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ArchitectECA2030

Trustable architectures with acceptable residual risk for the electric, connected and automated (ECA) cars

D8.2 - Interim Periodic Technical Report[1] 1

Period covered by the report: from [01/07/2020] to [31/12/2020]

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*[1] The interim periodic report must be submitted by the coordinator within 30 days following the end of each interim reporting period (M6, M18, M30, etc). It is similar to the **Part B** of the periodic technical report and it consists of a narrative part that includes explanations of the work carried out by the beneficiaries during the reporting period and an overview of the progress towards the objectives of the action justifying the differences between work expected to be carried out in accordance with Annex I and the actually carried out, if any.*

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* Please use the same participant numbering as that used in the administrative proposal forms.

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1 Explanation of the work carried out by the beneficiaries and Overview of the progress

1.1 Summary of the work carried out during the reporting period in line with ANNEX1 to the GA

The first six months of the project were dedicated to define the requirements and specifications for residual risk in perception and connectivity systems, the requirements for fault detection in actuators and propulsion systems and work on the requirements and targets of an overall system monitoring device. In addition, the work addressed the overall requirements for standardization of methods and metrics for potential failure risks quantification, residual risk calculation and certification of level 3+ systems. The activities focused to elaborate appropriate reliability, safety, security, privacy, fail-safe including fail-aware and fail-operational requirements that need to be satisfied across all ECS levels, within a specified operational design domain (ODD) in order to guide and support the development an overall homologation framework for contacted autonomous vehicles (CAVs).

A process for collecting **the requirements** was defined and started WP1.The requirements can only be defined after a structured definition of the **demonstrators and related validation scenarios**, **planned in the supply chains.** After defining the process, the first collaboration with the supply chains was started to describe the demonstrators and **define the non- functional and functional requirements, their KPIs and measures to characterise and monitor each demonstrator.**

WP2 addressed the **development of methods, architectures, models, and tools for the validation framework**. Specifically, the objectives of the WP2 are focused on the **development of an architecture** representing all the necessary verification and validation processes including but not limited to critical scenario identification, simulation, Software in the Loop (SIL), Model in the Loop (MIL), Hardware in the Loop (HIL) tests, mileage tests. Also, the development of a methodology together with its corresponding toolchain that manages the processes at different abstraction levels (e.g., vehicle level, system level, and component level) is aimed to guarantee a sufficient verification coverage on the acceptable residual risk assessment. WP2 partners kicked-off the activities with an online event on October 7th 2020 with approximately 1 month delay from the official starting date. The delay is mainly motivated by ensuring full participation of the partners at the end of the summer holidays. A Task-leader workshop was organized to give each task leader the chance to introduce a proposal for the expected content and description of work for their respective tasks. Definitions and concepts were discussed but the inputs from SCs and Sub-Supply chains scenarios and WP1 are necessary for further work.

Regarding **standardization** topic, a first step was to get an understanding on the current state-of the art; focus lies on standards and best practices for safety levels. Although it is a term used in ISO26262:2018 the concept is relevant to other groups (e.g., ETSI, TC22 SC32 WG8) and standards (e.g., UL4600 (US), ISO/TR 4804:2020, ISO/PAS 21448:2020). A literature study was conducted to identify and synthesize existing more relevant standards. These are now collected, and a preliminary draft will be provided. The preliminary contribution will be reviewed and extended in the next half year. The first and second reporting period is used to prepare an involvement of all partners of the consortium in this very relevant activity.

WP3 was kicked off on January 2021, Supply chains specific telcos will be arranged to align the task activities with the SCs leaders tasks' activities. Initial discussion with partners has been taken in the SCs telcos. Based on the requirement and specification definition for residual risks in the SCs - Demos in WP1 as well as the framework architecture for the validation process of perception, propulsion, connectivity systems in WP2, the different tasks will elaborate methods along the value chains for the validation and verification tools in order to assure the quality and safety requirements of the Monitoring Device.

Regarding the Twinning activities between European and U.S. partners and projects, during the first six months, it was not possible to start the activities efficiently because of travel restrictions related to COVID-19 and also because we have to perform the survey and create a focused strategy for this topic, due to the fact that the project is limited in partners, topics and budget. This is necessary to be more effective and to produce feasible results.

All the required deliverables in the period were achieved. Tables are reported in Chapter 1.5.

Interim Periodic Technical report 1 (July – December 2020)	Deliverables achieved **100%** with minor delay. No milestones in semester 1.
PR1 Year 1 Report (end of August 2021)	Deliverables and Milestones for the second half of the year behind schedule but feasible with minor delay.

1.2 Overview of the project results towards the key targets / overall objectives of the action

The first objective is to provide a continuous robust design optimization for each part in the ECS value chain through the activities related to objectives 3 for the identification and management of residual risks over the entire ECS value chain. These objectives support objective 2 for defining a framework for safety validation of the ECS value chain to assure end-user acceptance by trustworthy ECS value chain (objective 4) and address the societal challenges and zero-vision goals to provide zero emissions, zero crashes, zero congestions by Electric Connected Autonomous vehicles in 2030 (objective 5). The objectives aim to strengthen Europe's position in the fields of safe and reliable electronic components and embedded intelligence. Our aim **is a semiconductor-centric ecosystem** of innovation **in terms of reliable, robust, and fail-aware ECS for ECA vehicles** beyond the state-of-the-art and viable technologies to increase the attractiveness of ECA vehicles by translating customer requirements and concerns into a value proposition. The methods, tools, technologies, and applications are developed along the entire value chain in tandem.

The stringent implementation is driven by the spirit of a cross-skilled consortium of European partner across the ECS value chain.

The five overall objectives of ArchitectECA2030 together with the vision of **mission-oriented qualification of ECA vehicles** supported by **lifecycle monitoring** based upon **monitoring devices** gives rise to 6 key targets that ArchitectECA2030 will pursue. In this first interim periodic technical report, we will describe the Key Targets related activities, in the yearly report we will link to the overall objectives.

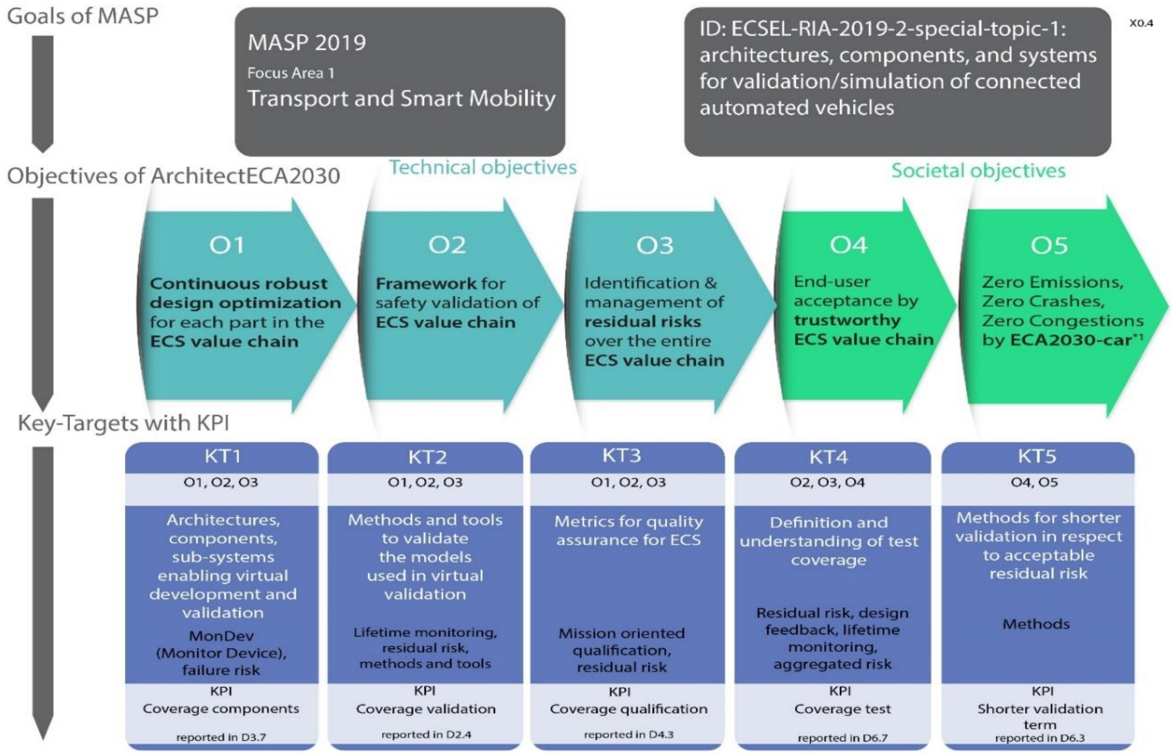


FIGURE 1 OVERVIEW OF OBJECTIVES AND KEY TARGETS OF ARCHITECTECA2030.

Objective	Type	Description	Relation to the MASP 2019	Outcome	KPI
O1	Technical	Continuous robust design optimization for each part in the ECS value chain	1.3.3 Ensuring secure connected, cooperative and automated mobility and transportation 6.3.1 Managing critical, autonomous, cooperating, evolvable systems	Robust mission-validated design	Coverage components
O2	Technical	Framework for safety validation of ECS value chain	6.3.1 Managing critical, autonomous, cooperating, evolvable systems 6.3.2 Managing Complexity 6.3.7 Increasing compactness and capabilities by functional and physical systems integration	Accepted residual risk in ECS for HAD to enable type approval	Coverage validation
O3	Technical	Identification and management of residual risks over the entire ECS value chain	1.3.3 Ensuring secure connected, cooperative and automated mobility and transportation 8.3.2 Reliability and Functional Safety	Accepted Monitoring Device Methodologies	Coverage qualification
O4	Value	End-user acceptance by trustworthy ECS value chain	1.3.3 Ensuring secure connected, cooperative and automated mobility and transportation 8.3.3 Secure, safe and trustable connectivity and infrastructure	Usability	Coverage test
O5	Value	Zero emissions, zero crashes, zero congestions by ECA2030-car	1.3.3 Ensuring secure connected, cooperative and automated mobility and transportation 6.3.7 Increasing compactness and capabilities by functional and physical systems integration	Sustainability	Energy efficiency Shorter validation term

FIGURE 2 ARCHITECTECA2030 KEY TARGETS, EXPECTED OUTCOMES, AND RELATION TO OBJECTIVES.

1.2.1 Key Target 1: Architectures, components, sub-systems enabling virtual development and validation (O1, O2, O5)

Currently no agreed development framework exists to certify SAE L3+ automated driving functions in unstructured environments and adverse weather conditions using virtual validation methods. During the first six months the main activities were focused to identify the demonstrators and the scenario-based validation in virtual environments. This poses the basis for the identification of the functional and non-functional requirements and the validation procedures of automated driving functions for dissimilar demonstrators' use cases and various traffic scenarios, including cross-border travelling within the ArchitectECA2030 validation framework.

1.2.2 Key Target 2: Methods and tools to validate the models used in virtual validation (O1, O2, O3, O4, O5)

The incorporation of real-world test data into the virtual V&V process, in combination with test data derived from a knowledge base, is most likely the key to develop, certify and re-certify automated vehicles with reasonable costs and efforts. The process of data acquisition (accuracy, resolution, sampling etc.), data mining, data analysis, scenario screening, and parameter variation has to be structured, harmonized and the level of accessibility has to be discussed in the next semester.

1.2.3 Key Target 3: Metrics for quality assurance for ECS (O1, O2, O3)

Standardized safety, security and privacy metrics are of high relevance for type approval, vehicle operation residual risks (e.g., insurance) and homologation procedures. Initial work of SC5 in the first reporting period focused on collecting all relevant standards used in the ArchitectECA project. This was done not only with the partners in SC5, but also with the partners from the whole consortium. Preliminary result are Standardization Maps which contain relevant standards correlated with processes or high-level view of the ArchitectECA2030 project. This point is to consider the pillar to systematically analyse sources of risks, provide a recommendation of tools and tool chains to be used for homologation of ECS and identify the need for an extension of the ISO 26262 standard for the certification of level 5 systems and the currently existing gaps become apparent in the scenarios, in which fail-safe functionality clearly is not sufficient.

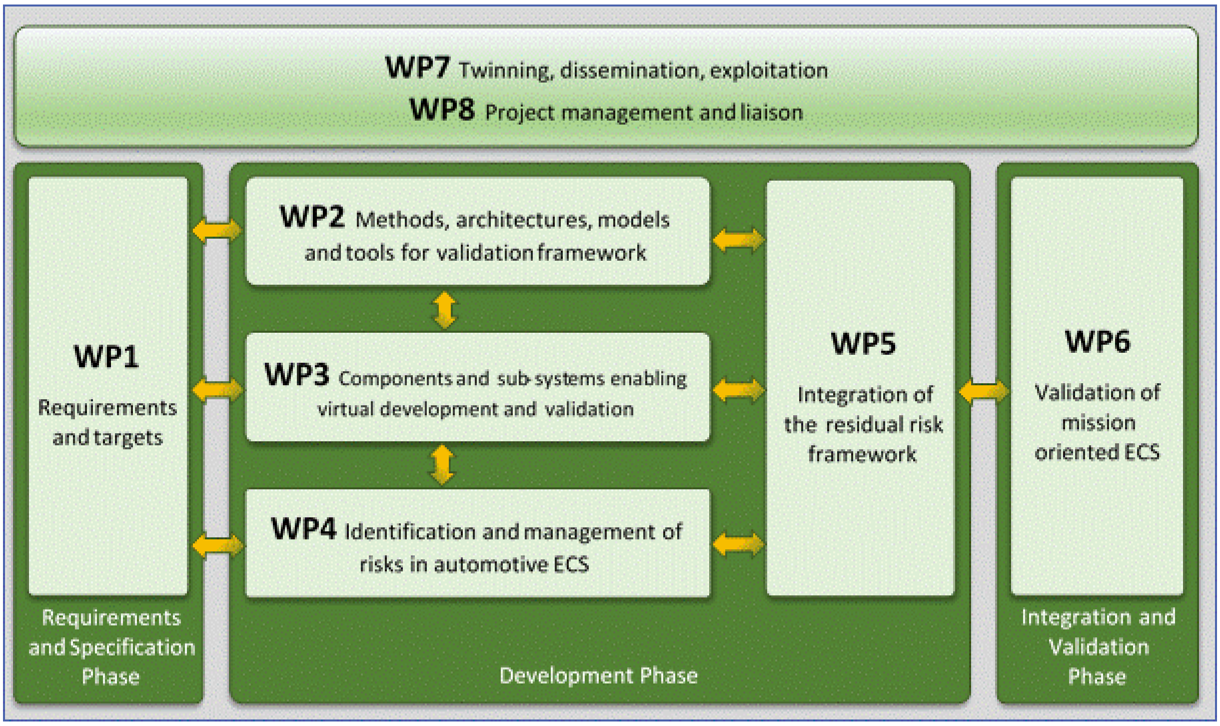
1.2.4 Key Target 4: Definition and understanding of test coverage (O1, O2, O3, O5)

The system understanding is the precondition to elaborate the homologation of automated vehicles. The functional safe design, system availability, and safe operation are mandatory to bring the vehicles into real traffic operation. The definition and understanding of test coverage has to be considered in the next months after the identification and definition of the demonstrators` requirements.

1.2.5 Key Targets 5: Methods for shorter validation in respect to acceptable residual risk Identification & management of residual risks over the entire ECS value chain (O1, O2, O3)

The project's goal is to provide methods for shorter validation in respect to an acceptable residual risk. In this context, ArchitectECA2030 wants to actively involve main stakeholders to solve today's challenges and use cases in a structured manner. The projects shall also, but not solely, be perceived as a platform of experts on homologation which is open for other stakeholders willing to actively contribute to the topics addressed by ArchitectECA2030. Therefore, we discussed a survey to identify the representative stakeholders from public authorities and reduce the heterogeneity of regulations to allow autonomous mode by introducing the developed homologation framework.

1.3 Explanation of the work carried per WP



1.3.1 WP1: Requirements and targets (m01 – m12) – Leader VW

1.3.1.1 Summary of results achieved during reporting period

WP1 objective is to define requirements and targets for an in-vehicle Monitoring Device (MonDev) that detects potential faults in components and systems (e.g.**, perception, propulsion and connectivity**) and quantifies the residual risk accordingly.

For development of the overall homologation framework, it is furthermore required to elaborate appropriate reliability, safety, security, privacy, fail-safe including fail-aware and fail-operational requirements that need to be satisfied across all ECS levels, within a specified operational design domain (ODD).

Besides the obtained requirements WP1 defines in collaboration with the supply chains suitable use cases and validation methodologies for the design and development of:

- Methods, architectures, models and tools for the ArchitectECA2030 validation and homologation framework in WP2.
- Components and subsystems enabling virtual development and validation in the context of automated driving in WP3.
- Methodologies to identify and manage risks at runtime (in terms of safety, security, and privacy) in the context of automotive ECS in WP4.

WP1 consist of 5 tasks led by partners UNEV (T1.1), INRIA (T1.2), SINTEV (T1.3), IFAT (1,.4) and VIF (T1.5) spanning from M1 to M12 of the project. The technical work and partner interactions have started in all these tasks.

The first steps after the start of the project and the WP1 was the definition of requirements to be considered, collected and documented in WP1. After that, a process for collecting the requirements was defined and started.
After the initial discussions, it became clear that the requirements can only be defined after a structured definition of the **demonstrators and related validation scenarios**, planned in the supply chains. Therefore, a close cooperation of the tasks in WP1 with the corresponding supply chains is necessary. After defining the demonstrators and use cases in the supply chains, the necessary requirements are then defined.
The current status corresponds to the planning of the project. After defining the process, the first collaboration with the supply chains was started in order to describe the demonstrators and define the requirements for this purpose.
Currently, all tasks in WP1 work together with supply chains. The supply chains have different *stati* in terms of demonstrators and **related validation scenarios**. Therefore, the status of the collected requests in each task in WP1 is different.

There are currently no deliverables to deliver according to the project plan. Currently, no technical changes are necessary. There is currently no need to postpone or change the planned schedule. A risk for WP1 is the definition of the demonstrators in the supply chains, possible delays in this activity could affect the work schedule in WP1.
There are some risk to consider, see also chapter 1.6 for details:
Limited access to standards and regulations (ISO26262, ISO21434, SAE J3061, SOTIF, etc.) as well as global homologation procedures. Impact: Reduced knowledge base results in incomplete requirements and targets definition.
Insufficient access to global regulation and certification bodies and governments. Impact: Reduced impact of ArchitectECA2030 results on emerging standards and regulations.
Insufficient knowledge about failure risks in components and systems. Impact: Incomplete requirements and targets definition for in-vehicle monitoring device and homologation framework.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation

1.3.1.2 Key achievements during reporting period task level

Task 1.1 [SC1]: Requirements and specifications for residual risk in perception system (leader: **UNEV**, DATA, IFAG, IFAT, TUDR, VIF, VW**)**

Collection of requirements and specifications for residual risk in perception systems is proceeding based on the development of use cases and demonstrators in SC1. To support this development, the Task 1.1 members have worked to formalize the mechanism for storing requirements specifications, and have worked on defining and developing the demonstrators and use cases that will provide the functional and non-functional requirements to be memorialized in this task.

Going forward, Task 1.1 members will continue to work with SC1 members to refine use cases and demonstrators, and to develop requirements and specifications for residual risk from those use cases and demonstrators.

Part. no. and short name	Work carried out
14 - UNEV	UNEV participated in regular WP1 meetings and provided input in those meetings to the preparation of the requirements specification template. UNEV also started preparing for work on the SC1 demonstrators, focusing presently on how the initial discussions regarding demonstrators and use cases will translate into requirements that are reportable under Task 1.1.
1 - IFAG	Re-adjustment of the tasks and activities. IFAG left the SC1.
10 - VW	In this task VW was active in all the consortium meetings and contributed to the preparations of the requirements and specification collection template as well as the definitions of these information in relation to the perception systems for automated vehicles and automated driving systems.
17 - DATA	An automotive compatible data structure for the structured capture of requirements with an assignment to supply chains and the V-model according to Automotive SPICE and ISO26262 on demand was developed and presented to the entire project. This proposal was positively accepted by VW (Volkswagen) and jointly further developed in several meetings and completed in a first version. Accordingly, an Excel sheet for data capture of the requirements was developed together with the partners, especially with VW, and is now in use for the capture of all requirements over the entire project. First system requirements have already been defined. System Requirements for Device Driver Abstraction were developed and presented in collaboration with IFAT.
4 - IFAT	Requirement collection and safety assumptions documentation for magnetic position sensor development started. Difference between target performances in calibrated mode versus start up accuracy opened up new questions on system level residual risks. Comparable optical measurement system do not suffer from limitations in start-up phase. Can we quantify this limitation on system level or describe a safety measure for this use case? Detailed discussions about the severness of this limitation will follow.
16 - TUDR	TU Dresden started the work to define requirements regarding foreign object detection within wireless power transfer systems. We focused on literature and standard review in order to gather information about .sensors and methodologies that should be considered for foreign object detection as well as the current status of the standardization. In the context of SC1 we worked together with other partners on relevant use cases that represent the content of this supply chain and can be used as starting point to define requirements
15 - VIF	In this task VIF was active in all the consortium meetings and contributed to the preparations of the requirements and specification collection template as well as the definitions of these information in relation to the perception systems for automated vehicles and automated driving systems. VIF contributed fundamentally with the definition of use cases for SC1, providing the framework in cooperation with VW. Moreover, VIF was quite active in establishing and initiating regular communication with UNEV for defining the use cases to be analysed in the SC1. Use case 3 of SC1 was drafted by VIF. The detailed requirement definition of the use cases will be target of the second half of year 1.

Task 1.2 [SC2]: Requirements for fault detection in actuators and propulsion systems (leader: INRIA, AVL, BUT, TUDR, TUG, UNEV)

According to the methodology adopted in the project, the requirements elicitation for actuators and propulsion systems is performed based on the demonstrators in SC2. Several demonstrators and validation use cases were proposed by the T1.2 partners, some of them being suitable for fruitful cooperation of several partners. This is, e.g., the case for INRIA, who can provide generic quality assurance contributions applicable at various levels to several use cases, by means of verification and validation technologies based on formal methods. These demonstrators induce functional and non-functional requirements on the behaviour of the considered use cases, which will be defined in the next period.

Currently, the partners involved in T1.2 are working on making the perimeter of the demonstrators and use cases more precise, with the goal of providing a solid basis for requirements elicitation.

Part. no. and short name	**Work carried out**
18 – INRIA	We participated to several meetings related to the requirement engineering in WP1 and SC2, and initiated discussions with the partners involved in task T1.2 regarding the contributions of INRIA to the various demonstrators and use cases proposed in SC2
2 – AVL	AVL started discussions with partners about demonstrator requirements. For the demonstrator AVL will provide a co-simulation environment based on AVL Model. CONNECT platform.
3 - BUT	Initial activities on definition of requirements for detection of faults in powertrains were performed. The activities were focused mostly on categorisation of the faults to be detected. Requirements on HW/SW components to allow faults detection were studied.
13 - TUG	Started obtaining requirements for fault detection and localization related to model-based diagnosis. Participation in online meetings.
16 - TUDR	In the context of SC2 a map of planned demonstrators was prepared together with all other partners. This map shall be used as starting point to define requirements for the demonstrators.
14 - UNEV	SBA has presented its contribution to this task’s meetings and is currently gathering requirements for an overall system monitoring device.

Task 1.3 [SC3]: Requirements and specifications for residual risk in connectivity systems (leader: SINTEF, DATA, NXT, TSENSE, TUDR, NXP, INRIA, TUDE)

Since the supply chain SC3 kick-off web meeting in October 2020, it has been arranged four consecutive regular SC technical web meetings for discussions and coordinating of the work in task T1.3. The intention is to have these regular web meetings every three weeks. The SC3 objectives and expected results have been presented and discussed, including full stack presentation followed by partners' relationships, clustering, synergies, and mapping discussions. A clear methodology is defined, and the work is divided into four phases (in short: structure and description; non-functional requirements, functional requirements; verification and validation).

A technology stack proposal is prepared and the work on mapping all SC3 partners are ongoing. The identification of sub-supply chains (SSCs) and definitions of SC3 physical demonstrators are progressing well and will continue in the next period. A micro to meta level overview is prepared. The current levels are subcomponent/element, component, subsystem, system vehicle domain, vehicle, and mobility ecosystem (the nomenclature will be aligned with the prevailing standards).

Worked on functional and non-functional requirements together with KPIs and measures (that make it possible to measure progress for the demonstrators), and mapping of existing standards which will be reported in deliverable D1.3 (Report on requirements and specifications for residual risk in connectivity systems). The alignment with the WP1 requirements template is ongoing.

According to the proposed amendment the activities of SC1 are merged with the activities of SC3, and the activities of the partners in SC 1 and SC3 should be reported in deliverables related to these tasks. Therefore, the partners NXP, INRIA and TUDE are included in T1.3.

Part. no. and short name	Work carried out
11 - SINTEF	SINTEF is leading the T1.3/SC3 work and has arranged four regular SC3 technical web meetings. Prepared a technology stack proposal for mapping, and a micro to meta level overview for demonstrator identifications and relations. Worked on identification and mapping of standards. Initial identification of relevant demonstrators and defined some relevant functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including gateway, V2V, V2I and GPS technologies (together with NXT); and optical sensor technologies (together with TSENSE). SINTEF has structured the work to be delivered in D1.3 (Report on requirements and specifications for residual risk in connectivity systems).
17 - DATA	Worked on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrators including SW defined methodology, modularisation, and reuse of code; gateway stack and V2X interface connectivity; in-vehicle connectivity ECU; and embedded system SW development tool and platform. First system requirements for safety and security extensions were developed. Consideration was given to a possible extension of the architecture. There must be made distinction between the system level and the software level: On the software level, the monitoring device for the OSAM Gateway stack is "Keystone" (Keystone is an internal designation for a tool). On system level, further features have to be implemented for "Keystone". The definition of the necessary requirements was discussed with VW on system level. First system requirements were defined, which extend the Keystone tool for debugging and operating the gateway stack.
6 - NXT	Initial identification of a relevant demonstrator including gateway, V2V, V2I and GPS technologies (together with SINTEF).
8 - TSENSE	Initial identification of a relevant demonstrator including optical sensor technologies (together with SINTEF).
16 - TUDR	TU Dresden has cancelled the activities within SC3. The planned 2 PMs for task 1.3 were moved to tasks 1.1 and 1.2 in equal parts.
7 - NXP	Worked on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including built in connectivity; and digital twin package monitoring (together with TUDE).
18 - INRIA	Worked on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including formal verification and validation tool.

Task 1.4 [SC4]: Requirements and targets of an overall system Monitoring Device (leader: **IFAT,** AVL, DATA, IFAG, SBA**)**

The work in the first half year was focussed on

- collection of contributions of each partner to the monitoring device

- consolidation of the contributions
- derive of concrete use cases.

Because two partners are not available anymore for the monitoring device (AVLSE and KTH), we are looking to contributions of the monitoring device in other SCs as well.

Part. no. and short name	Work carried out
4 - IFAT	Start of development of model for drift of discrete parameters: o literature review, o collection and formulation of requirements for mathematical drift model, and o comparisons of different model candidates. Basically we follow up two kind of discrete data: o real discrete data, where the state space of the parameter itself is discrete, and o continuous data, which are discretized due to the tester resolution. Each situation requires a different mathematical model. Currently we are in the phase of model development.
2 - AVL	AVL refined the idea of their proposed system level scenario generator for testing highly automated vehicles. The work included developing an overall system as well as specifying the requirement for the scenario generator. Additionally, first collaboration areas with other partners were identified.
17 - DATA	Adaptations of the OSAM architecture regarding a security extension and functional security were considered and first system requirements for the OSAM middleware were defined. Use-Case for applying the technology was discussed and accepted by IFAT.
1 - IFAG	Start of demonstrator identification and contribution to monitoring device.

Task 1.5 [SC5]: Requirements for standardization of methods and metrics for potential failure risks quantification, residual risk calculation and certification of level 3+ systems (leader: **IMA,** DATA, VIF, SAFE, all**)**

The activities in the Task1.5 have been focused on cooperation with WP leader and other task leaders in order to align requirements collection process in SC5 with other SCs. The outcome of the task has been already specified – partners will work on identification and collection of the relevant and accessible standards addressing the homologation framework, if any. The gaps in homologation standards were discussed. Study of the relation with SOTIF standards has been discussed. As the activities in T1.5 are specific, concentrating on methods and metrics for potential failure risks quantification, residual risk calculation and certification of level 3+ systems, more communication and cooperation with involved partners is needed.

Part. no. and short name	Work carried out
5 -IMA	IMA led the preparatory work for the requirements collection in task 1.5 within the reported period. For the next period the leadership changed. The main activity within the reported period was to participate at the periodic telco discussing the way how to set up tools for the requirements acquisition (linked to lead role). The cooperation with VIF established as the activities incl. deliverable needs to be aligned and IMA needs an expertise knowledge in the field.

	As an involved partner in T1.5 (SC5) IMA studied related standards for testing ECS embedded software systems. The main focus in the initial work was to find out the software integration and testing related chapters, recommended chap. 9 to 11. No deliverable created in the period.
17 - DATA	During the participation in SC5 meetings corresponding proposals were made, in particular for the V-model according to ASPICE, ISO26262 and ISO21343. The suggestions were accepted and taken into account by the project partners.
15 - VIF	A first step was to get an understanding on the current state-of the art; focus lies on standards and best practices for perception, dependability and safety. This implies a broad spectrum of different standardization groups (e.g. ETSI, TC22 SC32 WG8) and standards (e.g. UL4600(US), ISO/TR 4804:2020, ISO/PAS 21448:2020). A literature study was done to identify existing and using standards. These were collected and a preliminary draft was provided to SC5. This preliminary contribution will be review and extended in the next half year. The cooperation with IMA was initiated and will be intensified in the upcoming reporting period; especially to align on deliverables for SC5.
9 - SAFE	-Contribution to developing a 'standardization map' (based upon results of ENABLE-S3 project) -Major contribution to identifying relevant standards, pre-standards and specifications, with a focus on those covering safety (incl. residual risk quantification) for ECAS/autonomous cars
11 - SINTEF	SINTEF worked on the identification of relevant standards and defined the link between the existing standards and the activities in SC3.
2- AVL	As SC5 leader, AVL focused on creating a standardization map that gives a broad overview of the standards used within the ArchitectECA2030 project. In collaboration with partners a gap analysis of the standards was performed.
6 - NXT	Initial identification of a relevant standards.
8 - TSENSE	Identify the standards that are used and how they are applied to the work in the project.
1 - IFAG	Alignment of SC5 with WP7 Task 7.5 standardization.
16 - TUDR	TU Dresden has set the main focus on standard reviews. We created a list of standards that may be relevant to our work in this project. We identified two groups of standards. The first group is fundamentally related to the project and deals with functional safety, safety of the intended functionality and cybersecurity for road vehicles. The second group is related to wireless power transfer. The main topics of this second group are test procedures, the interoperability between primary and secondary side of the system as well as alignment methodologies. Regarding foreign object detection the standardization is just beginning.

1.3.1.3 Deviations from plan

Part. no. and short name	Deviations from plan
1 – IFAG	Minor deviations from plan and delay of the requirements due to internal personal planning.
5 – IMA	The leader of T1.5 will change on January 2021.
7 - NXP	NXP will provide the requirement and specification for in-field process monitor inside IC for in-vehicle networking devices for task 1.3 the coming period according to amendment 2.
10 - SBA	Due to some discussions on how to obtain and present requirements there is a delay in summarizing the requirements for the monitoring device, which we expect to do in the second half year.
13 - TUG	Due to a discussion on how to obtain and present requirements there is a delay in summarizing the requirements, which we will do in the second half year. Moreover, Covid-

	19 causes challenges of hiring staff where we found a solution so that we expect no delays after the end of the first project year.
16 - TUDR	Cessation of activities in task 1.3, because the work on only one task within the SC3 provides not enough content to this supply chain Distribution of the PMs of task 1.3 to the tasks 1.1 and 1.2 in equal parts Short delay in defining requirements, due to discussions on how to obtain the requirements
19 - TUDE	No deviations from the technical plan, only correction made on the PMs in Amendment #2 (December 2020)

1.3.2 WP2: Methods and architectures, models and tools for validation framework (m03 – m30) – Leader VIF

1.3.2.1 Summary of results achieved during reporting period

WP2 is about the development of methods, architectures, models and tools for the validation framework. Specifically, the objectives of the WP2 focus on the development of an architecture representing all the necessary verification and validation processes including but not limited to critical scenario identification, simulation, SIL, MIL, HIL tests, mileage tests. Also, the development of a methodology together with its corresponding toolchain that manages the processes at different abstraction levels (e.g., vehicle level, system level, and component level) is aimed to guarantee a sufficient verification coverage on the acceptable residual risk assessment.

WP2 consist of 4 tasks led by partners IFAT (T2.1), TUG (T2.2), AVL (T2.3) and VIF (T2.4) spanning from M3 to M30 of the project. The technical work and partner interactions have started in all these tasks.

WP2 has kicked-off with an online event on October 7th with approximately 1 month delay from the official starting date. The delay is mainly motivated by ensuring full participation of the partners at the end of the summer holidays. Upon agreement with the WP2 partners, bi-weekly meetings were organized (In total 4 regular meetings after the WP2 kick-off meeting) to coordinate and track the status of the work in the scope of the WP2. During the first 6 months of the project (of which 4 months were officially in the scope of WP2), mostly WP2 specific procedures and reporting methods and standards were setup and put into action. In this scope, the following main developments and actions were achieved:

- A partner introduction template was prepared and an opportunity for each participating partner to introduce themselves to the others was facilitated.
- The task leaders (main contact persons) were defined on behalf of the responsible partners.
- A Task-leader workshop was organized to give each task leader the chance to introduce a proposal for the expected content and description of work for their respective tasks. This also allowed other participating partners to evaluate and plan their contributions to these tasks.
- An open-item list tracking Excel file system was setup to keep track of all the discussion and action points corresponding to each regular meeting.
- A one-slide format for task status reporting was set-up to be used in every regular status Teleconference. The reporting format also includes status of the deliverables, partner interaction and collaboration matrix as well as the risk reporting and tracking.
- Work package level coordination Ammendment-2 (submitted in November) was also discussed and handled within the regular meetings.

Besides from the above main action points, WP2 also interacted with WP1 to contribute to the specifications & requirements definitions and has been in close collaboration with SC1 and SC4 for validation and verification methodology planning and coordination purposes, particularly in the context of perception system for automated vehicles.

There has been no significant delays or deviations to be reported in the current M6 reporting period other than missing the partner contributions that left-out the project. Particularly, AVLSE and KTH has left the consortium, who had planned contributions within the Task 2.3. These contributions had to be removed from the DoA as part of the Amendment 2. The impact of the missing partners and their

removed content (amounting to 20PM of effort) on achieving the main goals of WP2, and particularly for the Task 2.3 is marginal and is not expected have to have a large effect on the objectives.
During the reporting period, a discussion for the change of context and content for the Task 2.1 has started. Some input regarding this has been included in Amendment-2 but is not finalized. The planned change can significantly affect the context of the planned activities for Task 2.1 and is to be put into its final form during the next amendment. The task leader IFAT is in interaction with the coordinator (IFAG) about the planned changes.

There have been no deliverables during the reporting period. The first due deliverable (D2.1) is expected to be submitted in M18 of the project.

The only risks that can be mentioned at the WP2 level are the missing left-out partner contributions (from AVLSE and KTH) for the Task 2.3, and potential content changes for Task 2.1 (which are still in drafting phase by IFAT). Both of these risks are considered to be manageable and non-critical.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation
T2.1	M3/M30	M3/M30	No Deviation
T2.2	M3/M26	M3/M26	No Deviation
T2.3	M3/M30	M3/M22	No Deviation
T2.4	M3/M30	M3/M22	No Deviation

1.3.2.2 Key achievements during reporting period task level

Task 2.1 [SC1]: Methods and tools for validation of perception systems (leader: **IFAT,** BUT, IFAG, TUDR, UNEV, VIF, VW**)**

The alignment on a proper definition of perception system was initiated by overall SC1 team. Furthermore, different use cases are defined. In this task the methods and tools for validation are under discussion between different task partners. Finally an overlap to the proposed use cases in SC1 must be given.

Part. no. and short name	**Work carried out**
4 – IFAT	From IFAT point of view the detailed work on methods and tools for the development of perception sensors are started. A common target alignment covering all partner contributions is pending
3 – BUT	No activities in the first half of period 1.
1- IFAG	No work has been performed for this activity during the first semester.
16 - TUDR	No activities done within this period
14 - UNEV	No activities done within this period
15 - VIF	VIF was active in clarify Task 2.1 content and the required contributions from the VIF perspective in the development of the validation framework for perception systems.
20 - VW	VW participated in the meetings and discussions of WP2. Moreover, intense work and research was carried out to align it with SC1. A workshop with all SC1 members was organized and document to identify use cases for this and further WP. VW contributes a use case in the area of camera perception in combination of vehicle enhanced positioning

	Significant coordination needs to be done to ensure the overall feasibility of the project. Both, planning and technical personal was involved in the discussions and research.
12 - TERA	Regarding WP2, the TERA (TG LV) partner has been participated in all the regular bi-weekly coordination virtual meetings during the 1st semester (July to December 2020), where appropriate directions and interaction plans with all the supporting partners were established through WP2 leader. Furthermore, TG LV members were worked mainly on bibliographic search regarding validation methods, architectures, models and tools that have been introduced in the past within the Highly Automated Driving (HAD) context.

Task 2.2 [SC2]: Fault detection framework and architecture for actuators and propulsion systems (leader: **TUG,** AVL, BUT, INRIA, TUDR)

Task 2.2 deals with the development of a framework for fault detection, localization, and correction that is well adapted to the application domain of actuators and propulsion systems. It is based on requirements obtained from Task 1.2. Based on the framework we will come up with an architecture of a tool that well interacts with the Monitoring Device. The outcome of this task will be a report describing the framework and the architecture of a tool to be further developed.
The task has started but still requires input from work package WP1 that is currently under development.

Part. no. and short name	**Work carried out**
13 – TUG	TUG started organizing Task 2.2. TUG plans to continue working on model-based reasoning focusing on actuators and propulsion systems. Most of the work will start after finalizing the requirements coming from work package WP1.
2 – AVL	AVL started to setup a prototypical co-simulation model based on the requirements from WP1.
3 – BUT	No activities in the first half of period 1
18 – INRIA	No activities in the first half of period 1
16 - TUDR	No activities in the first half of period 1

Task 2.3 [SC4]: Methods, architectures, models and tools for validation of an overall system Monitoring Device (leader: **AVL**, DATA, IFAG, IFAT, SBA, TUG)

Part. no. and short name	**Work carried out**
2- AVL	Based on the discussions in T1.4 AVL started work preparation for T2.3. In collaboration with other partners, AVL will focus on evaluating state-of-art scenario descriptions.
17 – DATA	First activities on Requirement definitions on System Level have been performed.
1 – IFAG	Infineon's work focussed in this initial phase of the project on two aspects: Manual implementation of standard CPU devices, that help to detect errors, and setup of hierarchical methods to do analysis of fault effects. In detail: The Infineon design generation framework has been enabled to generate standard RISC-V instruction and performance counters from a formalized specification. To do so, the methods for generating RISC-V CSRs from specification have been harmonized and extended. This enables the insertion of this features based on formalized entries in the specification. Further on, FW code has been developed hat help to use the mentioned

	hardware for fault detection. Next, this code should be generated from the formalized specification as well. Second, a hierarchical fault analysis framework is in development. A first Verilator extension to support fault injection campaigns has been developed. The results have been given to open source and are in discussion with the peers of the Verilator development. An approach for hierarchical – i.e. mixed abstraction – construction of Verilog code has been started. Next, the hierarchical approach shall be finalized, evaluated and published.
10 – SBA	SBA is (planned) to work on combinatorial testing methods for the monitoring device. Initial work on such methods in terms of a survey has been started. Which method to apply will be decided after work package WP1 has been fulfilled, as we require knowledge about the Monitoring Device requirements first, which is still in progress.
13 - TUG	TUG will work on testing methods for the monitoring device. Initial work on testing metamorphic testing for theorem provers have been performed. Most work will be carried out after work package WP1 has been fulfilled, because we require knowledge about the Monitoring Device requirements first.

Task 2.4 [SC5]: Definition of safety levels and acceptable residual risks for critical functions (leader: **VIF**, all partners in WP2)

Task 2.4 investigate risk classes, safety levels and redundancy levels for critical functions and systems. After evolving a common understanding, risk classes and safety levels for the project are defined. This tasks continues the work in from Task 1.5 which is the more general approach. Focus of this task are potential gaps in standards, standardised calculation of residual risk and the exchange with all partner of the project regarding acceptable residual risk.

Part. no. and short name	Work carried out
15 - VIF	A first step was to get an understanding on the current state-of the art; focus lies on standards and best practices for safety levels. Although it is a term used in ISO26262:2018 and SOTIF the concept is also relevant to other groups (e.g. ETSI, TC22 SC32 WG8) and standards (e.g. UL4600(US), ISO/TR 4804:2020, ISO/PAS 21448:2020). A literature study was done to identify existing and using standards. These is now collected, and a preliminary draft will be provided to SC5. This preliminary contribution will be reviewed and extended in the next half year. The first and second reporting period is used to prepare an involvement of all partners of the consortium.
2 - AVL	No work has been performed for this activity during the first reporting period.

1.3.2.1 Deviations from plan

Part. no. and short name	Deviations from plan
1 – IFAG	Infineon work is slightly delayed by completing the hiring of the employees working on architect2030 and by introducing the new hires in Infineon’s design environment and code generation framework. Infineon is confident to catch-up the delay in the first phase of the project.
17 - DATA	DATA not part of Task 2.4
19 - TUDE	No deviations from the technical plan, only correction made on the no of PMs in Amendment #2 (December 2020)

1.3.3 WP3: Components and sub-systems enabling virtual development and validation (m03 – m33) – Leader IFAG

1.3.3.1 *Summary of results achieved during reporting period*

WP3 was kicked off on January 2021, Supply chains specific telcos will be arranged to align the task activities in the Work Package. Initial discussion with partners has been taken in the SCs telcos.
Based on the requirement and specification definition for residual risks in the SCs - Demos in WP1 as well as the framework architecture for the validation process of perception, propulsion, connectivity systems in WP2, the different tasks will elaborate methods along the value chains for the validation and verification tools in order to assure the quality and safety requirements of the Monitoring Device.

The WP3 started later but no deviations are expected on the project plan.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation

1.3.3.2 *Key achievements during reporting period task level*

Task 3.1 [SC1]: Virtual tools for virtual validation of perception systems (leader: **VIF,** BUT, DATA, IFAG, IFAT, TUDR, VW)

Based on the requirement and specification definition for residual risks in perception systems in WP1 as well as the framework architecture for the validation process of perception systems in WP2, Task 3.1 will elaborate methods along the value chain for the validation of perception systems.
After WP3 will be kicked off in January 2021, task specific telcos will be arranged with all contributing task leaders. Initial discussion with partners has been taken place in SC1 telcos.

Part. no. and short name	**Work carried out**
15 - VIF	ViF took part in SC1 telcos and joined the use case discussions. ViF started internal discussion to organize the contribution from ViF side as preparation for the upcoming WP3 kick-off.
3 – BUT	No activities in the first half of period 1
17 - DATA	Not participating in the time scope of this report.
1 - IFAG	IFAG is no more in SC1, this was reported in the amendment n° 2 v1.1
4 - IFAT	Not started yet.
16 - TUDR	No activities done within this period
20 - VW	VW participated in the kick-off of WP3 and started the alignment of the WP3 with the use case of SC1 described above.

Task 3.2 [SC2]: Tools for fault detection and validation in actuators and propulsion system (leader: **BUT,** AVL, INRIA, TUDR, TUG)

Part. no. and short name	**Work carried out**
3 – BUT	No activities in the first half of period 1

2 – AVL	No work has been performed for this activity during the first reporting period.
18 - INRIA	No activities in the first half of period 1
16 - TUDR	No activities done within this period
13 - TUG	No activities in the first half of period 1

Task 3.3 [SC4]: Components and sub-systems enabling virtual development and validation of an overall system Monitoring Device (leader: **TUG**, AVL, DATA, IFAG, IFAT, SBA)

Task 3.3 is for further elaborating on the overall system Monitoring Device based on the framework and architecture from Task 2.3. The Monitoring Device will be able to be coupled with simulations for virtual validation. In addition, we will work on validation and verification tools in order to assure the quality and safety requirements of the Monitoring Device. Once Task 2.3 is sufficiently advance, we will continue on virtual development and validation activities in this task.

Part. no. and short name	Work carried out
13 - TUG	We started organizing this task. Work will be carried out in close collaboration with Task 2.3.
2 – AVL	No work has been performed for this activity during the first reporting period.
17 - DATA	No activities with the time scope of this report, however changes proposed in amendment
1 – IFAG	No work has been performed for this activity during the first semester.
10 - SBA	Initial work has been done to organize this task in cooperation with Task 2.3

Task 3.4 [SC5]: Elaboration of fail-operational strategies (functional availability) in terms of standardization (leader: **IMA,** all partners in WP3)

The Consortium started the discussion on how to align the different tasks in terms of “standardization”.

Part. no. and short name	Work carried out
5 - IMA	Within this period IMA carried out only preparatory work on investigation how to support code review and as well test code development methodology with standard.
2 - AVL	No work has been performed for this activity during the first reporting period.
1 - IFAG	Alignment with SC5 for tasks and deliverables planning.

1.3.3.1 Deviations from plan

Part. no. and short name	Deviations from plan
1 – IFAG	WP3 Leader available since January 2021. Delay does not affect the activities because WP3 waits for WP1 and WP2 demos and use cases definition and requirements.
15 - VIF	Due to the fact that WP3 will be kicked-off in January 2021, with a 5 months delay Task 3.1 specific telcos and discussions could not be organized during within the reporting period.
19 - TUDE	No deviations from the technical plan, only correction made on the nr. of PMs in Amendment #2 (December 2020)

1.3.4 WP4: Components and sub-systems enabling virtual development and validation (m03 – m33) – Leader TUG

1.3.4.1 Summary of results achieved during reporting period

Work package WP4 started in Month 5. TUG started organizing the work package. In particular, TUG fixed an official kick-off event, which will take place mid of January 2021, and presented the work package at the general assemblies and other internal meetings. Accordingly, to the project application WP4 has the following objectives:
Identify risks that correspond to automotive ECS within the context of autonomous and automated driving including risks that are related to methods developed within ArchitectECA2030.
Come up with a framework for classifying risks that correspond to automotive ECS considering safety, security, and privacy concerns.
Provide methodologies for identifying and evaluating risks for concrete components and systems at design time.
Come up with methodologies for estimating and managing risks at runtime in order to keep systems safe during operation.
There is currently no plan to change the objective and corresponding tasks. However, due to changes in the consortium, we do have changes in the participants: In Task 4.3 the partners KTH (supposed task leader) and AVLSE did not join the project. As a consequence, TUG is not also leading Task 4.3. Regarding content there is until now no planned deviation.

Besides of the already discussed risks from the proposal, no further risks have been identified so far. The main risks include failing to be able to identify all risks, not having access to concrete components and systems, and not being able to come up with an estimate or managing procedure of risks during operation. The first two risks are considered to be low due to the competencies of involved partners and procedures like obtaining required information as early as possible during development. The last risk is considered medium, which most likely can be mitigated using the available research network of involved project partners.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation

1.3.4.2 Key achievements during reporting period task level

Task 4.1 [SC1, SC3]: Identification and management of risks in automotive ECS in the connectivity and perception interacting domains (leader: **SINTEF,** DATA, IFAT, NXT, TSENSE, TERA)

Part. no. and short name	**Work carried out**
11 - SINTEF	The activities have not started yet. The work will be aligned with the activities in WP1.
17 - DATA	No activities within the time scope of this report.
4 - IFAT	IFAT activity not started yet
6 - NXT	The activities have not started yet. The work will be aligned with the activities in WP1.

8- TSENSE	The activities have not started yet. The work will be aligned with the activities in WP1.
12- TERA	Regarding WP4, the TGLV partner has been participated in all the regular bi-weekly coordination virtual meetings during the 1st semester (July to December 2020), where appropriate directions and interaction plans with all the supporting partners were established through WP4 leader. Furthermore, TG LV members were worked mainly on bibliographic search regarding the classification and identification of risks related to connectivity and automated perception, within fast changing driving environments.

Task 4.2 [SC2]: Identifying risks for fault detection and identification in actuators and propulsion systems (leader: **TUG,** AVL, INRIA)

In this task, we deal with identifying involved risks for fault detection and identification in actuators and propulsion. In particular, residual risks when starting to use automated fault detection and identification tools in the context of actuators and propulsion systems, will be considered. Initial work on discussing risks in the case of fault detection and localization have been started but will mainly lead to contributions to requirements that are part of work package 1. We will make use of these requirements once available to come up with a classification of risks specifically to the application domain.

Part. no. and short name	**Work carried out**
13 - TUG	Started organizing this task together with the organization of the whole work package. Initial work has been started on the identification of risks considering fault detection and identification.
2 – AVL	During the first reporting period initial discussions with TUG and INRIA have started.
18 - INRIA	

Task 4.3 [SC4]: Identification and management of risk of an overall system Monitoring Device (leader: ~~KTH, AVLSE,~~ IFAG, IFAT, SBA, TUG)

Part. no. and short name	**Work carried out**
13 - TUG	Started organizing this task together with the organization of the whole work package. Work on content is going to start latest after the requirements coming from work package 1 are available.
1 – IFAG	No activities within the time scope of this report.
4 – IFAT	No activities within the time scope of this report.
10 - SBA	Work on this task will start as soon as the requirements identified in WP1 become available.

1.3.4.3 Deviations from plan

Part. no. and short name	**Deviations from plan**
1 – IFAG	WP3 Leader Kick off started on January 2021. Delay of 3 months due to personal problems by IFAG. This is not impacting ArchitectECA2030 because the WP1 and WP2 activities are also slightly delayed. No deviation from the plan.
19 - TUDE	No deviations from the technical plan, only correction made on the nr of PMs in Amendment #2 (December 2020)

7 - NXP	NXP will work on a method to monitor the aging of in-vehicle networking devices to assist fail-prediction and identification of the residual risks for IC process monitoring devices for task 4.1 according to amendment 2.

1.3.5 WP5: Integration of residual risk framework (m12 – m36) – Leader SINTEF

1.3.5.1 Summary of results achieved during reporting period

This work package has not started. The WP5 activities will start in m12 (June 2021) according to plan presented in DoA.

Task 5.1 [SC1, SC3]: Integration of the residual risk framework in connectivity and perception systems (leader: **SINTEF**, INRIA, NXP, NXT, TSENSE, TUDE, TUDR**)**

WP5 will start on m12 (June 2021).

Summary of the future objectives: *"WP5 focuses on the integration of the residual risk framework by taking into account the residual risk identification and the methodologies and metrics developed for the automated and connected vehicles perception, cognition, connectivity and propulsion domains (SENSE, THINK, CONNECT, ACT) using available tools or prototype methods to support virtual validation. The residual risk framework is expected to reduce safety threats such as residual risk of the intended function, through analysis, unintended behaviour in known situations through verification, residual unknown situations that could cause unintended behaviour, through validation of verification situations. The work support then the implementation of virtual simulation to complement the road testing to achieve controllable, repeatable, exhaustive and fast enough validation to prove that the automated and connected vehicle provide the intended functionality over a wide range of situations and weather conditions."*

Part. no. and short name	Work carried out
19 - TUDE	TU Delft is responsible for the task of developing a methodology of digital twin based health monitoring of electronic packages. Literature review on the following two topics is carried out – digital twinning technology and physics of degradation. In the first one, the focus was on gathering information about the history of digitalization, the idea and definition(s) of digital twin, the structure and components of a digital twin, and the concept evolution over the past 10 years in the context of manufacturing industry. This information is summarized in a document. In parallel, the second aspect, physics of degradation, is researched briefly in the area of moisture diffusion and thermal ageing of electronic packages.

1.3.6 WP6: Validation of mission oriented ECS (m25-m36) - Leader AVL

1.3.6.1 Summary of results achieved during reporting period

This work package has not started. The WP5 activities will start in m25 (July 2022) according to plan presented in DoA.

Summary of the objectives: *"WP6 focuses on providing validation methods for the ArchitectECA2030 framework integrated in WP5. The defined framework is designed to ensure reliable, robust and safe development of connected and automated vehicles, considering a quantifiable residual risk across all electric components from semiconductor to system level. Furthermore, the framework is designed to continuously monitor the implemented ECS state of health to enable predictive diagnosis and maintenance, ultimately ensuring safety both by design and in-operation.*

During validation chosen use cases are applied to the proposed ArchitectECA2030 framework to proof the feasibility of the achieved project results. The mentioned use cases are hereby defined to meet the standards of the current functional safety norm ISO 26262 and its installed working group on "fail-operational systems" (SOTIF, ISO PAS 21448).

The ArchitectECA2030 framework integrated in WP5 will be applied and evaluated. The framework was designed in WP2. For the evaluation, the defined requirements and targets in WP1 will be validated."

1.3.7 WP7: Twinning, dissemination, exploitation (m01 – m36) - TERA

1.3.7.1 Summary of results achieved during reporting period

Regarding the Twinning activities between European and U.S. partners and projects, they did not start. Twinning activities are mostly based on networking. It was not possible to start the activities efficiently because of travel restrictions related to COVID-19.

Regarding the External stakeholder strategy and alignment, during the first 6 months of the project, stakeholder identification has been the main activity here, with a special focus on stakeholders active in extending existing standards and/or establishing new standards needed for homologation/type approval of ECAS. This set of stakeholders obviously does include relevant standardization bodies, but, even more importantly, it also includes OEMs, suppliers and research organizations (RO) that are pushing those new standards (like, e.g., the SAFAD group that is pushing ISO TR 4804, or the US American RO Edge Case Research that is pushing UL4600). During the next month, this stakeholder identification and assessment will be extended to cover also non-standards related stakeholders as well as potential twinning partners.

Active dissemination work for the project was started by developing the visual identity for the project (project's 'brand'). Development of the logo, project poster, project presentation template, and website was undertaken. Furthermore, social media presence (via Twitter and LinkedIn) was launched, which will be populated and regularly updated with the latest consortium's activities. This material was created to ensure the visibility of the project by having a common and easily identifiable project identity and common images.

A very important resulting deliverable and the guideline for this period Milestone was the development of a project website. The initial version of it is published.

The ArchitectECA2030 Internet presence is divided into three parts: the official project website https://architect-eca2030.eu/, the social media Twitter and Linkedin (@architectECA2030 and @eca2030) timelines, and the project's internal data exchange realized through the platform NextCloud. Public Internet content is based on the content of the project and its activities. It provides detailed information about the project as outcomes of project dissemination activities, meetings, discussions and ongoing work. The project website aims are to inform both the wider public as well as members of the project. The foreseen visitors range from experts in the field, research programs, companies and universities and the general public.

Active project dissemination at events has also started: ArchitechtECA2030 was presented at the European Forum for Electronic Components and Systems EFECS 2020 (November 2020).

Regarding the exploitation work, WP7 leader will start periodic questionnaires and interviews with partners to collect information about exploitable results starting from month 12.

No deviations during this first interim report.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation

1.3.7.2 Key achievements during reporting period task level

Task 7.1: Twinning activities between European and U.S. partners and projects (leader **BUT,** all partners contribute**)**

No activities performed in the first half of period 1. *"The specific challenge is to address networking gaps and deficiencies between the partners' research institutions in the US and the EU as well as on the academic side."*

Part. no. and short name	**Work carried out**
3 - BUT	No activities performed in the first half of period 1
1 – IFAG 11 – SINTEF 5 – DATA 9 – SAFE 2 – AVL 15 - VIF	Discussion on how to identify the twinning partners but no plan elaborated. The ArchitecECA2030 activities framework should be identified before in more defined way and after we start focusing on twinning.

Task 7.2 [SC5]: External stakeholder strategy and alignment (leader: **SAFE,** all**)**

The objective of this task is to foster global alignment, by (a) identifying stakeholders and setting up a stakeholder management plan, and (b) implement this stakeholder management plan through coordinated activities with those stakeholders according to this plan. Those coordinated activities include (i) setting up an External Advisory Board with members identified in (a), and (ii) twinning activities with appropriate stakeholders (also identified in (a)).

As foreseen in the DoA, during the first 6 month of the project, stakeholder identification has been the main activity here, with a special focus on stakeholders active in extending existing standards and/or establishing new standards needed for homologation/type approval of ECAS. This set of stakeholders obviously does include relevant standardization bodies, but, even more importantly, it also includes OEMs, suppliers and research organisations (RO) that are pushing those new standards (like, e.g., the SAFAD group that is pushing ISO TR 4804, or the US American RO Edge Case Research that is pushing UL4600).

During the next month, this stakeholder identification and assessment will be extended to cover also non-standards related stakeholders as well as potential twinning partners. The complete results of this process will be reported in deliverable D7.2 at M12.

Part. no. and short name	Work carried out
9 - SAFE	- Identification of relevant standards, pre-standards and specifications (c.f. Tasks 1.5 and 7.5) - Identification of stakeholders pushing those standards - Preliminary assessment of theses stakeholders, which, during the next 6 month, will o be extended to cover all relevant stakeholders o be harmonized with the whole consortium o be the basis of the stakeholder management plan reported on on D7.2 in M12.
1 – IFAG 11 – SINTEF 5 – DATA 2 – AVL 15 - VIF	Alignment and discussion on the standardization plan and stakeholders identification.

Task 7.3: Dissemination (leader **TERA,** all partners contribute)

Dissemination and communication work for the project was started by developing the visual identity for the project (projects 'brand') by TERA, which includes the project's logo, poster, presentation templates, and website creation. The common project Dissemination and Communication Guidelines were prepared. Furthermore, social media presence (via Twitter and LinkedIn) was launched, which will be populated and regularly updated with the latest consortium's activities.

The ArchitectECA2030 Internet presence is divided into three parts: the official project website https://architect-eca2030.eu/, the social media Twitter and LinkedIn (@architectECA2030 and @eca2030) timelines, and the project's internal data exchange realized through the platform NextCloud. Public Internet content is based on the content of the project and its activities. It provides detailed information about the project as outcomes of project dissemination activities, meetings, discussions and ongoing work.

Active project dissemination at events has also started: ArchitectECA2030 was presented during the European Forum for Electronic Components and Systems EFECS 2020 (November 2020). The main project related news were generalized in the first ArchitectECA2030 Newsletter.

Part. no. and short name	Work carried out
12 -TERA	The main TERA activities of the first semester: • The visual identity for the project was created; • Collaborated to create a project website; • The common project Dissemination and Communication Guidelines was prepared; • The project accounts in social media platforms were created and active dissemination was implemented; • The first ArchitectECA2030 Poster and Newsletter were prepared; The project was presented during the EFECS 2020 (November 2020).
5 - IMA	IMA deals with planned dissemination activities with only less effect of the Covid19 issue. The inputs for project web site has been provides as well as project information on the company web site www.ima.cz has been updated.

Task 7.4: Exploitation (leader IFAG, all partners contribute)

Part. no. and short name	Work carried out
1- IFAG 11 – SINTEF	No activities performed in the first half of period 1
5 - IMA	IMA deals with planned exploitation activities with impact of the Covid19 issue. The envisioned meetings with the distributors and partners have been re-planned and the annual exploitation event of IMA IMAINFODAY2020 was held virtually.

Task 7.5: Standardization (leader IFAG, all partners contribute)

Part. no. and short name	Work carried out
1 - IFAG	Contribution to developing a 'standardization questionaries' and standardization plan.
6 – NXT	Identification and evaluation of the standards that are relevant for the activities in SC3.
7 - NXP	No activities in this reporting semester
8 - TSENSE	Identification and evaluation of the standards that are relevant for the activities in SC3.
9 - SAFE	- Contribution to developing a 'standardization map' (based upon results of ENABLE-S3 project) - Major contribution to identifying relevant standards, pre-standards and specifications, with a focus on those covering safety (incl. residual risk quantification) for ECAS/autonomous cars - These contributions have been forwarded to SC 5 (within Task 1.5, see description there), but will also be included in the upcoming Deliverable D7.8.
10 - SBA	No activities in this reporting semester
11 - SINTEF	Identification and evaluation of the standards that are relevant for the activities in SC3.

1.3.7.1 Deviations from plan

Part. no. and short name	Deviations from plan
3 – BUT	Twinning activities strongly depends on networking. Start of the activities was postponed because of travel restrictions related to COVID-19.
5 – IMA	Due to Covid19 issue exploitation activities made either virtually or re-planned.

1.3.8 WP8: Project management and liaison (m01 – m36) - IFAG

1.3.8.1 *Summary of results achieved during reporting period*

The main objective within this work package during the first six months was the start and ramp-up phase of the project, enabled by suitable structures, roles and defined management processes.
This includes organization, preparation and moderation of kick-off meetings, vision and technical workshops, phone conferences etc. Also, there are no major risks and necessary fall-back solutions to be applied at this time of the project.
To general assemblies and parallel Consortium workshops were organized on 29 September and 27 October, 2020 to speed up the ramp-up. Another Semester Workshop was planned on 3 February, 2021 together with a “standardization plan” Workshop.
The Deliverable 8.1 “Management and Quality Assurance Handbook (MQAH) was submitted with some delay on January 2021. The work on Deliverable 8.2 “Interim Report 1 (M1-M6)”has started.
During the semester the Coordinator responsible person for Infineon Technologies AG changed, Reiner John left Infineon and Dr. Cristina De Luca took over the direction of the project. At the moment no other Project Management changes are foreseen.
IFAG coordinated the Consortium Agreement preparation and the signing is proceeding due to a needed amendment.

To report that due to the fact that the project started on 1st July, 2020, the Consortium suffered of missing communication in the first months, due to holidays and Corona Virus parallel topics that impacted marginally ArchitectECA2030 too. WP8 does not evidenced any particular deviation in the activities. To underline that the Reporting periods are strongly affected by Christmas and summer holidays therefore delays in submitting in time are possible during all the three years.

Deviations from plan			
Task #	Start / end date Planned	Start / end date Actual	Reason for deviation

1.3.8.2 *Key achievements during reporting period task level*

Task 8.1: Consortium, contracts and legal management (leader **IFAG)**

Following the DoA during the semester we performed the tasks as requested:

- Monitoring and tracking of the overall technical progress.
    - Iterative meetings, Consortium Meetings and other tel. conferences for dedicated topics, WPs and SCs.
- Cooperation with the Steering Committee and the EC.
- Management of contracts (e.g. Grant Agreement, Consortium Agreement) and eventually their amendments.
- Review of the project plan, deliverables, milestones and reports, from the management and technical viewpoint.
- Risk assessment
    - Monthly tracking of the activities

- Coordinator change management
- Handling all communication between the project consortium and the EC
- Management and Quality Assurance

Task 8.2: Operational project management (leader **IFAG)**

During the semester the project plan was maintained and update together with the tracking of all milestones and deliverables. To facilitate smooth and efficient progress of the project work, a Project Guidelines document was delivered D8.1. This document defines project-internal processes related to all day-to-day R&D and administrative activities in the project (e.g. reporting, meetings, document management, distribution of information, responsibilities, management procedure for decision making, communication and dissemination guidelines, social media guidelines, website,...).
It is the role of this task to facilitate all project-internal communication. A centralized document management system was set up and maintained. Report and presentation templates were developed to ensure a coherent appearance of all project-related documentation. During this first Semester we further prepared and consolidated the project-internal reports as well as the semester report to the EC, including quality assurance through a project-internal review process.
We started monitoring the resource utilization, collecting the first inputs by partners in an organized template. Further, adherence to the H2020 rules and regulations were monitored.

Task 8.3: Project, quality and change management – continuous risk assessment – reporting (leader **IFAG)**

Risk assessment organized structure was discussed and reported on D8.1. The further organizational aspects is planned for next semester.

Project RISK Matrix, STEPS:

1) Identify the project risks and potential causes

2) Rate (P) Probability and (I) Impact

3) Team members prioritize potential risks by calculating the product of the probability of occurrence and the impact on the project. They can create a traffic light scale to indicate which risks warrant mitigation actions and at what priority (Figure below). The matrix will not be symmetrical because high-impact risks are considered more critical than risks with a high probability of occurring.

4) The team designs a plan for each risk in the yellow and red zones, including actions required to mitigate the risk, who is accountable and a due date.

5) Team members should always double check whether the actions are truly actionable and will really help to mitigate the impact or the probability of occurrence of the risk. In the best case, actions fully eliminate the risk. Second best are actions that reduce the probability of occurrence, while the third-best option is to define counter measures that work as a fall-back plan (i.e., if the team cannot prevent a risk from happening, they should still know what to do if it occurs).

6) Continuously Update and Review Project-RISK Matrix. Assessing risk is not a one-off activity. As the project moves forward, the team continuously updates the project FMEA and checks off the completion status of mitigation actions.

Task 8.4: Management of intellectual property rights (leader **IFAG)**

A grant agreement and a consortium agreement will be was signed by all partners specifying all rules about intellectual property generated within the project, including access rights, exploitation and dissemination activities. A constant watch is maintained over the international arena, which will be part of all tasks and work packages on the R&D side of this project.

Task 8.5: Management of technical work in the work-packages (leader **IFAG)**

During the semester the WPs leaders performed the continuous supervision of technical progress together with the Supply Chain leaders and coordinated exchange of information between the individual research activities.
A strong dependency with the 5 Supply Chains in relation to the tasks was assigned and project management structure communicated.

FIGURE 3 EXAMPLE OF THE RELATION BETWEEN WPS, SCS AND TASKS

Task 8.6: Liaison with other projects – project clustering and partner-project interfaces (leader **TERA,** IFAG, IFAT, INRIA, SBA, SINTEF, TUG**)**

ArchitectECA2030 was included in The Mobility.E Lighthouse collaboration and networking platform as one of eleven excellent projects to keep the European industry ahead of the global competition. This will ensure the cooperation of automotive ECSEL and H2020 projects.

Tight collaboration is performed with the project AI4DI, which is coordinated by Infineon Technologies. A good practice is applied in the preparation of common guidelines and templates for deliverables, milestones, and reports.

Part. no. and short name	Work carried out
12 - TERA	The main activities of the first semester: • Collecting and listing dissemination events of ArchitechtECA2030 and related projects. Communication of relevant events and information towards all partners involved.
1 - IFAG	Collaboration with Mobility.E. Networking started. Organization and discussion regarding project clustering and future plans for liaison with other projects is planned in February 2021 semester workshop.
11 - SINTEF	The work will start in the second year.
4 - IFAT	Activity not started yet – too early in project phase.

1.3.8.1 Deviations from plan

No deviations

1.4 Use of foreground and dissemination / exploitation activities during period

1.4.1 Use of foreground

Not applicable in the first Semester.

TABLE 1: USE OF FOREGROUND DURING PERIOD

No.	Type of IP rights	Application reference	Subject or title of applications	Applicant
1				

1.4.2 Publications

"Please enter your publications not only in this report but also directly into the "Funding and Tender Portal", Continuous Reporting Process, Publications Tab".

1.4.3 Conferences; workshop

a) Conferences and workshops during reporting period

TABLE 2: LIST OF CONFERENCE AND WORKSHOP CONTRIBUTIONS IN REPORTING PERIOD

Date	Event	Location	Topic (presentation title)	Author and Partner. Comments, e.g. number of participants
25-25 November 2020	European Forum for Electronic Components and Systems (EFECS) 2020	Virtual	ArchitectECA2030 project was represented in a virtual booth. The exhibition visitors could find out the main project goals, objectives, current stage and expected results. The project partner Virtual Vehicle Research represented the video – Validation Building Bricks at Virtual Vehicle.	There was an opportunity to communicate and to discuss with project partners representatives from Infineon Technologies AG, Virtual Vehicle Research GMBH, and Teraglobus.
2. Dec. 2020	27. SafeTRANS Industrial Day "Guarantees for object detection, classification, and intent detection in dynamic environments" and SafeTRANS General Assembly	Virtual	The objectives of Architect ECA2030 and its role in the 'family of projects' that are currently running in the area of homologation and type approval for autonomous systems were discussed during the workshop's round table discussions; in addition, the project was presented in detail during the General Assembly	Presenter: Jürgen Niehaus (SAFE) Participants: 45 (Industrial Day) / 20 (General Assembly)
December, 2020	Virtual annual information day IMAinfoDay2020	Web	IMA activities in EU R&D projects, virtual presentation over company web sites.	IMA public materials available on Web
9-11 December 2020	The 32nd IFIP International Conference on Testing Software and Systems	Virtual	The publication "Automated Transition Coverage in Behavioural Conformance Testing" (Lina Marsso, Radu Mateescu, Wendelin Serwe) was accepted.	Participant: INRIA.

b) Contributions foreseen at upcoming conferences and workshops

TABLE 3: LIST OF UPCOMING CONFERENCE AND WORKSHOP CONTRIBUTIONS

Date	Event	Location	Topic (presentation title)	Author and Partner. Comments, e.g. number of participants

1.4.4 Project internal meetings

TABLE 4: SELECTED PROJECT INTERNAL MEETINGS AND WORKSHOPS

Date	Event	Location	Topic (presentation title)	Author and Partner. Comments, e.g. number of participants
14 July 2020	ArchitectECA2030 Kick-Off	Virtual	The ArchitectECA2030 project started with an online kick-off meeting. The main goals of this meeting was to set the official start of the project and to find out essential project implementation and management aspects.	All consortium
25 October	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
15 September 2020	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
6 October 2020	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
27 October 2020	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
17 November 2020	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
15 December 2020	Project Status Meeting	Virtual	WPs and SCs status meeting.	All consortium
19 January 2021	Steering Committee (STC) monthly meeting	Virtual	WPs and SCs status meeting.	Core team

23-10-2020	Supply Chain 3 (SC3)	Online meeting	KickOff	Nine participants representing SINTEF, NXT, NXP, DATA TUDR, and INRIA.
13-11-2020	Supply Chain 3 (SC3)	Online meeting	Technical meeting	Eleven participants representing SINTEF, NXT, TUDR, DATA, NXP, INRIA, TUDE, and VIF (SC1).
27-11-2020	Supply Chain 3 (SC3)	Online meeting	Technical meeting	Thirteen participants representing SINTEF, TUDR, DATA, NXP, INRIA, TUDE, IFAG, and VIF (SC1).
11-12-2020	Supply Chain 3 (SC3)	Online meeting	Technical meeting	Nine participants representing SINTEF, TUDR, DATA, NXP, TUDE, and IFAG.
9 November 2020	Website update Meeting	Virtual	Discussions regarding ArchitechtECA2030 website update.	IFAG (OTH-AW), TERA
11 January 2021	Website update Meeting	Virtual	Discussions regarding ArchitechtECA2030 website update.	IFAG (OTH-AW), TERA
15 January 2021	Website update Meeting	Virtual	Discussions regarding ArchitechtECA2030 website update.	IFAG (OTH-AW), TERA, SYNTEF, AVL, VIF, VW
22 January 2021	Website update Meeting	Virtual	Discussions regarding ArchitechtECA2030 website update.	IFAG (OTH-AW), TERA, SINTEF, AVL, VIF, VW
25 January 2021	Website and Logo update Meeting	Virtual	Discussions regarding ArchitechtECA2030 website and Logo update.	IFAG (OTH-AW), TERA, SINTEF, AVL, VIF, VW

1.4.5 Process releases, flyers, tec.

TABLE 5: LIST OF PRESS RELEASES, FLYERS ETC.

Type	Date and place of publication	Details

1.4.6 Dissemination on the internet

TABLE 6: THE LIST OF DISSEMINATION CASES ON THE INTERNET

Partner/ Organization	Country	Type	Link
SBA Research	Austria	Project description on the partner's website	https://www.sba-research.org/research/projects/architecteca2030/
SafeTrans	Germany	Project description on the partner's website	https://news.safetrans-de.org/ausgabe-2020-01/forschungsprojekt-europaeisch-architect.html
IMA	Czech Republic	Project description on the partner's website	https://www.ima.cz/research-and-development/grant-projects/international-projects-ongoing/architecteca2030/?lang=en
Tu Delft	Netherlands	Project description on the partner's website	Electronic Components, Technology and Materials (tudelft.nl)
TU Graz	Austria	Project description on the partner's website	https://www.tugraz.at/institute/ist/projects/current/
Teraglobus	Lithuania	Project description on the partner's website	https://www.teraglobus.com/
Austrian Research Promotion Agency	Austria	Project description on the website of National authority	https://projekte.ffg.at/projekt/3704254
Federal Ministry of Education and Research of Germany	Germany	Project description on the website of National authority	https://www.elektronikforschung.de/projekte/architecteca2030
The Mobility E. Lighthouse	Germany	Project description	https://www.mobilitye.eu/projects/architecteca2030

1.5 Deliverables and Milestones table

List of Deliverables

Table 3.1c: List of Deliverables

Deliverable (number)	Deliverable name	% achieved	Delivery date planned	Delivery date (shift)	Observations
D1.1	Report on requirements and targets for fault detection in acquisition and perception	10%	12		
D1.2	Report on requirements for fault detection in actuators and propulsion systems	10%	12		
D1.3	Report on requirements and specifications for residual risk in connectivity systems	10%	12		
D1.4	Report on requirements and targets of reliability and safety at system level	10%	12		
D1.5	Report on requirements of standardization methods and metrics ensuring quality of homologation process	10%	12		
D2.1	Report on architecture for validation of perception systems	0%	18		
D2.2	Report on framework for validation of perception systems including methods and tools	0%	30		
D2.3	Report on the fault detection framework and architecture for actuators and propulsion systems	0%	26		
D2.4	Report on the concepts for Monitoring Devices at the use cases	0%	22		
D2.5	Report on definition of safety levels and acceptable residual risks for critical functions	0%	22		
D3.1	Tools for fault detection and validation in the acquisition and perception system	0%	30		
D3.2	Report on tools for fault detection and validation in the acquisition and perception system	0%	33		
D3.3	Tools for fault detection and validation in actuators and propulsion systems	0%	31		
D3.4	Report on tools for fault detection and validation in actuators and propulsion systems	0%	33		
D3.5	Concept for Automatic Integration of Safety Measures into a Micro-controller Unit and Concept for Validation by Simulation	0%	12		
D3.6	Preliminary concept for Monitoring Device	0%	12		
D3.7	Final concept for Monitoring Device	0%	24		

Deliverable (number)	Deliverable name	% achieved	Delivery date planned	Delivery date (shift)	Observations
D3.8	Prototypic Implementation of the Design Methodology to Automatically Integrate and Validate Safety Measures in Micro-controller Units	0%	33		
D3.9	Elaboration of fail-operational strategies in terms of standardization	0%	25		
D4.1	Report on identification and management of risks in automotive ECS in the connectivity and perception interacting domains	0%	30		
D4.2	Catalogue of risks corresponding to fault localization and identification	0%	28		
D4.3	Identification and management of risk of an overall system Monitoring Device	0%	26		
D5.1	Report on the integration of the residual risk framework in connectivity and perception systems	0%	33		
D5.2	Report on residual risks for fault detection and identification	0%	32		
D5.3	Integration of the residual risk framework of an overall system Monitoring Device	0%	32		
D5.4	Support of standardization activities for the elaborated methodology	0%	33		
D6.1	Report on validation of mission oriented ECS in the connectivity and perception interacting domains	0%	36		
D6.2	Report on validation of fault detection and identification methods and tools considering actuators and propulsion systems	0%	36		
D6.3	Validation of an overall system Monitoring Device	0%	36		
D6.4	Consensus on validation results with standardization bodies	0%	36		
D7.1	Report on research networking between European and U.S. partners	0%	36		
D7.2	External stakeholder strategy	5%	12		
D7.3	External stakeholder alignment	0%	36		
D7.4 DELIVERED	Project website: web portal established and operating	100%	3	7	Amendment 1.1 WebPage need improvement and there were some challenges for resources
D7.5	Report 1 on dissemination and exploitation of the foreground	10%	12		

Deliverable (number)	Deliverable name	% achieved	Delivery date planned	Delivery date (shift)	Observations
D7.6	Report 2 on dissemination and exploitation of the foreground	0%	24		
D7.7	Final plan and report for use and dissemination of the foreground	0%	36		
D7.8	Standardization survey on standards involvement, technologies concerned, and plan	10%	12		
D7.9	Intermediate report on standardization and technology activities and plans	0%	24		
D7.10	Final report on standardization and technology achievements and future plans	0%	36		
D8.1 DELIVERED	Management and Quality Assurance Handbook	100%	3	7	Delay due to parallel activities and challenges of the Project Manager
D8.2 DELIVERED	Interim report 1 (M1-M6)	100%	7	8	No observations
D8.3	Interim report 2 (M13-M18)	0%	19		
D8.4	Interim report 3 (M25-M30)	0%	31		
D8.5	Final report	0%	37		
D8.6	Liaison with other projects – project clustering and partner-project interfaces	0%	24		

List of Milestones

Table 1.5a: List of Milestones

Milestone number	Milestone name	Related work package(s)	Estimated date (shift)	% achieved	Motivation of the shift
MS1	Requirements and targets available Initial concept for Monitoring Device prepared	WP1, WP3	m12	5%	Delay in demonstrators and scenarios descriptions by SCs. In the first semester no concept identified and targets are not available. Discussions and meeting are planned. Possible shift of the milestone to plan in 3 months.
MS2	Architecture for validation of perception systems defined	WP2	m18		
MS3	Safety levels and acceptable residual risks for	WP2, WP3	m24		

Milestone number	Milestone name	Related work package(s)	Estimated date (shift)	% achieved	Motivation of the shift
	critical functions defined Final concept for Monitoring Device provided				
MS4	Methods, architectures, models and tools for validation framework prepared Fail-operational strategies in terms of standardization elaborated	WP2, WP3, WP4	m30		
MS5	Components and sub-systems prepared Residual risk framework integrated	WP4, WP5, WP6	m33		
MS6	Validated mission oriented ECS Overall system Monitoring Device validated	WP6	m36		
MS8.1	Launch of project website	WP8	m03		
MS8.2	Project review 1	WP8	m12		
MS8.3	Project review 2	WP8	m24		
MS8.4	Project review 3	WP8	m36		

1.6 Critical risks for implementation

Table 1.6a: Critical risks for implementation

Description of risk (indicate level of likelihood: Low/Medium/High)	Work package(s) involved	Proposed risk-mitigation measures	Status Semester 1 [July;December] 2020	Status Year 1
Category: Requirements Limited access to standards and	WP1	Gather and distribute relevant standards and regulations from all	Standardization plan on going and survey needed to identify the project	

regulations (ISO26262, ISO21434, SAE J3061, SOTIF, etc.) as well as global homologation procedures. Impact: Reduced knowledge base results in incomplete requirements and targets definition. (Low)		project partners with respective access.	related standards. Review of the risk in some months.	
Category: Standardization Insufficient access to global regulation and certification bodies and governments. Impact: Reduced impact of ArchitectECA2030 results on emerging standards and regulations. (Low)	WP1	Form advisory group with representatives from EU, US and Asia to manage communication with respective standardization bodies.	Standardization bodies will be identified in the survey planned in the second semester. Review of the risk after survey results.	
Category: Requirements Insufficient knowledge about failure risks in components and systems Impact: Incomplete requirements and targets definition for in-vehicle monitoring device and homologation framework. (Medium)	WP1	Profound component/system analysis required regarding failure modes and failure detection. Strong alignment with experts from the domain.	Definition of the Demos needed before evaluation. Alignment with experts planned as soon as the experts are identified.	
Failure to achieve the necessary low latency connectivity properties for safety critical applications. Impact: High. Rank before remediation: Medium	WP2	Calculations and simulations will be carried out in an early stage to ensure low latency properties and verified by pre-tests. If the pre-tests results diverge from the expected results, necessary action will be taken (e.g. re-calculations/-simulations, exchange	No further risks were reported by WP2 partners as of today but are expected to become available after the ramp-up phase.	

		of SW/HW components, design refinements, etc.)		
Sensitivity and effectiveness of the MonDev under contextual conditions show unforeseen variations of the device. Sensitivity of the MonDev may be limited by external exposure conditions	WP3	Currently there is no experience in Monitoring Devices, mitigation actions will be elaborated during the course of the project to cover such unforeseen problems.	Risk assessment analysis and mitigation actions as soon as Monitoring Devices are clarified.	
Not being able to identify all risks related to automotive ECS (Low)	WP4	This risk is very much unlikely due to the involved partners and their expertise. If information is missing, we will use our automotive industry network to gain the necessary information.	n.a.	
Not having access to concrete components and systems (Low)	WP4	We will ask our partners very much early in the project to deliver the requested information for allowing to provide methodologies for evaluating risks.	n.a.	
Not being able to estimate or manage risks of components and systems during operation (Medium)	WP4	In case the reason is missing information, we will try to obtain this information. If it is due to principle more general issues, we know limitations. Otherwise, we will ask for additional support considering our research network.	n.a.	
Due to incomplete information; fail to predict the residual risks of a fault detection and identification device to be coupled with the relevant systems.	WP5	These residual risks predictions are based on the outcome from WP4 and different SCs. WP5 will enter into dialogue and cooperation with	n.a.	n.a.

(Medium; due to several inputs from different partners)		WP4/SCs partners at an early stage to ensure necessary relevant WP4 output/WP5 input.		
Divergence in the quantification of uncertainty and residual risk calculations (Low)	WP5	The quantification of uncertainty/residual risk calculations is not an exact science, but to ensure reliable results; WP5 will support these activities with the experienced personnel, up to date simulation tools and test facilities, in addition to ensuring necessary relevant input from other activities in the project.	n.a.	n.a.
Fail to integrate of the residual risk framework following the best practices to the current functional safety norm ISO 26262 and extension to the “fail-operational systems” (SOTIF, ISO PAS 21448) (Low)	WP5	In case of uncertainty regarding the integration, relevant external expertise be consulted, (inside and/or outside the ISO organization).	n.a.	n.a.
Failure to achieve the seamless integration of the combined V2X connectivity platform. Impact: High Rank before remediation: Medium	WP5	All HW/SW sub-systems will be evaluated and tested in an early stage to ensure interoperability among all components and sub-systems. If any discrepancies are detected, they will be reported, and necessary action taken depending on the challenge.	n.a.	n.a.
Category: Resources In-time availability of required resources for validation (tools, methods, framework, demo vehicle)	WP6	Early alignments for in-time provision of required resources and resource maturity. Pooling of resources if required	n.a.	

Impact: WP delay and reduced quality of project results. (Medium)				
Category: Validation Maturity level of implemented homologation framework insufficient to proof feasibility of the achieved projects results. Impact: Risk of dissent with standardization bodies and reduced contribution to emerging standards and regulations (Low)	WP6	Early testing to ensure framework implementation reaches a sufficient level of maturity to demonstrate the feasibility of achieved project results.	n.a.	
Project did not achieve sufficient wide spread communication and it not known for the stakeholders (Low)	WP7	A detailed and well thought- out plan for use and dissemination of the foreground to be prepared in the first half year of the project; an experienced communication and dissemination manager leading the WP7	Plan for dissemination and communication started.	
Insufficient number of open source publications resulting from the research and development (Medium)	All WPs; especially WP7	Guidance for partners on open source publishing prepared and distributed at the beginning of the project. Reminders and discussions about publications included in agenda for each partners' meeting	Publicaton tracking started.	
An insufficient number of exploitable results are apparent from the project (Medium)	WP7	WP7 leader will start periodic questionnaires and interviews with partners to collect information about exploitable results starting from month 12. Consortium will be informed on how to	Not applicable in the first semester.	

		report about exploitable results without prejudice to confidentiality of their company's product and market information		
Project-related decisions are unduly delayed. (Low)	WP8	Implementation of an effective project management structure with clearly defined responsibilities and escalation hierarchies.	Project management implemented. Improvement and adoption of a flexible management structure to evaluate based on the project' need evolution. Role and responsibilities are at the moment set and accepted by partners.	
Project risks are neglected or not adequately managed. (Low)	WP8	Implementation of a project risk management with risk register and regular review of project risks (semi-annual).	Project risk management already addressed in D8.3.	

1.7 Progress at ArchitectECA2030 Supply Chains (SCs) level

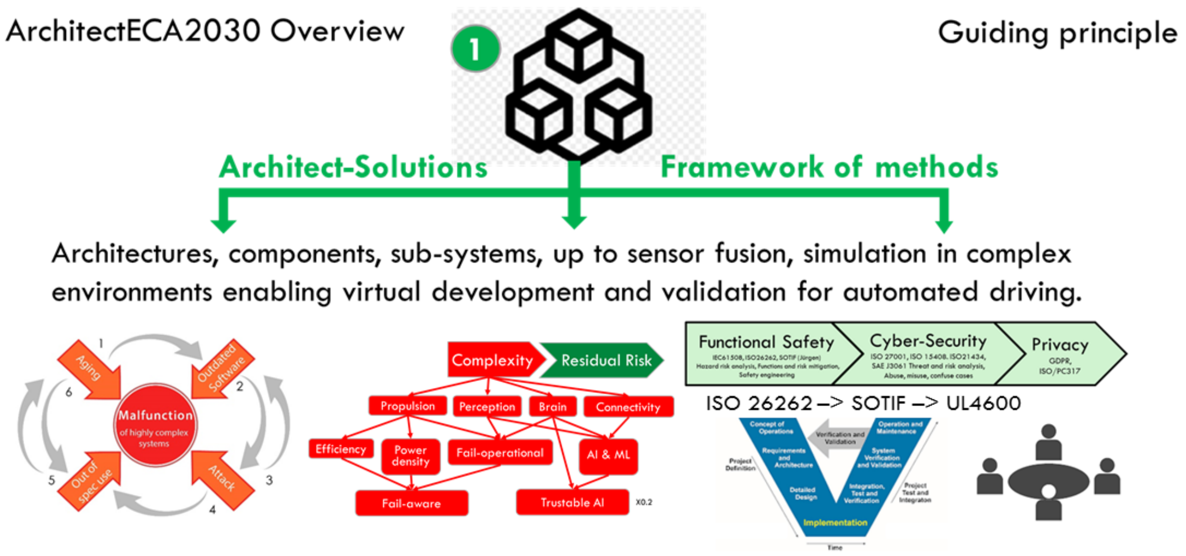


FIGURE 4 ARCHITECTECA2030 – GUIDING PRINCIPLE

"This includes the following abilities to be faced within the project:

- *Ability of ECA vehicles to operate without harmful states and catastrophic failures.*
- *Ability of ECA vehicles to protect itself and the autonomous system information from unauthorized actions, deliberate and accidental intrusion/attacks.*
- *Ability of ECA vehicles to transform, renew, resist, respond and recover timely from damaging effects and states.*
- *Ability of the ECA vehicles to connect securely, anytime, anywhere, to any mission dedicated network (24/7).*
- *Ability of the ECA vehicles to deliver services and information when requested.*

*By **providing a framework of methods and tools**, ArchitectECA2030 will be **the enabling R&D&I project to quantify trustworthiness** (safety, security, resilience, connectivity, availability) **in terms of calculating failure and residual risks of HW and embedded SW across the ECS value chain**. This will significantly support standardization bodies and insurance companies to consider type approval of ECA vehicles." Part-B V1.0*

Supply Chain	Title of SCs	Type
SC1	Failure modes, fault detection and residual risk in **acquisition and perception systems**	Technology enabler
SC2	Failure modes, fault detection and residual risk in **actuator and propulsion systems**	Technology enabler
SC3	Failure modes, fault detection and residual risk for **safety and security in connectivity systems.**	Technology enabler
SC4	Failure modes, fault detection and residual risk for **safety security privacy on overall system architecture**	Technology enabler
SC5	**Global Alignment and Contribution to Standards**	Technology enabler

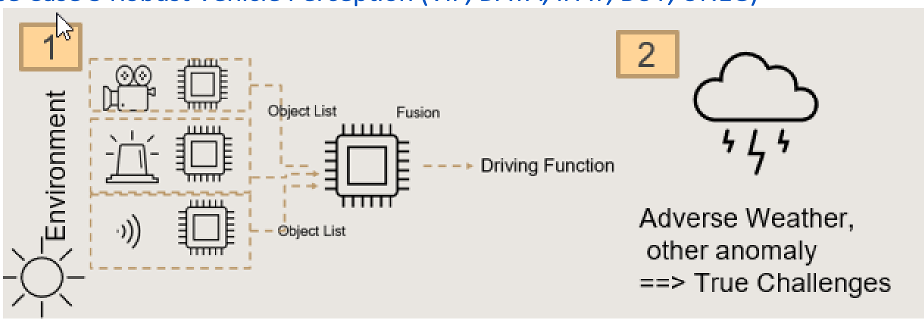
1.7.1 SC1: Failure modes, fault detection and residual risk in acquisition and perception systems

<table>
<tr><td>Supply chain number</td><td colspan="2">SC1</td></tr>
<tr><td>Supply chain title</td><td colspan="2">Failure modes, fault detection and residual risk in acquisition and perception systems</td></tr>
<tr><td>Related key targets</td><td colspan="2">KT1, KT2, KT3, KT4, KT5</td></tr>
<tr><td>Type</td><td colspan="2">Technology Enabler</td></tr>
<tr><td>Supply chain partners</td><td colspan="2">VIF, BUT, TUDR, DATA, VW, IFAT</td></tr>
<tr><td rowspan="5">Supply chain specific objectives</td><td colspan="2">Analysis of situations in which sensors do not work as expected, like different weather conditions, electromagnetic radiation, resonance effects, temperature influences and construction of the car (autobody, bus systems, …, else)</td></tr>
<tr><td colspan="2">Analysis, qualification and quantification of the failure risk of electronic sensor components</td></tr>
<tr><td colspan="2">Definition and specification of failure sources and systemic uncertainties</td></tr>
<tr><td colspan="2">Evaluation of real measurement data from sensors</td></tr>
<tr><td colspan="2">Description of how faults, systemic uncertainties and data ambiguities propagate through the signal processing chain and influence decision making, e.g. classification of objects</td></tr>
<tr><td rowspan="5">Description of results (e.g. of demonstrators) including ambition expressed by TRL level</td><td>List of possible sensor failures on specific examples (TRL 5)</td><td>Will be targeted in UseCase 1
Will be targeted in UseCase 3</td></tr>
<tr><td>Methods to analyze sources of systemic uncertainties of sensors (TRL 4)</td><td>Will be targeted in UseCase 1
Will be targeted in UseCase 3: @ARMIN</td></tr>
<tr><td>Models of the observable behavior of sensors (TRL 5)</td><td>Will be targeted in UC 1, UseCase 3</td></tr>
<tr><td>Simulation environment for residual risk calculation with real data of acquisition and perception (TRL 4)</td><td>Will be targeted in Use Case 1, UseCase 2 & UseCase 3</td></tr>
<tr><td>Classification of sensor data in tests on the real vehicle (TRL 4)</td><td>Will be targeted in UseCase 2, 3</td></tr>
<tr><td>Main partners contributions in the supply chain</td><td colspan="2">The last 6 month were used for the ramp-up of the supply chain and the definition of top-level usecases for the supply chain. All partners contributed actively the to definition. This was considered nessecarey to align work, and steer the effort of the supply chain towards tangible results.

VW took the lead in the first idea creation phase and organized a brain-storming workshop and provided a template for usecase description. The outcome of the workshop are three big use-cases which are lined out below.

Use Case 1: Foreign object detection system within a wireless charging system (Lead TUDR):
Initial situation:
The wireless charging system transfers energy over an air gap of approximately 10 cm (z-class 1, SEA J2954) to 25 cm (z-class 3, SAE J2954) from ground to the underbody of the vehicle. The charging power ranges from 3 kW (power class 1, SAE J2954) up to 20 kW (power class 4, SAE J2954).
The magnetic flux between the ground assembly (GA) coil under the vehicle and the vehicle assembly (VA) coil may strongly heat a metallic object that is on the surface of the GA. One of the consequences of objects heating on the surface of the GA is a potential damage of the surface of the GA. In worst case scenario, this creates failures leading to safety issues, such as contact with a conductor in the GA. Other</td></tr>
</table>

	possible consequences could be burns of human body parts when touching such a strongly heated object or the ignition of such an object under the vehicle. The safety process for the avoidance of thermal events is managed through detection and automated shutdowns. A foreign object detection (FOD) system shall be able to detect the object and prevent its overheating. **Goal:** Wireless charging systems must be able to determine any objects in close proximity to the system that would cause an unsafe condition at any time during charging operation and to take appropriate action by alerting the operator or powering down when needed. Therefore, such systems require a working FOD system. The standard SAE J2954, for example, contains test procedures that can be used during development and production to evaluate the performance of the FOD system. However, the FOD system should be designed in such a way that it can also be tested at runtime. In this context, a general model applicable to several possible methods for FOD should be developed and specific test methods and procedures should be available. Two possible sources of uncertainty must be checked during the runtime tests: a possible malfunction in the FOD system and the possible presence of a foreign object during the tests. **Recommended methods and solutions:** Methods and procedures for runtime tests should be defined and will be demonstrated using selected practical examples of FOD systems in order to ensure the functional safety. Therefore, the selected FOD systems have to be built and characterized in passive state and in the presence of specific test objects. In addition, the combination of test objects and objects that may influence the detection, like rainwater, should be considered and tested. The tests will be carried out in the test stand available at ILK. **Relation to SC1:** The FOD system is the main component of the charging system to guarantee the safety of the system and to protect the operator and uninvolved third parties. This use case focuses on runtime tests of this safety component. Thus, this use case is related to the objectives SC1_O1 (analysis of situations where sensors may not work as expected), SC1_O3 (specification of failure sources and uncertainties) and SC1_O4 (evaluation of real measurement data from sensors). **TUDR**: Lead of usecase and main developments At least one more partner would be good! What about sensors from e.g. Infineon? **Use Case 2: Road segmentation using 2D a camera (VW, VIF, BUT, UNEV, DATA)** Road segmentation using 2D a camera **Initial Situation:** The precise vehicle location plays a major in car safety. Common localization sensors are GPS, IMU and odometer but these sensor suffer from significant errors depending on the environment (e.g. high buildings in the city, trees). Additional 3D sensors such as Lidars are expensive and therefore not always available. In case of no 3D sensors the usability of SLAM approaches is reduced. In these cases also other perception systems like simple 2D cameras can help to increase localization in combination with a low quality GPS signals.

	Goal:
	
	Using a simple 2D camera, a function should be developed which segments the road (e.g. street, curb, lane markings, grass etc.). Specifically the lateral (point of view of the driving vehicle) segmentation is of interest. Using the lateral segmentation, the given longitudinal position of the vehicle and a HD map, the lateral position of the car should be improved. The function should be fused with the longitudinal position and run on a vehicle on-board embedded device (e.g. the camera controller).
	
	Recommended methods and solutions:
	
	A NN architecture should be used to segment the camera imagine. From the segmented image the lateral position should be calculate based on a known longitudinal position, a uncertain lateral position, vehicle heading and a HD map (this should be done using a more simple approach without ML).
	
	VW: Lead of use case and development of
	
	VIF: Support of development in cooperation with its automated drive racing team
	
	BUT: Support Demos/scenarios tests with field measurement Data from Czech republic
	
	UNEV: Support Demos/scenarios with field measurement Data from the US
	
	DATA: Provisioning of OSAM development platform
	
	Use Case 3 Robust Vehicle Perception (VIF, DATA, IFAT, BUT, UNEG)
	
	
	
	Goal:
	• Improve robustness of EPS against these influences/adverse conditions
	    o Fault Detection
	    o Fail-Operational Design
	    o Applying of existing and upcoming recommendations from standards ==> in exchange with SC5
	• Definition of relevant sources for sensor failure
	• Definition of KPIs to evaluate performance against sensor failure (baseline everything is shiny and work as intended
	• Recommendation for Certification
	Method
	• Definition of relevant sensors + data processing (algorithms= we are investigation (camera, lidar, radar….)

<table>
<tr><td></td><td>

Definition of which driving function we investigate (Requirements for DF-perspective)
Development of fault detection methods in simulation and for sensors
Drift model for discrete parameters, start angle sensor and extension to further sensors
Definition of sensor influences we want to investigate
KPI/Metric Definition of residual risk assessment by considering standards (sotif, Iso 26262, UL 4600,…)
Testprocedures (Real World, XiL)
Link to MonDev/Overall Framework

VIF: Lead of Use Case: Develop algorithm for sensor fault detection, identification and robustness (Lidar shield, vibration adverse, weather)

IFAT: Drift model for discrete parameters, start angle sensor and extension to further sensors

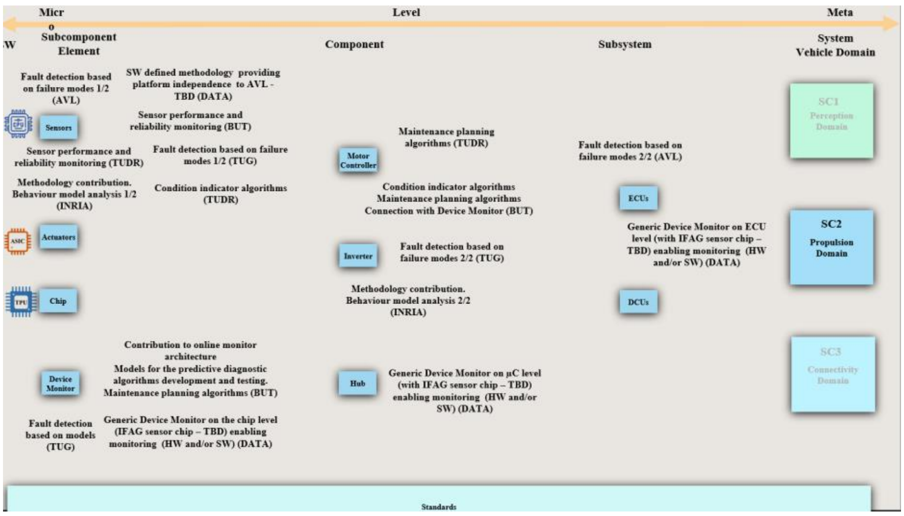
BUT: But will analyze RGB cameras, thermal imagers [..] with respect to different weather conditions

DATA: Provisioning of OSAM development platform
</td></tr>
</table>

1.7.2 SC2: Failure modes, fault detection and residual risk in actuator and propulsion systems

<table>
<tr><td>Supply chain number</td><td colspan="2">SC 2</td></tr>
<tr><td>Supply chain title</td><td colspan="2">Failure modes, fault detection and residual risk in actuator and propulsion systems</td></tr>
<tr><td>Related key targets</td><td colspan="2">KT1, KT2, KT3, KT4, KT5</td></tr>
<tr><td>Type</td><td colspan="2">Technology Enabler</td></tr>
<tr><td>Supply chain partners</td><td colspan="2">AVL, TUG, BUT, NXP, SINTEF, DATA, INRIA; TUDR</td></tr>
<tr><td rowspan="5">SC specific objectives</td><td colspan="2">Analysis of fault modes and their consequences on the behavior of actuator and propulsion systems.</td></tr>
<tr><td colspan="2">Providing methods and tools for fault detection, localization and repair.</td></tr>
<tr><td colspan="2">Coming up with a verification methodology specifically adapted to ensure quality of the proposed system fulfilling safety requirements of such kind of mission -critical systems.</td></tr>
<tr><td colspan="2">Quantifying the residual risks when applying the fault detection, localization, and repair methods and tools.</td></tr>
<tr><td colspan="2">Developing a demonstrator showing the applicability and the reduction in development time of the proposed methods and tools.</td></tr>
<tr><td rowspan="2">Description of results (e.g. of demonstrators) including ambition expressed by TRL level</td><td>Framework for failure detection, localization and error correction for actuator and propulsion systems (TRL 4)</td><td>In SC2 framework for failure detection, localization and error correction will be a platform where supply chain partners will be able to integrate their approaches.

Currently the definition of use cases and requirements is performed. Based on these a first prototype to assess the viability of the before mentioned framework will be created.</td></tr>
<tr><td>Quality assurance methods and tools</td><td>First methods for quality assurance were proposed by partners. When demonstrators and framework for</td></tr>
</table>

<table>
<tr><td rowspan="3"></td><td>improving the fulfillment of safety requirements (TRL 5)</td><td>failure detection, localization and error correction are further defined formulation of the specific requirements of the methods will be made. This will be done in order to avoid the unnecessary overhead of changing the requirements later on.</td></tr>
<tr><td>Framework for quantifying the residual risks when applying the proposed methods and tools. (TRL 5)</td><td>Foundation for the framework for failure detection, localization and error correction will also be used for the framework for quantifying the residual risks. Therefore, no work has been performed for this objective.
However, AVL will reevaluate if deviation from this plan is needed.</td></tr>
<tr><td>Demonstrator of a fault detection, localization, and error correction system in the area of actuators and propulsion systems. (TRL 5)</td><td>Based on the initial work AVL plans to create a general demonstrator, where contributions from the partners will be shown, Additionally, specific demonstrators will be created to demonstrate specialized approaches from partners (e.g.: requiring a special component).</td></tr>
<tr><td>Main partners contributions in the SC</td><td colspan="2">The focus of SC2 is to define relevant demonstrators which showcase partner's use cases. Based on these demonstrators the requirements for Deliverable 1.2 will be derived.
A Demonstrator map (see below) has been created according to planned contributions by supply chain partners.
In this initial phase partners are working with each other to further refine the demonstrators and to identify possible collaboration areas.
AVL, as the leader of SC2, has been involved in defining the demonstrators for which a co-simulation platform will be provided for the collaborating partners.
DATA: Despite not officially participating in SC2 related tasks DATA has participated in meetings. Currently and amendment to cover the participation has been performed.

</td></tr>
</table>

1.7.3 SC3: Failure modes, fault detection and residual risk for safety and security in connectivity systems

Supply chain number	SC3	
Supply chain title	Failure modes, fault detection and residual risk for safety and security in connectivity systems.	
Related key targets	KT1, KT2, KT3, KT4	
Type	Technology Enabler	
Supply chain partners	**SINTEF,** NXP, TSENSE, NXT, INRIA, TUDE, DATA, TUDR	
Supply chain specific objectives	Providing advanced means for identifying security related abnormal behaviour during operation Introducing guidelines for estimating the residual risk of connected subsystems focusing on security related issues	
	Identifying possible faults in the interaction between perception system (camera) and connectivity (C-V2X, ITS G5, IoT) of an automated vehicle	
	Assessment and quantification of possible failures according to the standards IEC 61508 and ISO/PAS 21448: SOTIF	
	Methodology and methods for identifying security issues in communication protocols	
Description of results (e.g. of demonstrators) including ambition expressed by TRL level	Methodology for risk estimations of connectivity systems considering the planned system integrity and dependability (TRL5)	Methodology is defined for the identification and definition of non-functional and functional requirements, and the work is mainly divided into four phases. Phase 1 includes SC3 structure and description. Identification and description of the demonstrators, and homologation framework mapping. Phase 2 focus on the non-functional requirements (NFR) for each demonstrator and phase 3 focus on the functional requirements (FR) for each demonstrator. A framework is established for both phase 2 and 3 including the mentioned requirements (NFR and FR), KPIs for verification and validation descriptions, type of measures, and how to collect, analyze and measure progress. Phase 4 include the demonstrator verification and validation with respect to failure modes, fault detection and residual risk for safety and security in connectivity systems.
	Analysis and quantification of the residual risk for the case of the interaction of camera in the perception domain with the connectivity domain. (TRL 4)	The identification of sub-supply chains (SSCs), clustering and definitions of relevant physical demonstrators are progressing. The work on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures are ongoing. Assessment and quantification and mapping of possible failures according to IEC 61508, ISO/PAS 21448 (SOTIF), and other standards are in progress.
	Dynamic risk management in mission- and safety-	No results to report for the dynamic risk management in the current period.

	critical automated and connected systems (TRL 4)	
	Virtual simulation of residual risk for different types of connectivity systems for an automated connected vehicle (TRL 4)	No results to report for the virtual simulation of residual risk in the current period.
Main partners contributions in the supply chain	SINTEF: Leading the SC3 and has arranged four regular SC3 technical web meetings. Prepared a technology stack proposal for mapping, and a micro to meta level overview for demonstrator identifications and relations. Contributed on identification and mapping of standards. Initial identification of relevant demonstrators and defined some relevant functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including gateway, V2V, V2I and GPS technologies (together with NXT); and optical sensor technologies (together with TSENSE). NXP: Contributed on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including built in connectivity; and digital twin package monitoring (together with TUDE). TSENSE: Initial identification of a relevant demonstrator including optical sensor technologies (together with SINTEF). NXT: Initial identification of a relevant demonstrator including gateway, V2V, V2I and GPS technologies (together with SINTEF). DATA: Prepared a requirements template (together with the partners in WP1). Contributed on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrators including SW defined methodology, modularisation, and reuse of code; gateway stack and V2X interface connectivity; in-vehicle connectivity ECU; and embedded system SW development tool and platform. INRIA: Contributed on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including formal verification and validation tool. TUDE: TU Delft is responsible for the task of developing a methodology of digital twin based health monitoring of electronic packages. Literature review on the following two topics is carried out – digital twinning technology and physics of degradation. In the first one, the focus was on gathering information about the history of digitalization, the idea and definition(s) of digital twin, the structure and components of a digital twin, and the concept evolution over the past 10 years in the context of manufacturing industry. This information is summarized in a document. In parallel, the second aspect, physics of degradation, is researched briefly in the area of moisture diffusion and thermal ageing of electronic packages. TUDR: Contributed on technology stack mapping and micro/meta level alignment. Identification of functional and non-functional requirements together with KPIs and measures. Initial identification of a relevant demonstrator including wireless charging V2G connectivity.	

1.7.4 SC4: Failure modes, fault detection and residual risk for safety security privacy on overall system architecture

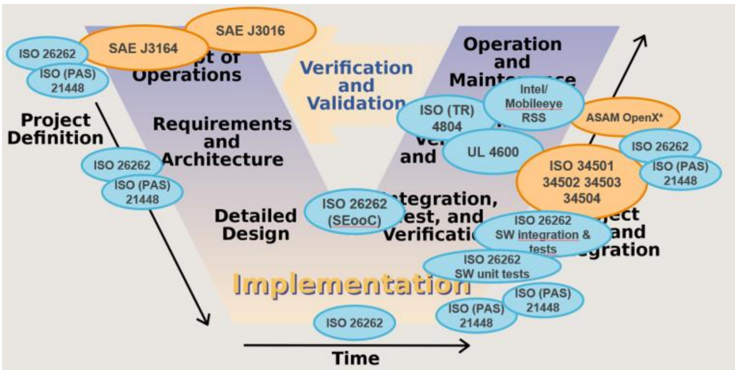
Supply chain number	SC4	
Supply chain title	Failure modes, fault detection and residual risk for safety security privacy on overall system architecture	
Related key targets	KT1, KT2, KT3, KT4, KT5	
Type	Output Enabler	
Supply chain partners	**VIF**, AVL, DATA, IFAG, IFAT, SBA, KTH, TUG	
Supply chain specific objectives	Monitor overall system performance online Measure reliability and uncertainty Anomaly detection and decision on function availability State estimation and condition monitoring Consideration of environmental conditions	
Description of results (e.g. of demonstrators) including ambition expressed by TRL level	MonDev: HW-Model and / or IoT-device to collect driving data, execute the implemented algorithms and provide evaluation results (TRL 5)	In the scope of Architect2030, the term "overall monitoring device" refers to possibilities for monitoring performance along the value chain. Once, all partner contributions are collected, interfaces as well as interactions between these contributions can be identified.
	monitoring device methodologies implemented (TRL 4)	We are in the concept phase and the definition of use cases has priority. The implementation of methodologies will follow in later tasks.
	Catalogue describing necessary configurations of MonDev for different safety-, security- and privacy-critical components. (TRL 4)	The configuration of the MonDev is targeted in task 2.3. as it depends on use case and demonstrator definitions as well as requirements.
	Integration in vehicle and real-world driving operation demo (TRL 3)	Has not started yet.
Main partners contributions in the supply chain	SC4 has kicked-off on 8^{th} of October. Based on a partner profile template, SC4 contributing partners got the chance to introduce themselves, their company and plans in SC4. Task leaders and main contacts for SC4 were determined and approved by the partners. **VIF** as SC4 leader takes part in task 1.4 meetings to reduce the high number of telcos and to relieve partners. In Task 1.4, discussions to collect contributions from partners and identification of use cases as well as possible collaboration between partners has been started. **IFAT:** IFAT is task leader of task 1.4, that contributes to SC4. In alignment with the task leader 1.4, the identification of use cases and contributions from partners in SC 4 will mainly take place in task 1.4 meetings in close cooperation with the SC4 leader. IFAT presented their specific activities and contribution to SC4. **AVL:** AVL is task leader of task 2.3 that contributes to SC4. AVL presented their contribution to SC4 in task 1.4 meetings. AVL supports the current stage of use case discussions with their expertise.	

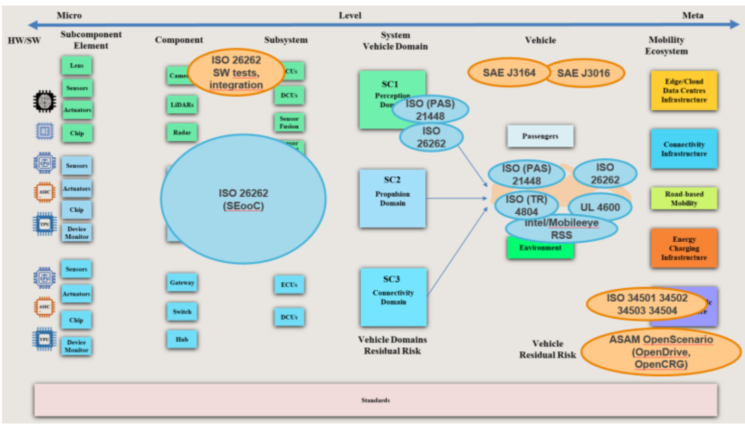
	TUG: TUG is task leader of task 3.3. Since TUG is not involved in task 1.4 it was decided in compliance with the task 1.4 leader to incorporate TUG in the use case discussions as well. The contribution from TUG is essential for a successful progress of SC4 and requirements of their intention has to be considered and summarized in detail as well. TUG gave an overview of their planed contribution to SC4. **DATA:** DATA is task leader of task 5.3 that contributes to SC4. DATA presented their contribution to SC4 in task 1.4 meetings. Use case discussions benefits from DATA`s commitment and expertise. **IFAG:** IFAG presented their contribution in task 1.4 meetings. Definition of the demonstrator: The Infineon Architect2030 Demonstrator will be a Power Control (e.g. Voltage Regulator, Battery Charging) or Motorl Control Design. The Design is accessible via SPI-Interface from outside to transmit data and program snippets and to read status information. The Design will be hardened with the automatisms developed in ArchitectECA2030, whereas hardening includes both error correction and error detection hardware as well as a „security controller“ which accumulates the detected errors. The security controller is accessible from on-chip CPU and via SPI-interface. The hardening hardware will be verified with generated properties and the fault propagation methods will be validated with simulation. Both use ArchitectECA2030 developed tools and methods. The goal of the demonstrator is to show the industry strength of the implemented methods and to act as an edge device in ArchitectECA2030 addressed domains. **KTH**: Is out of the project. **SBA** presented their contribution to SC4 in task 1.4 meetings. **VIF:** ViF is leading SC4. ViF will provide an AD demonstrator for SC4 specific use cases and MonDev demonstrations. Specific requirements will be elaborated together with the consolidation of use cases. **Next steps:** As it is already announced in the task 1.4 description, further discussions with other supply chains are planned, to identify further contributions to SC4, to fill gaps that occurred due to withdrawn partners. Once, all contributions are collected and use cases are identified, demonstrators and requirements for SC4 can be established and will be documented.

1.7.5 SC5: Global Alignment and Contribution to Standards

Supply chain number	SC 5
Supply chain title	Global Alignment and Contribution to Standards
Related key targets	KT3, KT4
Type	European Values
Supply chain partners	**AVL, VW,** SafeTRANS, All partners of ArchitectECA2030
SC specific objectives	SC 5 specific objectives are: Alignment and collaboration with standardization and certification bodies as well as insurance companies. Alignment with governments, industry and academia on emerging standards.

<table>
<tr><td></td><td colspan="2">Contribution to ISO PAS 21448 and ISO 26262 (next releases); several ArchitectECA2030 partners are in those task forces
Twinning with the relevant stakeholders, especially with the US via NIST and University of Nevada</td></tr>
<tr><td rowspan="3">Description of results (e.g. of demonstrators) including ambition expressed by TRL level</td><td>Integration of EAB (TRL 4)</td><td>Based on the collection of relevant standards used in ArchitectECA2030 a list of relevant stakeholders will be identified. These will consequently be invited to join the EAB.</td></tr>
<tr><td>Preparation of proposals for standardization of metrics that measure system quality and safety as well as methods for homologation. (TRL 4)</td><td>The collection of standards relevant to the project is needed, in order to perform a gap analysis of standards. Currently, potential contributions to existing standards are being evaluated.</td></tr>
<tr><td>Consensus on the above results with a large variety of stakeholders (represented in the External Advisory Board) as well as knowledge exchange and coordinating with the US via NIST (TRL 4)</td><td>In the first semester no work for this objective has been performed.</td></tr>
<tr><td>Main partners contributions in the SC</td><td colspan="2">Initial work of SC5 in the first reporting period focused on collecting all relevant standards used in the ArchitectECA project. This was done not only with the partners in SC5, but also with the partners from the whole consortium. Preliminary results are Standardization Maps (see below) which contain relevant standards corelated with processes or high-level view of the ArchitectECA2030 project.




</td></tr>
</table>

	These maps will serve as the foundation for the next steps planned in the SC. Based on the maps potential candidates for the EAB will be determined. Additionally, these maps will be used to investigate gap analysis of the standards and to identify in turn meaningful contributions to existing standards. All partners: **AVL:** AVL, as the leader of SC5, created the standardization map together with project partners, and also contributed to it. Based on the information provided, AVL and supply chain partners will identify relevant standards in the ADAS/AD domain and contribute missing extensions to these particular standards. **IFAG:** In relation to WP7 Task7.5 standardization, it was discussed about the future document describing the standardization plans and the survey preparation. Harmonization of the incoming deliverables D1.5 (m15) and D7.8 (m12) and preparation of the Consortium's Workshop on February 3, 2021 about standardization. **SINTEF:** Standardisation and standards have been emphasized and discussed in regular technical meetings. Identification of relevant standards and defined the link between the existing standards and the activities in WP1/SC3. Evaluation and mapping of standards that are relevant for these activities as input for SC5.NXT: Initial identification of standards relevant for the connectivity part (WP1/SC3). **TSENSE:** Identified the standards that are relevant for the monitoring part (WP1/SC3) and how they are applied to the work in the project.

1.8 Impact (related to the description in the technical Annex)

The expected impact is still valid and the description in the Technical Annex is up to date.

1.9 Access provisions to research infrastructures

Not applicable

1.9.1 Trans national access activities (TA)

Not applicable

1.9.2 Virtual Access activities (VA)

Not applicable

1.10 Resources used to provide access to research infrastructures

Not applicable

2 Update of the plan for exploitation and dissemination of result (if applicable)

Not applicable

3 Update of the data management plan (if applicable)

Not applicable

4 Follow-up of recommendations and comments from previous review(s) (if applicable)

Not applicable.

5 Deviations from Annex 1

During the reporting period the need for contract **amendment request no. 1 v1.**0 turned out. The amendment no. 1 was submitted on September 23, 2020 It covered the following items:

1. Removal of beneficiaries due to their non-accession to the GA
2. Changes on Annex 1 (Description of action)
3. Changes of Annex 2 (estimated budget of the action)
4. Decrease on the maximum grant amount
5. Changes to the action’s estimated eligible costs

Description:
The Partner AVL MTCAB dd not sign the accession form. Therefore they need to be removed from the project. The coordinator had the contractual obligation to remove these kind of partners after their entry into force of the contract.
The WP’s PMs were updated accordingly together with the related resources table.

Change of Beneficiary: D21 D4.3 new beneficiary TUG, old one AVL MTCAB

A no. 2 amendment V1.1 was submitted on January 2021 and will be part of the description in the annual report because outside the semester reporting period.
Mainly it will concern:

1. Changes in Annex 1 (description of action)
2. Changes in Annex 2 (estimated budget of the action)
3. Errata corrige of deliverables in ECAS System

6 Use of resources -> only for PR1 Report, not included in Semester Report

"Include explanations on deviations of the use of resources between actual and planned use of resources in Annex 1, especially related to person-months per work package per period.

Include explanations on transfer of costs categories (if applicable).

Include explanations on adjustments to previous financial statements (if applicable)."

6.1 Cumulated efforts spent in Semester 1

The effort will be available during the yearly report PR1 (end of July - August), nevertheless we have checked by partners the estimated effort in the first semester and without describing in deeper detail we see that we have used in the first semester only ~ 27% of the global PMs planned for the first year. In the following figures are also reported the % of the actual semester PMs versus the planned for the year 1.

The used PMs for WP1 are between 41% and 45% (3 Partners are missing in the calculation) and WP3 is behind schedule in comparison to other WPs. WP2, WP4, WP7 and WP8 are all underspending.

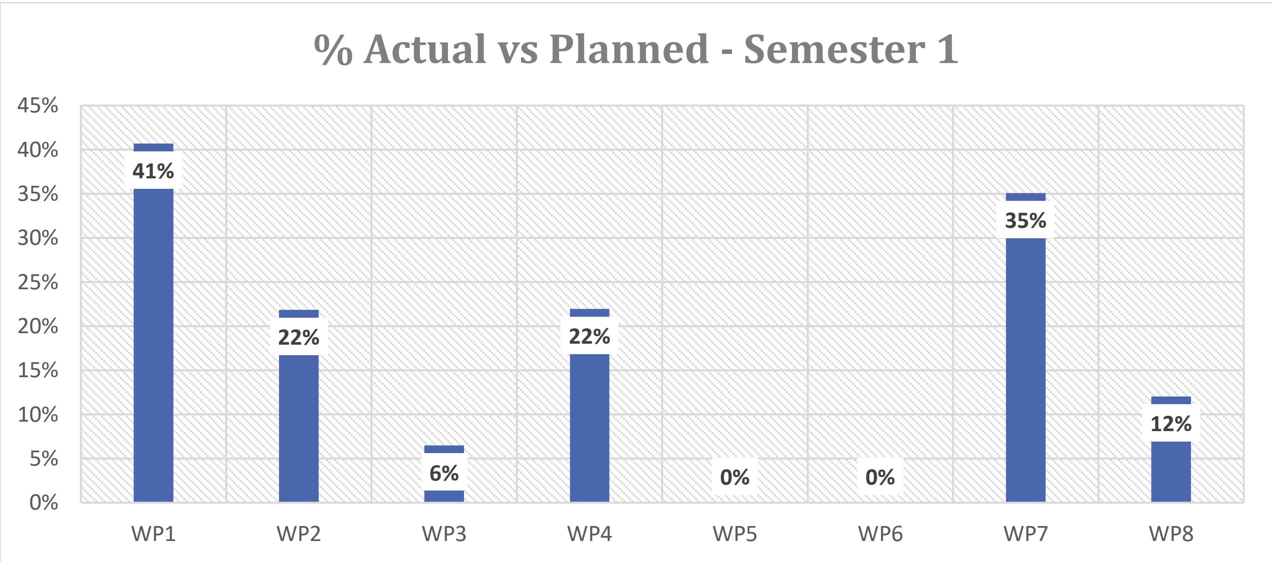


FIGURE 5 % PMS ACTUAL VS. PLANNED – SEMESTER 1

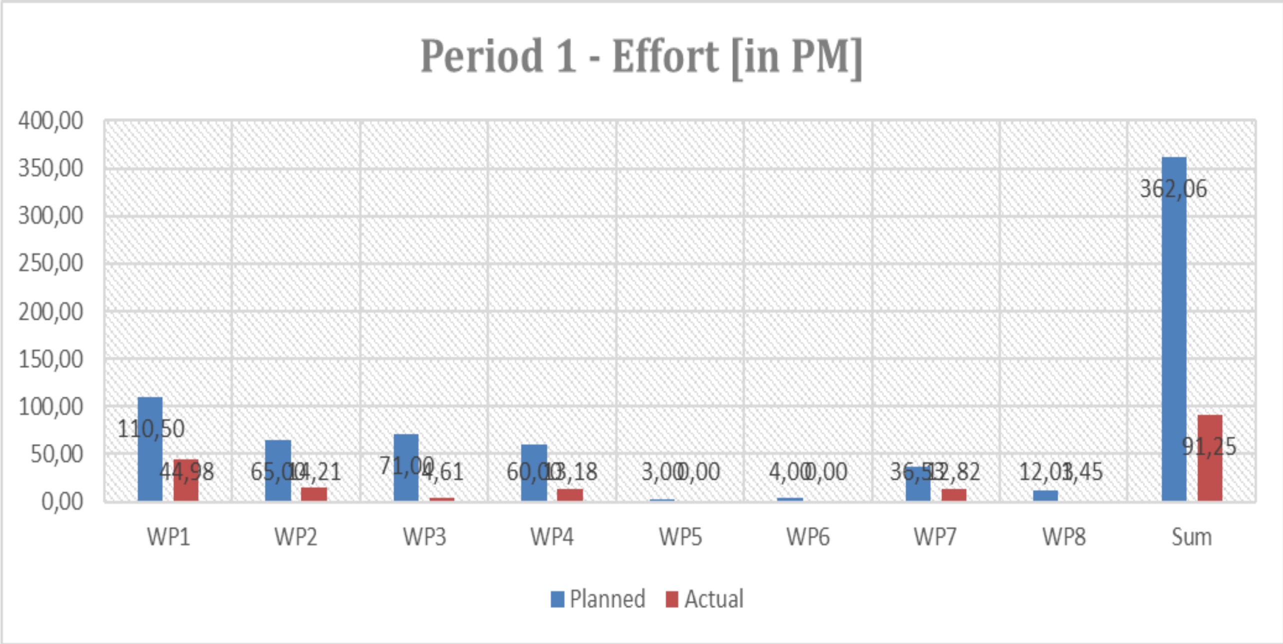


Figure 6 Semester 1 estimated and Planned Effort – PMs (3 Partners missing)

6.2 Use of resources per partner and work package

To be reported for the yearly report (PR1).

6.3 Explanations on the use of resources in period 1

The effort tables in section 6.2 indicate some differences between the planned and actual efforts. Explanations for partners with deviations higher than +/-10% are listed in the table below.

No.	Short Name	Explanation on the deviation between planned and actual efforts

6.4 Unforeseen subcontracting

Specify in this section:

- *a) the work (the tasks) performed by a subcontractor which may cover only a limited part of the project;*
- *b) explanation of the circumstances which caused the need for a subcontract, taking into account the specific characteristics of the project;*
- *c) the confirmation that the subcontractor has been selected ensuring the best value for money or, if appropriate, the lowest price and avoiding any conflict of interests.*

6.5 Unforeseen use of in kind contribution from third party against payment or free of charges

Specify in this section:

- *a) the identity of the third party;*
- *b) the resources made available by the third party respectively against payment or free of charges*
- *c) explanation of the circumstances which caused the need for using these resources for carrying out the work.*

7 References

General Guide to Formatting a Bibliography

For a book:
Author (last name first). Title of the book. City: Publisher, Date of publication.

EXAMPLE:

Dahl, Roald. The BFG. New York: Farrar, Straus and Giroux, 1982.

For an encyclopedia:
Encyclopedia Title, Edition Date. Volume Number, "Article Title," page numbers.

EXAMPLE:

The Encyclopedia Britannica, 1997. Volume 7, "Gorillas," pp. 50-51.

For a magazine:
Author (last name first), "Article Title." Name of magazine. Volume number, (Date): page numbers.

EXAMPLE:

Jordan, Jennifer, "Filming at the Top of the World." Museum of Science Magazine. Volume 47, No. 1, (Winter 1998): p. 11.

For a newspaper:
Author (last name first), "Article Title." Name of newspaper, city, state of publication. (date): edition if available, section, page number(s).

EXAMPLE:

Powers, Ann, "New Tune for the Material Girl." The New York Times, New York, NY. (3/1/98): Atlantic Region, Section 2, p. 34.

For a person:
Full name (last name first). Occupation. Date of interview.

EXAMPLE:

Smeckleburg, Sweets. Bus driver. April 1, 1996.

For a film:
Title, Director, Distributor, Year.

EXAMPLE:

Braveheart, Dir. Mel Gibson, Icon Productions, 1995

CD-ROM:
Disc title: Version, Date. "Article title," pages if given. Publisher.

EXAMPLE:

Compton's Multimedia Encyclopedia: Macintosh version, 1995. "Civil rights movement," p.3. Compton's Newsmedia.

Magazine article:
Author (last name first). "Article title." Name of magazine (type of medium). Volume number, (Date): page numbers. If available: publisher of medium, version, date of issue.

EXAMPLE:

Rollins, Fred. "Snowboard Madness." Sports Stuff (CD-ROM). Number 15, (February 1997): pp. 15-19. SIRS, Mac version, Winter 1997.

Newspaper article:
Author (last name first). "Article title." Name of newspaper (Type of medium), city and state of publication. (Date): If available: Edition, section and page number(s). If available: publisher of medium, version, date of issue.

EXAMPLE:

Stevenson, Rhoda. "Nerve Sells." Community News (CD-ROM), Nassau, NY. (Feb 1996): pp. A4-5. SIRS, Mac. version, Spring 1996.

Online Resources
Internet:
Author of message, (Date). Subject of message. Electronic conference or bulletin board (Online). Available e-mail: LISTSERV@ e-mail address

EXAMPLE:

Ellen Block, (September 15, 1995). New Winners. Teen Booklist (Online). Helen Smith@wellington.com

World Wide Web:
URL (Uniform Resource Locator or WWW address). author (or item's name, if mentioned), date.

EXAMPLE: (Boston Globe's www address)

http://www.boston.com. Today's News, August 1, 1996.

8 List of figures

9 List of tables