Project plan for City of Tampere
as a reply to 'Call for Tender: Autonomous mobility pilot in Hiedanranta, Tampere, Finland'

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Idea of offered transportation service

Roboride offers its Robo service to City of Tampere to be used as last mile solution within developing Hiedanranta area. Robo service is a turn-key on-demand transportation solution based on autonomous vehicles.The Service includes comprehensive planning for the project which is concluded with a Service Plan. Roboride also provides the two stages of implementation: Rollout Planning and Rollout. As a turn-key solution Robo service includes all required requirements defined in the Call of Tender.

The service will be based on route network, which is developed during the project. Figure on the top-right corner illustrates initial route network. Route network will be further refined in the planning phase, and, as the area develops to serve new destinations and support changes within the area in future. Route network serves routes 'A' and 'B' as defined in the tender.

The route network can be served with scheduled routes and on-demand traffic. Additional stops can be added along the routes. Each of the vehicles can be assigned separately to either of the modes. Flexible capacity allocation makes it possible to serve various traffic patterns, such as commuting and events. It is possible to increase the capacity easily in future with additional vehicles.

Parameter	Vehicle A	Vehicle B	Unit
Roundtrip length	1,4	1,8	km
Roundtrips per hour	5	4	
Seats	4	4	person
Capacity per hour	40	32	person
Average speed	8	8	km/h
Hours of service	9	9	
Distance covered	63	64,8	km
Daily performance	100	80-100	%

Daily performance of one vehicle is estimated in table on the right for back-to-back route service for links between Hiedanranta Bus Stop & Lielahden kartano (Connection A) and Lielahden Kartano & Lielahden Koulu (Connection B). Estimate for daily performance based on 9 hours operation time per day of the entire service is thus 648 people.

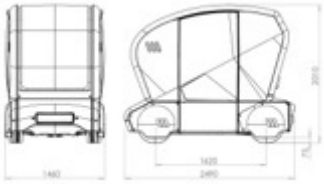
Routes will be operated according to agreed schedule (see table in right bottom corner). Schedule can be implemented as in tender, and, can be further refined during planning and operation phases. On weekdays, Connection A will be served in 15 minute interval, with another vehicle allocated to on-demand service for whole area. Service will be available in 5 Saturdays, that will be agreed in planning phase.

Schedule will be designed to support easy transferring between other modes of transport. Roboride has readiness to implement ticketing.

	Vehicle A	Vehicle B
Mon-Fri	Connection A 8-17 at least every 15'	Connection A&B On-demand
Sat* *agreed dates	Connection A 10-15 every 15'	Connection B 10-15 every 20'

Vehicle to be used in the transportation service

Roboride is offering to use two Aurrigo PodZero vehicles. Aurrigo vehicle is a small 4-seater electric L7e classified vehicle. It is ideal for operation in low speeds and limited space. Aurrigo pod is ecological and silent. PodZero is fully autonomous vehicle capable of operation without route infrastructure. Vehicle dimensions and specifications are given on the right in a figure and a table.

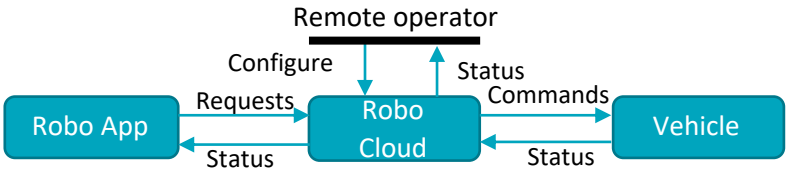


PodZero navigates fully autonomously based on waypoints given to it and it will stop upon obstacle on its path. PodZero operates based on predefined route network. In the planning phase the route network is designed, taking into account service level needs and safety issues, and further refined along the pilot.

Specification	Aurrigo PodZero
Capacity	4
Turning radius	3,5 m
Drivetrain	Electric
Battery Type	Lithium-Ion
Autonomous system	Level 4
Safety features	Seat belts Emergency stop Safety sensors

Robo Cloud is responsible for generation of waypoints for the PodZero controller. Robo Cloud waypoints are based on ride requests and schedules. Remote operator configures schedules and other variables into the Robo Cloud and can remotely monitor the vehicles. End users may use Robo App to order the vehicle or just step in. Figure on the right illustrates command structure.

A safety operator within the vehicle will be required during the pilot. Safety operator is able to take control of the vehicle and resume autonomous operation in case of issues.



Reference projects

As regards to references, we have chosen following two: an industrial park in Pori, Finland and a holiday resort in Zhangjiakou, in China.

The Pori pilot site was opened in summer 2019. The Robo service operated between the main gate and buildings within the area. Industrial areas have stringent safety measures and in spring 2019 Roboride got approval from the area authorities. Roboride's customers are the companies operating in the area. Service pilot was operated on-demand basis.

China site was opened in autumn 2019. The Robo service provides transportation for guests between the gates and the areas of the holiday resort. Purpose of the service is to enhance mobility within the area and provide customers on-demand access to their destination. Service and Rollout plan for the site was completed late 2019. Commercial service will be live beginning of July 2020 after construction work in the resort is completed.

Further information on the references is available upon request

Schedule with milestones

Project schedule is designed according to the call of tender document and describe in table below. Roboride has readiness to start the planning phase after approval. Decision to start implementation is needed after the planning phase is done.

Phase/Milestone	Start	Finish	Estimated decision	Deliverables
Planning	18th of Feb	13th of March	17th of Feb	Service Plan Roll-out plan
Milestone: planning complete		*13th of March*		
Implementation	16th of March	14th of June	16th of March	Readiness to start operation Communications & marketing plan
Operation I	15th of June	9th of August	16th of March	Operation of 8 weeks Reported statistics
Milestone: Robo in Hiedanranta		*9th of August*		
Operation II	10th of August	27th of November	6th of July	Operation of 16 weeks Reported statistics
Milestone: Pilot done		*27th of November*		

Working methods during planning phase

The planning phase is a co-creation phase with the customer organization. Planning phase follows Roboride's two phase Service Plan – Roll-out Plan structure, that spans from definition to creation of plans.

Work consists of workshops, meetings and information exchange of draft solutions and plans for the area. Planning documents are the key outcome of the process. Planning documents will be considered complete after both parties have reviewed and approved them. Steering group shall be formed for the project. The steering group shall be final decision authority and problem-solving body for the project.

Following workshops, described in a table below, will be held with tentative dates assigned to them, each taking half a day. Roboride can arrange additional workshops upon request.

Workshop	Autonomous Driving - Service Design	Safety & security of the service	Infrastructure for the service	Roll-out planning
Date	19.2.2020	21.2.2020	25.2.2020	27.2.2020
Shared documents	Service Brief	Service Plan Draft Risk assessment	Safety Case	Service Plan Final Roll-out Plan Final
Agenda	Service characteristics Vehicles Route & stops Operation time and service availability Roles & User groups Depot location and operation Service monitoring and maintenance Existing system integration Requirements review Ticketing system Mobile app Schedule Goals of the deployment KPIs for the goals and target range	Vehicle safety Safety of the operating area Risk factor identification Identifying authority permits Security of the site CCTV coverage	Proposed adjustments to lanes, crossings, stops Depot and charging point locations and infrastructure Safety improvements proposals Recognizing potential issues with service functionality in the traffic network and potential workarounds.	Risk analysis Trainings Roll-out materials Stakeholder network and organization Steering group set up for operational phase Project team – Infrastructure Schedule for the changes identified
Outcome	After the workshop Roboride collects all information into a Service Plan document that becomes the goal setting standard for the project.	Target of the workshop is to establish basis for safety & security plan for the site. Plan consist of using existing infrastructure and additions required to it.	Based on the workshop, Roboride will create Roll-out plan.	Approval to start implementation.

Implementation of demand-based service

Robo App provides capability to request a ride and track its status. The Robo App is offered through application stores for end users to download. The Robo app supports Apple iOS and Android. Usage of application is simple: choose departure & destination and request the Robo. Users need to register to use the application.

Robo Cloud supports also external ride requests. A call button or a kiosk could be installed in a Robo stop to request a ride. Ride will be then ordered as anonymous from the stop 'Lielahden kartano'. Also in this case, it will be possible to track the movement of the Robo with the app.

Requested rides are queued into the system and combined where possible. Rides will be served on first-come-first-served basis with scheduled traffic having higher priority. The Robo app will show current queue status to estimate the pickup time. On-demand rides are possible throughout the entire route network. On-demand rides may be also temporarily blocked. Roboride has already implemented on-demand ride capability and additional requirements can be added easily.

Data collection during the pilot

Robo Cloud automatically collects information of movements of the Robos and passengers. Based on the data, the Robo Cloud will create the statistics & reports. The statistics can be viewed through the Robo Cloud or exported in CSV format. Additional statistics and reports can be implemented on request.

Following information will be available:

- Number of users registered
- Number of trips requested per hour
- Number of passengers per hour per vehicle
- Average waiting time for on-demand ride per hour
- Distance travelled per hour per vehicle
- Passenger distance travelled per vehicle
- Energy consumed per hour per vehicle
- Service breaks including reason per hour per vehicle
- Service availability per day compared to planned hours
- Weather conditions per day

Roboride has implemented GDPR-compliant privacy policy, that will be adhered into with data collection.

Safety aspects of the deployment

Roboride has developed in collaboration with VTT a safety process. Roboride has received approval to operate from Traficom, insurance company If and safety authorities. Safety process is based on risk-based approach. Risks are actively identified and mitigated to ensure safety of the service.

Roboride requires from its suppliers, risk mitigation and compliancy of automotive industry practices. Aurrigo, vehicle supplier is compliant with ISO 26262 & IATF 16949, that are the industry standards.

Phase	Safety activities
Planning	Safety case Safety plan
Implementation	Permits Infrastructure Training Acceptance testing
Operation	Risk & incident management Continous improvement

Safety activities are listed on a table in right. Key outcome of planning phase is a 'safety case' which is detailed description of operating environment, risks and mitigations. Another deliverable is a safety plan, which is used to obtain permission from Traficom in the implementation phase. Implementation phase contains construction of infrastructure, training of personnel and testing of safety features to ensure compliancy. During operation phase, risks & incidents are actively monitored and mitigated through continuous improvement. Roboride's safety process includes also occupational safety.

Communication method of the solution

The vehicle is connected to Robo Cloud through mobile network. The solution does not require any additional infrastructure and is based on robust existing technology. During the planning phase Roboride will measure the network to assess suitability. If there are problems, Roboride can work with operator or switch to another operator. Roboride worked in this manner in Pori with Telia and obtained excellent results in spite of detected problems within the network.

Insurances

Roboride has traffic and vehicle insurances from IF insurance company to cover third parties and vehicles. Vehicles are insured with traffic insurance and protection against loss, collision, damage and liability (liikennevakuutus + liikennekasko). Roboride employees are insured according to general policies in Finland.