

# Digital Twin to Support Autonomous Driving

June 20, 2019

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731993.



# Outline

- What is a digital twin?
- Why do we need a digital twin?
- How can we build a digital twin?
- Data model for a digital twin
- IoT platform functionality
- Next steps: Advanced digital twin functionality
- Takeaway points





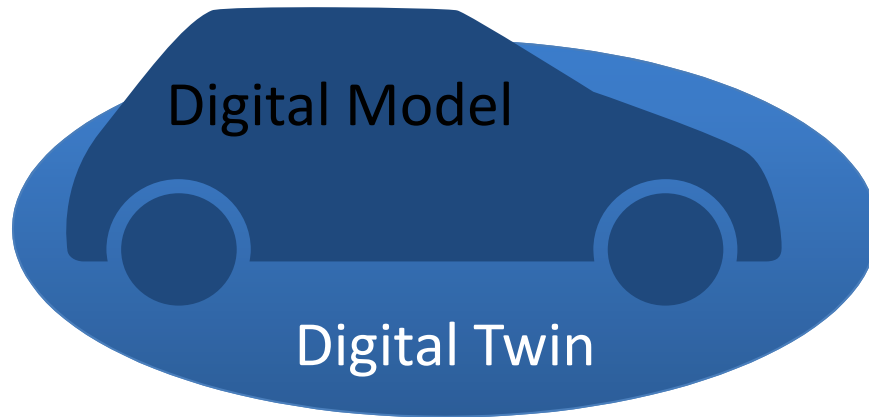
**Digital Twin is  
a concept supporting  
autonomous driving**



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# What is a digital twin?



## Digital twin:

- digital replica of physical assets, processes and systems
- provides both elements and dynamics of operation and life cycle

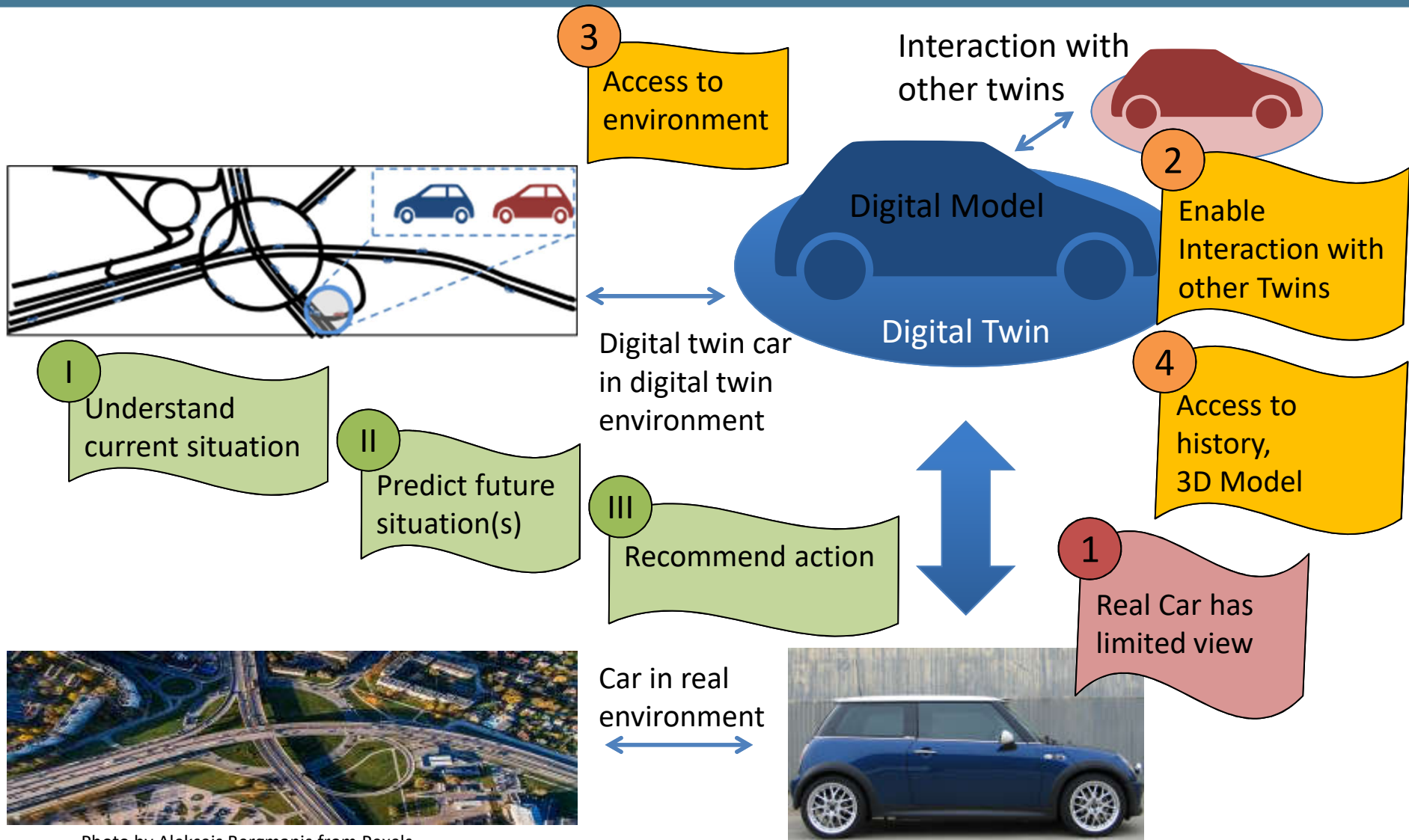
(based on Wikipedia)



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# Why do we need a digital twin?



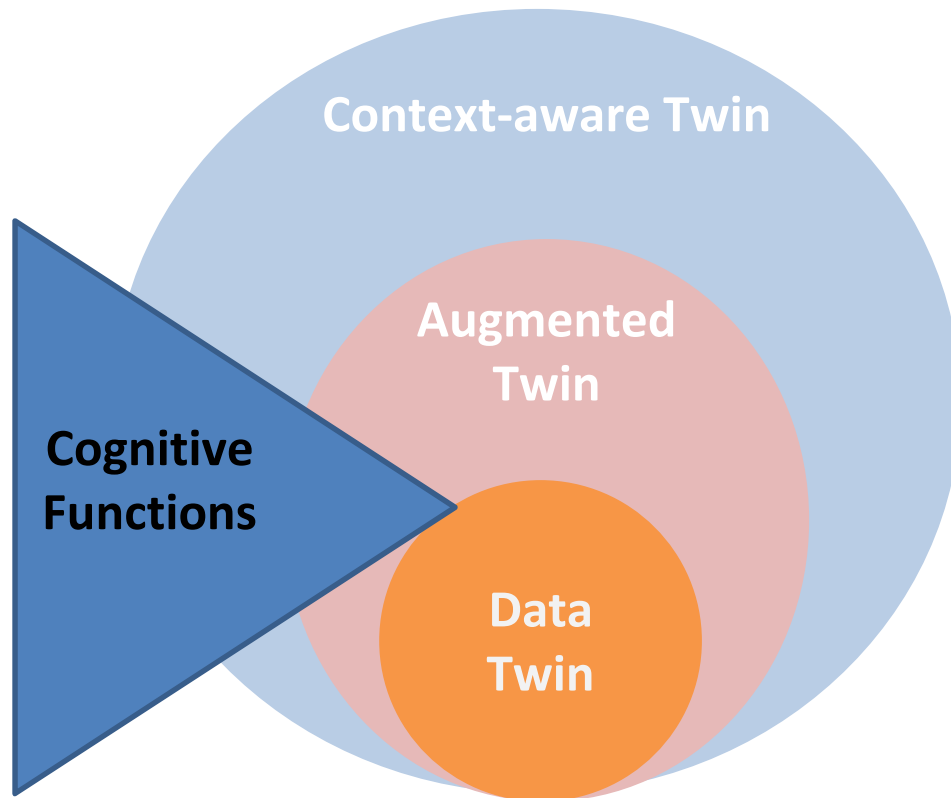
The idea is **NOT** to remote control the car, but to provide “extended view” to improve driving



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# How can we build a digital twin?



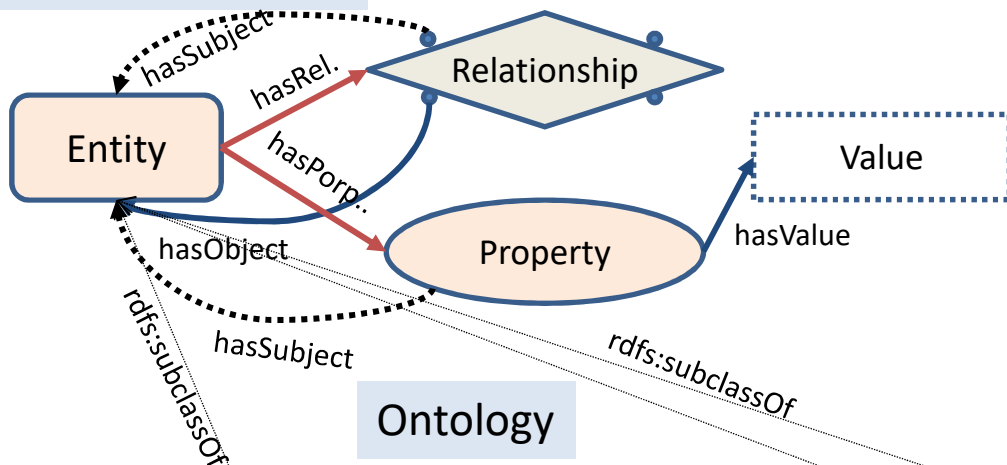
- **Data Twin** – digital representation of the real twin incl. its state
- **Augmented Twin** – adding „augmentation“ to the data twin: new functions & new properties
- **Context-aware Twin** – information about the current situation and context of the real twin
- **Cognitive Functions** – AI and data analytics function to capture context and twin state



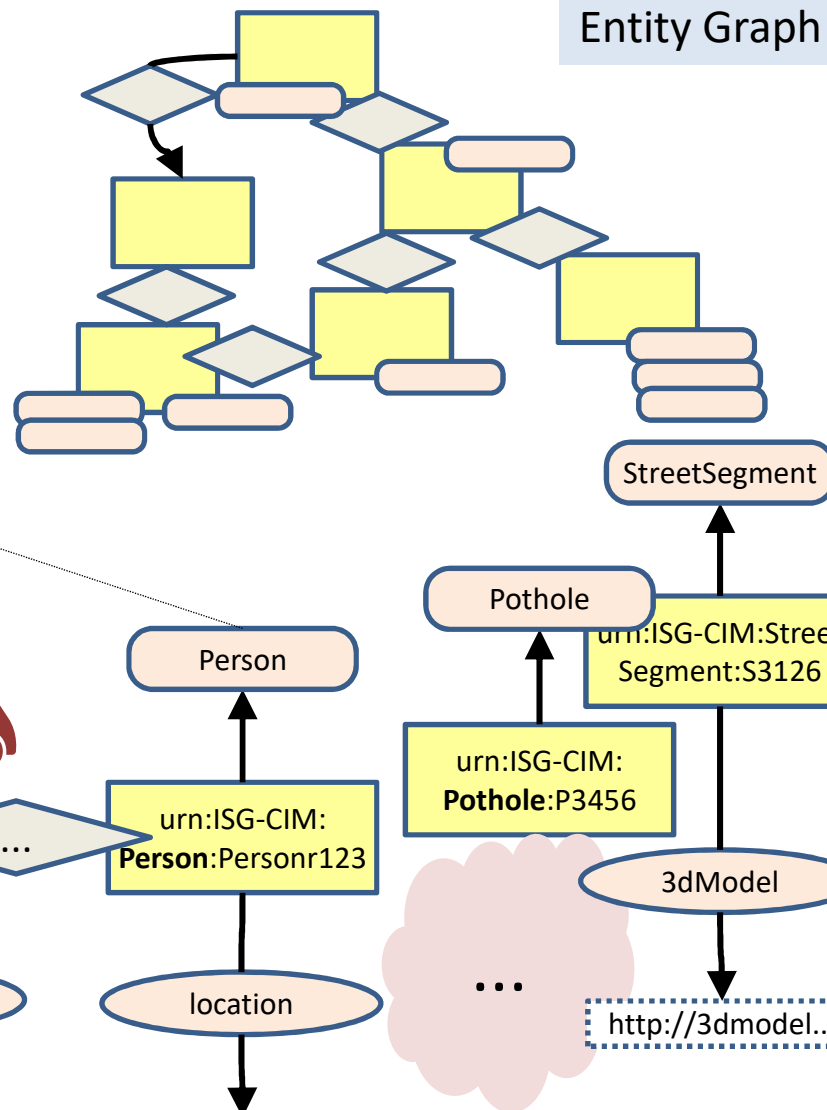
# Animation NGSI-LD as data model for digital twin



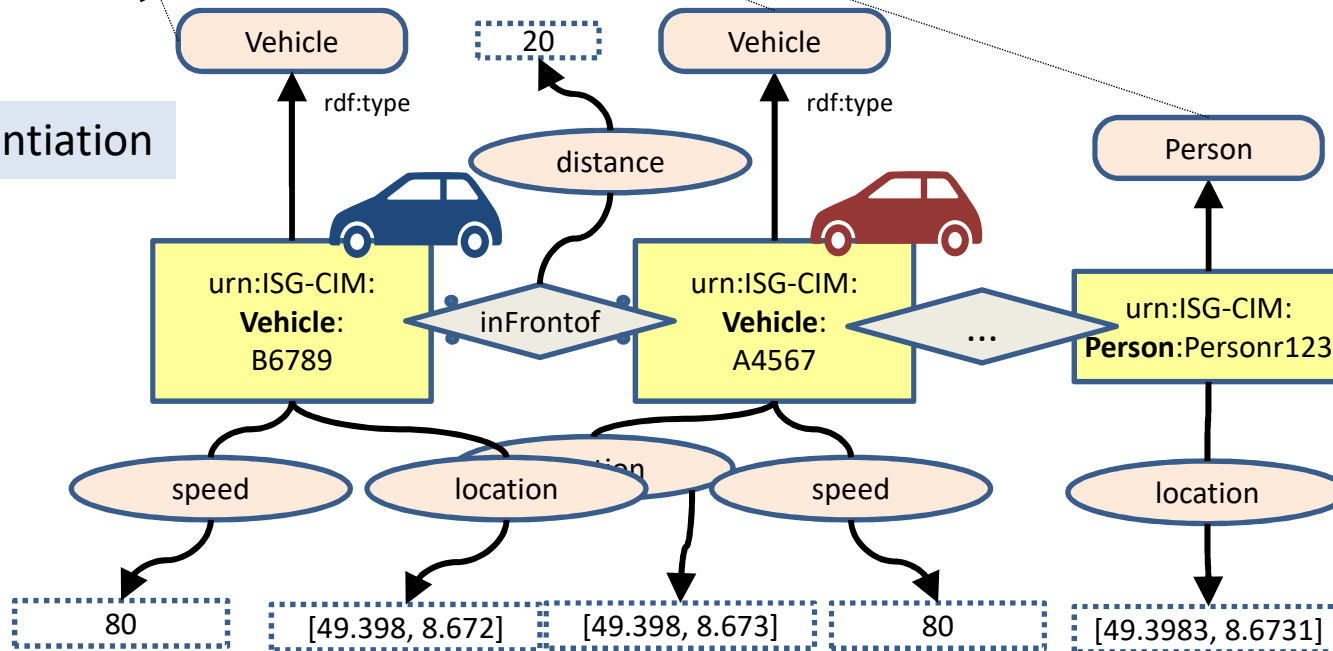
## Information Model



## Entity Graph



## Instantiation

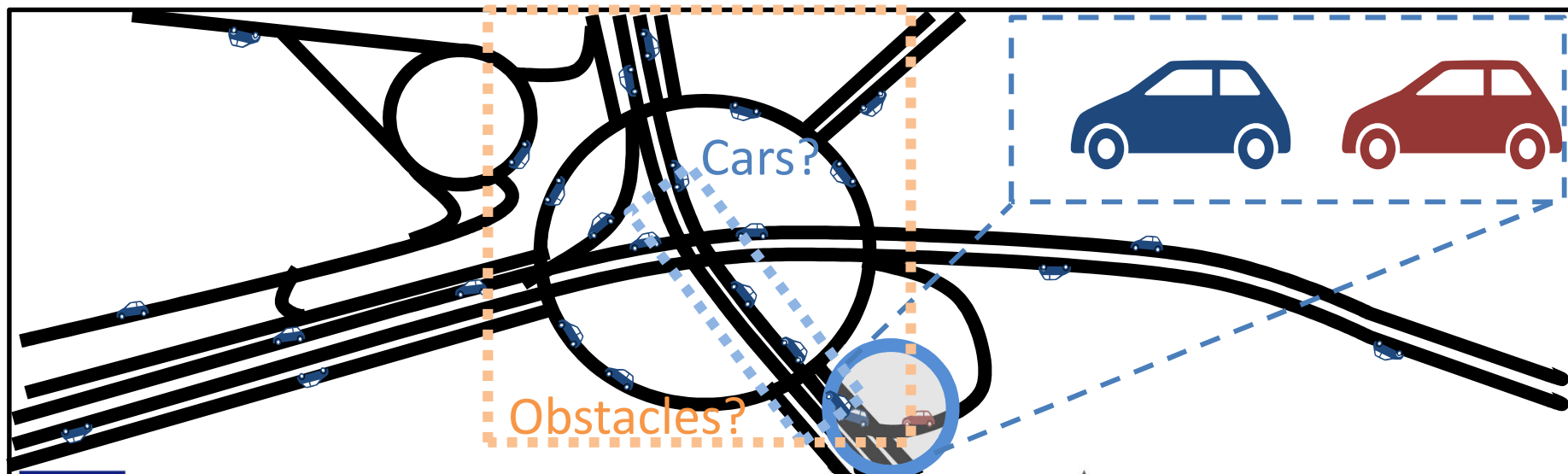


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# Animation IoT platform functionality

- To support autonomous driving based on digital twins, efficient information retrieval is needed:
    - about the car itself, other cars and other traffic participants & environment
  - NGSI-LD enables the modelling as entities, relationships and properties
  - NGSI-LD API enables specifying relevant entities, relationships and properties and filtering according to values/objects and geographic location
- NGSI-LD API + model provides a suitable basis for digital data twin





# Next steps: Advanced digital twin functionality

**Digital twins consists of information + intelligent processing**

## **NGSI-LD enabled**

- knowledge representation of digital twins
- relationships between twins
- efficient search & discovery of relevant digital twins

**Digital twins contain active objects (“augmentations”) that realize**

- analytics functionality & simulations
- cognitive situation understanding
- goal-directed behaviour for assistance



# Takeaway points

- IoT information provides “extended view” to improve autonomous driving
  - Transferring and processing all information in the car is not feasible
  - NGSI-LD can be used for modelling of the digital twin
  - IoT infrastructure connects the real twin with the digital twin
  - Digital twin provides information representation and intelligent processing
- **Digital Twin is a concept supporting autonomous driving**





**Thank you for  
your attention!**



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