

# UL 4600 Fact Sheet

## Developing the Standard for Safety of Autonomous Products

Underwriters Laboratories (UL) and Edge Case Research (ECR) are collaborating to develop of a comprehensive set of proposals that will be advanced through UL's standards development process. The resulting UL Standard, UL 4600, will address safety principles and processes for the evaluation of autonomous products. The initiative to develop this Standard will be undertaken by a balanced panel with representatives from relevant stakeholder groups and subject matter expertise. This collaborative development approach includes a review and comment process, which is open to public participation.



EDGE CASE RESEARCH

### Intent and key principles

The Standard will seek to specifically address the ability of autonomous products to perform the intended function without human intervention based on their current state and sensing of the operating environment. Reliability of hardware and software necessary for machine learning, sensing of operating environment and other safety aspects of autonomy will also be addressed. The Standard will encompass fully autonomous systems that move such as self-driving cars, as well as mining, agriculture, maintenance, and other vehicles including lightweight unmanned aerial vehicles (UAVs). It is envisioned that future end product standards will tailor UL 4600 to address specialized applications.

The Standard intends to use a goal-based approach which prescribes topics that must be addressed in creating a safety case.

The Standard will remain technology neutral, in that it will not mandate the use of any specific technology in creating the system, and further will permit design process flexibility.

The Standard intends to specifically cover validation of any machine learning based functionality and other autonomy functions used in life critical applications.

Compliance with UL 4600 will permit but will not require conformance to other safety standards such as ISO 26262, IEC 61508, MIL STD 882, etc., as well as security standards, where such conformity is demonstrated.

The Standard is intended to address changes required from traditional safety practices to accommodate autonomy, such as lack of human operator to take fault mitigation actions.

Topics covered in the Standard will include: safety case construction, risk analysis, safety relevant aspects of design process, testing, tool qualification, autonomy validation, data integrity, human-machine interaction (for non-drivers), lifecycle

concerns, metrics and conformance assessment. Security is addressed as a requirement, but details are currently outside the scope of the proposed Standard.

UL will pursue recognition of UL 4600 by the American National Standards Institute (ANSI) and as a National Standard of Canada.

### Standards Technical Panel membership

The initial authoring team includes subject matter experts representing automotive software safety, aviation safety, rail safety, process control safety and military system safety.

Standards Technical Panel representation will include individuals from Canada, the U.S., and other countries. Organizations and individuals with interest or technical expertise in the subject category are encouraged to apply for membership on the UL 4600 Standards Technical Panel.

Contact Deb Prince for information about UL Standards Technical Panels at [Deborah.Prince@ul.com](mailto:Deborah.Prince@ul.com).

### Proposed timeline

**2018-2019**  
Draft document for UL 4600 prepared by UL, Edge Case Research and MITRE

**Q1-Q2 2019**  
Establish a balanced Standards Technical Panel (STP)

**Q2-Q3 2019**  
Review and update UL 4600 based on industry stakeholder review and STP feedback

**Q4 2019**  
Publish UL 4600

**Q1-Q2 2020**  
Initiate end-product Standard development efforts

