



AI4REALNET Project



AI4REALNET has received funding from European Union's Horizon Europe Research and Innovation programme under the Grant Agreement No 101119527

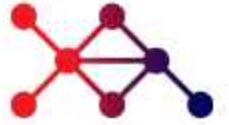


ai4realnet.eu



Project's overview

What are our objectives?



Develop the next generation of decision-making methods



INCREASE RESILIENCE, SAFETY, AND SECURITY OF CRITICAL INFRASTRUCTURES



electricity

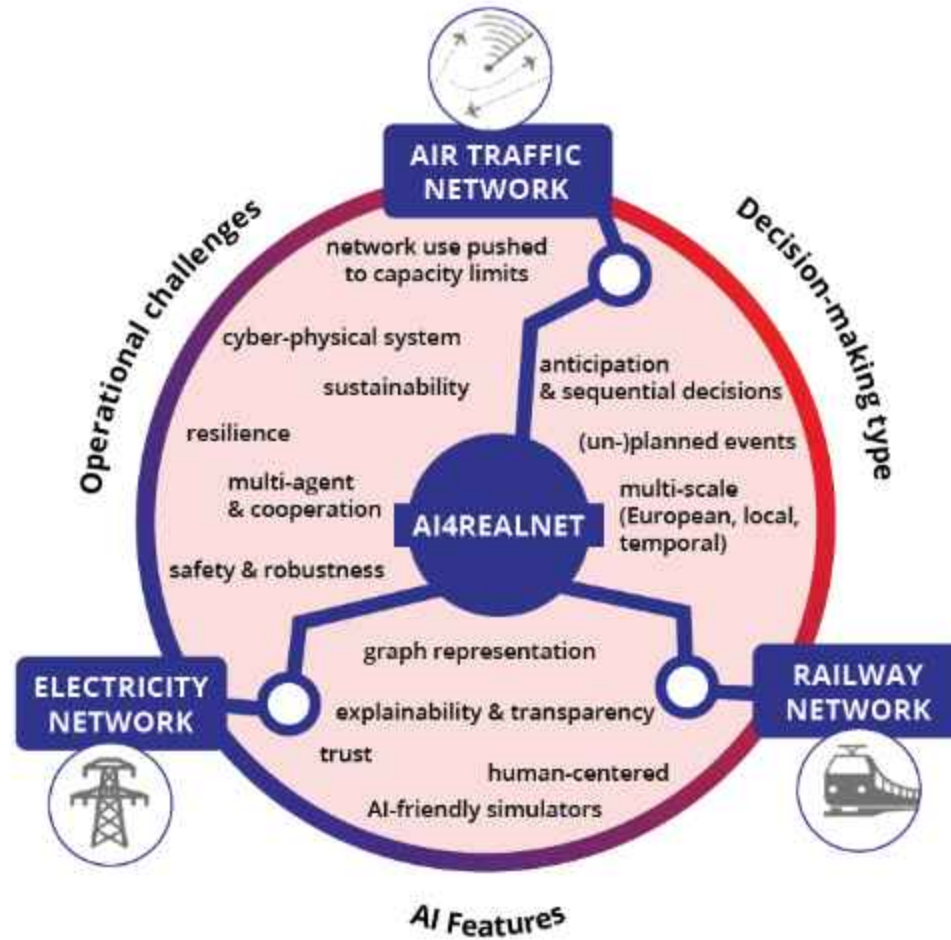
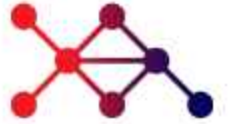


railway

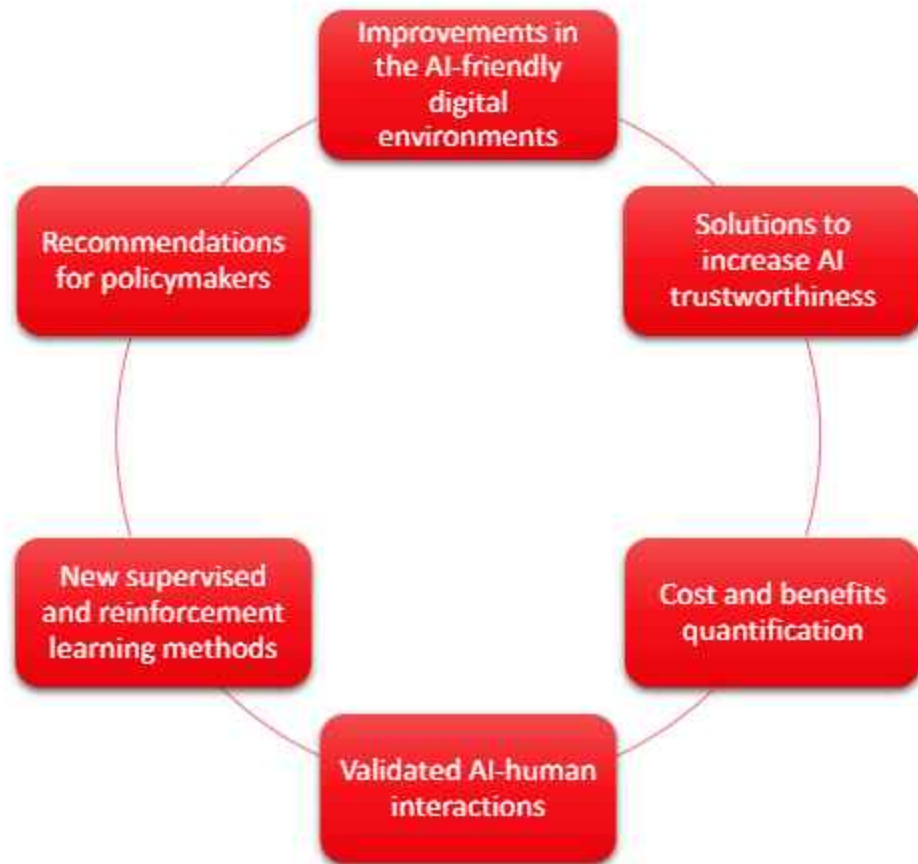
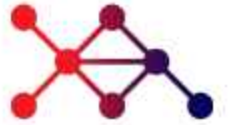


air traffic

Focus on critical infrastructures



What are our expected outputs & ambitions?



Support energy transition & increase resilience to natural and man-made hazards

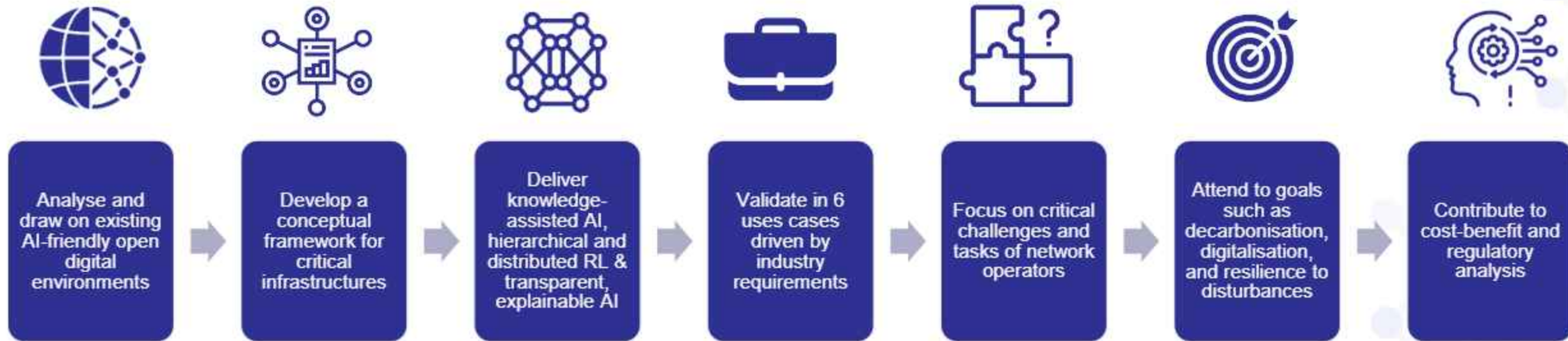
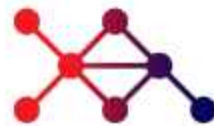


Provide more flexibility and operational reliability to maximize the capacity of the current infrastructures

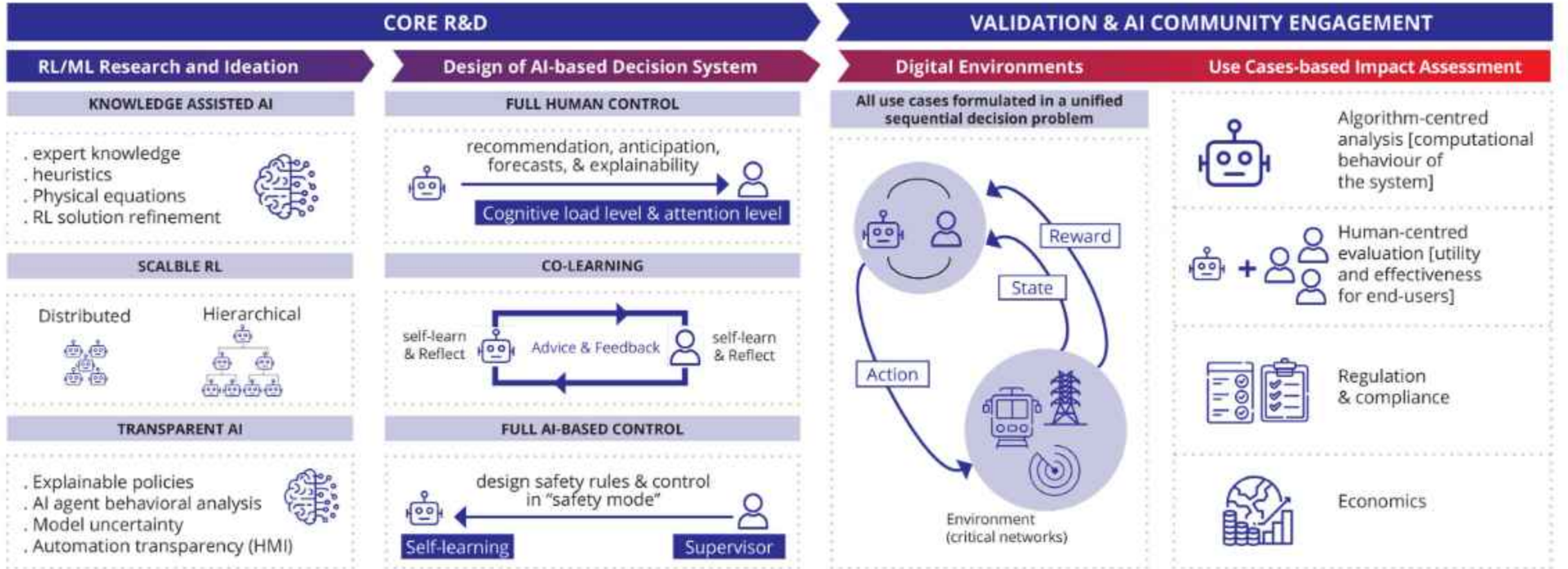
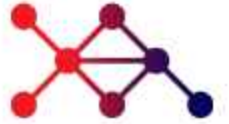


Facilitate continuing growth of air traffic demand while maintaining a high level of safety

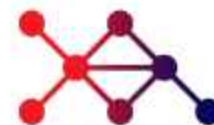
How do we plan to achieve it?






Project concept

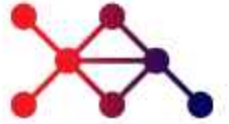


Digital environments



	 Grid2Op	 Flatland	 BlueSky
Single or multi-agent?	Single (will be extended to multi-agent)	Multi-agent	Both
Observation space: type & (size)	Discrete & continuous (large, > 4000 dimensions)	Discrete & continuous (large)	Continuous (large)
Competitive or collaborative		Collaborative	Both
Sequential or episodic?		Sequential	
Stochastic or deterministic environment?		Stochastic	Deterministic (stochastic elements are possible)
Static or dynamic environment?	Static		Dynamic
Discrete or continuous action space or mixed?	Mixed (discrete and continuous actions)	Discrete	Mixed (discrete and continuous actions)
Size of action space	Large (> 65,000 different discrete actions & 200 continuous actions)	Small (5 actions currently)	Large
System represented as a graph?		Yes	No

Use cases – Electricity network



AI4 REALNET

UC1



AI assistant supporting human operators' decision-making in managing power grid congestion

AI ROLE

Provide a human operator with remedial action recommendations aimed at safely managing overloads on the electrical lines and easing the workload of the human operator.

7 AFFORDABLE AND CLEAN ENERGY 

13 CLIMATE ACTION 

FULL HUMAN CONTROL

 recommendation, anticipation, forecasts, & explainability 

Cognitive load level & attention level

AI4 REALNET

UC2



Sim2Real, transfer AI-assistant from simulation to real-world operation

AI ROLE

Provide a human operator with remedial action recommendations, considering a transfer from training (digital) to real-world environments.

7 AFFORDABLE AND CLEAN ENERGY 

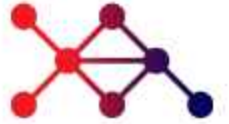
13 CLIMATE ACTION 

FULL HUMAN CONTROL

 recommendation, anticipation, forecasts, & explainability 

Cognitive load level & attention level

Use cases – Railway network





UC3

Automated re-scheduling in railway operations



AI ROLE

The re-scheduling task is performed in a highly automated manner by an AI-based re-scheduling system. It observes the real-time state of all the trains and tracks in the control area of interest and automatically detects the need to intervene, decides on an intervention, and executes this intervention.

9 INDUSTRY, INFRASTRUCTURE AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



FULL AI-BASED CONTROL

design safety rules & control in "safety mode"



Self-learning




Supervisor



UC4

AI-assisted human re-scheduling in railway operations



AI ROLE

Assist the human dispatcher in railway operations in re-scheduling train runs to fulfil all offered services and minimise delays for the customer.

9 INDUSTRY, INFRASTRUCTURE AND INFRASTRUCTURE



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JOINT DECISION MAKING

self-learn & Reflect

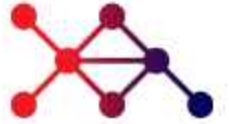


Advice & Feedback

self-learn & Reflect



Use cases – Air Traffic network





UC5

Airspace sectorisation assistant



AI ROLE

Partially and fully automate the sectorisation process to assist or replace the staff manager in deciding when and how to split and merge sectors to balance the workload of tactical ATCOs.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



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13 CLIMATE ACTION



FULL HUMAN CONTROL

recommendation, anticipation, forecasts, & explainability

Cognitive load level & attention level



UC6

Flow and airspace management assistant



AI ROLE

Provide advice to air traffic controller about deviations with better sector capacity adherence and performance measured by an indicator of environmental area. Also consider the need to review the sectorisation plan due to the activation of military areas and required trajectory efficient deviations.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



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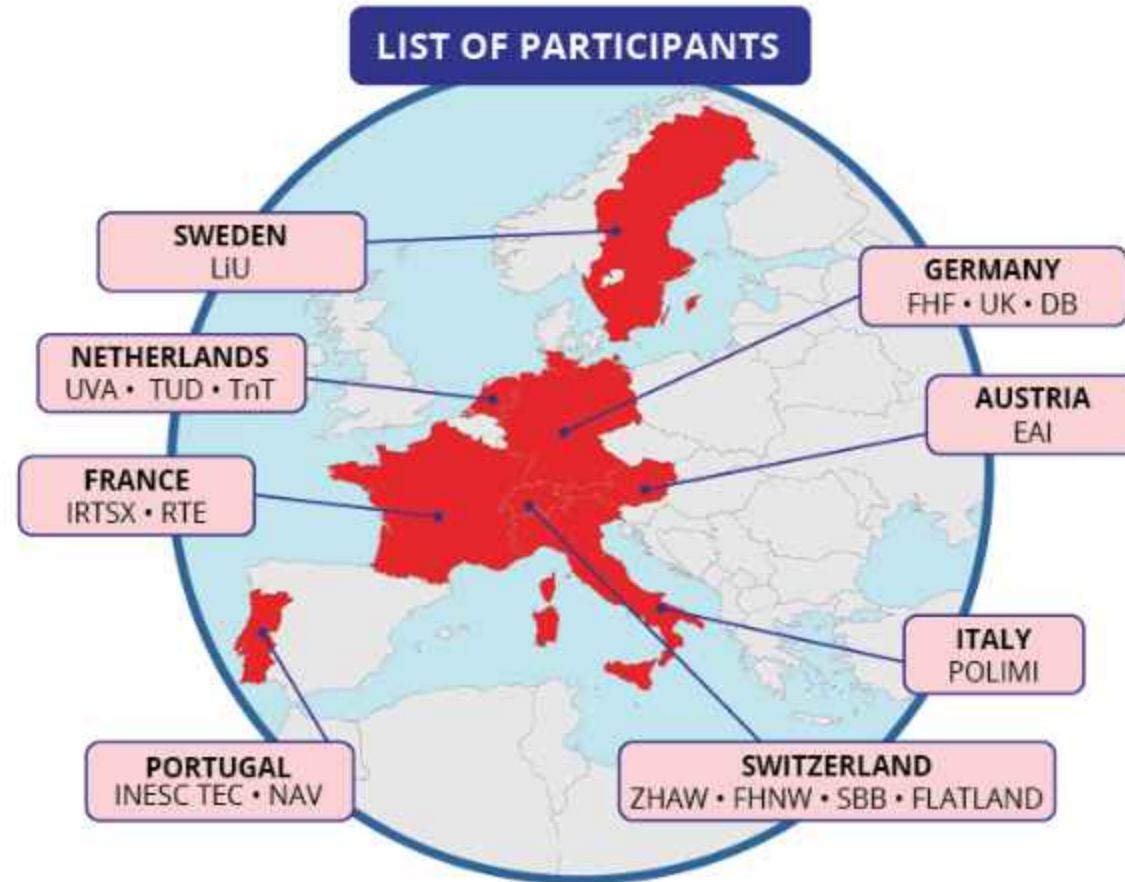
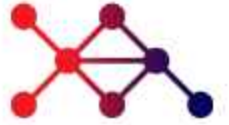
13 CLIMATE ACTION



JOINT DECISION MAKING

self-learn & Reflect  Advice & Feedback  self-learn & Reflect

Who will contribute?



What are our contacts?



@AI4REALNET Project



@AI4REALNET



@AI4REALNET



<https://ai4realnet.eu>



ai4realnet@inesctec.pt



github.com/AI4REALNET

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