

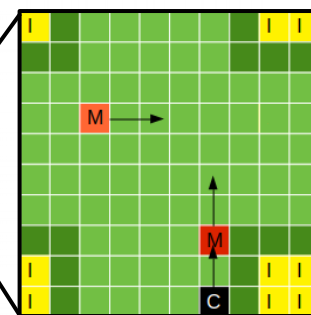
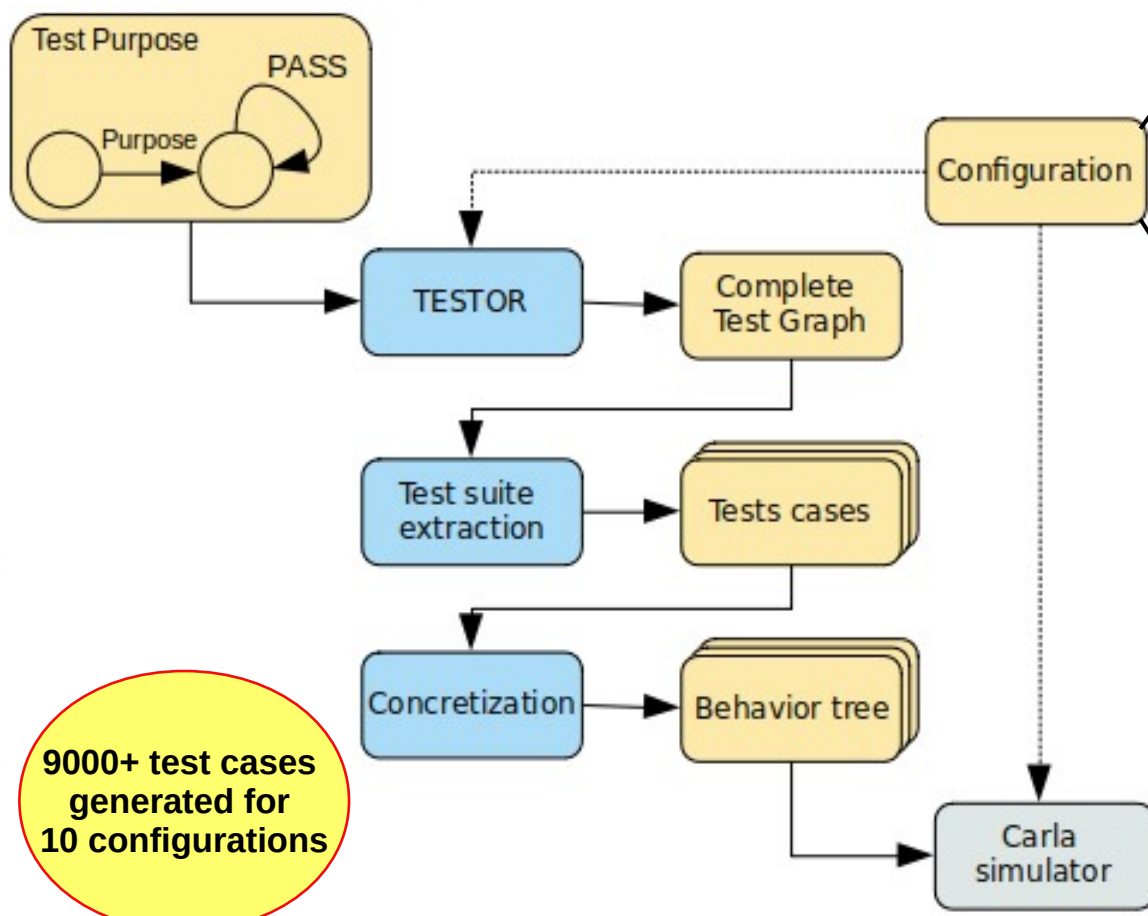
Using Formal Modelling to Generate Scenarios for Autonomous Vehicles

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Context

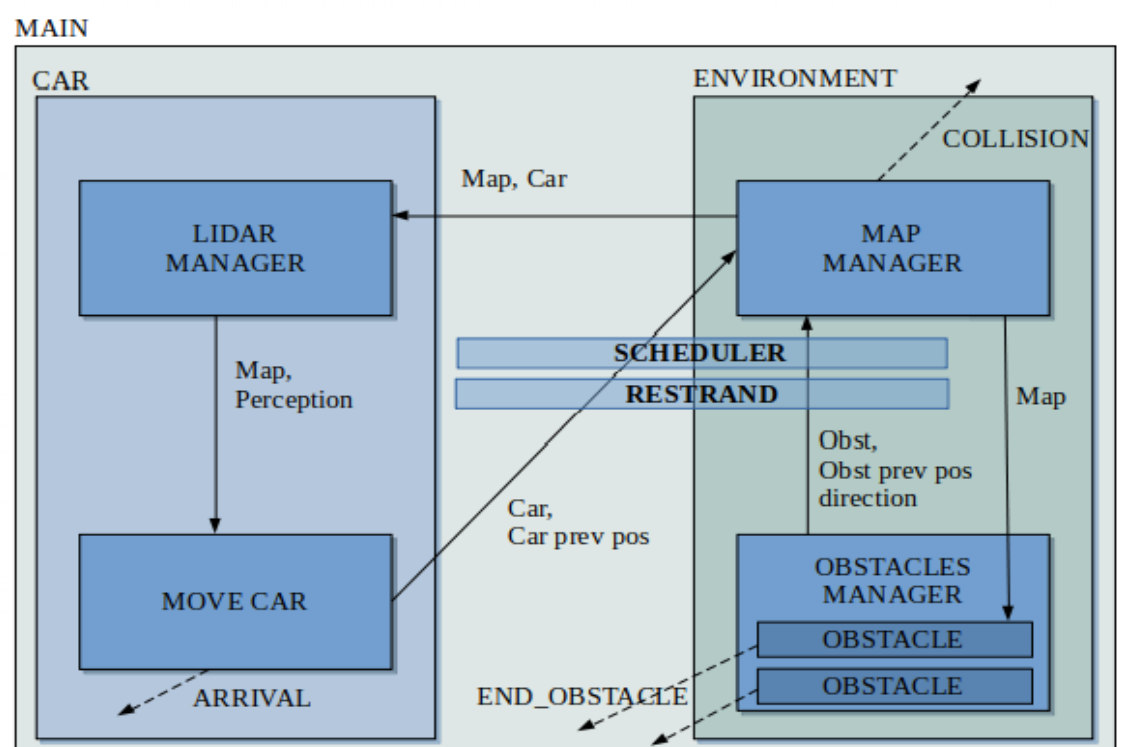
- Autonomous vehicles (AV) are complex and critical systems
- ArchitectECA2030 project (ECSEL) aims to devise reliable and safer AV
- Intensive testing required before AV release. How to generate relevant tests?



- Grid** modelling the **environment** (ground truth)
- Initial state of the **map** and behavior of the **actors** (ego vehicle and obstacles)

- Test purposes** defining **critical** situations (collisions, near misses)
- CTG** generated from **formal model** (configuration) and test purpose
- Extraction of **test cases** (sequences) containing actor trajectories
- Translation into AV **simulation scenarios**

- Formal model in **LNT** focused on validating the **perception**
- Structured in **processes** communicating by multiway rendezvous
- Each **actor** modeled as a process, **updating** and **sending** its position to the process managing the **map**
- Actor behaviors modeled as sequences of **predefined** or **random** moves
- Perception component** (LIDAR) handling a **perception grid** (current view of the map around the ego vehicle)



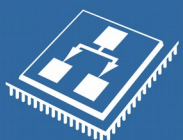
References

[1] Using Formal Conformance Testing to Generate Scenarios for Autonomous Vehicles

Horel, J.-B., Laugier, C., Marsso, L., Mateescu, R., Muller, L., Paigwar, A., Renzaglia, A., Serwe, W. Date/ASD 2022

[2] Formally Modeling Autonomous Vehicles in LNT for Simulation and Testing

Marsso, L., Mateescu, R., Muller, L., Serwe, W. MARS/ETAPS2022



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