# Vehicle simulation model with traffic and Validation

**Challenges and solutions:**

In-vehicle measurements provide definitive information about the performance of a vehicle on a given mission under a specific real-world traffic situation. However, the real-world traffic is not repeatable. This presents a challenge when assessing predictive controls that utilise dynamic electronic horizon. Alternatively, if the vehicle, controllers, environment, traffic and connected electronic horizon infrastructure can be modelled in an integrated way, then simulation may be used to make repeated assessments of performance under a given traffic situation. When in-vehicle measurements are used to validate the models, the simulation environment can be used to assess and make a model-based validation of the performance of predictive control advances enabled by dynamic electronic horizon under consistent situations.

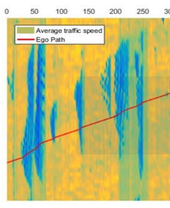
**IMPERIUM's contributions:**

Ricardo has developed an integrated, model-based simulation environment that can be used to assess the potential of the application of the IMPERIUM advances under simulated 'real-world' traffic conditions. The technology set provides at least one improvement for each of the following subsystems: vehicle, engine and exhaust aftertreatment system, vehicle thermal management systems, hybrid system and waste heat recovery. The potential benefits brought by the dynamic eHorizon are assessed in simulation using optimisation techniques. An advanced simulation environment is used, co-simulating the vehicle models, the traffic and the environment. Sensitivity of the results to external factors is considered.

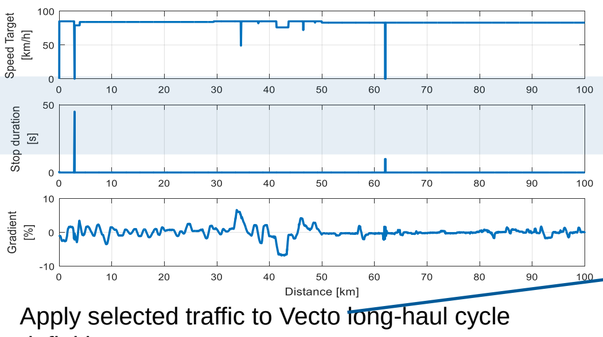
The VECTO long-haul cycle was used as the basis for the creation of a virtual road network. An elevation profile was created by integrating the defined gradient against distance. The cycle was divided into a set of 32 road segments, with varying combinations of speed limit, number of lanes, and stop junctions. The variation in road speed limit and number of lanes provokes varying traffic flow conditions. Vehicle measurements performed by AVL and a the joint development of evaluation methodology and criteria led to a validated simulation and evaluation platform that enables simulation and statements regarding fuel consumption including traffic with predictive, interactive control algorithms.

**Impact / what's next:**

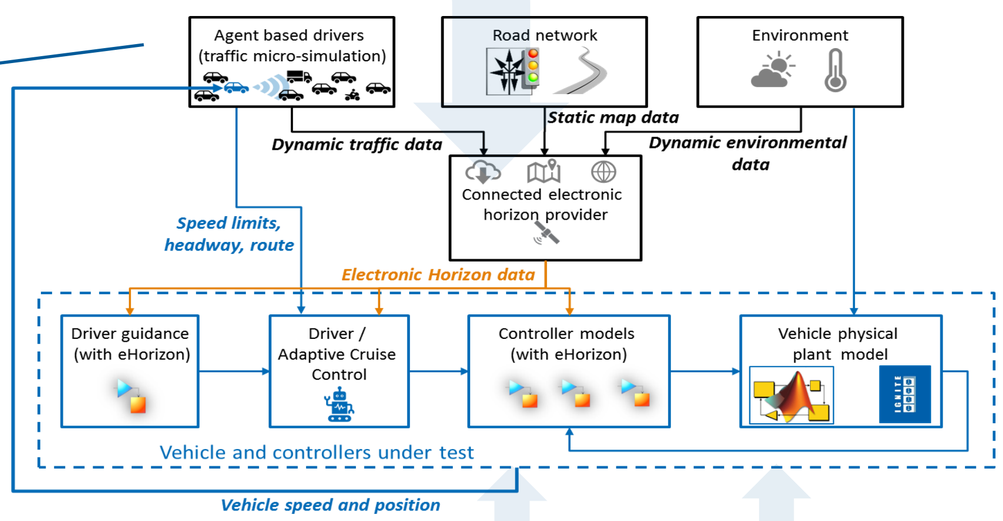
Currently CO2-reduction technologies, such as developed within the IMPERIUM project including the technologies based on eHorizon e.g. predictive cruise control, are not yet covered by VECTO and therefore these measures – although contributing to CO2 reduction in real life – does not count towards CO2 target compliance. This asset describes one example of possible validation of these measures.




Traffic scenarios based on real life data as basis.




Apply selected traffic to Vecto long-haul cycle definition




Testbed and Truck measurement campaign with and without control improvements and different missions / traffic scenarios.

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