

- 4.2. The ADS shall interact safely with the authorized user in the vehicle¹

[Should this section be moved to follow after the current sections 4.3. and 4.4. given the intention to address ADS responses to safety-critical situations and failure modes at least in part via the ODD-based approach to scenario generation and assessment against safety models?]

[The Users workstream initially provided input focused on identifying possible user roles. Interactions are dependent upon these roles. For example, a fallback user would not be involved in activating an ADS feature; the feature has to be in use in order for a user to be in the role of fallback to the ADS. Input has been provided suggesting that ADS configurations/use cases can be differentiated based on whether the vehicle is designed to transport human beings and whether such human beings would have any roles in vehicle operation or be limited to passengers. In-vehicle occupant roles have been identified as “driver”, “fallback user”, or “passenger”, aligning with a detailed provision in Table 1 that interactions should be simplified, including by limiting the number of roles. Additional input has suggested possible external roles such as dispatcher or remote operator.

Therefore, should the user interaction requirements be structured to enable objective decisions on which requirements apply to which ADS use cases based on the possible roles of human users of the ADS vehicle. If so, should FRAV define user roles, create subsections of requirements based on these

¹ [The Human Centred Design Process is an important process to achieve a safe interaction between a vehicle with and its users. Any process should encompass

- Analyses of user needs and risk, setting safety and usability objectives, as well as specifying user requirements and ensuring user understanding and context]
- Producing design solutions to meet these requirements
- Conducting evaluations, particularly real world testing on real users (i.e., not the people who are developing the products)
- Competent personnel; human factors design and testing activities should be assigned to qualified personnel, with clearly defined roles and responsibilities, including process oversight and sign-off.
- Monitoring; device performance should be monitored in the field and this information should be used to set future design targets and evaluate designs against these requirements.]

This part should be integrated in the safety management system of the organization (for audit) (ISO 13407: 1999)

roles, and add provisions requiring the manufacturer the declare the permissible roles of users of the ADS vehicle?

How can the requirements below and the detailed provisions in Table 1 be transformed into objective and verifiable requirements for ADS interactions with users performing these various roles?]

Vehicle/ADS configuration versus user roles. Regulation should define user roles. Repetition issue—would we repeat same functional requirements under each role. [15 user roles?]

User workstream will provide a proposal in September for a path to feasible verifiable requirements/recommendations, including proposal on whether requirements should have a logical structure and if so, what structure (e.g., how to break down into subsets of requirements that can be objectively applied to various ADS configurations/use cases). Review Table 1 detailed requirements to bring into main body of D5.

- 4.2.1. User interaction with and the interface of ADS (features) shall have a high-level commonality of design.
 - 4.2.1.1 [The ADS should be designed to foster a level of trust that is aligned with its capabilities and limitations to ensure proper use of the system]
 - 4.2.1.2 [The operation of the interaction shall have in common:
 - a) [use of common sequence of states in the transition/activation/overriding/...]
 - b) ...
 - 4.2.1.3 [The interaction should be simplified:
 - a) [Limit the number of user roles]
 - b) [Limit the number of potential transitions]
 - c) [Limit the number of settings]
 - d) [Limit the number of different interaction modes]
 - e) ...
- 4.2.2. The ADS HMI shall provide clear and unambiguous information to the user.
 - 4.2.2.1 [The vehicle shall indicate its ADS capabilities in terms of their automated [features] and their ODD.]
 - 4.2.2.2 [The ADS shall inform the user on the current conditions:
 - a) ADS status information
 - b) The availability of automated features
 - c) User Role
 - d) Responsibility
 - e) Permitted NDRA

- f) Potential roles to activate
 - g) “Standard” information
 - i) [Vehicle speed, range and Time to Fuel]
 - h) ADS failure information]
- 4.2.2.3 [The ADS shall inform the user on the upcoming conditions:
- a) ODD boundaries
 - b) Upcoming actions or change in roles
 - c) Oncoming decisions/manoeuvres
 - d) Estimated time until take over in normal conditions
 - e) Transition related communication.]
- 4.2.2.4 [The ADS shall ensure that safety related information is prioritised and presented in a clear and unambiguous manner.]
- 4.2.3. The ADS shall be designed to prevent misuse and errors in operation.
- 4.2.3.1 [The ADS shall be designed to prevent inadvertent activation or deactivation]
- 4.2.3.2 [The controls dedicated to the ADS shall be clearly distinguishable from other controls]
- 4.2.3.3 [The ADS shall provide feedback when the user attempts to enable unavailable functions]
- 4.2.4. The ADS shall ensure safe ADS feature activation.
- 4.2.4.1 [The ADS shall inform the user that preconditions for activation are met]
- 4.2.4.2 [The activation should follow a common sequence of actions and states
- a) Common sequence to be a pass/fail criterion]
- 4.2.4.3 [The ADS shall provide confirmation that the system is activated]
- 4.2.5. An ADS which permits a transition of control shall be designed to ensure safe transitions of control.
- 4.2.5.1 [The interaction shall follow a common sequence of actions and states in the Transition of control (change of user roles)
- a) Common sequence to be a pass/fail criterion [see Annex ?)]
- 4.2.5.2 [Transition of control shall return to a common default user role
- a) This shall normally be a fully engaged driver without any control assistance (conventional driver; safety systems such as ESC will remain activated)
 - b) Common default user to be a pass/fail criterion]
- 4.2.5.3 [The ADS shall continuously verify whether the user is available for the Transition of Control and

- a) adapt the Transition of Control process, including the time budget where feasible, to the state of the user and/or to the ADS.
 - b) warn the user if not available when required
 - c) register user response indicating readiness for transfer of control]
- 4.2.5.4 [The ADS shall verify that the user is in stable control of the vehicle to complete the Transition of Control process]
- 4.2.5.5 [During transition, the ADS shall remain active until the Transition of control has been completed or the ADS reaches a minimal risk condition]
- 4.2.6. An ADS which permits user takeovers of control shall be designed to ensure safe user-initiated takeovers.
- 4.2.6.1 [The user is allowed to initiate a take-over process of the ADS]
- 4.2.6.2 [The deactivation shall follow a common sequence of actions and states in the transition of control (change of user roles)
- a) Common sequence to be a pass/fail criterion (see Annex ??)]
- 4.2.6.3 [The ADS may momentarily delay deactivation of driving control when immediate human resumption of control could compromise safety.]
- 4.2.6.4 [The ADS shall provide clear, specific feedback of the completion of a user initiated take over.
- a) The clear and specific feedback shall be a pass/fail criterion]
- 4.2.6.5 [The user initiated take over shall return to a common default user role being the driver.
- a) This shall normally be a fully engaged driver without any control assistance systems with the exception of mandated systems (conventional driver)
 - b) Common default user role to be a pass/fail criterion]
- 4.2.7. The use of the ADS shall be supported by documentation and tools to facilitate user understanding of the functionality and operation of the system.
- 4.2.7.1 [The ADS manufacturer / vehicle manufacturer (as appropriate) should create documentation available for audit on:]
- 4.2.7.1.2 [Its intended educational approach:
- a) Theoretical and practical training
 - b) How its HMI design aligns with common HMI and interaction]
- 4.2.7.1.2 [Owner's manual describing at least:
- a. An operational description of ADS' (features) capabilities and limitations (the information should also refer to specific scenarios)
 - b. A description of the roles and responsibility of driver/user and ADS when an ADS (feature) is on/off

- c. A description on the permitted transitions of roles and the procedure for those transitions
 - d. A general overview of NDRA allowed when an ADS feature is active]
- 4.2.7.2 [The ADS manufacturer / vehicle manufacturer (as appropriate) should create the following in-vehicle tools such that]
- 4.2.7.2.1 [the ADS supports the user in correct operation (coaching)]
 - 4.2.7.2.2 [the ADS gives prompt feedback on erroneous operation]
- 4.2.8 [The integration of an ADS which permits a transition of control with the entire vehicle HMI shall be assured]
- 4.2.8.1 [The entire HMI design should be defined and the integration with ADS HMI assured by analysis and/or test.]
 - 4.2.8.2 [The vehicle and ADS HMI needs to take into account potential impairments of users (such as colour blindness, impaired hearing) which do not require specific hardware adaptations of the vehicle.]
- 4.2.9 [Passenger-carrying ADS vehicles that may operate without a fallback user shall provide means for ensuring passenger safety.]
- 4.2.9.1 [For the safety of the occupants, the ADS vehicle should:
 - a) Stop in accordance with the designated route;
 - b) Open the service doors when at a stop and close them before starting moving again;
 - c) Achieve a minimum-risk condition (MRC) by demand of the vehicle occupants upon application of the designated control (button);
 - d) Provide sound notification to the occupants in the case of emergency braking.]
 - 4.2.9.2 [For the occupant information, the ADS vehicle should provide audio messages to the occupants about approaching a stop and starting the motion after a stop.]
 - 4.2.9.3. [The ADS vehicle should provide voice communication between the occupant compartment and a remote operation dispatcher/assistance personnel.]

Annex ?

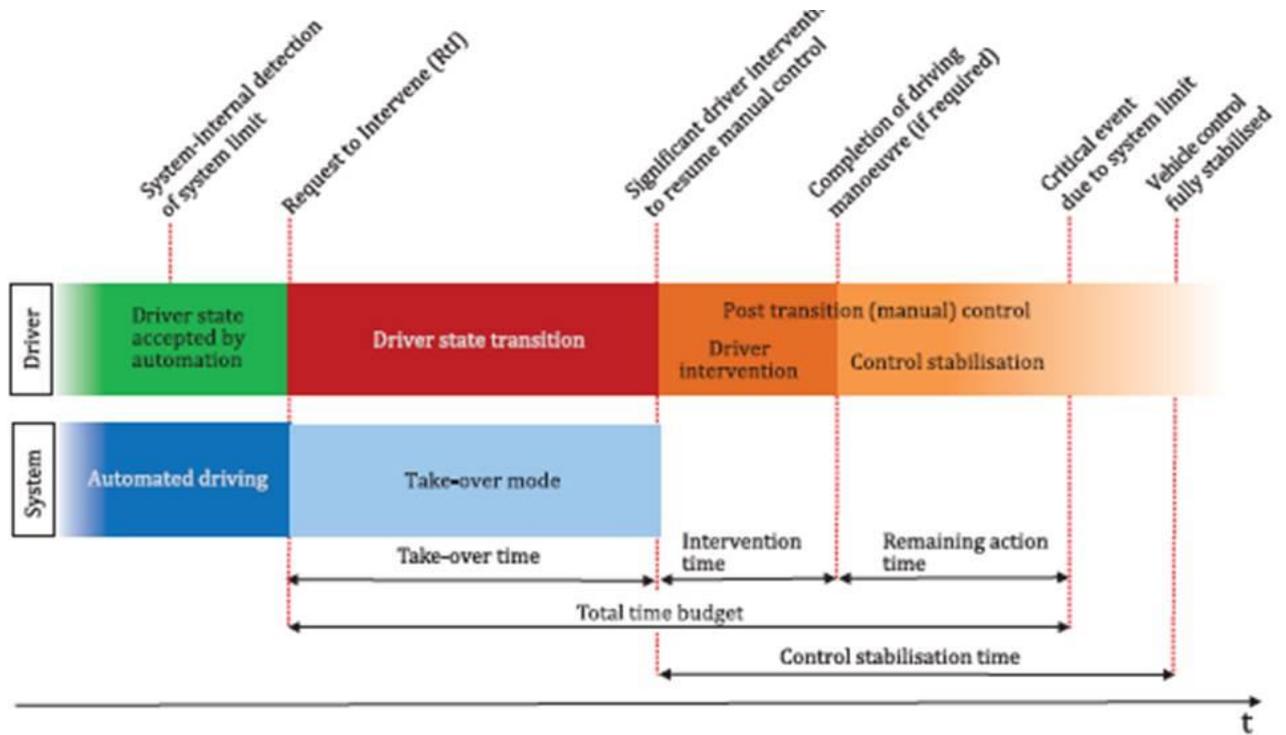
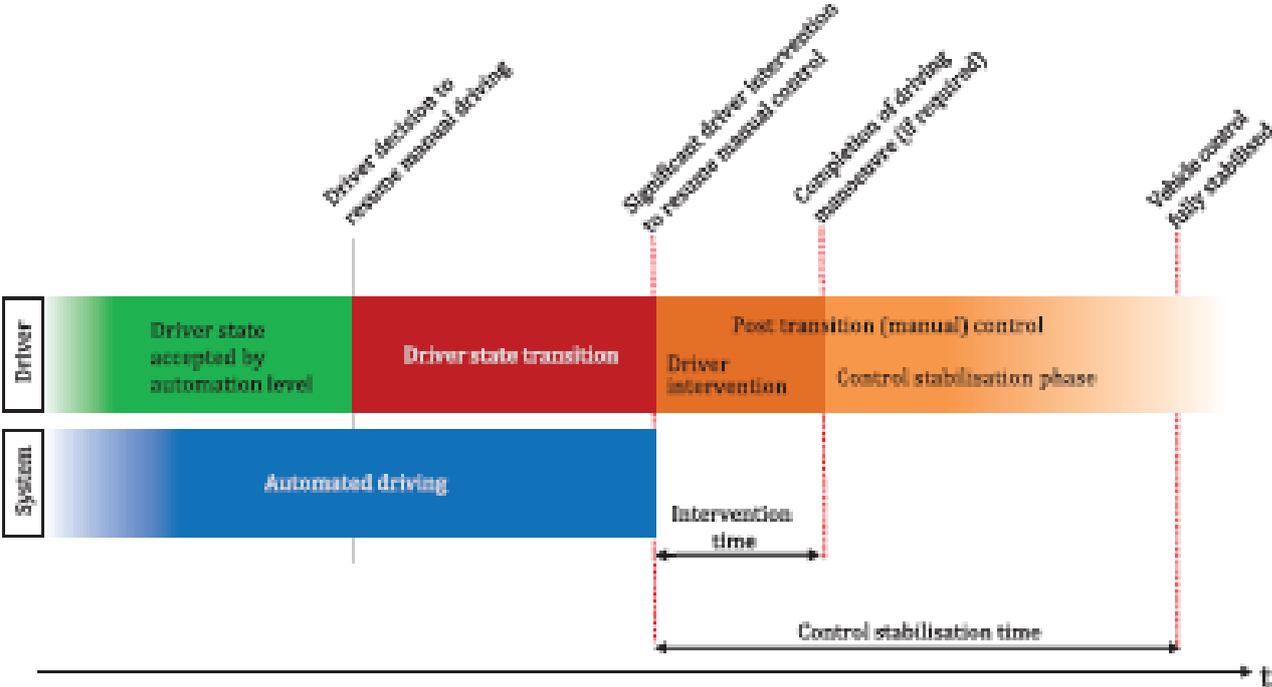


Figure 2 — System-initiated transition from automated to manual driving

Annex ??



(ISO/TR 21959-1:2020(E))

User initiated take over