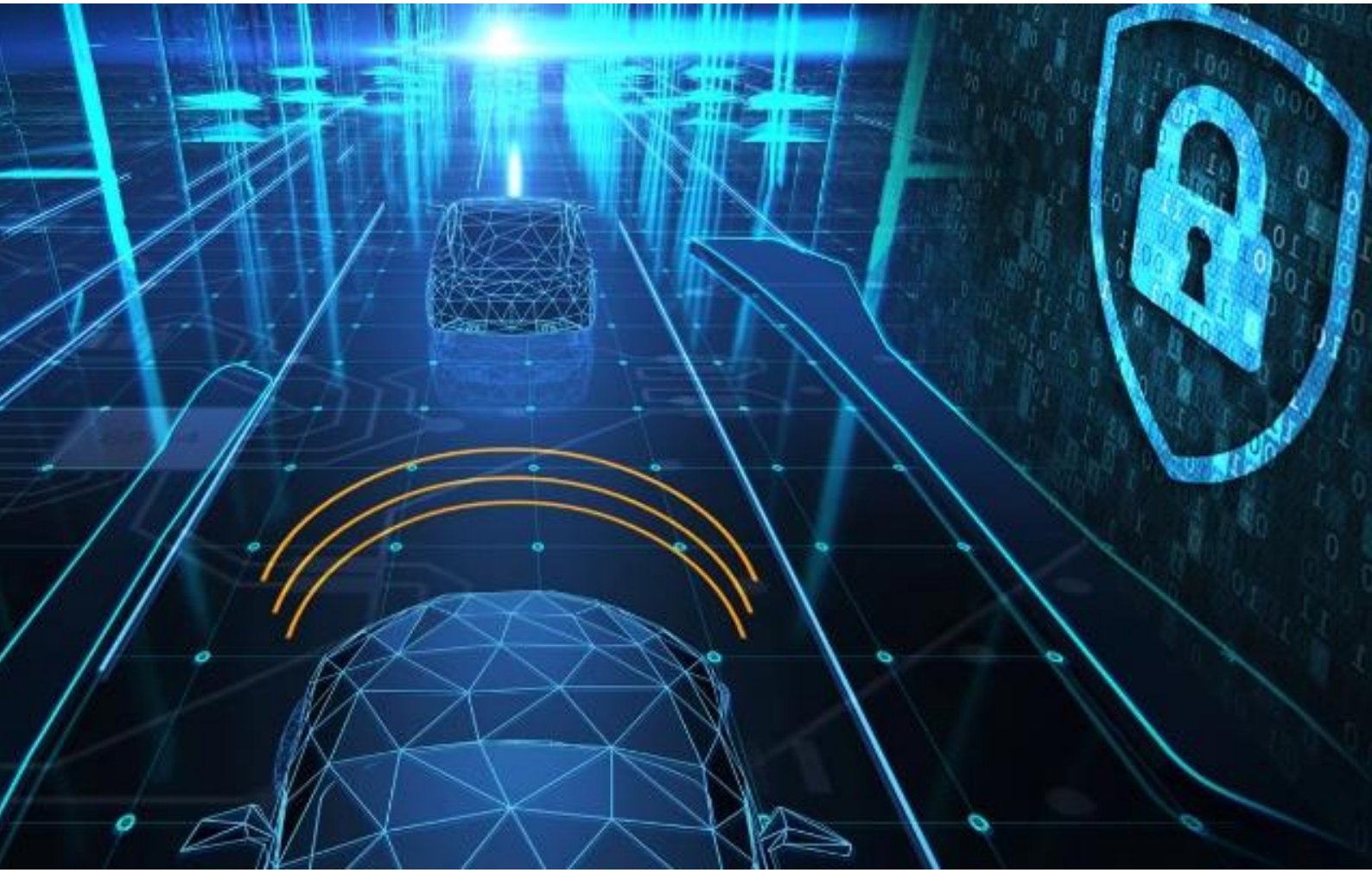
smashHit

Smart Dispatcher For Secure And Controlled Sharing Of Distributed Personal And Industrial Data

Demonstrator of Services Using Integrated Traffic, Smart City and CPP Data

Public Deliverable D7.5



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Foreword

Welcome to our smashHit Demonstrator of Services Using Integrated Traffic, Smart City and Data coming from Consumer Products (CP). From the very beginning of the project, we were absolutely convinced that the growing Data Economy has to become more attractive for its key stakeholders (data subjects, data providers and data controllers) to overcome existing barriers, as e.g. the complicated and time-consuming consent/contract processes, hindering to build-up innovative services using data from multiple sources.

With the growing ability of Consumer Products (such as cars, smart devices, etc.) to generate, gather and share data with third parties among different data-sharing platforms, there will be a general need for flexible and easily manageable procedures to handle data subject's consent and legal rules, to achieve effective and traceable contracting. The complexities of the General Data Protection Regulation (GDPR), for example, possess some challenges and require complex mechanisms to obtain, record and manage consent. Also, data subjects are afraid about improper use of their data. The combination of understanding and relating to the value proposition, consumer trust, and complex consent processes, results in a low opt-in rate for connected product data exchange (e.g. data from cars) and prevents the creation of innovative services (e.g. connected vehicle insurance programs, or smart city solutions).

Thus, we have conceptualised the smashHit system solution as a trusted, secure and integrating privacy-by-design reference Framework to simplify the consent/contract process, as well as to enable consent/contract tracing and sharing among multiple data platforms. In addition, smashHit will offer solutions to identify data misuse as well as to support stakeholders in the creation of legally binding contracts.

All along, we have followed the maxim to think about the needs of data subjects and data customers, but also to win CP manufacturers (e.g. car makers) to open up their products, by designing a convincing trustworthy ecosystem.

During the project lifetime we have finalized the smashHit system concept, its detailed specification and development by our software and RTD development partners and created a working prototype capable of scale. Several public presentations of our smashHit system concept and results have been presented (see smashHit project website).

This public report covers the Demonstrator of Services Using Integrated Traffic, Smart City and CP Data (smashHit Business Case 2).

If you got curious about how all that is made possible, just continue on the following pages, enjoy the reading, and please contact us with your feedback or questions!

- smashHit support email: info@smashhit.eu
- smashHit project website: https://smashhit.eu

Executive Summary

Forum Virium Helsinki has been in charge of the preparation of demonstrators in the Business Case 2 and responsible for the deliverable D7.5. Demonstrator of Services Using Integrated Traffic Smart City and CP data. The work has included intensive cooperation with other main partners of the Business Case 2 Arctic Machine Oy (previously Infotripla) and VW.

In the Smart City Business Case the aim has been to develop and improve personal data sharing services in the smart city context. All three demonstrators of the use cases are described more in detail next.

This document, which comprises the Demonstrator of the smashHit Business Case 2 is structured as follows:

1 Demonstrator of UC2.1 - Enriching situational awareness of city traffic with the City Feedback System

Enriching situational awareness of city traffic with the City Feedback System (including the mobile App) was realised in the form of a video which had two specific objectives. First, to serve as a demonstrator to show app functionality and highlight the features of the system as well as the privacy and consent management done according to the MyData principles and second, to serve as a communication material for attracting test-users for the City Feedback System.

The video was filmed by Flux film company in the City of Helsinki Jätkäsaari area and it was used in various ways such as in the social media channels (Facebook, YouTube, Twitter, LinkedIn) and in Forum Virium Helsinki Newsletters in the communication campaign launched in September 2022. Support communications to share the video was received from the City of Helsinki and the Urban Environment Division of the City of Helsinki and MyDataGlobal. Communication campaign was done in Finnish, English and Swedish as it is the second official language in Finland.

Impact of the video and communication campaign was great as the number of app downloads increased with more than 260 in the first week of the campaign and at the time of writing stands at 323. Currently there are 256 registered users for the app while the target was 100. More than 400 feedback have been given via the app. A lot of positive feedback was received via different channels and the citizens themselves have shared information about the City Feedback App in various district social media groups.

Link to the video: City Feedback App: creating a more pleasant city with feedback

2 Demonstrator of UC2.2 - An installed road site unit helps having awareness of hidden road users

An installed road site unit helps having awareness of hidden road users was realised also in the form of a video. The video demonstrates the testing of the Corner View solution in the City of Helsinki Jätkäsaari area which serves as a testbed area for smart mobility pilots and testing in the City of Helsinki. Location of the testing area was selected with the city traffic planners to select a crossing which has a need to improve safety for road-users and would benefit from a solution such as the one of Corner View.

To do the demonstrator, VW did a road trip to Helsinki 15.10.-21.10.2022. VW brought their test vehicle Volkswagen Bus T6.1 and roadside unit including camera for object recognition and tracking, warning light to alert pedestrians and drivers, mobile phone to alert drivers, full smashHit backend and additional collision detection system deployed to AWS.

The solution was tested for three days and the video of the testing was filmed on 18th October with Flux Productions. The video consists of a presentation of the technology/Corner view system, demonstration of the consent management and presentation of the City of Helsinki as a real-world testbed for companies to test their solutions and PoC's in Helsinki.

Link to the video: [Safer streets for pedestrians – smart corner tested in Helsinki in smashHit project - YouTube]

2.1 Test environment

The test spot in Jätkäsaari is a new built street cross where vehicles, vans, and pedestrian are participant in the traffic, thus is a perfect place for CornerView use case. The tests were conducted 20 times with light rainy or cloudy weather between 9 a.m. and 3 p.m. The location and images about the test spot are shown in the Figure 1-3.

Multiple testing persons participated in the test, including:

1. 3 employees from Volkswagen, in which one play as pedestrian, one as driver and one as observer.
2. 3 employees from Forum Virium Helsinki as observers.
3. 2 employees from FLUX as the camera team to record the test video.

Test tools mainly are: one Road Side Unit (RSU), one Vehicle with CarNeo installed to send the GPS data, and a laptop to connect to the Backend on the cloud and to monitor the test process. Other tools were also used to hold the RSU in the corner.

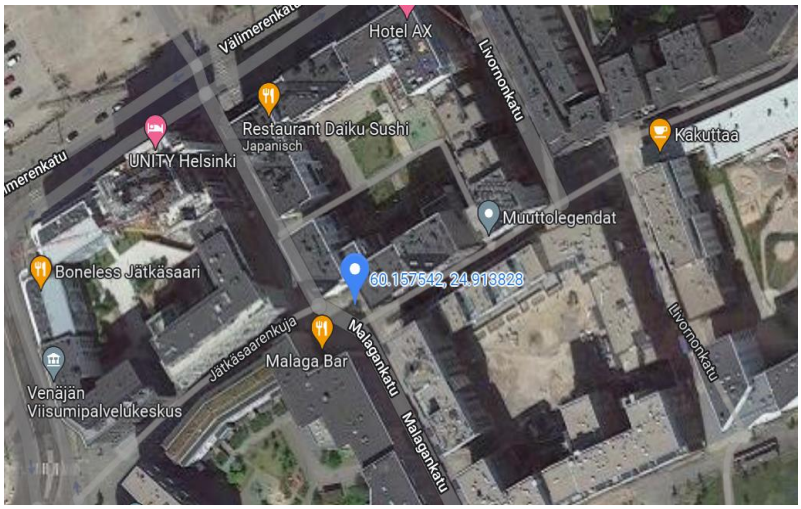


Figure 1: GPS location of the testing spot on Google maps

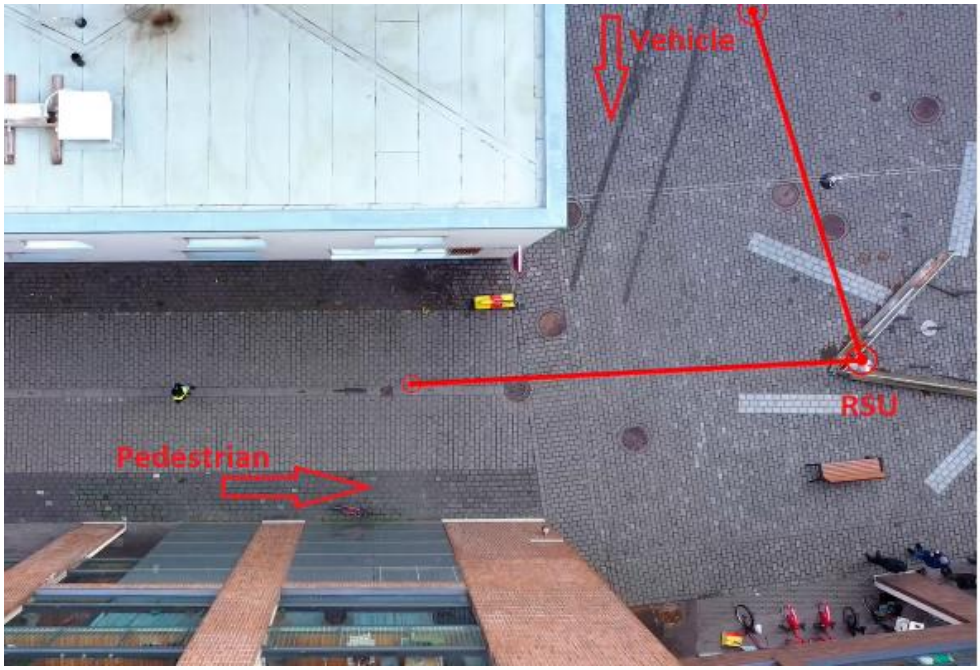


Figure 2: Bird view of the testing spot

Figure 3: RSU in the corner

2.2 Test results

2.2.1 Qualitative KPIs

For the test we used one vehicle to sending GPS data via CarNEO and one pedestrian entering the crossing. Our evaluation of the CornerView system shows that the described prototype meets the functional qualitative requirements defined in the KPIs. To this extend, the end-to-end system enables the sharing of data of road users approaching the intersection. Moreover, the RSU is able to determine the road users' positions from camera pictures and to predict the corresponding trajectories. The collision warnings are issued to a flashing warning light to inform road users

about the possibly dangerous situation. Optionally, the warning may be issued to additional devices, e.g., a smartphone or an in-car app. There have been sometimes false positives with standing vehicles or sudden connection loss of the vehicle or the road side unit.

2.2.2 Quantitative KPIs

Latency

The final testing day of CornerView has delivered following latency of the warning signal. To measure the latency, we consider the following interval: the timestamp of the first detection of a pedestrian in the pre-collision area having a potential collision with an arriving vehicle and the time until the warning lamp is physically turned on and flashing to indicate the respective detected collision. The reaction time of the system, for the above defined time difference was 3.7 seconds on average. The maximum time length in this test was 9.29 seconds. The minimal time length was 1.79 seconds.

The velocity in this testing was set to 20 km/h. In urban areas, esp. smart cities, one can assume vehicles to drive 30 km/h on a regular basis, which are 8.33 m/s. With ~ 8 meters per second, 3.7 seconds latency can make a delay of ~30 meters. This suggests that (with the current setup) the detection of possible collisions and the sending of warnings have to occur when the vehicle is still > 10m (for example 40m) away from the intersections.

The overall latency can arise from the following factors:

- The process of image in the RSU
- The transmission of the road user's position to the backend via internet
- The process of collision prediction in the backend using neural networks
- The transmission of warning signals to, e.g., the LED
- The low energy consumption mode of the raspberry pi in the RSU

Due to the latency issues mentioned above, the current prototype is currently not suited to reliably mitigate the considered dangerous situations without further optimizations. However, the developed solution can still be a valuable tool to detect dangerous traffic situations and to measure the frequency. Such data can enable numerous sophisticated Smart City use cases to increase traffic safety. In this regard, the statistics derived from our system can be used and archived to have a better understanding of smart city real-time solutions and a better foundation for upcoming real-time projects.

Collision Prediction Performance:

To assess the collision prediction performance, we performed a second set of experiments in which we re-enacted near-collision situations. In total, we measured 20 near-collision incidents. In our experimental settings, we were able to detect 17 out of 20 incidents corresponding to a relatively high recall of 85%. The 3 failed cases are:

1. Failed case 1: the waring was given with unexpected 9.29 seconds latency, in which the road user is detected by the RSU in time, however, the vehicle sends the GPS to almost 7 seconds after the detecting of the road user.
2. Failed case 2: the waring was not given and the system was shut down, from the road side unit, the reason is unknown.
3. Failed case 3: one backend service was shut down due to the loss of the internet connection, the backend needs to be restarted again, this is a logic bug for way the backend services were started, and thus can be avoid in the future test.

Considering the weather conditions, all the test was done under the light rainy or cloudy condition, the RSU was working fluently detecting the pedestrian and thus we expect that the RSU will also work under sunny weather, however the effectiveness of the RSU under heavy rainy or stormy weather needs to be verified.

2.3 Summary

Comparing the performance that we reported in the test in Hanover, the recall is increased from 70% to 85%. The improvement of the performance is due to two aspects: 1) The internet connection is steadier in the area we tested in Helsinki than in the factory area that we did our test in Hanover, 2) We improved the GPS sending module of the vehicle so that we have less delay of the vehicle GPS signal than the previous test.

There are still some spaces that we could ty to improve the performance of the prototype in the future, which hasn't been done yet due to limited time. For example, using server site event instead of constant request to get the warning signal, using V2X infrastructure rather than using a cloud-based backend to process the collision prediction. In summary we see the CornerView prototype shows the potential of increasing the traffic safety, yet more works needs to be done to have a stable and low latency production-ready system.

3 Demonstrator of UC2.3 - Creating better services for citizens by sharing data

Creating better services for citizens by sharing data was realised in the form of Privacy Design Toolkit - reference manual and canvas in order to advance the human-friendly privacy policies for services that share personal data.

Work on human-friendly privacy communications included a review of existing practices and initiatives, as well as a series of workshops to design the privacy communications of the City Feedback App. The lessons learned were distilled into a Privacy Design Toolkit, consisting of a reference manual and a canvas. The toolkit was reviewed by two legal scholars and found to comply with GDPR regulations and to produce very good quality in terms of human-friendliness of privacy communications. The toolkit has been presented to all smashHit consortium partners and can be used by everyone in the future service development.

Privacy Design Toolkit and its reference manual were finalised and published as open content (CC BY-SA) at the MyData Online Conference 27th October, followed by a panel discussion of experts on human-friendly privacy communications. The session on Human friendly privacy policies held at MyData Global online conference was a successful dissemination event and got the smashHit project global visibility. In summary, 72 participants from 22 countries joined the session of human-friendly privacy policies. 16 participants have visited the FVH booth. In total, 283 participants from 56 countries attended the event. The City Feedback App was presented as a concrete example of a service with a user-friendly way for end-users to manage their consents to the use of their personal data. The toolkit has generated a lot of interest in external stakeholders such as MyData Global.

The Privacy Design Canvas and Reference Manual can be found at the following location: Privacy Design Canvas and Reference Manual

4 Glossary

AWS: Amazon Web Services

Consent: As per Article 4(11) of the GDPR, 'consent' of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her

CP: Consumer Products. Generalized term to characterize products, such as cars, smart buildings, smart devices etc. Cyber Physical Products (CPP) are considered to be a subset of the CP.

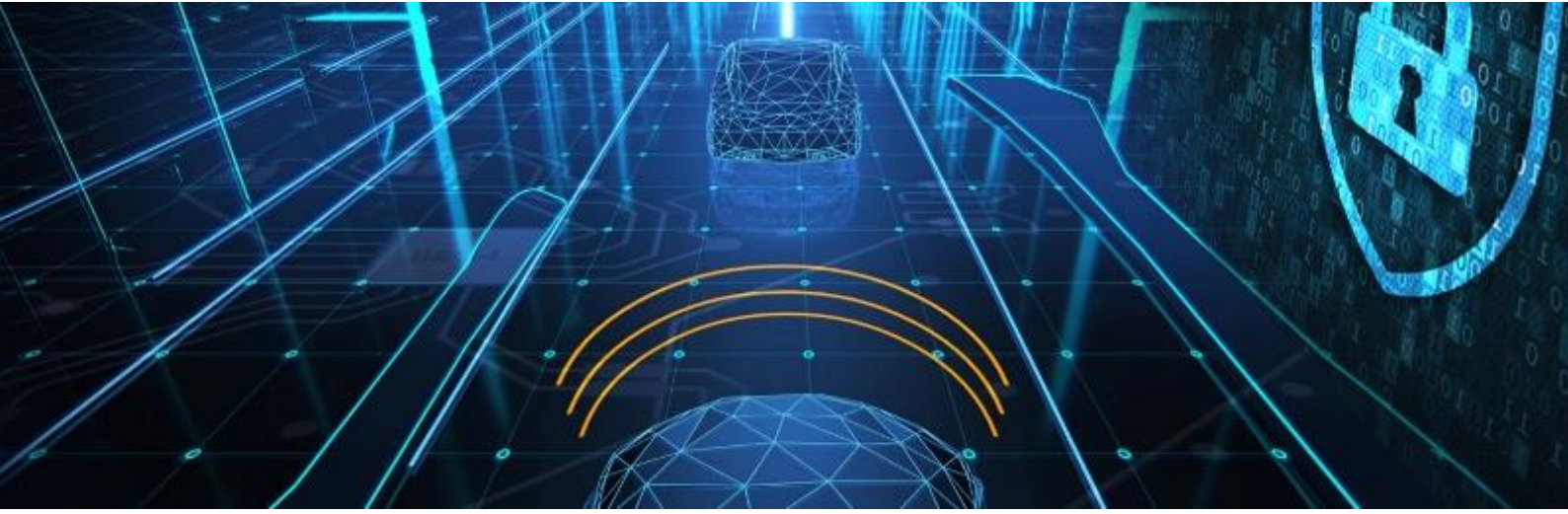
CPP: Cyber Physical Products

GDPR: Abbreviation for 'General Data Protection Regulation', a legal norm on EU level adopted in 2016, which is directly applicable within its scope and lays down rules for the processing of personal data so as to protect natural persons' fundamental rights and freedoms, in particular their right to the protection of personal data

OEM: Original Equipment Manufacturer

Personal data: Any information which are related to an identified or identifiable natural person (GDPR Art.4 (1))

Road Site Unit (RSU): Camera system installed by Volkswagen in the scope of the Corner View Use Case, including a camera for object recognition and tracking, warning light to alert pedestrians and drivers, mobile phone to alert drivers, full smashHit backend and additional collision detection system deployed to AWS



Our vision - Solving Consumer Consent & Data Security for Connected Car and Smart City

smashHit

Further information

More information about smashHit, recent blog posts, the publications created within the project and other material like white papers and guidelines for users and developers can be found on our project website:

https://smashhit.eu

Our consortium

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LexisNexis RISK SOLUTIONS

THE Open GROUP

infoTripla

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Atos

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