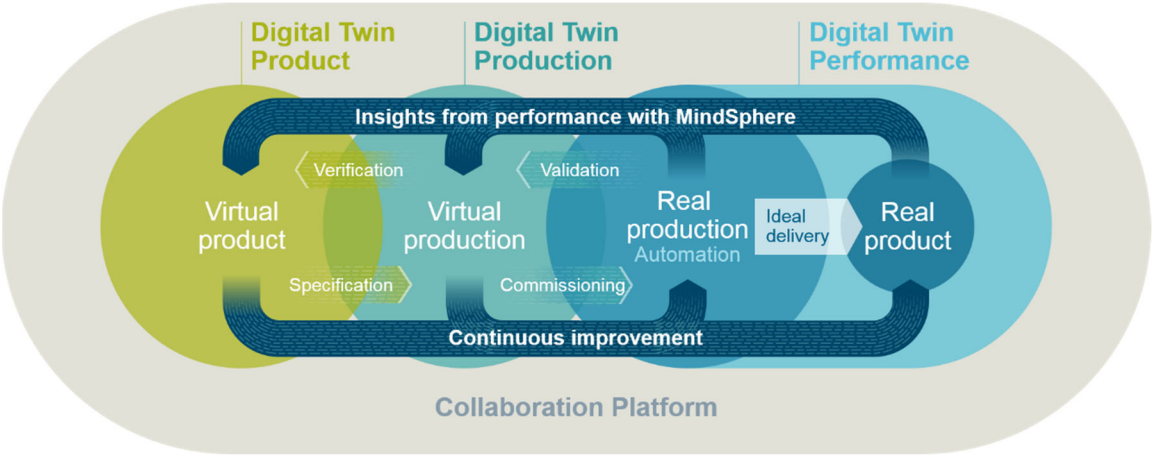
SIEMENS

2021 FSG Siemens *Digital Twin* Engineering Excellence Award

For the 3rd year - at FSG '21, Siemens Digital Industries Software is sponsoring the "**FSG Siemens Digital Twin Engineering Excellence Award**", a 10.000 EUR award to recognize 3 teams which have used the most professional, innovative and thoughtful 'Digital Twin' practices.

'Digital Twin' is the concept of a digital, simulation-oriented representation of the targeted product from the earliest concept stages of the design cycle all the way through to fabrication, testing, operation and maintenance. It uses both feed-*forward* and feed-*back* between your comprehensive virtual model and your fabricated, tested and raced - Formula Student racecar.

4.000 EUR = 1st Place
3.500 EUR = 2nd Place
2.500 EUR = 3rd Place



General Conditions

- FSG '21 teams can apply for the Digital Twin award by submitting an application (max. 6 pages including figures) by **Sunday, August 1th, 23:59 CEST**. You may include appendices with additional supportive information. We may also be reviewing your FSG Static Design document.
  - Please upload your application via the FSG website => MyTeam => Events => Deadlines
- Be sure to address all 7 rating categories listed below.
- 5 finalists will be selected by the Siemens judging panel by Monday afternoon, August 2nd. The head judge in cooperation with FSG will contact each selected team by Monday evening to arrange a virtual time slot on Tuesday, **August 17th between 15:00 and 20:00 CEST** for a virtual 10-15 minute presentation followed by Q&A. Presenters may include up to 6 people.
- The award-winning teams will be announced during the FSG ceremony on Friday night.
- Use of Siemens software tools is highly encouraged but not required. Such as **NX** for 3D-CAD, CAM and 3D-printing, **Fibersim** for big cost-savings with carbon composite

manufacturability-simulation, **STAR-CCM+** for 3D-CFD, **NX-NASTRAN** for FEA, **VeSys/Capital** for wire-harness design, **Caital Networks** for CAN design/simulation, **PreScan** for autonomous driving simulation, **Motorsolve** for custom electric motor design, **PADS Professional** for circuit board design, **Amesim** for mechatronics system lap-time simulation, and other Siemens software tools.

For no-cost grants of Siemens software, see this application form: www.plm.automation.siemens.com/global/en/our-story/partners/partner-program-grant.html

For questions about the Digital Twin Award - email leigh.anderson@siemens.com

The 7 categories that are judged and rated numerically:

1. **Electrical** Design & Simulation plus its connections to other disciplines and product/data management. Level of simulation automation. Use of professional software for design and simulation of electrical system design, electrical schematics, and wire-harness.
   Also **Embedded Software** sophistication and integration of in-vehicle software into electro-mechanical simulations.
2. **Mechanical** design & simulation plus its connections to other disciplines and product/data management. Level of simulation automation. Integration of mechanical with electrical and other disciplines.
3. **Product/Data management** systems and software in place and used deeply and broadly.
4. **Professional** level of Digital Twin process and the Digital Twin application, as well as the Design Report plus the professional conduct of the Meeting with judges if selected as a top-5 candidate.
5. **Innovation** in Digital Twin Process/methods, and/or innovation of the car/parts/performance derived using Digital Twin processes.
6. Depth and breadth of **Feed-forward and Feedback**/continuous-maintenance of the simulations/models.
7. **Knowledge and personnel management, training, infrastructure** - to keep digital twin engineering process going and improving despite annual graduation turnover.

Backgrounder - Digital Twin Thinking

Learn more about Digital Twin concept at: https://www.plm.automation.siemens.com/global/en/our-story/glossary/digital-twin/24465
The best FS teams in the world rely on digital design and simulation models to guide the full product lifecycle from its early ideas to competing on the tarmac and judging.
Below are examples to help you recognize the type of engineering thoughtfulness and process we're looking to reward, even if you don't enter for the award – it's a good goal for your team's development.

- Explain the overall strategy/architecture process starting with the first concept of your car and simulations, other digital models or calculations that guided the architecture and key attributes of your car.
- Show the maturity and completeness of your "Digital Twin" virtual design across all domains: such as mechanical, electrical, software, documentation for judges and team collaboration, fabrication, and racecar operations.
- Explain how multi-physics simulations (including but not limited to CFD, FEM, MBS, Electrical, System simulation) were used to influence the design of your aero package, chassis or other aspects of the car. Did it drive trade-offs or innovations in other parts of your 'virtual car'?
- Did your CFD simulations influence other disciplines such as electrical system, sensors, telemetry, actuators, or the drivetrain? Did you come up with some innovations using CFD simulations? Or what major insights did you discover when analysing cooling your engine or accumulator?
- Explain the digital design of your car's electrical system and wire-harness design. Did you innovate to modify/augment the car's performance and/or endurance via electronics and wiring, especially relating to light-weighting, or innovative use of sensors and/or actuators? Did you virtually integrate your 3D-CAD chassis model with wire-harness layout to calculate correct 3D wiring lengths? We are looking for well-developed electrical system & wiring harness designs including use of schematics, design-checking, electrical simulation, 3D CAD virtual integration, and a formal parts library. Did you use a professional software tool meant for wiring - or just Excel and Visio for your harness design?
- Show your team's ability to accurately predict your race car's performance from simulation models, such as vehicle dynamics or lap-times. Did you use special sensors for measuring the car during race or testing conditions? How did the digital models and physical measurements evolve as you learned? Sensors? Telemetry? Feed-forward examples? Feed-back examples?
- Explain how your car's electro-mechanical design includes thorough and accurate digital models and simulation, including embedded software if used.
- Have you made parts using 3D-printing/additive manufacturing (AM), or CAM to drive CNC machines, or other digitally-driven production such as composites part design (such as using carbon composite design software to drive a CNC ply-cutter?
- Have you discovered performance or other problems that showed up in the physical car or physical parts, that you diagnosed the root-cause and solved back in the digital model of the car or parts, then validated the fix in the physical car? Or updated the digital model from physical data, (feed-back), that then guided improvement in the physical car (feed-forward)?
- How did you keep track of your requirements and the data created along your design process? Did you use a product data management system (PDM), and/or requirements management software? What effort did you take to make sure every team member works on the most current status of any available data/models/documents? PDM software helps you manage product data and process-related information in a unified database system. This information includes design data, models, parts information, manufacturing instructions, requirements, notes and documents. A PDM system provides solutions for secure data management, process enablement, and configuration/version management.