

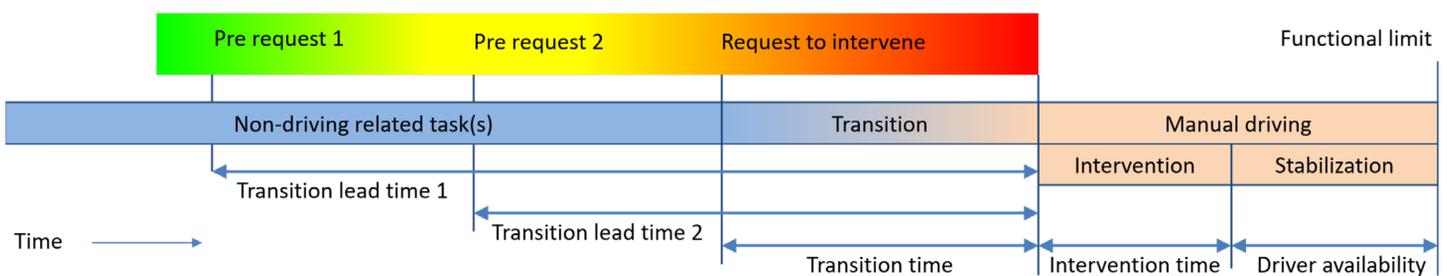
# Organizing, Triggering and Supervising Driver Control

## THE TAKEOVER PROCESS AND THE REQUEST TO INTERVENE

The takeover process happens when the driver transitions from Non-Driving Related Tasks (NDRT) or activities back to manual driving mode. Triggering this process, the driving system sends the driver a request to intervene (R2I) with the appropriate leeway to transition and intervene successfully before arriving at the system's functional limit.

## MULTI-STAGE REQUEST TO INTERVENE

Driver monitoring can provide information that allows the system to estimate the driver's current state and optimize the temporal aspects of the takeover for convenience. However, in the case of a deferred R2I and subsequently deteriorating driving situation, the safety of the takeover may become compromised. Multiple requests with rising urgency - a so called multi-stage request - is proposed to alleviate this dilemma as it allows convenient and safe takeovers using the vehicle's visual and auditory display eco-system.

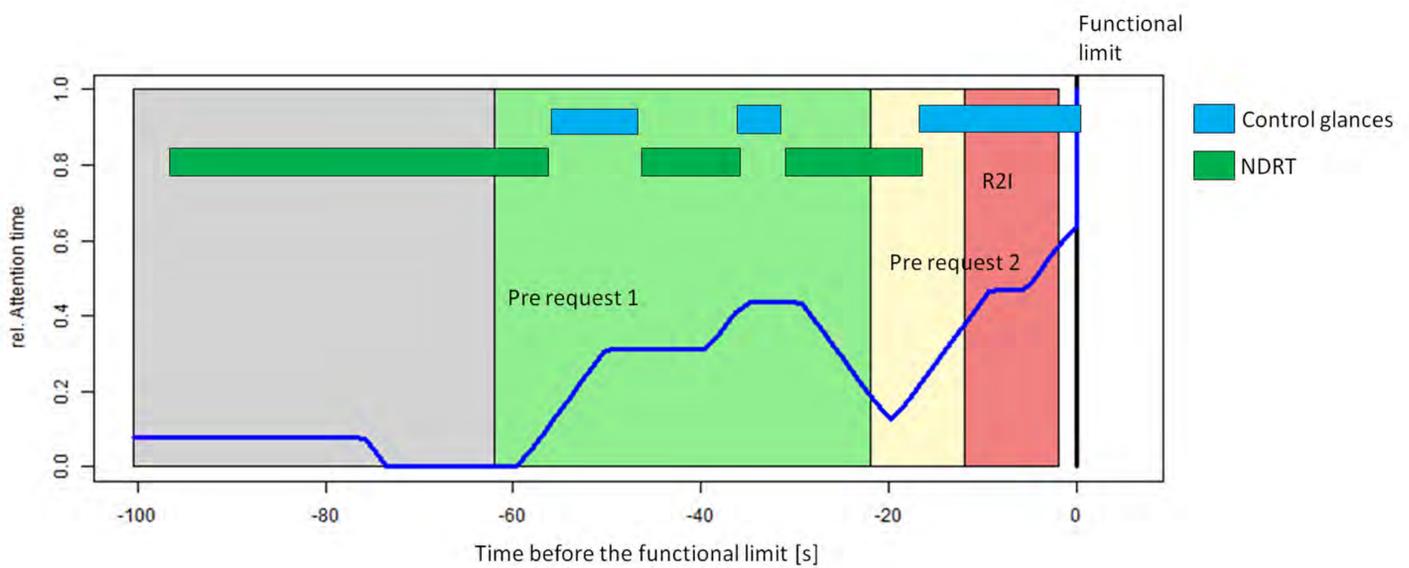


The transition task separates the NDRT and manual driving task of the takeover process.  
The multi-stage request to intervene guarantees convenient and safe takeovers.

## DRIVER STATE MONITORING AND BEHAVIOR SUPERVISION

While transitioning the driver should attain readiness for the intervention at the sensory, motoric and cognitive level. While readiness at the former two levels are established as a "reflex" and in parallel, the cognitive level depends on the driver's behavior – seeking situation awareness – and the traffic situation. As a result of the research in WP3, we concentrate for the following driver behaviours:

- Control glances prior to the R2I:**  
Monitoring the driver's glance within a sliding window provides a first mean (relative attention time) to assess the driver's situation awareness when facing a functional limit.
- Reactions following the R2I:**  
Supervising distinct actions such as the initial gaze reaction, hands on the wheel, etc. allow the system to assess if the driver is likely to react adequately.



Typical course of actions when the occurrence of a functional limit requires a takeover.  
The colored zones illustrate the different temporal stages of the request. The horizontal bars at the top illustrate the glance behavior of the driver. The blue line of the graph shows the relative attention time, i.e., the total duration of control glances in a sliding window.