

**21. SafeTRANS Industrial Day, November 29, 2016, Munich**  
**„Architekturen hochautomatisierter Systeme“**

**Title:** From fail-safe to fail-operational – challenges in development and testing

**Authors:** Daniel Watzenig<sup>1</sup>, Michael Paulweber<sup>2</sup>, Horst Bischof<sup>3</sup>

Automated driving is a disruptive technology that opens the door to future multi-billion markets providing business opportunities to value chains in automotive, ICT, and semiconductor industry. Currently, even the most sophisticated vehicle automation technology on the road is not able to surpass human driving capabilities – especially considering context awareness in any situation and under adverse weather conditions. Moreover, there is no common agreement on quantifiable reliability and robustness measures which architectures (hardware and embedded software) have to achieve to allow safe automated driving for SAE Levels 3-5.

This talk discusses future architectures, emerging standards (AUTOSAR Adaptive Platform), and testing needs to ultimately achieve fail-aware (performance monitoring, self-diagnostics), fail-safe, and fail-operational (HW and SW redundancy) components and systems that enable the introduction of automated driving in all car categories. A special focus is on the introduction of the upcoming Austrian testregion ALP.lab that is setup complementary to and harmonized with already existing German test regions. ALP.lab envisions to engage the entire development and testing chain from model-/software-in-the-loop (testing of automated driving software functions), hardware-in-the-loop (driving simulator, test of human interactions, sensor validation and qualification), vehicle-in-the-loop (vehicle qualification prior road testing), proving ground (reproducible test of safety-critical scenarios), and public road testing (test of regional-specific real-world scenarios).

---

<sup>1</sup> Virtual Vehicle, Inffeldgasse 21A, 8010 Graz

<sup>2</sup> AVL List GmbH, Hans-List-Platz 1, 8020 Graz

<sup>3</sup> Graz University of Technology, Inffeldgasse 16/II, 8010 Graz