

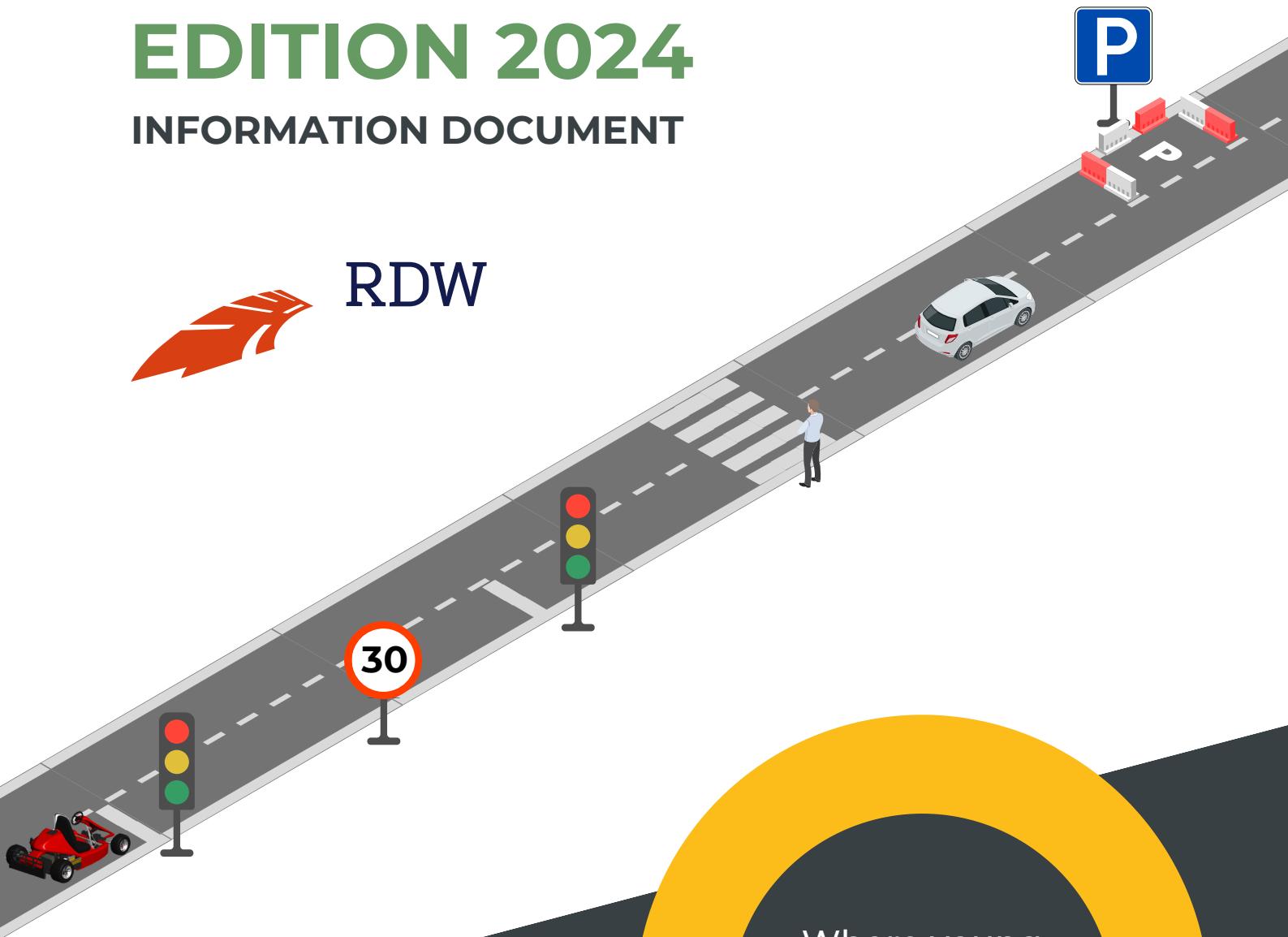


EDITION 2024

INFORMATION DOCUMENT



RDW



Where young
talent and smart
mobility come
together.

The Self Driving Challenge

With the Self Driving Challenge (SDC), the RDW is offering young talent the opportunity to further develop their skills in the field of smart mobility. This is a unique project in which student teams compete with each other by driving their autonomous vehicle through a set of challenges on a track that represent real-world driving scenario's.

The Self Driving Challenge is an ongoing yearly event since 2019, with the goal of gaining knowledge about complex in-car decision-making technology. Each year a goal for the challenge is set and competing student teams are tasked to develop software for their vehicle to best achieve this goal. Previous challenges included driving in a simulation environment and driving on a real race track.



Edition 2024

The challenge will be set-out on the RDW Test Centre in Lelystad (TCL). Starting in February 2024, teams have the opportunity to analyse, record and test their project every week. On June 14th 2024, an exciting final event will be organised where all teams will demonstrate their abilities in front of a public audience and the winner of the Self Driving Challenge 2024 will be decided upon.

Teams will be able to participate in either a 'closed category' or an 'open category'. The RDW will provide the kick-off, webinars, technical information, testing-days and the final race event. The educational institutions are responsible for the necessary resources, supervision and guidance for their participating teams.



Challenges

The 2024 edition of the Self Driving Challenge differs vastly from previous editions. For this years challenge, a custom track has been created at the RDW Test Centre in Lelystad, where a total of six different objectives are set out on asphalt in order of increasing expected difficulty. These objectives represent situations which autonomous vehicles would commonly find in the real-world.

1. Start on green traffic light

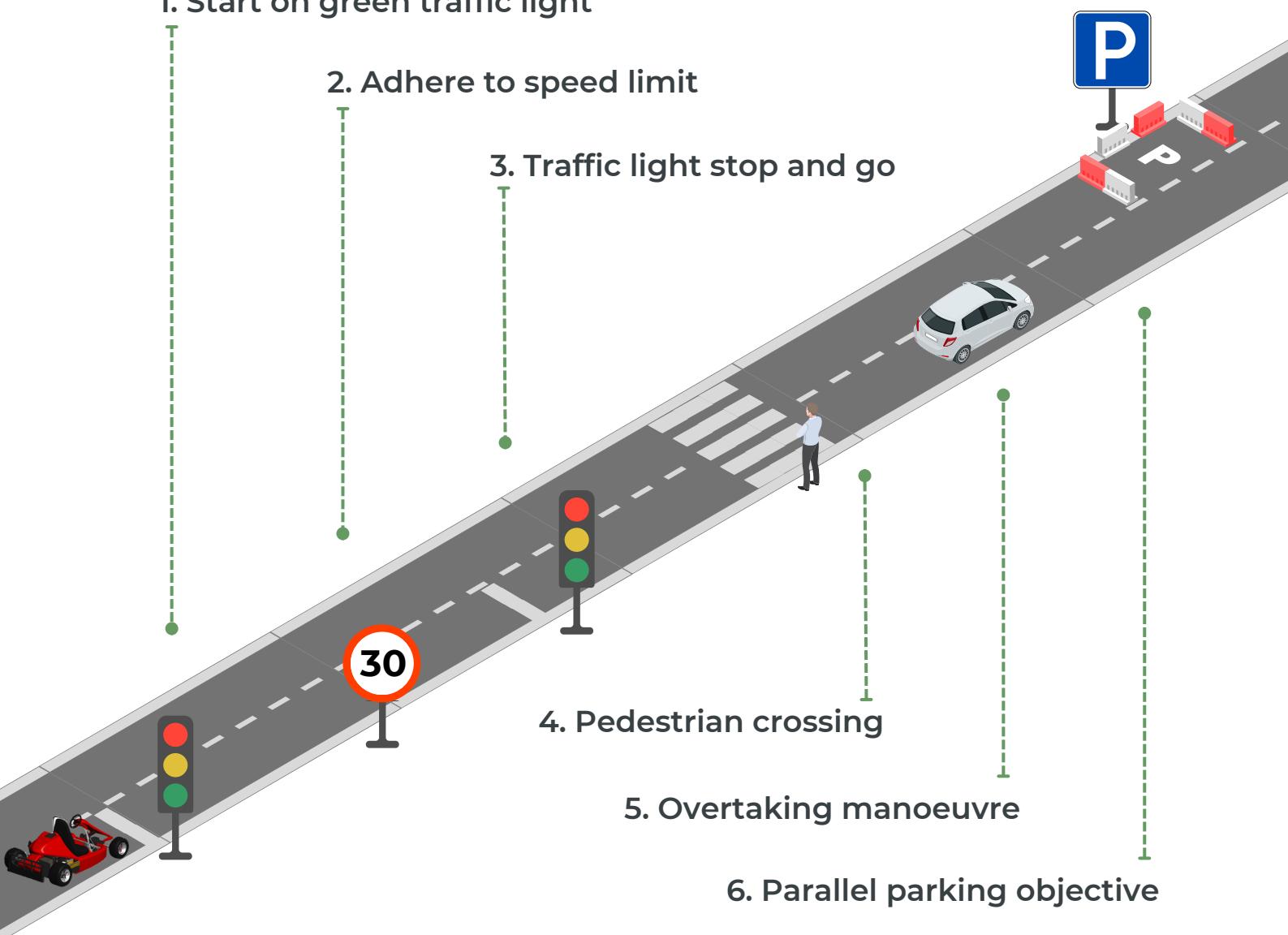
2. Adhere to speed limit

3. Traffic light stop and go

4. Pedestrian crossing

5. Overtaking manoeuvre

6. Parallel parking objective



Note: This is a simplified visualisation. Actual track may differ in size, shape and order of objectives.

Challenges

The following six unique tasks will be present in the Self Driving Challenge 2024. Note that the order of the individual tasks given below is not yet determined. Once the challenge starts, the order will be definite and all tasks will need to be solved in the given order. Teams will try to get as far as they can, dealing with the various traffic situations on their way. The road will contain straight and curved sections and parts with one and two lanes. The vehicle should adequately deal with all these factors during the entire drive.

1. Start on green traffic light

The vehicle starts in a standstill, positioned in front of a traffic light. The first objective is to detect the green light status of this traffic light with, for example, the front-facing camera's. Once the traffic light has turned green, the vehicle may start driving.



2. Adhere to the speed limit

Traffic signs indicating speed limits will be placed amongst the course of the track. Multiple different signs may be present. The vehicle should adhere to these limits, until a new speed-limit is given.



3. Traffic light stop and go

A red traffic light with a 'stop-line' will be present on the track. The vehicle approaching the traffic light will need to stop at an adequate location in front of the traffic light, and wait for a green sign to continue driving.



Challenges

4. Pedestrian crossing

A pedestrian may be waiting on the side of a zebra crossing. The approaching vehicle will need to detect the presence of a waiting pedestrian, wait for them to cross and then continue its journey once the zebra crossing is cleared. A combination of camera's and the LiDAR sensor may, for example, be used to complete this task.



5. Overtaking manoeuvre

A real-life sized 'balloon-vehicle' - identical to the props used in safety testing - will be present in the lane of the vehicle. It will not be moving. The approaching vehicle will need to plan and execute an overtaking manoeuvre by changing lanes, passing the balloon-vehicle and then returning to its original lane, and continue driving.



6. Parallel parking objective

To finish the parkour, the vehicle will need to perform a parallel parking manoeuvre. It will need to park itself in a parking spot surrounded by barriers. To complete this task, the vehicle may, for example, need to combine its camera's, LiDAR sensor and advanced path planning.



Closed category

Teams participating in the closed category will be provided with a vehicle platform by the RDW. The teams will be loaned an Intel NUC (mini-computer), which they should bring and mount on RDW's electric karts to control and drive them. Teams are not allowed to modify the hardware platform in the closed category.

Advantages

- The vehicle, hardware and safety equipment such as helmets and emergency stop buttons are provided by RDW
- Accessible development platform
- Low barrier for entering the challenge

Limits

- Limited computing-power (no GPU)
- No hardware modifications allowed
- Test-time with vehicles is shared amongst teams
- No hands-on time with the vehicle outside of testing days



Open category

Teams participating in the open category will need to design and manufacture their own vehicle. RDW will not provide any support or assistance regarding hardware and vehicles in the open category. The vehicles in this open category will be subject to requirements and maximum constraints set by the RDW to maintain a safe environment.

Advantages

- Freedom in hardware, sensor options and computing power
- As easy or complex as you design it to be
- Access to your vehicle outside of testing days

Limits

- Need to build your own vehicle, higher up-front cost
- Minimum requirements and safety constraints set by RDW
- No support from RDW



Technical specifications

Closed category kart system

- 3.5 kW electric direct-drive motor, powered by a 'fixed-speed' motor controller that automatically regulates output power.
- Hydraulic brake line powered by a linear actuator.
- Servo motor mounted to steering shaft.
- CAN-bus to communicate with actuators.

Closed category sensors

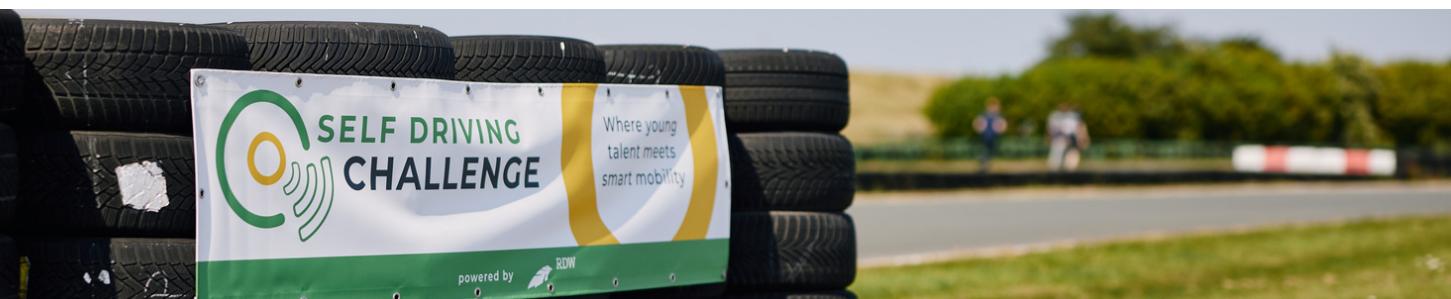
- 3 x Logitech StreamCam (1920x1080 @ 60 fps, 78° FOV)
- 1 x LiDAR (planar 360° laser ranging, up to 6.0 m radius)
- Steering angle sensor
- Speed sensor

Closed category computing platform

- Intel NUC mini-computer
- Intel® Core™ i5-1135G7 processor with 16 GB RAM
- 512 GB NVME SSD with Ubuntu Linux installed

Challenge track setup

- Located at the RDW Test Centre in Lelystad, sector 9
- Straight road approximately 180 to 220 meters long
- Up to two lanes, each approximately 3 meters wide
- Lanes marked with white road-marking, real-life speed signs and traffic lights, pedestrian crossings and parking.



Open Category Requirements

Vehicles in the open category will be subject to requirements set by the RDW. The vehicle you use to enter the challenge needs to be reasonably sized and appropriately powered for the real-life driving environments, road- and lane-size and various weather conditions present on track.

Requirements

The basis for the vehicle requirements are defined by a subset of the requirements as described in European Union regulations **168/2023**, vehicle category **L7e-C**. The formal description of these regulations can be found here: [EUR-Lex - 32013R0168](#).

Accessibility

To keep the SDC accessible, we use a limited set of criteria based on the requirements for an "individual [type approval](#)". For example, a vehicle that wants to participate in the SDC does not need to meet the requirements for electromagnetic compatibility (EMC) or rollover protection, but it does need to meet requirements for power, voltage, and weight.

Your vehicle

Participants can build their own vehicle conform the specifications, or use a real-world vehicle that falls within the L7e-C category, such as a Renault Twizy or similar. Does the vehicle you intend to use for the challenge exceed the indicative limits? Contact RDW to explore the possibilities.

Participation

Teams members and their teams

- Are not limited in amount of participants. We recommend that teams consist of at least 4 students. During test-days, at most 6 students and 2 supervisors can be present. Teams are allowed to consist of students from different educational institutions.
- Require one or more participants with experience or affinity with artificial intelligence, programming and team-leading.
- Should decide on one team-captain, who will also be spokesperson and contact person between the team and RDW.
- Students are not allowed to participate in multiple teams.

Educational institutions

- Should provide supervision, advice and guidance to the students from their educational institutions.
- Should provide resources to enable their teams to participate. For example, this could consist of digital collaboration tools, knowledge, computing power, development hardware, travel accommodations, team shirts and banners, etc...

RDW

- Will provide the vehicle and hardware platform in the 'closed category'. This includes a mini-computer, camera and LiDAR which can be taken 'home' by teams during the project.
- Will provide the opportunity to test on track in Lelystad.
- Will provide webinars, information and resources about the challenge and self driving.
- Will host the kick-off, testing days and final race event.
- Will set out regulations for participating in the final race.
- Will decide who will participate in the Self Driving Challenge.
- Will measure who wins the Self Driving Challenge.

Roadmap

July - September:

RDW reaches out to potential partners, sharing information and resources. Educational institutions express their interest in participating.

January: Team member selection completed by institutions. Team captain / contact shared with RDW.

February 12th: Kick-off Self Driving Challenge 2024. Start of weekly testing days on fridays in Lelystad.

2023

Q3

2023

Q4

2024

Q1

2024

Q2

October 1st: Deadline for interested institutions to formally declare intention to participate.

November 1st: Definitive selection of participating teams by RDW.

June 14th: Final race event of the Self Driving Challenge 2024 in Lelystad.



Join edition 2024

For educational institutions

Is the Self Driving Challenge the event that can make the education program of your course challenging, exciting and above all very fun? The Self Driving Challenge is well suited for many disciplines within or related to the IT-sector. Think for example of courses on Software Engineering, Artificial Intelligence, Mathematics, Electrical Engineering, Mechatronics or Robotics! Together we can look at how we can best integrate the challenge into your institution.

For students

Have you always wanted to learn how to program a self-driving vehicle? Then the Self Driving Challenge is perfect for you! The SDC is an exciting and educational project where you learn to control an electric kart together with other students. You can participate in the challenge if you are following a course in or related to the IT-sector, such as Software Engineering, Artificial Intelligence, Mathematics, Electrical Engineering, Mechatronics, Robotics and more! Bring the Self Driving Challenge to the attention of teachers or education managers and have them contact us. Who knows, you might be on stage next time!

For organizations

Are you looking for a way to profile your company or organization as an innovative and socially involved partner in the Automotive or IT sector? Then the Self Driving Challenge is a unique opportunity to do so! You can support the challenge with your knowledge, expertise, services or other matters, and thus contribute to the development of future IT-professionals. Contact us and discover the possibilities to work together!

Contact RDW to explore the possibilities.

Will **YOU** join the next Self Driving Challenge?



More info

For an impression of the previous edition,
see the 2023 aftermovie on YouTube:

<https://youtu.be/4thIXKlggt8>



To get in touch with the crew behind the Self Driving Challenge, contact René Hulshoff and Thijmen Fellinger by sending an email towards **selfdrivingchallenge@rdw.nl** or give René a call at **+31 6 52 02 47 46**.

Website:

selfdrivingchallenge.nl

LinkedIn:

[@Self Driving Challenge](#)

Instagram:

[@selfdrivingchallenge](#)

X (Twitter):

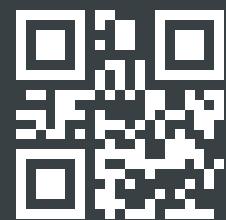
[@sdc_finale](#)

YouTube:

[@SelfDrivingChallenge](#)



RDW



RDW, the Netherlands Vehicle Authority, stands for safety, sustainability and legal certainty in mobility. RDW has developed extensive expertise through its years of experience in executing its statutory and assigned tasks in the area of the licensing of vehicles and vehicle parts, supervision and enforcement, registration, information provision and issuing documents. RDW plays a significant role in the field of international, including European, policy and regulations.

Website:

rdw.nl

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