

**Sergey**

### **Application Scenarios:**

1. Start of the route
2. Arrival to the destination point
3. Adding a slave truck
4. Slave truck's close approaching to a head/master truck
5. Obstacle in front of a head/master truck
6. Obstacle in front of a slave truck
7. Obstacle aside near a slave truck
8. Lost of connection with a head/master truck

Application Scenario: Start of a route	11/05/2021	AS P01	Page 1
<p><b>Description of the partial development task AS P01:</b></p> <p>Any platoon before start should execute a starting procedure. The procedure should define heading truck and following trucks, arrange the positions of the following trucks, configure communication channels between members of platoon</p> <p>A single vehicle has the ability to be a platoon leading vehicle, another vehicle should be able to join the lead vehicle and together construct a platoon system, which will consist of 2 vehicles: a leader and a follower. It can take place either before start the vehicle or while driving.</p>			
<p><b>Principle solution for AS P01</b></p> <p>A communication channel functions for both vehicles: it includes a well-defined real-time communication protocol for message exchanging and data sharing between vehicles, in addition to a hardware communication unit, it works as hardware unit for encoding.</p> <p>A message passing technique between the two vehicles and the approval of the request is upon the leading vehicle.</p> <div> <div>A : Sends a request to join the platoon</div> <div> B: Checks for free places   Approvement or rejection   Sends the point of disengaging </div> </div> <p>Reference : Requirements 2.8</p> <p>Written By Sergey Rogachevsky</p>			

Application Scenario: Obstacle in front of a head/master truck	11/05/2021	AS J00	Page 1
<p>Description of the partial development task ASJ00:</p> <p>Moving platoon may meet an unexpected obstacle in front of it. It can be an animal, another uncontrolled car or truck. Lead truck should execute procedures to avoid the collision by the entire platoon.</p>			
<p>Principle solution for ASJ00</p> <p>Lead truck should scan the platoon's environment to be able to avoid any collisions. After detection of a possible collision, it should predict the probability of an accident and, in case of high likelihood, execute a procedure of alerting a moving obstacle, a procedure of avoiding collision, and a procedure of giving commands to other trucks of platoon.</p> <p>A : I see an obstacle</p> <p>A: The likelihood is high</p> <p>A: Send a signal "Emergency break" to the entire platoon                      B: Emergency break</p> <p>A: Alerting the obstacle about the moving platoon</p> <p>Reference : Requirement ref Engaging</p> <p>Written By Sergey Rogachevsky</p>			

Application Scenario: 9. Obstacle in front of a slave truck	11/05/2021	AS J00	Page 1
Description of the partial development task ASJ00:  Some cars may try to change a lane, animals can jump across the road between trucks of platoon, a heading truck in platoon without any reasons and messages stops moving.			
Principle solution for ASJ00  In case a slave truck detects an obstacle in front of it, it should assess the possibility of collision, when the likelihood is high it should execute the procedure of emergency break, alert all other trucks in the platoon.  A : I see an obstacle A: the likelihood is high A: Execute emergency stop A: message to other trucks B: Emergency stop  Ref : Requirement ref Engaging Written By Sergy			

Application Scenario: 10. Obstacle aside near a slave truck	11/05/2021	AS J00	Page 1
<p>Description of the partial development task ASJ00:</p> <p>A slave truck may encounter a moving obstacle aside. It can be an animal, an uncontrolled vehicle.</p>			
<p>Principle solution for ASJ00</p> <p>When a slave truck will detect an approaching object from aside, it should execute a procedure of alerting the object about moving platoon, message other trucks of the platoon, in case of dangerous decreasing of distance between the platoon and the object it should execute the procedure of avoiding the collision.</p> <p>A : I see an approaching object</p> <p>A: I alert it</p> <p>A: The object is still moving towards the platoon</p> <p>A: I alert other trucks                      B: We start the procedure of avoiding an obstacle</p> <p>A: I start the procedure of avoiding an obstacle</p> <p>Ref : Requirement ref Engaging</p> <p>Written By Sergy</p>			



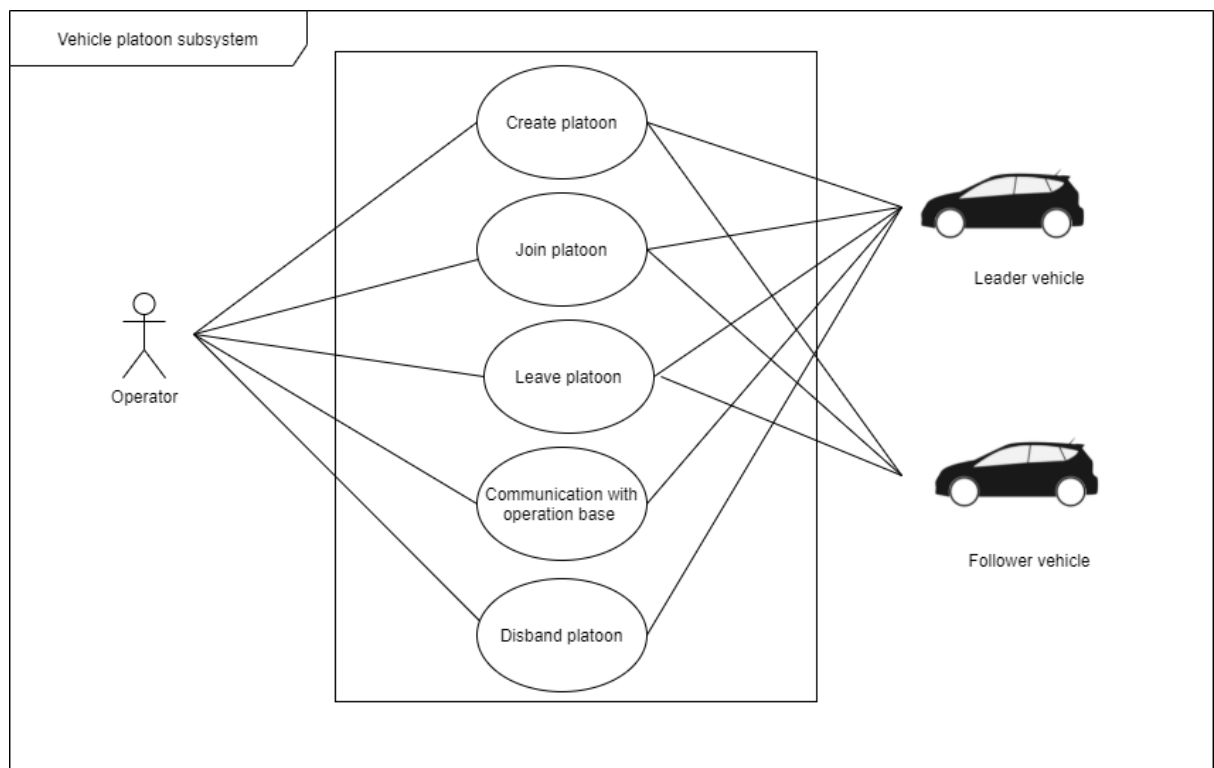
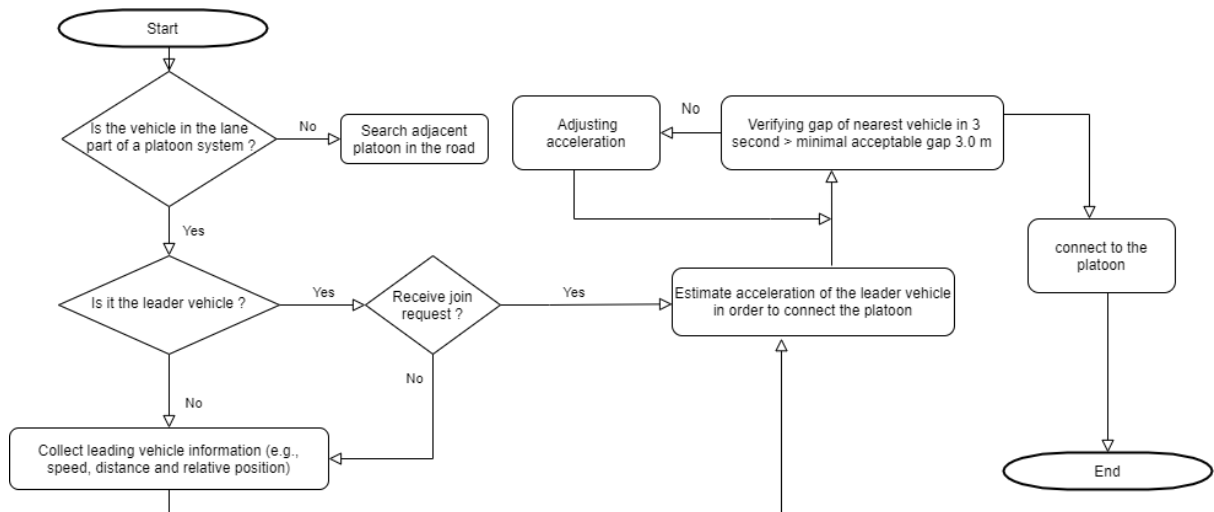
Mohammadreza

2- Participant vehicles being able to maintain a stable platoon

4-The leader will notify other vehicles any instability and disturbances by varying its speed and acceleration

6- Other participants will follow the platoon leader in the desired headway distance while maintaining platoon stability.

8- The participant vehicles can get all driving information of the platoon vehicles, like location, velocity and acceleration, via vehicle-to-vehicle communication. The participant vehicle has to determine whether it is possible to merge between the platoon vehicles or to follow the last vehicle





Application Scenario: At an intersection with a traffic light	12/05/2021	AS JXX	Page 1
<p>Description of the partial development task ASJXX :</p> <p>The connected vehicles reach to the traffic light , there is the possibility that some of the participants vehicles have already passed the traffic light and that would cause the participant vehicle disconnect from the platoon system .</p>			
<p>Principle solution for ASJXX :</p> <p>We can consider two separate platoon systems(1-participant vehicles behind the traffic light 2- participant vehicles which have passed the traffic light ) . After the traffic light turns Red , the first participant vehicles in the line behind the traffic light notify the leader about interruption and take the control of the second platoon system and after the traffic light turns green, the second platoon system can proceed with higher speed in order to get to the first platoon system and when they get close enough to each other, they can merge and the second platoon system can give up the control .</p>			

Application Scenario: Establishing vehicle to vehicle and vehicle to infrastructure communication	12/05/2021	AS JXX	Page 1
<p>Description of the partial development task ASJXX :</p> <p>It is possible that the leading vehicle has an accident or loses control due to technical problems or it may fail in communicating with the platoon participants .This may cause the whole platoon system unstable and unsafe .</p>			
<p>Principle solution for ASJXX :</p> <p>We should have a control room which have a control over the platoon system, leader, participant vehicles, weather and other parts of the system so in case of any kind of problems between participant vehicles or in the road , the responsible employee for the operation have to act immediately and fix the issue .</p>			

Application Scenario: A Vehicle Joining the platoon	11/05/2021	AS J00	Page 1
<p>Description of the partial development task ASJ00:</p> <p>A single vehicle has the ability to be a platoon leading vehicle, another vehicle wants to join the first vehicle and together construct a platoon system consists of 2 vehicles a leader and a follower. It can take place either before start the vehicle or while driving. From behind (by single truck &amp; existing platoon)only , as the first truck is a platoon of one member per se. [1]</p>			

### Principle solution for ASJ00

A communication channel exists in both vehicles; it includes a well-defined real-time communication protocol for message exchanging and data sharing between vehicles, in addition to a hardware communication unit, it works as hardware unit for encoding.

A message passing technique between the two vehicles and the approval of the request is upon the leading vehicle.

A : I want to join the platoon

B: let me think

Yes welcome or No I do not want you

in my platoon I will exit the highway

Ref : Requirement ref Engaging

Written By Anas

Application Scenario: Leading vehicle Operating modes failure	11/05/2021	AS J01	Page 1
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Description of the partial development task ASJ01:

The leading truck has 2 operation modes, first one is manual driving; second one is Assisted driving. ADAS relies on several hardware and software components, so ADAS is susceptible for failures.

Principle solution for ASJ01

The level of automation in ADAS is level two which means the driver is engaged most of the times.

The system offers the driver to alter between manual and assisted mode, however in case of ADAS failure, it warns the driver to take over. It also warns any platoon members for this incident. A failure in ADAS could be technical or an environmental affects its functionality i.e fog or slippery road ...

Ref: Requirement ref Engaging

Fail over safe req

1. Traffic light distributes the platoon..?? DONE BY MOHAMMEDREZA
2. Environment disturbance such as rain/snow/obstructed visibility limit the capabilities of the system: Driver should take control in all platoon vehicles. DONE BY ANAS

3. Orchestration of platoon in a formation in case a vehicle is leaving the platoon from the middle of the platoon
4. If the leader vehicle leaves the platoon the immediate next vehicle or another vehicle takes the charge over as the leader,
5. If any of the trucks wants to leave the platoon due to a splitting point
6. In the platooning mode, the distance between the vehicles in the platoon can become very small to obstruct the view of the followers, where only the leading vehicle has a clear view of the road in front of the platoon. The streaming application solves this problem by sharing the view of the leading vehicle with the rest of the vehicles that belong to the platoon. This means that every vehicle, which can act as a leader depending on the particular circumstances, has to have a 4K-camera installed to record and stream a high quality image in real time

Application Scenario: Transfer of control for Leader Vehicle	11/05/2021	AS JXX	Page 1
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### Description of the partial development task ASJXX:

In case of situations where the trucks are bound to different destinations, and the leader vehicle has to leave the platoon, it shall inform and transfer the very next follower in line to take over control as the leader of the platoon.

### Principle solution for ASJXX

The leader vehicle shall pass the message via V2V communication to the very next follower vehicle to take over control of the platoon well in advance before it leaves the platoon. Once the acknowledgement has been received, it should hand over the control and inform all vehicles about the transfer. All other vehicles then request to join the new leader platoon. Only after completion of transfer, it should proceed to disengage from the platoon by increasing the distance.

A : I want to leave the platoon,  
take over as the leader

B: Yes, I am available or No, I have  
to leave too

A: Transfers control and informs all

B: I am the leader, send requests to join

Ref : Requirement ref Leader Vehicle Disengaging

Written By Mariam

Application Scenario: Truck leaves platoon	11/05/2021	AS JXX	Page 1
<p>Description of the partial development task ASJXX</p> <p>In the situation of splitting of one of the trucks, it should be informed about it well in advance for the driver to take over the control.</p>			
<p>Principle solution for ASJXX</p> <p>When a driver comes into the vicinity of a split point - a place where he is about to leave the platoon - the driver is informed of this upcoming event via the onboard HMI. When leaving a platoon, the CACC automatically increases the distance to the leading vehicle and the driver can leave the platoon at a highway exit or highway split. It is shown to the other drivers that the truck is about to leave the platoon and after splitting from the platoon the truck follows its individual route. The immediate next vehicle then reduces the distance after the split and CACC is again active.</p> <p>Ref : Requirement ref Engaging</p> <p>Written By Mariam</p>			

Application Scenario: Intruder crosses a platoon	11/05/2021	AS JXX	Page 1
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Description of the partial development task ASJXX

A car tries to drive between the platoon members.

Principle solution for ASJXX

When it is between 2 members they adjust the distance with it.

Ref : Requirement ref Engaging

Written By Team

Requirements:



[illegible]