D9.3

Final external cooperation report

Project short name
SUNRISE

Project full name
Safety assUraNce fRamework for connected, automated mobIlity SystEms

Horizon Research and Innovation Actions | Project No. 101069573
Call HORIZON-CL5-2021-D6-01

Funded by the European Union

ccam-sunrise-project.eu/

Dissemination level	Public (PU) - fully open
Work package	WP9: Dissemination and international cooperation
Deliverable number	D9.3: Final external cooperation report
Deliverable responsible	Djemre Ozmendji, IDIADA
Status - Version	Final – V1.0
Submission date	12/08/2025
Keywords	External Cooperation

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Peer review 1	Stefan de Vries	IDIADA	11/07/2025
Peer review 2	Phillipp Legran	IKA	21/07/2025

Version history

Version	Date	Author	Summary of changes
0.1	30/10/2023	Jordi Pont	First draft of document structure with status of cooperation activities M1-M18.
0.2	20/06/2025	Stefan de Vries	Improved and detailed document structure and content.
0.3	17/07/2025	Djemre Ozmendji	Template update and content enhancement according to status of cooperation activities M1-M36. Clean version for internal review, including partner inputs.
0.4	21/07/2025	Stefan de Vries Phillipp Legran	Updated resulting from internal reviews.

0.5	28/07/2025	Djemre Ozmendji	Implemented remaining comments from internal reviews.
1.0	12/08/2025	Djemre Ozmendji	Final version

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
AB	Advisory Board
AD	Automated Driving
ADAS	Advanced Driver Assistance System
ADS	Automated Driving System
AEB	Autonomous Emergency Braking
AI	Artificial Intelligence
AMP	Automated Mobility Partnership
API	Application Programming Interface
AV	Automated Vehicle
AVSC	Automated Vehicle Safety Consortium
CARRS-Q	The Centre for Accident Research and Road Safety - Queensland
CCAM	Connected, Cooperative, and Automated Mobility
C-ITS	Collaborative – Intelligent Transportation Systems
COTSATO	COncretizing Test Scenarios and Associating Test Objectives
CRHS	Cooperative Resilience and Healing System
D	Deliverable
DF	Data Framework
DSC	Driving Simulation Conference
EP	Expert Platform
EU	European Union
FAQ	Frequently Asked Questions
FOT	Field Operation Test
HE	Horizon Europe
HEADSTART	Harmonised European Solutions for Testing Automated Road Transport

IB	Industry Board
ISMR	In-Service Monitoring and Reporting
ISO	International Organization for Standards
ITS	Intelligent Transportation Systems
KATRI	South Korea Vehicle Safety Research
KPIs	Key performance indicators
L2-4	The Society of Automotive Engineers (SAE) Level 2-4
METI	Ministry of Economy, Trade and Industry of Japan
NATM	New Assessment/Test Method for Automated Driving
NIST	National Institute of Standards and Technology
Obj.	Objective
ODD	Operational Design Domain
OECD	The Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
PDF	Probability Density Function
P.E.A.R.S.	Prospective Effectiveness Assessment for Road Safety
SACP	Situational Awareness and Collaborative Perception
SAE ITC	Society of Automotive Engineers Industry Technologies Consortia
SAF	Safety Assurance Framework
SCDB	SCenario DataBase
SDOs	Standardization Bodies
SMS	Safety Management Systems
SOTA	Secure Over-The-Air
SSH	Social Sciences and Humanity
SUNRISE	Safety assUraNce fRamework for connected, automated mobIlity SystEms
SUT	System Under Test

TDMS	Trust Data Management System
UCs	Use Cases
WP	Work Package
VRUs	Vulnerable Road Users
VSBs	Vehicle Safety Bodies
VSOC	Vehicle Security Operations Centre
VTTI	Virginia Tech Transportation Institute
V&V	Verification and Validation
V2X	Vehicle-to-X
V4SAFETY	Vehicles and Vulnerable Road Users Virtual eValuation of Road Safety

EXECUTIVE SUMMARY

Safety assurance of Cooperative, Connected, and Automated Mobility (CCAM) systems is a crucial factor for their successful adoption in society, yet it remains a significant challenge. It is generally acknowledged that for higher levels of automation, the validation of these systems by conventional test methods would be infeasible. Furthermore, certification initiatives worldwide struggle to define a harmonized safety assurance approach enabling massive deployment of CCAM systems.

The **SUNRISE** project develops and demonstrates a **CCAM Safety Assurance Framework** (SAF). The overall objective of the SUNRISE project is to accelerate the large-scale and safe deployment of CCAM systems. In alignment with international twin projects and initiatives, the project aims to achieve this objective by providing a SAF consisting of three main components: a Method, a Toolchain and a Data Framework. The **Method** is established to support the SAF safety argumentation, and includes procedures for scenario selection, sub-space creation, dynamic allocation to test instances and a variety of metrics and rating procedures. The **Toolchain** contains a set of tools for safety assessment of CCAM systems, including approaches for virtual, hybrid and physical testing. The **Data Framework** provides online access, connection and harmonization of external Scenario Databases (SCDBs), allowing its users to perform query-based extraction of safety relevant scenarios, allocation of selected scenarios to a variety of test environments, and reception of the test results.

This deliverable presents a final **overview of the external cooperation activities**, aimed at amplifying SUNRISE outcomes by aligning and collaborating with existing works rather than diverging from them. The **main goal** is to foster and coordinate cooperations with all Safety Assurance Framework (SAF) stakeholders including industry, regulatory bodies, consumer testing associations, standardization bodies (SDOs) and other relevant groups (e.g. general public and consumers).

The SUNRISE external **cooperation activities include** the collaboration with other Horizon Europe projects, exchange and alignment with international twin initiatives, communication and collaboration with CCAM networks and experts worldwide, SUNRISE Expert Platform workshops, feedback gathered at the Midterm and Final Events and the connection guidelines (to the SUNRISE Data Framework) for global external Scenario Database hosts. This report concludes the work done during SUNRISE's lifespan and presents the final outcomes from these cooperation activities.

Deliverable D9.3 highlights the roles and responsibilities of project partners. It also gives indication of where to find further details on certain topics which are reported in other deliverables (e.g. D6.3, D8.1, D4.4 etc.). This report is designed to convey a clear understanding of the external collaboration that SUNRISE established during its lifespan, directed to stakeholders in the field of CCAM safety. However, as a publicly accessible document, we also ensure comprehensibility of the report for readers without knowledge about CCAM systems.

1 INTRODUCTION

1.1 Project introduction

Safety assurance of Connected, Cooperative, and Automated Mobility (CCAM) systems is a crucial factor for their successful adoption in society, yet it remains a significant challenge. CCAM systems need to demonstrate reliability in all driving scenarios, requiring robust safety argumentation. It is acknowledged that for higher levels of automation, the validation of these systems by means of real test-drives would be infeasible. In consequence, a carefully designed mixture of physical and virtual testing has emerged as a promising approach, with the virtual part bearing more significant weight for cost efficiency reasons.

Worldwide, several initiatives have started to develop test and assessment methods for Automated Driving (AD) functions. These initiatives already transitioned from conventional validation to a scenario-based approach and combine different test instances (physical and virtual testing) to avoid the million-mile issue.

The initiatives mentioned above, provide new approaches to CCAM validation, and many expert groups formed by different stakeholders, are already working on CCAM systems' testing and quality assurance. Nevertheless, the lack of a common European validation framework and homogeneity regarding validation procedures to ensure safety of these complex systems, hampers the safe and large-scale deployment of CCAM solutions. In this landscape, the role of standards is paramount in establishing common ground and providing technical guidance. However, standardising the entire pipeline of CCAM validation and assurance is in its infancy, as many of the standards are under development or have been very recently published and still need time to be synchronised and established as common practice.

Scenario Databases (SCDBs) are another issue tackled by several initiatives and projects, that generally tends to silo solutions. A clear concrete approach should be used (at least at European level), dealing with scenarios of any possible variations, including the creation, editing, parameterisation, storing, exporting, importing, etc. in a universally agreed manner.

Furthermore, validation methods and testing procedures still lack appropriate safety assessment criteria to build a robust safety case. These must be set and be valid for the whole parameter space of scenarios. Another level of complexity is added, due to regional differences in traffic rules, signs, actors and situations.

Evolving from the achievements obtained in HEADSTART and taking other project initiatives as a baseline, it becomes necessary to move to the next level in the development and demonstration of a commonly accepted **Safety Assurance Framework** (**SAF**) for the safety validation of CCAM systems, including a broad portfolio of Use Cases (UCs) and comprehensive test and validation tools. This will be done in **SUNRISE**, which stands for **S**afety ass**U**ra**N**ce f**R**amework for connected, automated mob**I**lity **S**yst**E**ms.

The SAF is the main product of the SUNRISE project. As the following figure indicates, it takes a central role, fulfilling the needs of different automotive stakeholders that all have their own interests in using it.

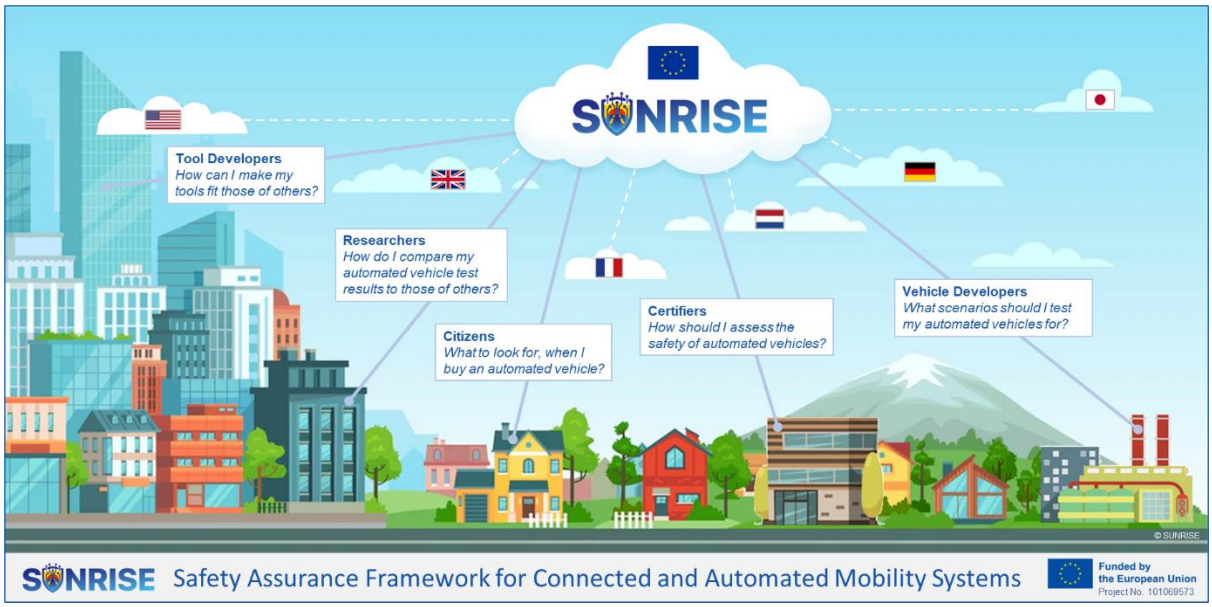


Figure 1: Safety Assurance Framework stakeholders

The **overall objective** of the SUNRISE project is to accelerate the safe deployment of innovative CCAM technologies and systems for passengers and goods by creating demonstrable and positive impact towards safety, specifically the EU's long-term goal of moving close to zero fatalities and serious injuries by 2050 (Vision Zero), and the resilience of (road) transport systems. The project aims to achieve this objective by providing a SAF consisting of three main components: a Method, a Toolchain and a Data Framework. The **Method** is established to support the SAF safety argumentation, and includes procedures for scenario selection, sub-space creation, dynamic allocation to test instances and a variety of metrics and rating procedures. The **Toolchain** contains a set of tools for safety assessment of CCAM systems, including approaches for virtual, hybrid and physical testing. The **Data Framework** provides online access, connection and harmonization of external Scenario Databases (SCDBs), allowing its users to perform query-based extraction of safety relevant scenarios, allocation of selected scenarios to a variety of test environments, and generation of the test results. The SAF will be put to the test by a series of **Use Cases demonstrations**, designed to identify and solve possible errors, gaps and improvements to the underlying methods, tools and data.

Following a common approach will be crucial for present and future activities regarding the testing and validation of CCAM systems, allowing to obtain results in a standardised way, to improve analysis and comparability, hence maximising the societal impact of the introduction of CCAM systems.

The following figure shows the general workplan of the SUNRISE project.

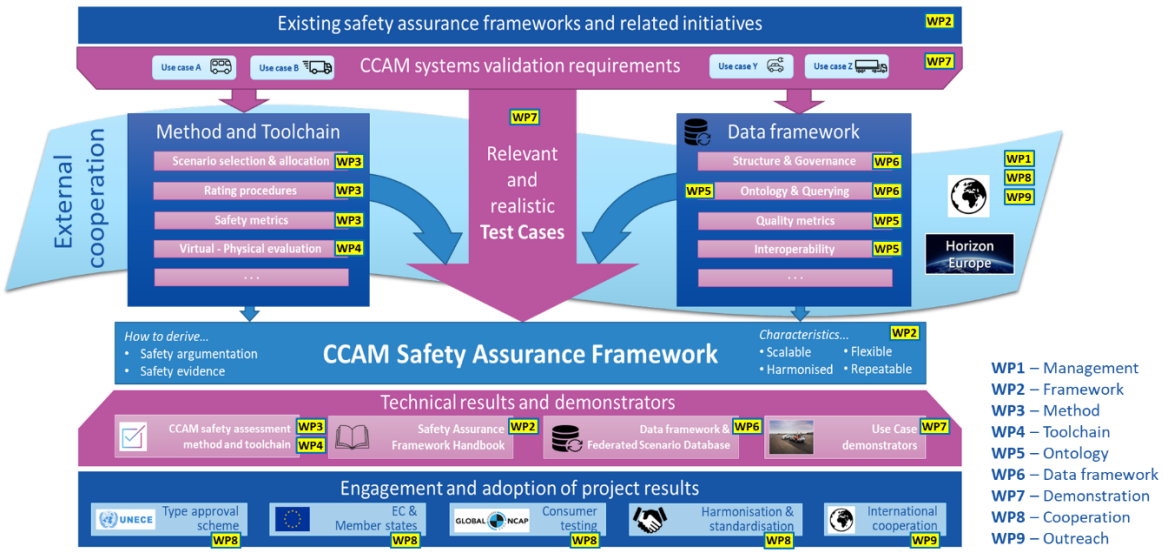


Figure 2: Workplan of the SUNRISE Project

1.2 Purpose of deliverable

Deliverable D9.3 reports about the completed final cooperation activities of the SUNRISE project. It describes how these activities are undertaken to collect external needs and feedback required by the different work packages and tasks in SUNRISE.

Table 1: Role of the partners in deliverable D9.3

Role	Who
• Collaboration with SINFONICA European project. • International collaboration with entities from Japan, Canada, United States of America, Australia, Germany and South Korea. • Partnering with twin projects and initiatives. • Distribution of connection guidelines.	IDIADA
• Cooperation Platform management and Workshop organization. • Collaboration with CONNECT European project.	ERTICO
• Collaboration with Australian initiatives and entities. • Collaboration with PODIUM project.	VEDECOM
• Collaboration with V4Safety European Project.	TNO
• Collaboration with AITHENA and AWARE2ALL European projects. • Preparation of connection guidelines for external stakeholders.	VICOM

• Collaboration with I4DRIVING and SELFY European Projects.	UoW
• Collaboration with German CCAM safety initiatives and entities.	IKA

1.3 Intended audience

The primary audiences for this deliverable are organizations and companies involved in safety of CCAM systems. These include but are not limited to national authorities, local/international certification bodies, EU agencies, standardization bodies, vehicle manufacturers (OEMs) and their suppliers and the CCAM research community.

For the project´s consortium, this deliverable serves as a conclusion of the results obtained from the external cooperations established, and a baseline for subsequent projects which would like to create a CCAM external cooperation network.

For interested CCAM entities *outside* the consortium, deliverable D9.3 is a document detailing international cooperation providing transparency on strategic partnerships, highlighting alignment with global best practices, and demonstrating the project's capacity to leverage diverse expertise and resources. The value of the cooperation activities described in this document include fostering trust, identifying opportunities for synergies, and supporting the creation of a *harmonized* SAF.

For the general public, this report serves as an accessible insight into how organizations work together across borders to address CCAM safety challenges and pool expert knowledge. This document also ensures clarity and helps readers without prior domain-specific knowledge to follow the document easily. The means of subsequent engagement intended for general public after reading deliverable D9.3, is to spark curiosity. The reader may access to information already published during the project lifespan in the form of webinars, guidelines, social media posts, the SUNRISE website, and of course the SAF Handbook published on the SUNRISE website.: https://ccam-sunrise-project.eu/handbook/

1.4 Deliverable structure and relation to other parts of project

Deliverable D9.3 is structured as follows:

- **Chapter 1** outlines the project **introduction**, purpose of the deliverable, intended audience and deliverable structure & relation to other parts of the project.
- **Chapter 2** focuses on the **Expert Platform**, detailing the SUNRISE Cooperation Platform and the workshops held with the registered Cooperation Platform users (experts).
- **Chapter 3** presents the **Horizon Europe Cooperation** of the SUNRISE project. This chapter describes the activities that have been done together with V4SAFETY, SINFONICA, AITHENA, AWARE2ALL, SELFY, I4DRIVING and CONNECT.
- **Chapter 4** introduces the **International Cooperation** between SUNRISE and CCAM entities in different countries such as Japan, Canada, United States of America, South Korea, Australia and Germany.

- **Chapter 5** provides the work done under the umbrella of **Twin Projects and Initiatives** (corresponding to the activities performed in task T9.3). This chapter details the benchmarking activities of the results or approaches applied by twin projects and initiatives, as well as gathering with the twin projects in international events. Finally, this chapter explains a possible co-creation and publication of a white paper about unified recommendations related to CCAM safety assurance.
- **Chapter 6** gives the overview of **Feedback Results** collected at the SUNRISE Final Event.
- **Chapter 7** summarizes the distribution of the **Connection Guidelines** (prepared by WP6) with external Scenario Database hosts.
- **Chapter 8** presents the **Conclusions** of deliverable D9.3.
- **Chapter 9** presents the **References** of deliverable D9.3.

This deliverable directly accomplishes **Objective 9** (Obj.9) of the SUNRISE project: "*To improve and strengthen the expert network on CCAM safety assessment created in HEADSTART to gather multi-stakeholder needs relevant for the project implementation and disseminate and promote adoption of the project results.*"

Deliverable D9.3 is the conclusive report of the work that has been performed in task **T9.3 Liaison and international cooperation**. The objective of work package WP9 in the SUNRISE grant agreement is defined as: "… *increase SUNRISE's impact by raising awareness and understanding of the project objectives and results among the stakeholder communities (*D9.3 sections 2.2, 4 & 5*), and ensuring stakeholder engagement for fostering acceptance, endorsement and uptake of the project's results (*D9.3 sections 3, 5, 6 & 7*). The ultimate goal is to pave the way for the exploitation of the solutions developed and validated within the project (*mainly in D9.3 sections 4, 5 & 7*). Where WP8 focusses on harmonisation with formal bodies, WP9 interacts with the wider public and the CCAM community (*D9.3 sections 2-7*)."* Chapters 2-7 reports the achievements regarding the above-mentioned objectives.

Deliverable D9.3 also collaborates with **WP6 Data framework design & usage definition** (D6.3) and **WP8 Cooperation with international vehicle safety bodies** (D8.1):

- WP6 prepared the content of the Connection Guidelines for external scenario databases (SCDBs). However, Connection Guideline distribution and communication to the external stakeholders is covered in this deliverable under chapter 7. For content details on Connection Guidelines for external databases please refer to D6.3.
- Deliverable D9.3 collaborates with WP8 regarding cooperation with international Vehicle Safety Bodies (VSBs). Due to the fact that VSBs are the main subject of WP8, it will be described in detail through deliverable D8.1 and not as a part of this deliverable D9.3. For details on the collaboration with international VSBs please refer to deliverable D8.1.

2 EXPERT PLATFORM

This section explains the cooperation with the SUNRISE Expert Platform, and how the SUNRISE Safety Assurance Framework (SAF) has been aligned to the feedback obtained from its members.

The Expert Platform is a group of external individual CCAM stakeholders, through which the SUNRISE project gathers feedback on its plans and results. Subsequently, that feedback is taken into account during the remaining course of the project and the development of the SAF and its adoption by target users.

As can be observed in the following figure, the Expert Platform is subdivided into the Industry Board (IB) and the Advisory Board (AB). This figure shows that the Expert Platform consists of both stakeholders from industry entities like OEMs and TIER1s, and non-industry entities like standardization bodies, regulatory authorities and policy makers.

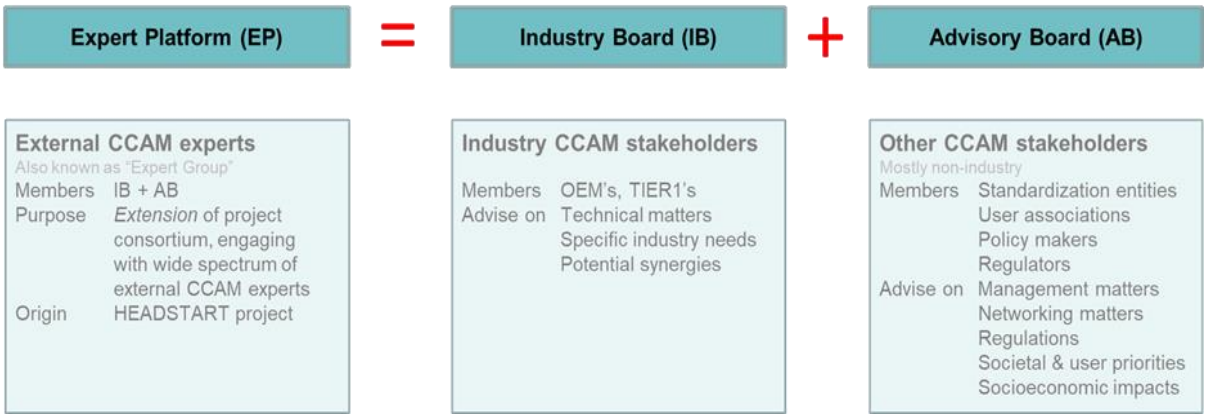


Figure 3: Expert Platform (EP) = Industry Board (IB) + Advisory Board (AB)

Expert Platform candidates were invited through several rounds of invitations. Becoming a member of the Expert Platform, requires a subscription through the SUNRISE website through the following link:

https://ccam-sunrise-project.eu/register/

The Expert Platform was established in July 2023 and the total number of registered members reached around 150.

The SUNRISE consortium cooperated with the Expert Platform in two different ways: [1] through the Cooperation Platform and [2] through online workshops, each of which will be treated in further details in the following sections.

2.1 Cooperation Platform

The Cooperation Platform is a discussion forum integrated into the SUNRISE website, with the purpose of providing a continuous communication channel between members of the

SUNRISE consortium and the Expert Platform. This forum allows members of the SUNRISE consortium to launch discussions, interact and cooperate with the members of the Expert Platform. The inputs registered on the Cooperation Platform, are used within the SUNRISE project to improve the development of its Safety Assurance Framework and other project results.

At the start of the SUNRISE project, IDIADA, ERTICO and TNO defined a set of requirements for the Cooperation Platform, after which it was integrated into the SUNRISE website. It was brought into operation in February 2023. And by July 2023, the total number of registered members reached around 150. After that, feedback on SUNRISE plans and results has been obtained from Expert Platform members by means of their written comments on numerous questions published on the Cooperation Platform. These comments were mainly provided during a series of Expert Platform workshops, which will be explained in the next section. The following figure shows some example questions and answers on the Cooperation Platform.

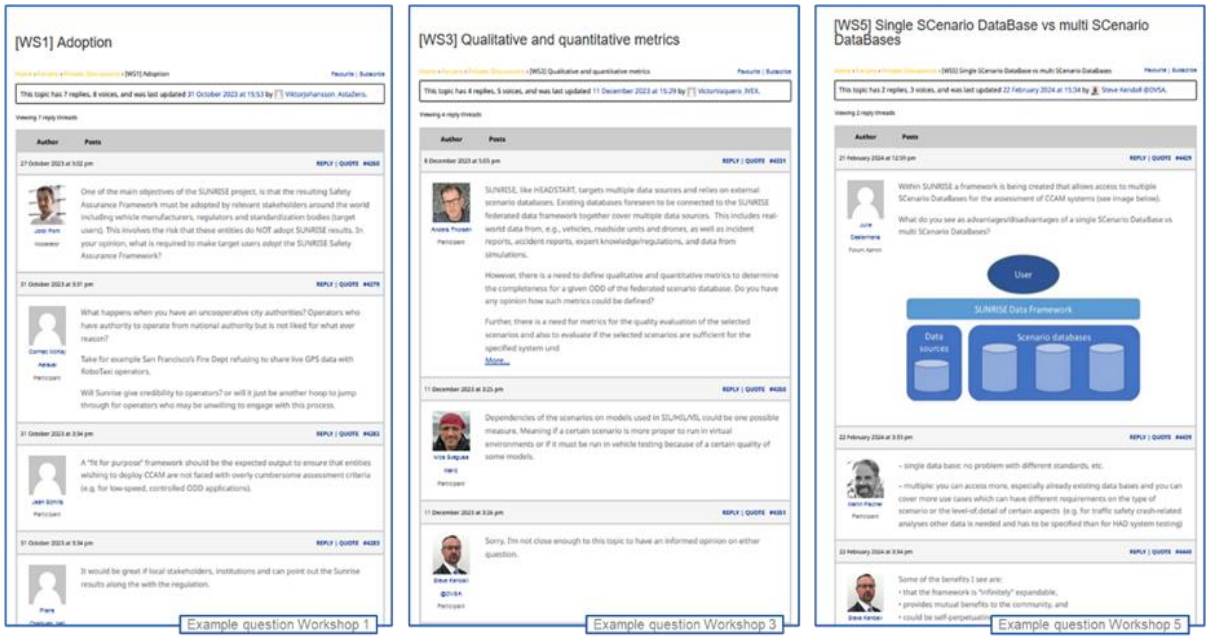


Figure 4: Example questions and answers on the Cooperation Platform

Once registered, the Cooperation Platform can be accessed through the following link:

https://ccam-sunrise-project.eu/forums/

2.2 Workshops

A total of 10 workshops has been celebrated with members of the SUNRISE Expert Platform. These workshops were organized and celebrated to inform Expert Platform members about project plans and results, and (most important) to obtain their feedback on it.

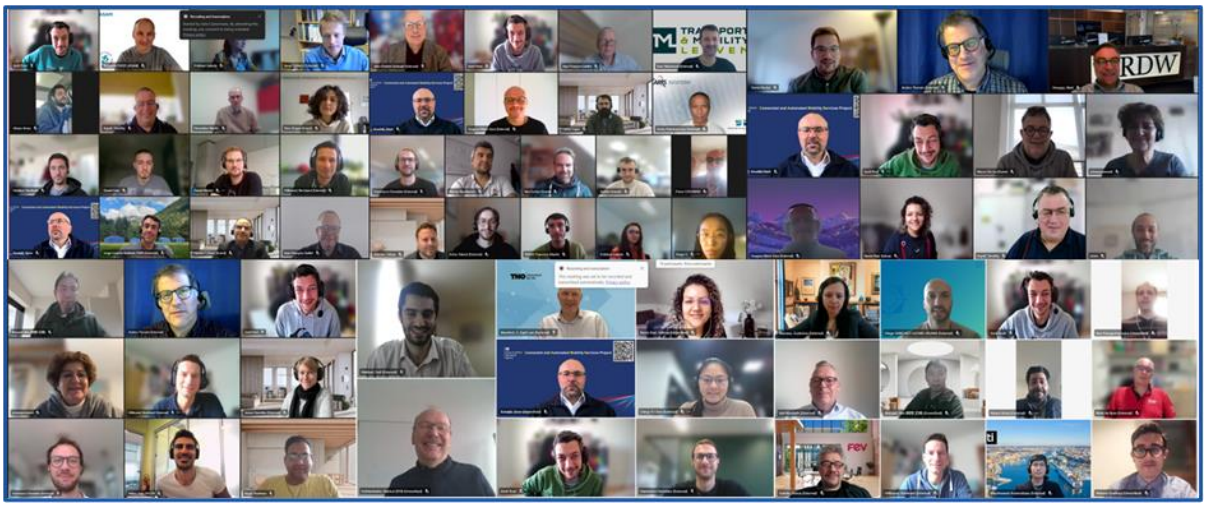


Figure 5: Some of the attendees to some of the Expert Platform Workshops

The table below provides an overview of all workshops including their topics (*Topics*), the people involved (*By*) and when the workshop was celebrated (*When*). As can be seen in this table, workshops 1-6 mostly focussed on the general explanation of the project, its work packages and the first deliverables produced, whereas workshops 7-10 focussed on external feedback resulting from the SUNRISE Midterm Event (celebrated on 24th of April 2024 in Brussels), where the first draft version of the SAF was presented.

Table 2: Overview Expert Platform Workshops

Nr.	Topics	By	When
1	A. SUNRISE Introduction B. Work package description C. Project goals	Leaders of WP1, T9.4	OCT 2023
2	A. WP2 Description B. D2.1 Summary - Overview and gaps of existing safety assessment frameworks	Leaders of WP1, WP2, D2.1	NOV 2023
3	A. WP3 Description B. D3.1 Summary - Report on baseline analysis of existing Methodology	Leaders of WP1, WP3, D3.1	DEC 2023
4	A. WP4 Description B. D4.1 Summary - Report on relevant subsystems to validate CCAM systems	Leaders of WP1, WP4, D4.1	JAN 2024
5	A. WP5 Description B. D5.1 Summary - Requirement for CCAM safety assessment data framework content	Leaders of WP1, WP5, D5.1	FEB 2024
6	A. WP7 Description B. D7.1 Summary - CCAM Use cases validation requirements	Leaders of WP1, WP7, D7.1	MAR 2024
7	***Draft* Safety Assurance Framework** Explanation and feedback on a draft version of the SAF in a dedicated session during the SUNRISE Midterm Event	Leaders of WP2, T2.1	APR 2024

	in Brussels, to which Expert Platform members participated online.		
8	**Industry engagement** Goals: Increase focus on SAF users in the industry (OEMs and TIER1s). Update them on draft SAF, including both the framework and its handbook. Collect and process their requirements, aiming for their engagement and adoption of the SAF. Convince and encourage them to start using the SUNRISE SAF, thereby boosting its uptake and after-life.	Leaders of WP1, WP2, T2.2, WP8	NOV 2024
9	**Role of society** Goals: Increase focus on role of wider public or society, ensuring to gain their trust and meet their safety expectations, while dully informing about the limitations of CCAM systems and their safety. To help achieving this, cooperate with EU-funded projects like SINFONICA and Cultural Road, and CCAM safety related associations like MOVING and PAVE.	Leaders of WP1, WP2, WP9	JAN 2024
10	**Alignment certifiers & industry** Goals: Increase focus on alignment between certifiers and industry regarding CCAM safety assurance. Aim for a SAF that is used by both groups in the same or similar way. Aim for a SAF that covers shared needs and expectations to the highest possible extend. Identify differences in SAF use in both groups, and make sure to cover these adequately.	Leaders of WP1, WP2, T2.2, WP8	FEB 2024

The workshops have benefitted or enriched the SUNRISE project and its SAF in various ways, thereby aligning the SAF with the feedback provided by the members of the Expert Platform. The main benefits and enrichments obtained in the workshops, are explained hereafter.

During **workshops 1-6** feedback was obtained by means of written comments on numerous questions published on the Cooperation Platform. In total 25 questions were raised, to which 74 written answers were provided by Expert Platform members. The exact questions and answers can be found on the Cooperation Platform (through the link provided earlier). What follows is are the main **conclusions** (in order of priority) drawn from all feedback received through the Cooperation Platform:

1. **Definition of the right metrics and KPIs** and their monitoring seems to be commonly considered of importance.
2. **Making the SAF future proof** is found to be of importance. That involves predicting the (foreseeable) future and updating various SAF items over time (like scenarios, metrics and KPIs).
3. **SAF application in CCAM pilot projects** on public roads (or similar real-life applications), would probably benefit the project and the adoption of its results.
4. Confirmation that the **role of standards is paramount**. This applies for example to scenarios, database contents and interfaces. But also, to the handling of new or conflicting standards.

5. Mechanisms for the **identification of unknown unsafe scenarios**, seems to be insufficiently covered by the current project plans and results.
6. The **public** or **society** should probably play a **bigger role** in the project. For example, to gain their trust and ensure that their safety expectations are met.
7. More focus on the **role of the human driver** with regards to safety assurance of CCAM systems. Their unpredictable behaviour is likely to significantly impact the safety of CCAM systems.
8. More focus seems to be required on the **alignment between certifiers and industry** regarding the safety assurance of CCAM systems.

In **workshop 7**, attendants were provided with access to an online draft version of the Safety Assurance Framework (on Miro.com), on which they could provide their feedback in the form of digital "sticky notes" (see figure below). These comments were then taken into account into the further development of the SAF.

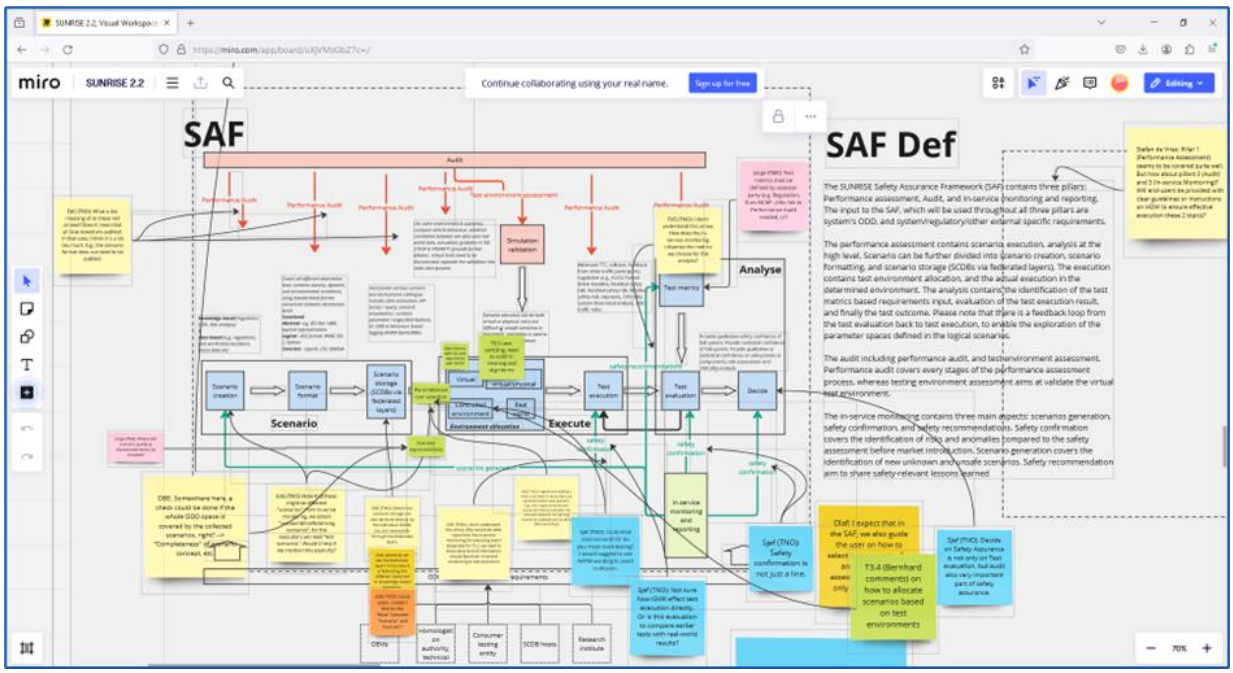


Figure 6: Example of feedback on SAF through "sticky notes" on Miro.com

During **workshop 8** potential SAF users from the industry (among which employees of Mercedes Benz, BMW and Volvo) were updated on the current version of the SAF. They also provided (spoken) answers on a series on predefined questions. Their feedback has been processed by the task and work package leaders involved in this workshop.

In **workshop 9** SUNRISE invited representatives of the SINFONICA and OPTIPEX projects. Each project was shortly introduced, after which an open discussion was sparked by a few predefined questions related to the role of society in safety assurance of CCAM systems. The main **conclusions** following from that discussion were as follows:

1. **Main take-away:** Address general public or specific CCAM user groups (like disabled, elderly, user associations), highlighting CCAM benefits and transparently communicating CCAM safety related matters. This will help to gain trust and manage expectations.

2. Both SINFONICA and OptiPex partly focus on **personal safety**, but only very limited on vehicle safety.
3. CCAM systems are generally **trusted to be safe** by the general public.
4. **Possible connections** to the SUNRISE SAF through the ISMR block (in-service monitoring and reporting), and by possibly taking public trust issues into account in the evaluation criteria, and by ensuring the existence of scenarios that are closely related to public trust, such as scenarios involving pedestrians or disabled people.

These conclusions have been addressed by the task and work package leaders involved in this workshop. The main take-away (conclusion number 1), is being addressed by publishing a series of frequently asked questions (FAQ) and answers on the SUNRISE website, in cooperation with the CONNECT project (due August 2025). See Section 3.8 in this document for further details on this topic.

In **workshop 10** representatives of both certifying and industry entities were invited, aiming for a SAF that is used by both groups in the same or similar way. After introducing the SUNRISE project and its SAF, an open discussion was sparked by various predefined questions related to alignment of the SAF with the needs and expectations of both groups. The main conclusions following from that discussion were as follows:

1. **Different roles in applying the SAF**: Vehicle Safety Bodies emphasized that, unlike industry users, they typically do not perform all steps of the Safety Assurance Framework (SAF) themselves. Instead, their role is more focused on auditing or witnessing the SAF activities carried out by others, rather than executing the process end-to-end.
2. **Need for guidance from a perspective of a Vehicle Safety Body**: Vehicle Safety Bodies once again highlighted the need for clear guidance on how to apply the SAF from an authority or certification perspective. There is a strong demand for structured documentation and practical instructions tailored to the specific needs of regulatory and certifying bodies.
3. **SUNRISE as a driver for advancing CCAM safety assurance**: Both Vehicle Safety Bodies and industry stakeholders agreed that the SUNRISE project could provide valuable methods and application examples that support the further development of safety assurance practices for CCAM systems. The project's outcomes can be seen as a meaningful contribution to aligning industry and regulatory efforts.

3 HORIZON EUROPE COOPERATION

Engaging the concurrent and complementary Horizon Europe CCAM projects and calls is essential for maximizing impact, avoiding duplication of efforts, and fostering innovation through shared knowledge. Such collaboration enables the alignment of goals, resources, and methodologies, ultimately enhancing the efficiency and effectiveness of outcomes across initiatives.

A flexible interaction with other Horizon Europe CCAM calls, independently of the time duration and start and end dates of these other projects, has been achieved. For projects starting later than SUNRISE, the latter iterations still allowed to consider the needs, requirements, benefits of the cooperation. The SUNRISE SAF built consensus or benchmarked complementary frameworks of the other (Horizon Europe) projects in terms of technical insights as well as social sciences and humanities (SSH) topics.

The following subsections report on the engagements established with other Horizon Europe projects, outlining the collaborative activities undertaken, the nature of the cooperation, and the outcomes achieved through these joint efforts.

3.1 V4SAFETY and SUNRISE

The main objective of the project Vehicles and Vulnerable Road Users Virtual eValuation of Road Safety (V4SAFETY) is to provide a comprehensive procedure for conducting computer simulations to determine the long-term performance and impact of road safety solutions. The project builds on the experience gained in the Prospective Effectiveness Assessment for Road Safety (P.E.A.R.S.) project. V4SAFETY scope ranges from the identification and collection of the relevant input data to the projection of the results to a region of interest (e.g., the EU) and a prediction of changes in performance and impact that might be expected in the coming years. The procedures come with guidelines on the application and a demonstration on selected use cases.

V4SAFETY intends to develop a widely accepted and harmonised predictive assessment framework for road safety to provide realistic, explainable, and verifiable prognoses on the effects of safety measures. A key element in the framework is the use of simulations, as they can model future traffic scenarios and analyse, in depth, solutions not yet on the market. The V4SAFETY project has the focus to address different types of safety solutions, such as new technologies, in-vehicle systems (both active and passive), infrastructure measures, and relevant regulatory changes. Despite the focus on a large variety of safety solutions, the V4SAFETY framework will also be used to support virtual testing in the SUNRISE safety assurance of CCAM functions. Additionally, SUNRISE's scenario mining and test case generation will be important for defining the baseline and making projections.

Beginning in 2024, a series of workshops were held with experts from both V4SAFETY and SUNRISE, to further establish the cooperation between the two Horizon Europe projects. While SUNRISE considered the complete safety assurance framework, including scenario collection, test scenario generation and testing (proving ground, public road and virtual

testing), V4SAFETY mainly focused on the virtual testing part. V4SAFETY defines a practical simulation framework for virtual testing and SUNRISE is providing the methodology to establish relevant test scenarios considering the system's ODD and requirements.

In these workshops two approaches of both projects were contrasted and compared. Although the principles were not the same, the higher-level framework approach within 3 main blocks were matching between both projects. From the V4SAFETY framework, the pillar Execute Simulation has a direct link to the presented scope of CCAM V&V framework within SUNRISE Task 4.4. The Harmonised V&V Simulation Framework from SUNRISE, studied the pillars and topics mentioned in the V4SAFETY framework such as "Configure Simulation", "Manage Simulation", "Simulate treatment", "Simulate baseline" as simulations per se, and the execution of the simulation framework. The final results of V4SAFETY are expected for September 2025. The outcomes of the benchmarking of the available versions in both projects (similarities and differences), technical details on simulation execution aspects developed in V4SAFETY and links to SUNRISE project, have been reported in SUNRISE deliverable D4.4

3.2 SINFONICA and SUNRISE

During September 2023 a meeting was held with UNIMORE, the coordinator of SINFONICA project. Both projects were presented during the meeting and several promising areas were identified for mutual benefit.

SINFONICA enriches SUNRISE with its expertise in user engagement strategies, established guidelines for understanding user needs and problems, and the interactive knowledge map. Additionally, the collaborative glossary built together with the FAME project would be an asset. SUNRISE, in turn, empowers SINFONICA's users with its Safety Assurance Framework, fostering a culture of safety and continuous improvement through user feedback.

In January 2024, SUNRISE has organized an Expert Platform Workshop (Workshop #9) together with SINFONCA and Cultural Road. The outcome of the workshop is reported in section 2.2. The feedback given during the workshop on how to cooperate for the benefit of society when it comes to CCAM systems, has been taken into account by the WP9 leader.

3.3 AITHENA and SUNRISE

The SUNRISE SAF does not make any assumptions about the technologies used to create a Cooperative, Connected, and Automated Mobility (CCAM) system or those operating within such a system for an automated vehicle. A black-box model is assumed. If any AI-based component is part of the CCAM system, then the SAF may overlook ethical requirements (as outlined by the AI High-Level Expert Group) or AI principles (defined by the OECD) on AI utilization in high-risk applications, with the EU AI Act classifying CCAM applications as high risk. The EU AI Act imposes certain legal regulations and obligations, and projects like AITHENA are attempting to define methodologies to map these regulations to the CCAM context. Specifically, AITHENA aims to provide a human-centric methodology focusing on four relevant use cases of CCAM: perception, situation awareness, decision making, and traffic management. Embedding AI-related considerations into the SUNRISE SAF proved to be complex, and impossible to achieve within the project's workflow. However, completely

overlooking AI could be a significant drawback for projects or customers intending to use the SUNRISE SAF if such projects or customers utilize AI and, therefore, need to ensure not only safety but also adherence to ethical requirements on AI.

The collaboration between SUNRISE and AITHENA is strategically beneficial, aiming to integrate ethical and legal AI considerations into the SUNRISE SAF for CCAM systems. At Transport Research Arena 2022, an initial engagement with AITHENA is accomplished during their presentation by Oihana Otaegui from Vicomtech. Later, at Driving Simulation Conference in August 2023 (DSC2023), SUNRISE and AITHENA projects held a special session together called "Current Industry and Research Activities: Projects AITHENA (Oihana Otaegui, VICOMTECH) and SUNRISE (Stefan de Vries, Applus+ IDIADA), Industry OEM, Supplier, Tool Provider". A joint discussion took place for 50 minutes under the topic "ADAS/AD (virtual) validation process targeting homologation" addressing:

- Common priorities, burning issues
- Current progress
- How do the puzzles fit together
- Gaps, white spots
- First experiences, lessons-learned

Figure 7: Special Joint Session in DSC2023 with speakers from SUNRISE and AITHENA

The insights from these discussions regarding ethical and legal considerations coming from AITHENA project have not been directly integrated into the SUNRISE Safety Assurance Framework, but the considerations raised will be addressed in a subsequent project, CERTAIN (Resilient and continuous safety assurance methodology for CCAM and its HMI components) funded under HORIZON-CL5-2024-D6-01-02. In CERTAIN, AI-related aspects

will be integrated and treated explicitly, and a SAF-extended methodology will be built accordingly.

3.4 AWARE2ALL and SUNRISE

AWARE2ALL targets "Safety systems and human-machine interfaces oriented to diverse population towards future scenarios with increasing share of highly automated vehicles".

Several personas (dimensions age, ethnicity, physical impairments, country, etc.) are defined, that interact with automated vehicles (L2-4, public or private) either as drivers, passengers/occupants, or pedestrians (VRU).

Scenarios have been defined in AWARE2ALL, using as much as possible current trends on scenario definitions, however, there is not a standardised scenario format or description flexible enough to manage the variety of human interactions of AWARE2ALL. As a consequence, the format and methodology for scenario definition and selection in AWARE2ALL has not used standards mechanisms.

From the perspective of AWARE2ALL, there is the believe that human aspects need to be covered by scenario-based testing frameworks, like the SUNRISE SAF, and as a consequence will support future activities that extend or adapt the SUNRISE SAF to include human aspects (e.g., driver interaction with automated functions, VRU interaction with automated vehicles).

3.5 SELFY and SUNRISE

Cyber vulnerabilities, such as spoofed sensor data, V2X message manipulation, or software tampering, can have direct safety implications and are thus relevant across multiple SAF components. Within the **Scenario** block, such threats can be modelled as part of scenario logic or environmental conditions. For example, a scenario may involve delayed or falsified infrastructure messages, simulating a degraded or malicious communications environment. These inputs enable targeted testing of the system's resilience to cyber-induced disturbances. In the **Execute** block, simulation and test environments can be configured to inject faults or disturbances reflecting cybersecurity failures, such as corrupted inputs or interrupted data flows. The SUNRISE SAF's emphasis on execution traceability and tool credibility ensures that such tests maintain evidential value. In the **Safety Argument** block, cybersecurity test outcomes can be used to support claims about system robustness. Internal monitoring data, such as intrusion detection alerts or fallback activations, can serve as evidence of safe system responses under attack or failure conditions. By structuring cybersecurity concerns into scenario design, execution, and evaluation, the SAF enables integrated testing of both functional and cyber-resilient safety performance.

This section maps SELFY project components to the **Performance Assurance** section of the SUNRISE Safety Assurance Framework (SAF), focusing on the **Scenario**, **Execute**, and **Safety Argument** blocks. This mapping is the result of a joint analysis of the main approaches of both projects.

Scenario

- **Create**: SELFY enhances data-driven scenario creation through its SACP (Situational Awareness and Collaborative Perception) tool, which gathers real-time environmental data from vehicles and infrastructure. This enables detection of complex, high-risk situations such as near-misses or occluded hazards—ideal for generating realistic and safety-critical scenarios.
- **Format**: While SELFY doesn't directly handle formatting, outputs from SACP and CRHS (Cooperative Resilience and Healing System) provide semantic context and behavioural traces, supporting construction of logical and abstract scenarios.
- **Store**: Though not a scenario database, SELFY's TDMS (Trust Data Management System) ensures secure, traceable storage of scenario data, supporting integrity within a federated SAF ecosystem.

Execute

- **Concretize**: CRHS informs parameter selection for test scenarios by identifying conditions like sensor degradation or V2X issues, enhancing the strategic value of concrete test cases.
- **Allocate**: SELFY's SOTA (Secure Over-the-Air) updates ensure consistent, verified software across test environments, supporting reproducibility and execution integrity.
- **Execute**: During scenario execution, SACP provides live context monitoring while CRHS manages resilience responses. These tools capture real-time dynamics and system adaptations—e.g., fallback behaviour during comms failure—offering behavioural depth difficult to simulate otherwise.

Safety Argument

- **Coverage Analysis**: SACP provides contextual metadata (e.g., weather, traffic density) that refines ODD coverage evaluation. CRHS highlights under-tested conditions, feeding iterative test refinement.
- **Test Evaluation**: SELFY's VSOC (Vehicle Security Operations Centre) monitors system-level anomalies, including safety-critical events and cybersecurity breaches. Even in collision-free runs, VSOC might flag internal faults or attack traces, enriching test verdicts with operational safety insights.

3.6 I4DRIVING and SUNRISE

Human driver reference models are an emerging element within the SAF. They aim to replicate or approximate human driving behaviour across different traffic and environmental contexts. Their integration into the SAF has been considered, particularly through collaboration with the i4Driving project.

Within the SAF, human driver reference models can serve three purposes:

1. to simulate surrounding traffic behaviour

2. to provide a baseline for benchmarking the SUT

3. to represent the human element in SAE Level 2, 3 or 4 systems

The benchmarking use case (bullet 2) is the most developed and was discussed during the SAF workshops. In this context, the human driver reference model serves within the Test Evaluate block of the Safety Argument pillar, supporting comparisons between the SUT and a competent human driver operating under similar conditions.

Rather than developing in-house human driver reference models, the SAF will reference established outputs from projects such as i4Driving. Its main objective is to create a naturalistic human driver model for the development and assessment of CCAM systems. Specifically, within the i4Driving project, work package 6 is in charge of introducing and aligning with safety evaluation method and consequently evaluate the human driver model in five unique applications. Due to the overlapping in project duration, since the 1st year of the i4Driving project, an earlier draft version of the SUNRISE SAF has been adopted by the i4Driving project as the evaluation workflow. This includes all the performance assurance components, covering scenario creation, formatting, database storage and query, simulation environment allocation, test execution and safety analysis and argumentation.

Within each of the five unique applications, workshops were conducted within i4Driving project to walk through the whole SUNRISE SAF, starting from scenario block. UoW has acted both as the i4Driving work package lead on evaluation, and the SUNRISE T2.2 lead on SAF development, forming a seamless integration and collaboration between the two projects. In addition, i4Driving project member RDW has been heavily involved in the SUNRISE Expert Platform, stakeholder engagement, and the mock up type approval exercise demonstrated at the SUNRISE Final Event.

3.7 CONNECT and SUNRISE

As requested by the European Commission at midterm (April 2024), SUNRISE continued with the collaboration with related projects like CONNECT to ensure alignment, cross-fertilisation, and potential cost-savings of the actions in the projects, in particular in relation to dissemination and communication activities. For that, Ainhoa Arrieta (ERT) suggested to create a specific Safety&Trust FAQ section on the website, potentially with support from CONNECT.

The FAQ explores how the two projects address key challenges in CCAM. Through five targeted questions, the FAQ examines safety from SUNRISE's perspective and trust from CONNECT's viewpoint. It also highlights how CONNECT tackles ethical concerns around trust, how both projects work to close the perception gap between technological safety advancements and public trust, and what risks they foresee at the intersection of safety and trust technologies. Together, the projects provide complementary insights that strengthen understanding for the wider audience, and foster synergies in building a safer and more trusted CCAM ecosystem. At the time of writing this document, the SUNRISE questionnaire has been sent to CONNECT, and their answers were awaited. We are aiming to implement the FAQ in the SUNRISE website before project ends in August 2025.

4 INTERNATIONAL COOPERATION

International Cooperation aims for fostering, coordination and cooperation with SAF stakeholders beyond Horizon Europe projects to increase the impact and dissemination of the SUNRISE results. SUNRISE has strengthened already established networks from the HEADSTART project by reaching out to CCAM experts in Japan, Canada, USA, South Korea, Australia and Germany. Joint activities and mutual exchanges for each country are explained in this chapter.

4.1 Japan

The International Cooperation in Japan is focused on the SAKURA project. The SAKURA project, which stands for Safety Assurance Kudos for Reliable Autonomous vehicles, is an initiative funded by the Ministry of Economy, Trade and Industry (METI) of Japan. It falls under the strategies defined by the Committee on Business Discussions on Autonomous Driving Technologies, which was established in February 2015. This committee oversees various initiatives by industry, academia, and government sectors in Japan related to autonomous driving.

The SAKURA project aims to address safety assurance in autonomous vehicles, particularly focusing on the challenges posed by the multitude of potential safety-relevant scenarios that autonomous driving systems may encounter in real-world traffic. These scenarios can vary widely, making it necessary to develop a structured approach to scenario generation and safety evaluation.

The project is structured into phases, with the first phase occurring from mid-2018 until the end of March 2021, and the second phase commencing in April 2021 and continuing until 2025.

The key aspects of the SAKURA methodology include:

- Scenario-based safety evaluation: The project focuses on structuring scenarios based on a description from the perspective of the autonomous driving (AD) system. This involves decomposing disturbance factors and scenarios and structuring them in accordance with the physics principles underlying the AD system.
- Definitions of functional, logical, and concrete scenarios: The project adopts definitions originally developed by the PEGASUS project. Functional scenarios define safety-relevant elements and their combinations, logical scenarios assign parameter ranges to functional scenarios, and concrete scenarios are defined based on these logical scenarios using parameter search engines.
- Safety criteria development: Once concrete scenarios are defined, safety criteria are necessary to discriminate between safe and unsafe conditions. These criteria are defined by the corresponding authorities.

The collaboration between SUNRISE and SAKURA projects encompasses several key areas of mutual interest and potential synergy:

Virtual Validation

- Both SUNRISE and SAKURA are aiming for a non-tool specific solution in virtual validation.
- The main intention is to address the connection between virtual validation and scenario-based testing.
- Collaborators include TNO and ViF from SUNRISE and potentially other members from SAKURA.
- A shared goal is to demonstrate alignment in guidelines between Japan (JP) and the European Union (EU) in virtual validation.
- Collaboration also extends to providing input to ISO 21943 and exploring multi-layer simulation.

Data Framework & SAKURA Database

- VICOMTECH is identified as the main contact for collaboration in this area.
- SAKURA expresses interest in understanding the SUNRISE Data Framework.
- Potential integration involves connecting SAKURA Database to SUNRISE Data Framework in 2025.
- Discussion includes the topic of data balance and efficient collection of real-world data, potentially involving SYNERGIES project, starting June 2024.

Scenarios

- TNO is identified as the main contact for collaboration on scenarios.
- Both projects are focused on traffic disturbance scenarios.
- Collaboration aims to define scenarios and maximize scenario coverage, with an eye on regulation at a UN level.

Glossary

- IDIADA is the main contact for collaboration on glossary exchange.
- Both projects have existing glossaries, with the intention to exchange and complement each other's documents.

Workshops and Events

- IDIADA and ERTICO are main contacts for collaboration on workshops and events.
- During 2023, several physical and online meetings were held in order to identify the potential technical topics to collaborate. Also, joint activities during conferences were done including ITS European Congress 2023 in Lisbon, ARTS TRB 2023 in San Francisco, SIP ADUS 2023 in Japan. Both projects also participated in a joint session in the Final Event of VVM Project.
- SAKURA members have joined both SUNRISE mid-term (March 2024) and final-event (2025 June) in-person.

- Both projects jointly participated in sessions on international congresses such as ARTS TRB 2024 and ITS World Congress 2024.
- IDIADA is the main contact for creating a joint white paper in collaboration with SUNRISE, SAKURA and V&V Methods projects. The scope of the whitepaper to develop a unified approach to CCAM safety assurance. This joint paper is explained in further details in section 5 of this document.

In summary, the collaboration between SUNRISE and SAKURA involves exchanges and joint efforts in various domains including virtual validation, data frameworks, scenarios, glossary development, and participation in workshops and events. The collaboration aims to leverage synergies between the projects and demonstrate alignment in approaches and guidelines at an international level. Since the SAKURA project is considered a SUNRISE twin, more information on the collaboration with SAKURA can be found in chapter 5.

4.2 Canada

Transport Canada is a federal institution in Canada responsible for transportation policies and programs. They work to promote safe, secure, efficient, and environmentally responsible transportation across the country. Their mission is to provide a safe, secure, efficient and environmentally responsible transportation system in support of Canada's social and economic goals and to regulate various modes of transportation including air, rail, marine, and road. They also set safety standards and issue licenses and permits together with developing and implementing policies related to transportation infrastructure, innovation, and sustainability. Transport Canada plays a crucial role in ensuring the smooth and safe operation of Canada's transportation system, which is vital for both the economy and everyday life.

An introductory meeting to explore the cooperation potential between SUNRISE and Transport Canada, was celebrated in September 2023. The two main potential cooperation topics that were identified were “Virtual Validation” and “Scenario allocation”.

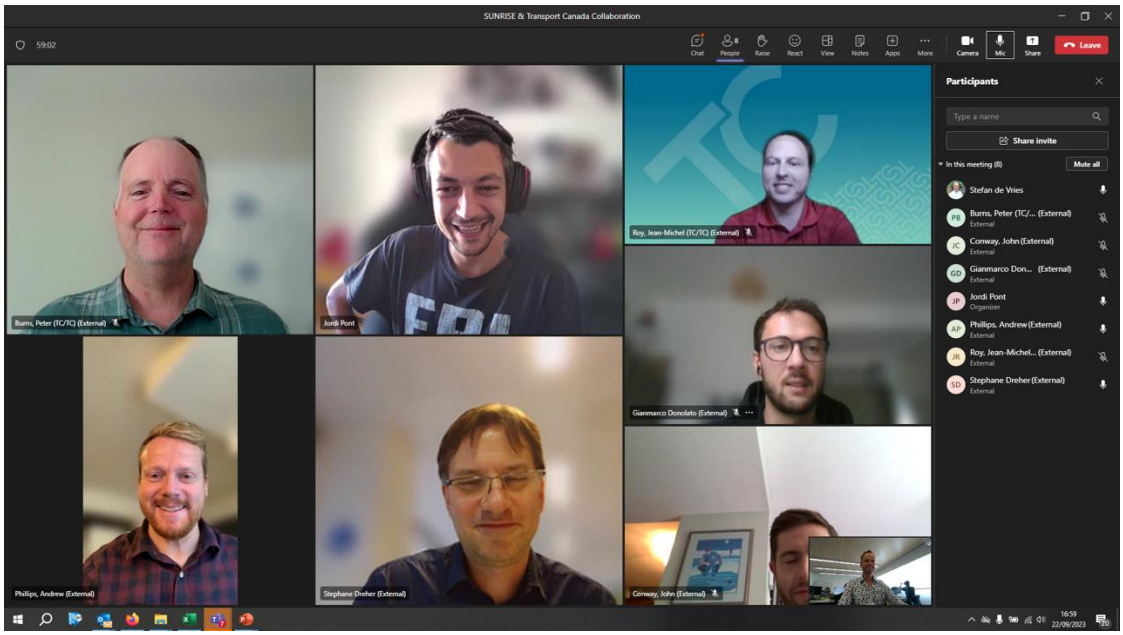


Figure 8: Online session between SUNRISE and Transport Canada

In April 2024, Transport Canada joined online to the SUNRISE Midterm Event and gave valuable feedback on the SUNRISE SAF. Since the Transport Canada is considered a SUNRISE twin, more information on the collaboration with Transport Canada can be found in chapter 5.

4.3 United States

From United States, two main entities were identified: The Automated Vehicle Safety Consortium (AVSC) and Virginia Tech Transportation Institute (VTTI).

4.3.1 AVSC

AVSC is an industry program of SAE Industry Technologies Consortia (SEA ITC). AVSC is comprised of engineering and technology company members in the automated vehicle space who bring decades of experience launching safe, innovative mobility technologies. AVSC aims to advance safer testing, development, and deployment of automated vehicles. Their members include but not limited to: Uber, Volkswagen, Waymo, ZOOX and SAE International. Their collaborators are Daimler and Lyft.

The collaboration between AVSC and SUNRISE focussed on the development and standardization of safety practices in the field of automated vehicles. A first meeting was done during September 2023 and the main points discussed were the following:

- AVSC is currently scoping a National Institute of Standards and Technology project (NIST project) supported by the US Department of Commerce related to a Use Case Database, with discussions on format architecture.
- AVSC is part of SAE ITC, a consortium of companies aiming to accelerate industry standardization through the development and promotion of best practices.
- Several potential collaboration areas were identified, such as ODD lexicon, metrics and methods, Safety Management Systems for testing and evaluations or Pass/Fail values. Another important topic where knowledge could be exchanged was the Data Framework used in both entities.
- An interest from SUNRISE was shown in AVSC's Best Practices guidelines.

A second meeting was held during December 2023, much focused on the Safety Assurance Framework which is being developed under SUNRISE project. The work done in SUNRISE related to the SAF was presented and seemed very much aligned with the AVSC Best Practices. It was agreed that, once the draft version of the Safety Assurance Framework of

When the SUNRISE SAF became available (March 2024) it was sent to AVSC for feedback. An AVSC representative joined in-person to the SUNRISE Midterm Event and gave that feedback. That same person has also joined in-person to the Final Event of the SUNRISE (June 2025) to follow the project development and to give feedback once again. Since the AVSC is considered a SUNRISE twin, more information on the collaboration with AVSC can be found in chapter 5.

4.3.2 VTTI

VTTI has been conducting research for 35 years to save lives, time, and money and protect the environment. In their world-class facilities, they investigate, invent, design, develop, refine and test transportation systems of the future. As one of seven research institutes created by Virginia Tech to answer national challenges, VTTI is continually advancing transportation through innovation and has affected public policy on national and international levels. VTTI is known for robust transportation studies, both with public partners and through proprietary research with private entities, original equipment manufacturers, and suppliers. Established in 1988 as the University Centre for Transportation Research, VTTI is now a key university-level transportation institute in the U.S. with one of the largest groups of driving safety researchers in the world.

The collaboration between VTTI (Virginia Tech Transportation Institute) and SUNRISE Project was in early stages of exploration as the first meeting was done in December 2023, with the potential for mutual benefit in various areas related to safety assurance.

VTTI presented the Automated Mobility Partnership (AMP) Program, which is focusing on supporting the advancement of automated driving systems. VTTI provided feedback and raised questions regarding the SUNRISE Project's approach and scope:

- Concerns were expressed about the quality assurance of external Safety Case Database (SCDB) connections to the SUNRISE Data Framework.
- Inquiry was made about the inclusion of a Business Case within the SUNRISE scope and its sustainability after the funding period.
- VTTI suggested discussing the adoption of scenario definitions from ISO34501 and 34502.
- Some areas with potential for collaboration were identified during the meeting.
- VTTI's experience in compiling SCDB contents globally could benefit SUNRISE in its efforts.
- Collaboration on the development of the Method and Toolchain, two key components of the SUNRISE Safety Assurance Framework.
- Exploration of a potential connection between AMP and SUNRISE’s Data Framework. VTTI's global experience in compiling SCDB contents and AMP's real-world driving data could enhance SUNRISE's capabilities in safety assurance.

Although the initial discussion explained above did not lead to any follow-ups during the project, many of the discussion points were addressed during the further development of the SUNRISE SAF. For example, the consortium elaborated ways to do business based on SUNRISE outcomes, resulting in a series of solutions to the SAF and its blocks as explained in the SAF Handbook. Furthermore, WP6 created detailed guidelines for external scenario database hosts to connect their databases to the SUNRISE Data Framework. Before the end of the SUNRISE project (in August 2025), these guidelines are intended to be distributed to external scenario database hosts, including VTTI as the host of the AMP database.

Figure 9: Online session between SUNRISE and VTTI

4.4 South Korea

The first contact was stablished during a meeting in March 2023. There, South Korea Vehicle Safety Research (KATRI) showed their interest in working with various organizations and R&D Projects to develop safety validation methods for automated driving vehicles. From their side, they suggested a physical meeting in September 2023 taking the advantage of the presence of both organizations (SUNRISE and KATRI) in the DSC Conference in Antibes. The proposal was accepted and both entities joined this first meeting in September 2023.

Figure 10: In-person meeting between SUNRISE and KATRI

The main points discussed during the meeting were the following:

- KATRI currently has a R&D project on ADS Safety running from April 2021 to December 2027. The period matches perfectly with SUNRISE and the initiatives that may follow SUNRISE.
- Their final goal is to “develop a method to secure the safety of the system from failures and unknown risks of Automated Driving Systems” and to “develop an edge case evaluation method using simulation”. This also matches with SUNRISE outputs.
- They also mentioned that they are about to start a Project dedicated exclusively to International Cooperation in 2024.

The main cooperation ideas raised during the meeting were:

- Organize regular technical seminars held by both projects (2024, more than once a year).
- Technical exchange information regarding test scenario and simulation correlation.
- Joint White Paper

KATRI members have joined to the SUNRISE Midterm Event in-person and gave their feedback on the draft version of the SUNRISE SAF. Since the KATRI is considered a SUNRISE twin, more information on the collaboration with KATRI can be found in chapter 5.

4.5 Australia

The cooperation with Australia is mainly focused on CARRS-Q. The Centre for Accident Research and Road Safety - Queensland (CARRS-Q) stands as a preeminent global institution dedicated to advancing research and education aimed at mitigating road trauma. CARRS-Q is a leading global research institution dedicated to reducing road trauma through interdisciplinary research and education. Operating in long-term partnerships with government, industry, international agencies, communities, and universities, CARRS-Q prioritizes informing policy directions in injury prevention and safety. Its key research programs focus on safe travel, high-risk road users, and interactions with advanced technology. With over 25 years of expertise, CARRS-Q informs the development of road safety countermeasures and policies, addressing all aspects of road safety from automated vehicles to the safety of cyclists and pedestrians.

The first contact with CARRS-Q was established during an online meeting in January 2024. With this first contact, the following topics were discussed:

- In the past, CARRS-Q has been involved in a 9-month Field Operational Test (FOT) focusing on V2X and C-ITS. This FOT resulted in a scenario database. Perhaps this scenario database can be connected at some point to the SUNRISE Data Framework (WP6).
- Since CARRS-Q heavily invested in infrastructures and equipment for hybrid testing, it is interested in SUNRISE's toolchain approach. Perhaps CARRS-Q can be an "external tester" in SUNRISE's toolchain validation phase (WP4).

- For SUNRISE it might be of interest to review Australia's exemption protocol for safety assurance of AV prototypes, to draw possible learnings for the creation of its own Safety Assurance Framework.

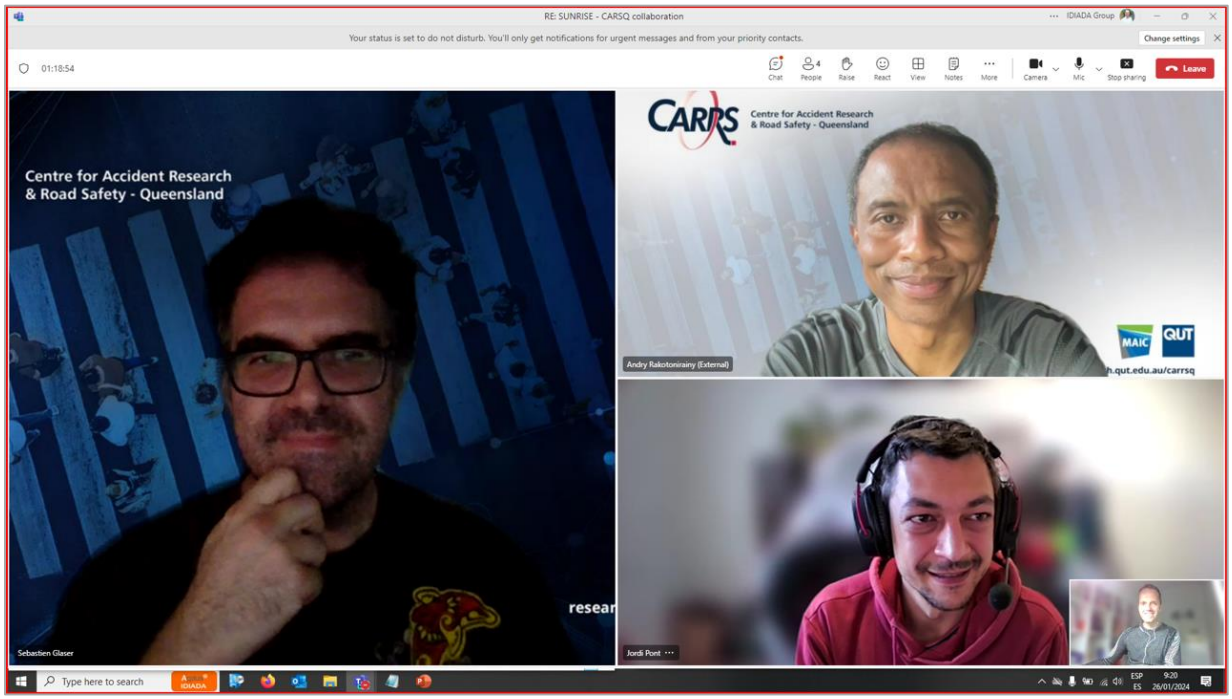


Figure 11: Online meeting between SUNRISE and CARRS-Q

Although the initial discussion explained above did not lead to any direct follow-ups during the project, some discussion points were addressed during the further development of the SUNRISE SAF. For example, WP6 created detailed guidelines for external scenario database hosts to connect their databases to the SUNRISE Data Framework. Before the end of the SUNRISE project (in August 2025), these guidelines are intended to be distributed to external scenario database hosts, including CARRS-Q as the host of the scenario database resulting from their 9-month Field Operational Test (FOT). Furthermore, CARRS-Q representatives joined the SUNRISE Expert Platform and participated in various online workshops, as well as online attendance to the SUNRISE Final Event.

4.6 Germany

Cooperation in Germany is mainly focused on the V&V Methods (VVM) project. This project is considered the “big brother” of the SUNRISE project. In various occasions throughout its life span, the SUNRISE project cooperated with the VVM project. See chapter 5 about Twin Project and Initiatives for further details on that cooperation. What follows is a description of the efforts that the SUNRISE consortium undertook to achieve the following goal: to make VVM framework users feel familiar with SUNRISE SAF, by aligning the components of both frameworks as much as possible.

The goal of the VVM project is the development of systems and methods to assure the safety of fully autonomous vehicles (Level 4/5) in urban environments for homologation [1]. The project wants to overcome challenges in the safety assurance process including insufficient test methods based on distance driven, too large and complex scenario spaces and

influencing factors and the need for safety without reliance on a human fallback. To achieve this, the projects present methods for the structured reduction of scenario spaces and the combination of simulation and real-world testing.

Since some of the methodologies developed within the VVM project align with the goals of the SUNRISE project, it is important to look at the VVM outputs to shape the SUNRISE SAF. Of special interest is the risk management component that has been one of the focus areas of the VVM project. Core of that risk management is the estimation of risk by considering both severity and probability of hazardous scenarios. Risks are then compared to an acceptable risk that could be defined using a human driver reference model. If the risk is not sufficiently low, treatment must be introduced. Even though the SUNRISE SAF does not have the same scope of evaluating the entire development cycle and instead focusing on evaluating a fixed CCAM system, components of this VVM risk management, especially the estimation of severity and exposure of the scenarios (see SUNRISE D3.4), as well as the comparison to an acceptable risk (see SUNRISE D2.2) could be introduced in both in the SUNRISE methodology and the SAF.

Another key input from the VVM project is the scenario concept (please refer to SUNRISE D3.2) and the use of such a structure as a template for a scenario database. The scenario centre database, which was created based on the findings from VVM, has influenced the structure of the SUNRISE data framework and is fully connected with the API defined in the SUNRISE project.

5 TWIN PROJECTS AND INITIATIVES

This section explains the cooperation with twin projects and initiatives, and how the SAF has been aligned to the feedback obtained from them.

Through various online meetings and international events in the first half of the project, strong connections have been established and collaboration talks initiated with key representatives of international twin projects and initiatives. Summaries of these initial efforts are described in chapter 4. During the further course of the project, these strong connections have been exploited in various ways, with the most relevant ones explained in the following sections.

In this context, projects and initiatives are indicated as “twins” if cooperation went beyond just making use of their results and involved bi-directional interactions such as (online) meetings and joint participation on events or other activities. Furthermore, and without downplaying their importance, twin projects and initiatives do *not* include other EU-funded projects in this context. The most notable twin projects and initiatives that comply with this are: V&V Methods, Sakura, AVSC, KATRI and Transport Canada.

The SUNRISE project also made use of the results and knowledge of many other non-EU-funded projects and initiatives. However, without bi-directional interactions as mentioned above. The most notable examples of this type of projects and initiatives are: SET Level and DIVP (both of which are closely related to the V&V Methods and Sakura projects).

5.1 Benchmark

In many occasions, SUNRISE team members used the results or approaches applied by twin projects and initiatives as a reference or benchmark in the creation of SUNRISE deliverables. That often involved previous discussions between experts on both sides, and lead to improved alignment between the SUNRISE SAF and other relevant safety assurance frameworks and approaches.

The most notable examples where twin projects and initiatives have been used as a reference or benchmark for SUNRISE deliverables, are summarized in the following table:

Table 3: Examples of SUNRISE deliverables influenced by twin projects and initiatives

D2.1_Overview-and-gaps-of-existing-safety-assessment-frameworks_V1.1	
Twins	V&V Methods project (under Pegasus), Sakura project
Influence	The CCAM safety assurance approaches applied by the indicated twins, have been used as a benchmark for the creation of the SUNRISE SAF, in which both their strengths and weaknesses (gaps) have been analysed and addressed.
D3.1_Report-on-baseline-analysis-of-existing-Methodology_V1.1	

Twins	V&V Methods project (under Pegasus), Sakura project
Influence	The scenario-based safety assurance methodologies applied by the indicated twins, have been used as a benchmark for the creation of the SUNRISE Methodology. For that, the HEADSTART methodology is taken as a baseline and complemented with existing best practices like those of the indicated twins.
D5.1_Requirement-for-CCAM-safety-assessment-data-framework-content_V1.1	
Twins	V&V Methods project (under Pegasus), Sakura project
Influence	The way the indicated twins apply scenarios (and related data) for safety assurance of CCAM, has been used as a reference for the definition of requirements for the SUNRISE Data Framework and the external scenario databases that connect to it.

As can be observed in the table above, various twin projects and initiatives formed an important reference or benchmark for laying the foundations of the SUNRISE Safety Assurance Framework.

5.2 International events

The cooperation with twin projects and initiatives has been strengthened and publicly displayed during joint participation in international events such as the SIP Adus Symposium 2022 in Kyoto, the ITS European Congress 2023 in Lisbon, the TRB ARTS 2023 in San Francisco, the V&V Methods Final Event 2023 in Stuttgart, and the SIP Adus Symposium 2023 in Tsakuba. Some examples of joint participation on international events can be observed in the following figure.

Figure 12: Joint participation by twin projects and initiatives on international event

Joint participation on international events went *beyond* just engagement with the broader CCAM community and promotion of individual projects. With SUNRISE, V&V Methods, Sakura and AVSC joining forces into a **CCAM safety assurance alliance** that displayed its views internationally, the participating entities jointly pushed the international CCAM safety community for its shared goals and objectives. This concept is shown in the following figure that has been displayed widely during presentations on international events.

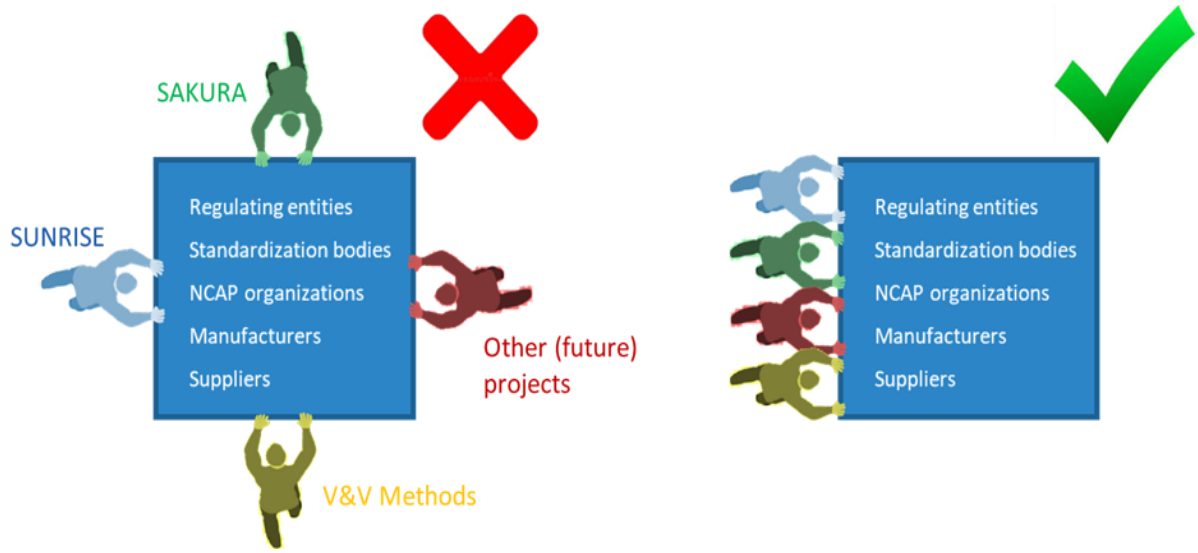


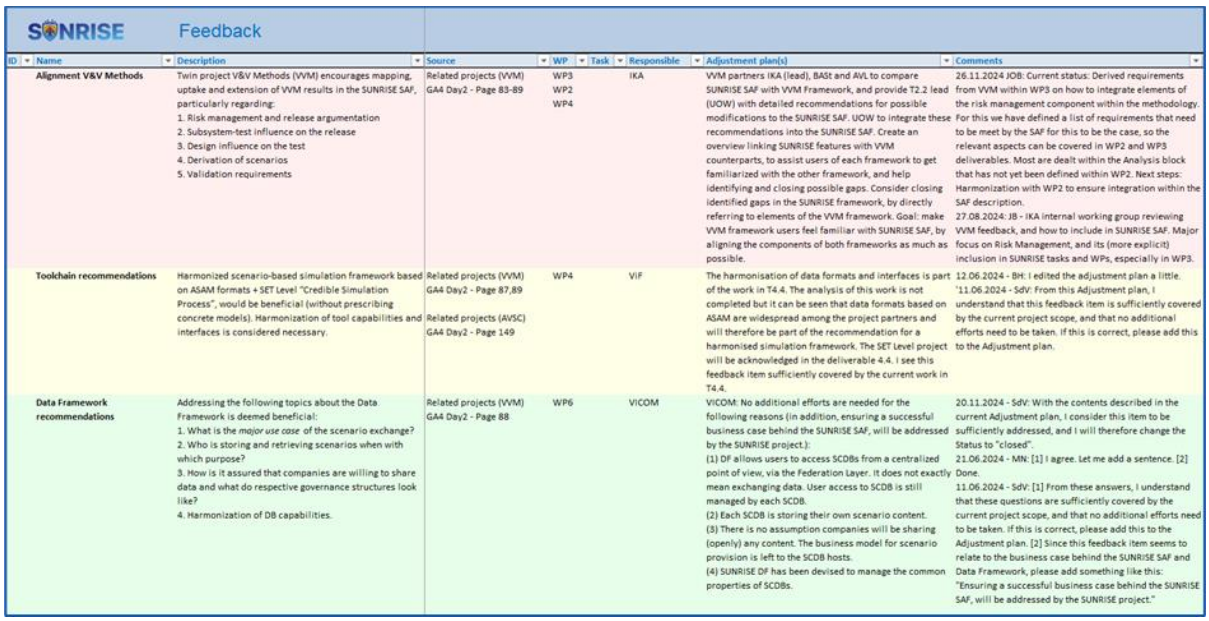
Figure 13: Twin projects and initiatives pushing CCAM safety community for shared goals

5.3 Feedback at Midterm Event

At the SUNRISE midterm event (celebrated on April 24th in Brussels), a draft version of the SUNRISE SAF has been presented. Key representatives of twin projects and initiatives joined that event and provided their feedback on the draft version of the SAF (on which they were previously briefed). Representatives of V&V Methods, Sakura, AVSC and KATRI joined that event in person. Transport Canada joined online.

Figure 14: Twin projects and initiatives providing feedback on draft SAF (SUNRISE Midterm Event)

The feedback received on the draft SAF has been of great value for its further refinement, during the 2nd half of the SUNRISE project. For that reason, it has been carefully document in an Excel spreadsheet, in which specific feedback has been assigned a priority level (in green, yellow or red) and a responsible SUNRISE partner, that defined an adjustment plan. During the further course of the SUNRISE project, regular follow-ups on each feedback item were then undertaken to ensure progress on each adjustment plan. In that way, all feedback items were addressed and closed towards the end of the project. A few examples of feedback items on that Excel spreadsheet can be observed in the following figure.



SUNRISE Feedback

ID	Name	Description	Source	WP	Task	Responsible	Adjustment plan(s)	Comments
	Alignment V&V Methods	Twin project V&V Methods (VVM) encourages mapping, uptake and extension of VVM results in the SUNRISE SAF, particularly regarding: 1. Risk management and release argumentation 2. Subsystem-test influence on the release 3. Design influence on the test 4. Derivation of scenarios 5. Validation requirements	Related projects (VVM) GA4 Day2 - Page 83-89	WP3 WP2 WP4		IKA	VVM partners IKA (lead), BASt and AVL to compare SUNRISE SAF with VVM Framework, and provide T2.2 lead (UOW) with detailed recommendations for possible modifications to the SUNRISE SAF. UOW to integrate these recommendations into the SUNRISE SAF. Create an overview linking SUNRISE features with VVM counterparts, to assist users of each framework to get familiarized with the other framework, and help identifying and closing possible gaps. Consider closing identified gaps in the SUNRISE framework, by directly referring to elements of the VVM framework. Goal: make VVM framework users feel familiar with SUNRISE SAF, by aligning the components of both frameworks as much as possible.	26.11.2024 JOB: Current status: Derived requirements from VVM within WP3 on how to integrate elements of the risk management component within the methodology. For this we have defined a list of requirements that need to be meet by the SAF for this to be the case, so the relevant aspects can be covered in WP2 and WP3 deliverables. Most are dealt within the Analysis block that has not yet been defined within WP2. Next steps: Harmonization with WP2 to ensure integration within the SAF description. 27.08.2024: JB - IKA internal working group reviewing VVM feedback, and how to include in SUNRISE SAF. Major focus on Risk Management, and its (more explicit) inclusion in SUNRISE tasks and WPs, especially in WP3.
	Toolchain recommendations	Harmonized scenario-based simulation framework based on ASAM formats + SET Level "Credible Simulation Process", would be beneficial (without prescribing concrete models). Harmonization of tool capabilities and interfaces is considered necessary.	Related projects (VVM) GA4 Day2 - Page 87,89 Related projects (AVSC) GA4 Day2 - Page 149	WP4		VIF	The harmonisation of data formats and interfaces is part of the work in T4.4. The analysis of this work is not completed but it can be seen that data formats based on ASAM are widespread among the project partners and will therefore be part of the recommendation for a harmonised simulation framework. The SET Level project will be acknowledged in the deliverable 4.4. I see this feedback item sufficiently covered by the current work in T4.4.	12.06.2024 - BH: I edited the adjustment plan a little. '11.06.2024 - SdV: From this Adjustment plan, I understand that this feedback item is sufficiently covered by the current project scope, and that no additional efforts need to be taken. If this is correct, please add this to the Adjustment plan.
	Data Framework recommendations	Addressing the following topics about the Data Framework is deemed beneficial: 1. What is the *major use case* of the scenario exchange? 2. Who is storing and retrieving scenarios when with which purpose? 3. How is it assured that companies are willing to share data and what do respective governance structures look like? 4. Harmonization of DB capabilities.	Related projects (VVM) GA4 Day2 - Page 88	WP6		VICOM	VICOM: No additional efforts are needed for the following reasons (in addition, ensuring a successful business case behind the SUNRISE SAF, will be addressed by the SUNRISE project.): (1) DF allows users to access SCDBs from a centralized point of view, via the Federation Layer. It does not exactly mean exchanging data. User access to SCDB is still managed by each SCDB. (2) Each SCDB is storing their own scenario content. (3) There is no assumption companies will be sharing (openly) any content. The business model for scenario provision is left to the SCDB hosts. (4) SUNRISE DF has been devised to manage the common properties of SCDBs.	20.11.2024 - SdV: With the contents described in the current Adjustment plan, I consider this item to be sufficiently addressed, and I will therefore change the Status to "closed". 21.06.2024 - MN: [1] I agree. Let me add a sentence. [2] Done. 11.06.2024 - SdV: [1] From these answers, I understand that these questions are sufficiently covered by the current project scope, and that no additional efforts need to be taken. If this is correct, please add this to the Adjustment plan. [2] Since this feedback item seems to relate to the business case behind the SUNRISE SAF and Data Framework, please add something like this: "Ensuring a successful business case behind the SUNRISE SAF, will be addressed by the SUNRISE project."

Figure 15: Excel with external feedback on draft SAF

The midterm feedback received on the draft SAF, lead to the most significant alignment of the SUNRISE SAF with the safety assurance frameworks and approaches of twin projects and initiatives.

5.4 Feedback at Final Event

Representatives of various twin projects and initiatives attended the SUNRISE Final Event at IDIADA headquarters in Santa Oliva (Spain) in June 2025. During that event, consortium-external attendees provided their feedback on a series of predefined questions about the SUNRISE project and its SAF. Among these respondents were representatives of the following twin projects and initiatives: V&V Methods, Sakura and AVSC. The results of this feedback session are described in chapter 6 of this document.

5.5 Joint white paper

On the SUNRISE midterm event (celebrated on April 24th in Brussels), representatives of V&V Methods, Sakura, AVSC and KATRI discussed the possible co-creation and publication of a **white paper** about **unified recommendations** related to CCAM safety assurance. This document would explain the “common ground”, that can help to convince shared target users

in adopting the results on which all contributing parties agree. As can be observed in the figure below, that idea was very well received by most of the parties present.

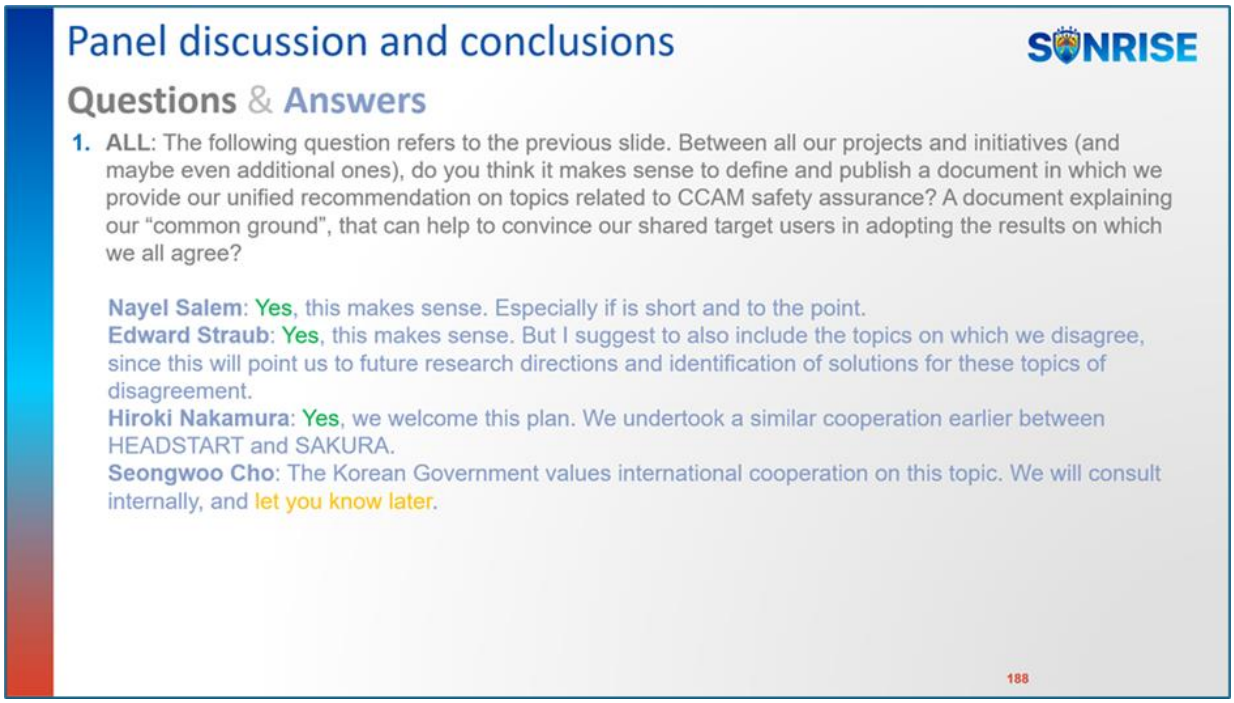


Figure 16: Midterm Event Slide proposing co-creation of white paper on CCAM Safety Assurance

Motivated by this support and the enormous potential of this idea, the creation of this white paper has been initiated in November 2024. At the time of writing this document, the white paper has not been published yet.

6 FINAL EVENT FEEDBACK RESULTS

During the SUNRISE Final Event in June 2025 in IDIADA HQ, a special session was held to gather feedback from target users to guide the final revisions of the SAF. The responses of the external users (obtained through Menti.com) provided valuable insights into how the SAF is perceived, its integration potential, and areas for further development. What follows is a summary of the feedback obtained:

- **Integration with existing processes:** Most participants felt the SAF aligned well or mostly with their existing processes and tools, though some noted only partial alignment. This points out overall compatibility but also highlights areas where integration support or adjustments could strengthen adoption.

- **Likelihood of future use:** A majority expressed a strong likelihood of using the SAF in future projects or within their organisations. This reflects a positive perception of its relevance and potential value in supporting CCAM activities. However, there was an interesting and important reminder from some members of the audience that there is still no official or legal requirements regarding the (mandatory) use of the SAF, which creates reluctancy on adoption for the near future.

- **Most valuable contributions:** *Safety argumentation* and *scenario databases* were identified as the areas where the SAF offers the most added value in the CCAM landscape. Other elements like *performance metrics*, *verification and validation*, and *federated data frameworks* were also mentioned, indicating a broad recognition of the SAF's contributions.

- **Interest in test environments:** Participants showed interest across all types of test environments, with notable preferences for virtual and hybrid setups. This suggests a need for the SAF to remain flexible and supportive of diverse testing contexts, from simulation to real-world environments.

- **Experience with the demonstration session:** Feedback on the demonstration was generally positive. While many found it useful, some suggested that additional materials or more detailed explanations of the use-case-based SAF applications could enhance understanding.

- **Standards in use for safety argumentation:** Respondents referenced several standards, including ISO norms, UNECE regulations, and EU directives, alongside other frameworks. This variety reinforces the importance of the SAF's compatibility with multiple regulatory and industry standards.

7 CONNECTION GUIDELINES

The SUNRISE Data Framework (DF) establishes a federated approach for scenario data sharing, enabling seamless integration of multiple scenario databases (SCDBs) while respecting data governance and ownership. Access to scenario data within each SCDB is managed according to the policies and requirements of the respective SCDB host, meaning users must obtain credentials or authorization directly from each SCDB host.

As a part of WP6, a guideline is prepared for external SCDB owners. This document guides them through the four-phase onboarding process to connect their scenario metadata to the SUNRISE DF. It outlines mandatory requirements, API interface expectations, ontology alignment, and long-term responsibilities. For further details of this guideline or to understand complete onboarding please refer to SUNRISE deliverable D6.3.

Providing preliminary guidelines for external SCDBs to get connected to the SUNRISE Data Framework, especially shortly after the SUNRISE Final Event (held in June 2025), is likely to stimulate SAF adoption during and after the project. For this reason, in July 2025 the guideline was distributed to below listed external SCDB hosts to get connected to the SUNRISE Data Framework as a part of the efforts on international cooperation addressed in task T9.3:

- SCDB provided by or related to the VVM project (Germany)
- SCDB provided by or related to the SAKURA project (Japan)
- SCDB provided by or related to the KATRI institute (South Korea)
- SCDB provided by or related to VTTI, especially the AMP initiative (USA)
- SCDB provided by or related to the CARRSQ institute (Australia)
- SCDB provided by or related to Waymo (USA)
- SCDB provided by or related to Transport Canada (Canada)

8 CONCLUSION

This chapter concludes the reporting of the **liaison and international cooperation** efforts undertaken by task **T9.3** of the SUNRISE project.

The SUNRISE project successfully established a robust ***international cooperation network*** that **significantly enhanced the Safety Assurance Framework (SAF)**. Through the *Expert Platform* with 150+ registered members from CCAM related entities, the project fostered **extensive international knowledge exchange** across Europe, Japan, Canada, USA, and South Korea (chapters 2 and 4). Other **key achievements** include the development of *Connection Guidelines* for external Scenario Database integration (chapter 7), successful collaboration with related Horizon Europe projects like V4SAFETY, AITHENA, SELFY and I4DRIVING (chapter 3) and with a variety of international twin projects and initiatives like V&V Methods, Sakura, AVSC, KATRI and Transport Canada (chapter 5).

The interactions with external entities played a vital role in enhancing the depth, reach, relevance and especially ***harmonization*** **of the SUNRISE SAF**. By aligning with ongoing twin activities, the SUNRISE project contributed meaningfully to the achievement of objectives *shared* with other entities in the field of CCAM safety assurance, thereby creating a *harmonized* SAF. Through joint efforts we exchanged knowledge, harmonized approaches, and amplified the visibility and applicability of SUNRISE results. These collaborations fostered mutual learning, co-development of approaches and **adoption of project results**.

Ultimately, the engagement strategy and tools reported previously within both deliverable D9.1 and D9.2, have proven instrumental in strengthening SUNRISE's impact, **positioning it within a wider international ecosystem** (compared to HEADSTART), and reinforcing its contribution to addressing the complex technological and societal challenges related to safety assurance of CCAM systems.

Continued cooperation and dialogue with external stakeholder remains essential for sustaining and expanding progress beyond the project's lifecycle. To help achieving this, the SUNRISE website will stay active for 3 more years, thereby enabling all CCAM value-chain members as well as the general public to discover the SUNRISE SAF and the interactive SUNRISE Handbook.

This deliverable directly **fulfills project Objective 9** by successfully growing an expert network of about 150 members and establishing comprehensive *international cooperation channels*. These cooperation channels significantly enhanced the SAF's relevance, harmonization, and adoption potential, ensuring broader stakeholder buy-in and sustainable impact beyond project completion. Furthermore, the comprehensive feedback mechanisms and multi-stakeholder engagements ensured that the **SAF addresses real-world industry and regulatory needs**.

9 REFERENCES

[1] Galbas, R., & Schiementz, M. (Eds.). (2024). Zusammenfassender Abschlussbericht: VVMethoden / Verifikations- und Validierungsmethoden automatisierter Fahrzeuge Level 4 und 5 (Version 1.0). Robert Bosch GmbH & BMW AG.

[2] Land Transport Authorities, "AV Milestone Testing Regime," A Singapore Government Agency Website, 27 January 2022. [Online]. Available: https://www.lta.gov.sg/

[3] Sunrise Project | Developing and providing a harmonized and scalable CCAM Safety Assurance Framework, 28 July 2025. [Online]. Available: https://ccam-sunrise-project.eu/

[4] Sunrise Project SAF Handbook, 28 July 2025. [Online]. Available: https://ccam-sunrise-project.eu/handbook/

[5] Sunrise Project Published Deliverables, 28 July 2025. [Online]. Available: https://ccam-sunrise-project.eu/library/

[6] Verification Validation Methods (VVM) project website, 28 July 2025. [Online]. Available: https://www.vvm-projekt.de/en/

[7] SAKURA project website, 28 July 2025. [Online]. Available: https://www.sakura-prj.go.jp/

[8] KATRI (Vehicle Safety Research) project website, 28 July 2025. [Online]. Available: https://main.kotsa.or.kr/eng/road/safetyResearch.do?menuCode=03020000

[9] VTTI (Virginia Tech Transportation Institute) website, 28 July 2025. [Online]. Available: https://www.vtti.vt.edu/

[10] AMP (Automated Mobility Partnership) project website from VTTI, 28 July 2025. [Online]. Available: https://www.vtti.vt.edu/projects/amp.html

[11] CARRS-Q (Centre for Accident Research & Road Safety – Queensland) website, 28 July 2025. [Online]. Available: https://research.qut.edu.au/carrsq/

[12] V4SAFETY project website, 28 July 2025. [Online]. Available: https://v4safetyproject.eu/

[13] SINFONICA project website, 28 July 2025. [Online]. Available:https://sinfonica.eu/project/

[14] AITHENA project website, 28 July 2025. [Online]. Available: https://aithena.eu/

[15] AWARE2ALL project website, 28 July 2025. [Online]. Available: https://aware2all.eu/

[16] SELFY project website, 28 July 2025. [Online]. Available: https://selfy-project.eu/

[17] I4DRIVING project website, 28 July 2025. [Online]. Available: https://i4driving.eu/

[18] CONNECT project website, 28 July 2025. [Online]. Available: https://horizon-connect.eu/