

Safety and performance of cooperative automated vehicles

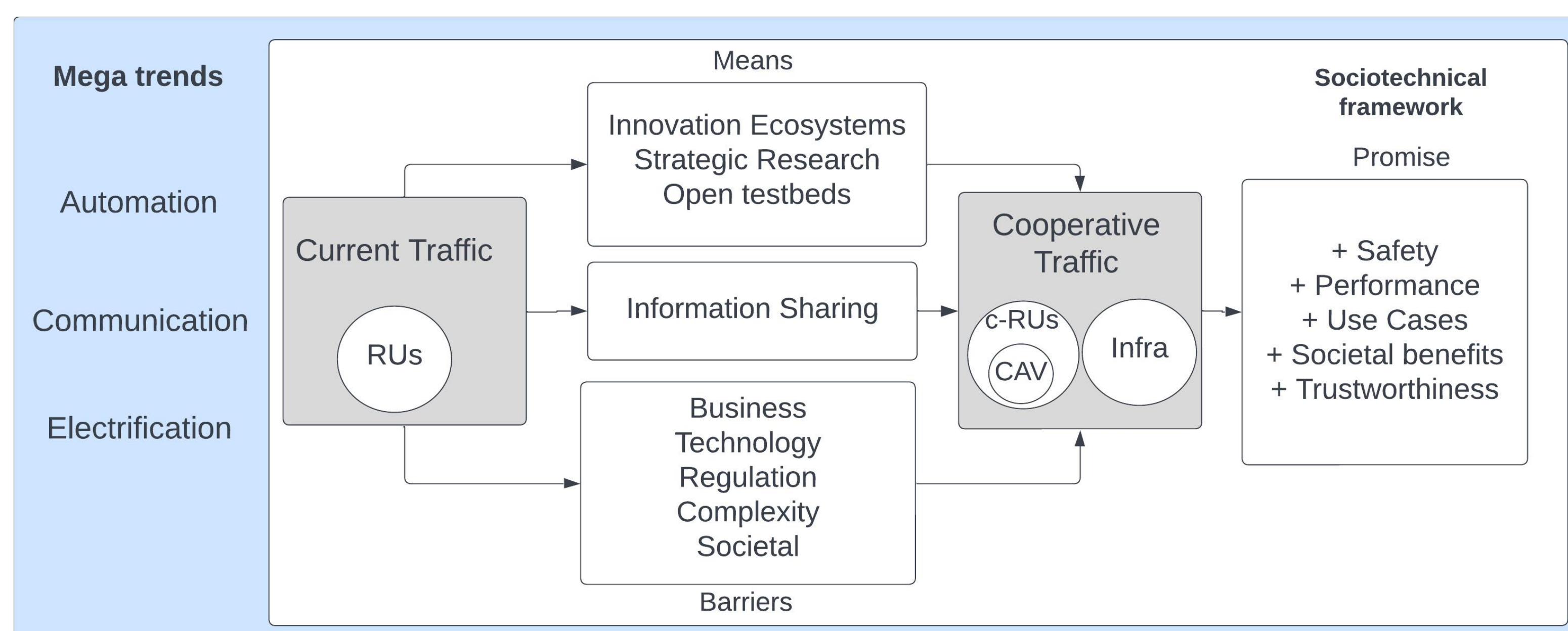
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Machine design - Mechatronics



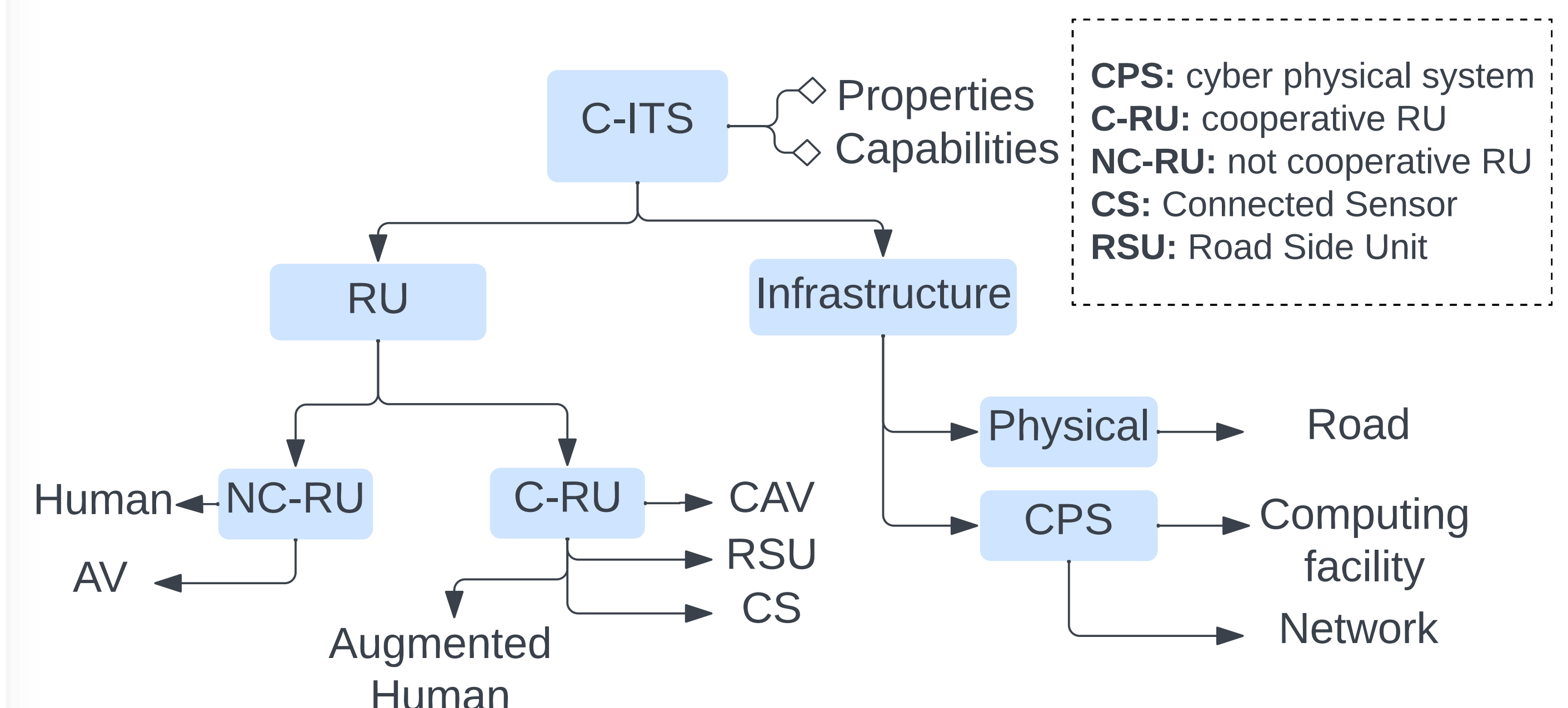
Introduction

The complexity of deploying automated vehicles (AVs) has been grossly underestimated and vehicles at high levels of automated driving (SAE level 4 and above) have so far only been deployed in very limited areas. Highly automated AVs will face complex traffic, e.g., due to occlusions and unpredictable road-user behaviour. Connectivity and collaboration promise to improve road traffic safety and performance by resolving the “information gap”.

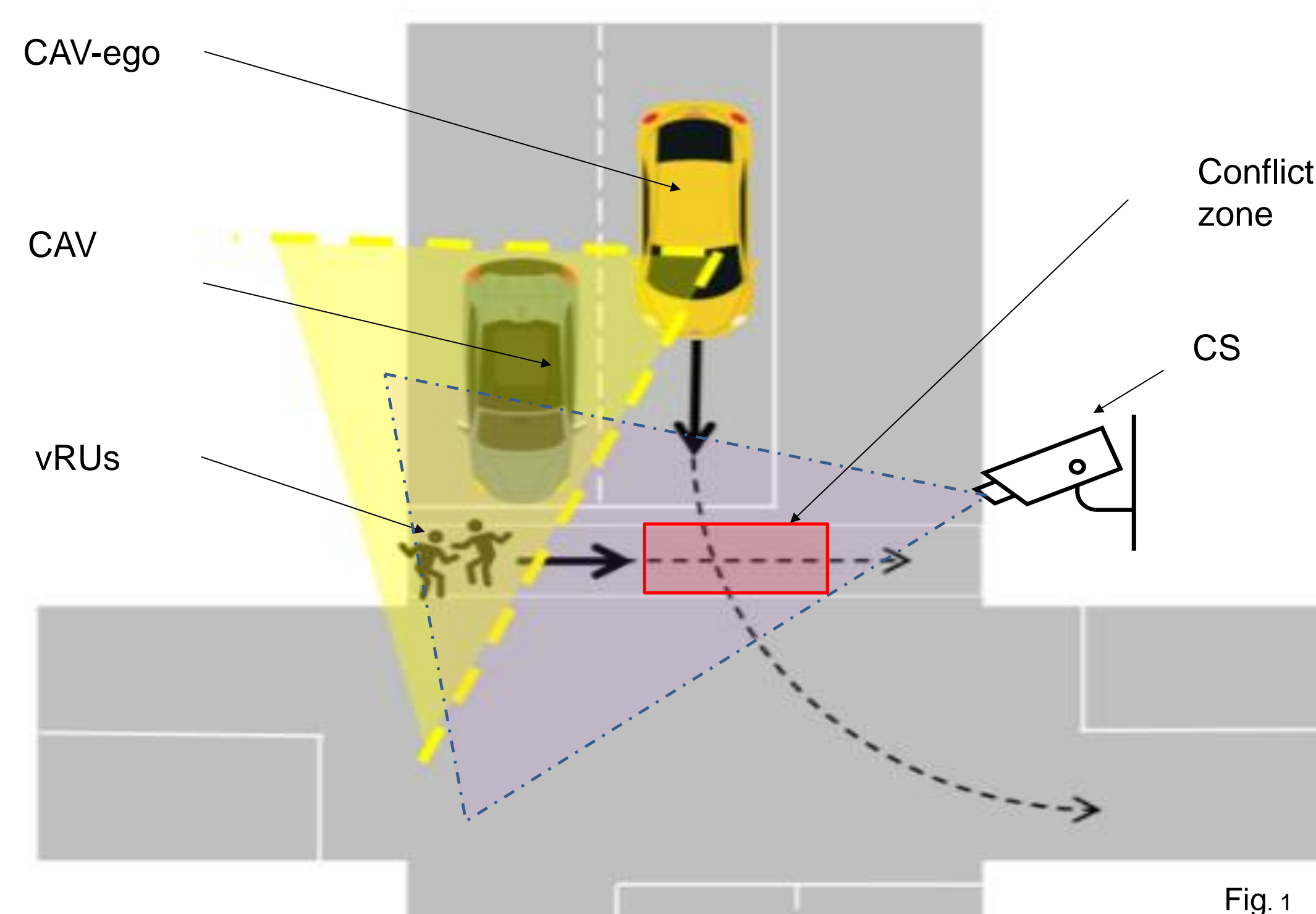
Connected C-ITS Traffic Transformation



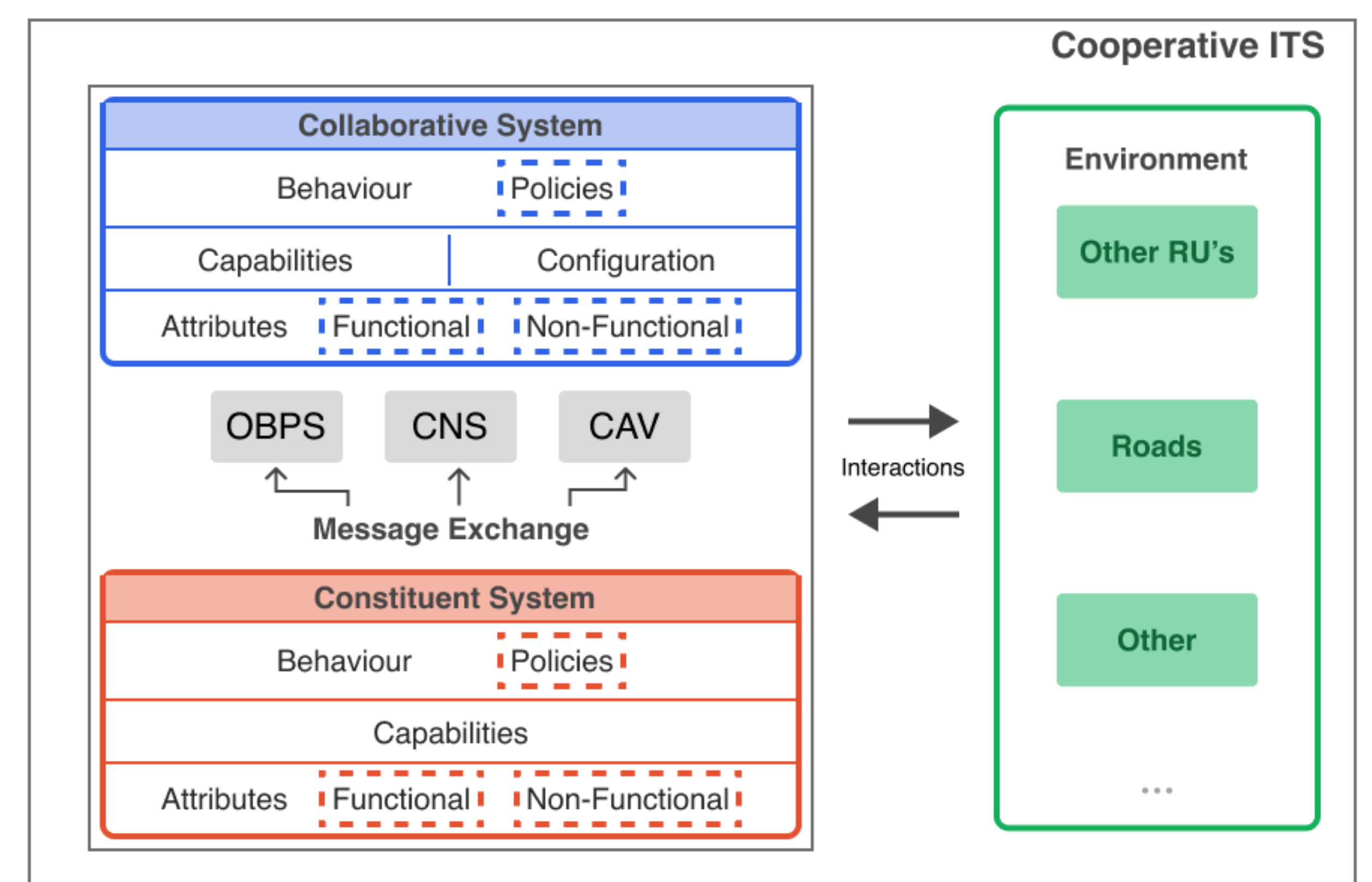
C-ITS model



Information Gap



Collaborative System model



KEY TOPICS

Resilient Collaborative Architectures

New failure modes with strategic level implications involving graceful performance degradation.

Safety and Performance trade-offs

Exploring the collaborative system design space to identify relationships and trade-offs across constituents' design space.

Tactical Safety

The anticipatory behaviour achievable through cooperation to avoid hazardous conditions. (e.g., information gap related)

Hybrid Settings

- RUs type
- Infrastructure type

Cooperation Levels

- Status
- Observation
- Intent
- Prescription

Capability Levels

- Connectivity
- Automation
- Cooperation
- Computation

Emergent Behaviour

Over time independent evolution.

New RUs and CPSs

New capabilities and interactions

New regulations and policies (socio technical context)

WAYS FORWARD

Knowledge, Method & Tools

Knowledge, methodologies and systems engineering tools to explore system-level behaviour.

Future Research

Means to foster research through innovation eco-systems, open testbeds by forming new coalitions, and engaging stakeholders

Future Trustworthiness

Anticipate users and regulatory demands (ethics & privacy) that arise post deployment, including updates and safe-ops.

References

Fornaro, G., Törngren, M. (2023). Improving Road Traffic Safety and Performance—Barriers and Directions Towards Cooperative Automated Vehicles. Lecture Notes in Computer Science, vol 14182. Springer, Cham.

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