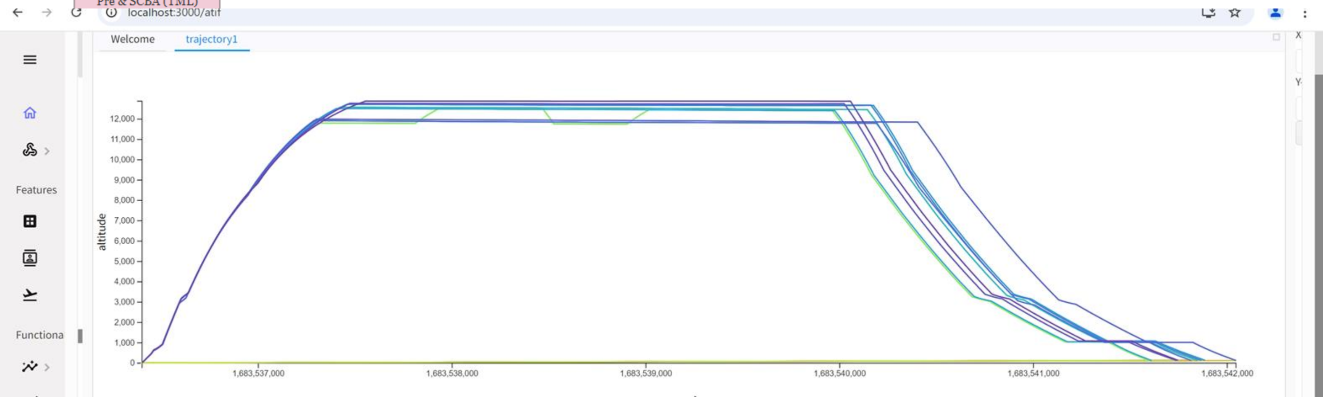
# UC2: Preliminary Results



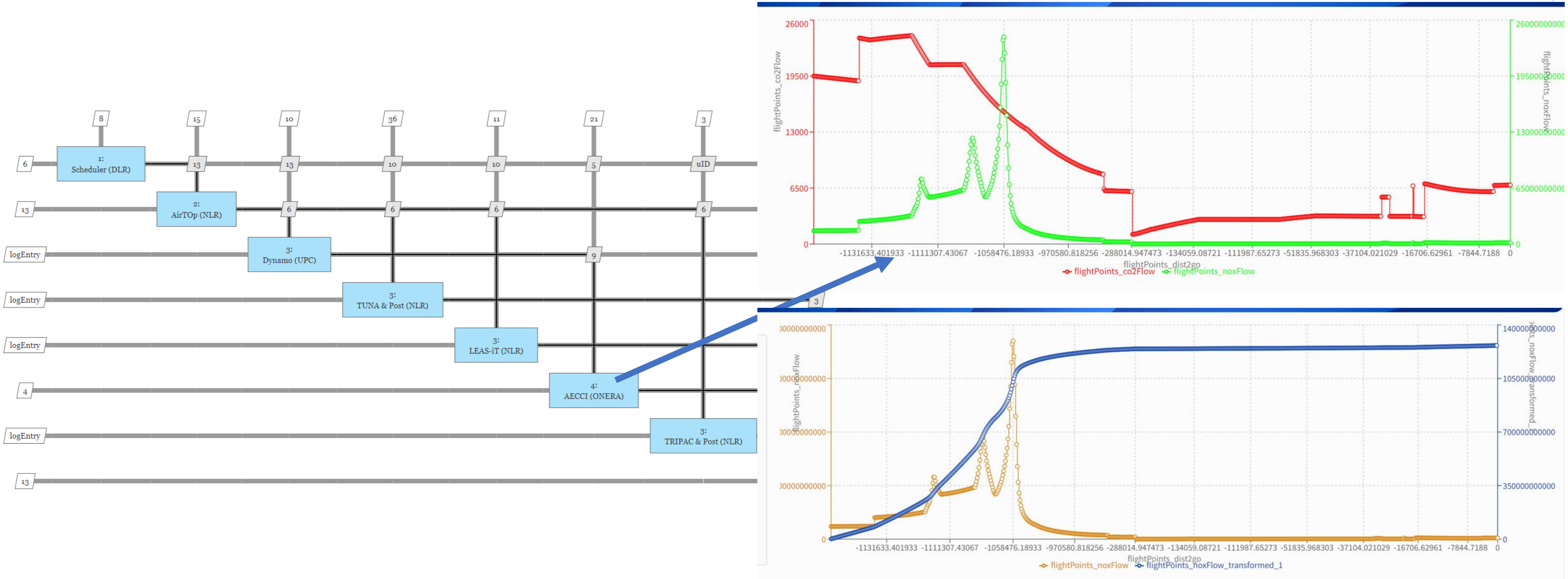







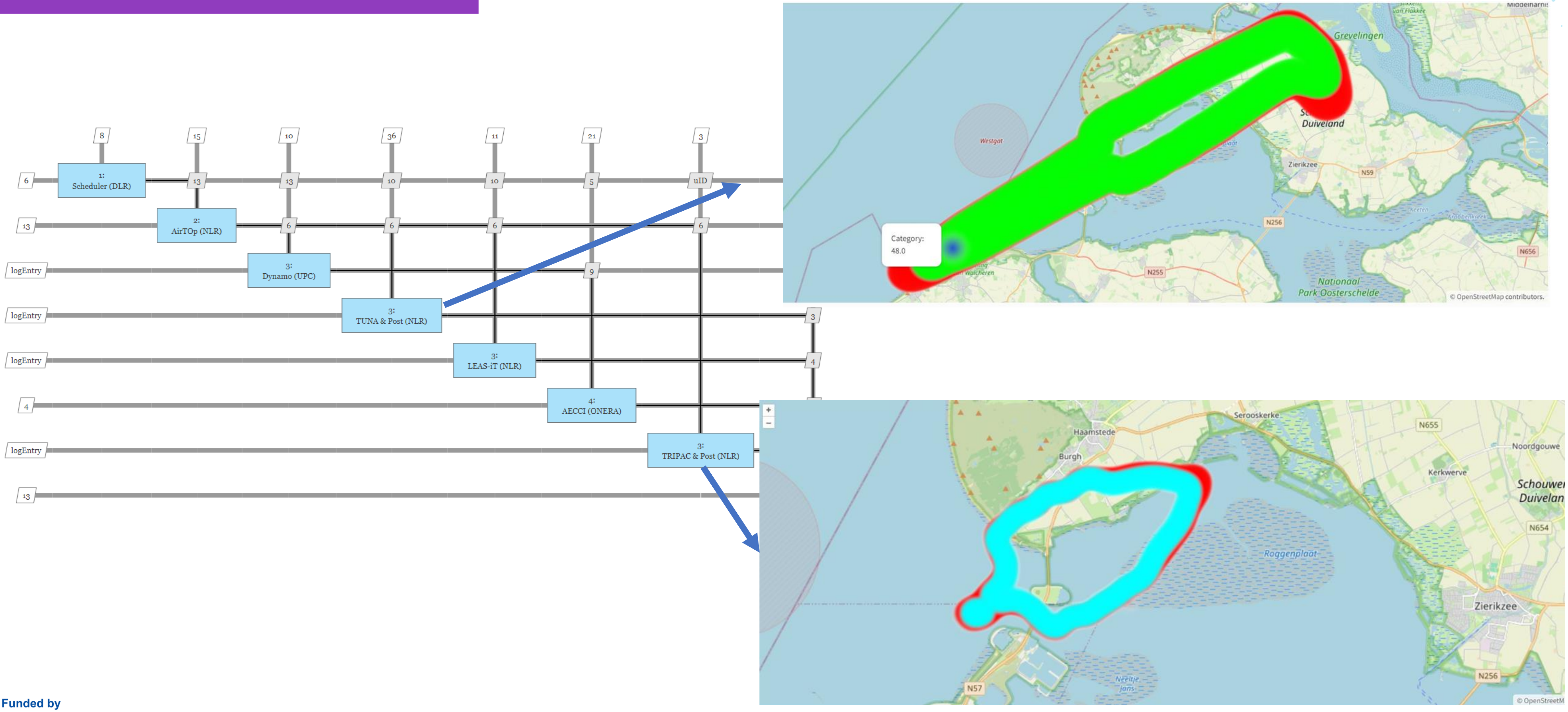



# UC2: Preliminary Results



# UC2: Preliminary Results



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# UC2: Conclusions and Further work

- Objective of Tool integration fulfilled
  - Workflow with a large number of tools
- All tools talking a common language: CPACS
- All tools communicated through RCE
  - Integration to RCE with Uplink and BRICS
- Initials Runs executed – share of a common CPACS file along the Workflow
- Initial integration with the Dashboard
- Finalize the execution of the complete workflow – On-going
- Complete Integration with the dashboard – On-going
- Definition and execution of the scenarios (Ref & CDO) – On-going

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# Benefits and Conclusions

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### Enhanced Efficiency and Productivity

- Streamlined workflows
- Improved data sharing
- Real-time collaboration

### Innovation and Knowledge Sharing

- Cross-functional collaboration
- Knowledge transfer
- Accelerated research and development

### Improved Decision-Making

- Comprehensive analysis
- Scenario planning
- Risk mitigation

### Improved Regulatory Compliance

- Centralized data management
- Enhanced traceability
- Reduced risk of non-compliance

### Cost Reduction

- Resource optimization
- Reduced development time
- Improved collaboration

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# Thank you!

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# Acknowledgments

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