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Bridging Ecosystems for
European Technological Advancement

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Disclaimer

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1 Publishable Summary

The ***Cynergy4MIE*** overall Consortium structure including **43 partners** out **of 16 countries**, is shaped according to the needs of effectiveness in research and execution of deliverables. A major cornerstone is the market relevance which is underlined by the ranking in the world market of the big consortium partners such as, ZF, IFAT, ST-I, NXP-NL or AVL among others.

Cynergy4MIE is set up by a strong consortium that covers the whole value chain comprising: **11 large enterprises** (AVL, IFAT, TAAT, NXP-NL, ZF, IMA, MURATA, PRODRIVE, RECHI, ST-I, BelGaN[1]), which are deeply interested in Cynergy4MIE and plan to directly exploit the project findings in improving their products. **15 SMEs** mostly **technology suppliers** (I&M, VER, TG, GIM, IOTAM, MEDISYS, MEV, VAISTO, INSAR, XENOMATIX, SAT, SSOLSTRIKER, SOFT, DRIVEU, GRO), system integrators and innovation management companies, mostly SMEs) that cover all technological aspects to be studied within ***Cynergy4MIE*** disposing of versatile expertise that is necessary to fulfil the goals of this ambitious endeavour. **10 academic partners** (BUT, TUG, FAU, THRO, KFU, POLITO, TU/e, TUD, KTH, UNEV) that will provide a link between fundamental research, applied research and education. In many cases, universities are also providing research infrastructure necessary for ***Cynergy4MIE*** execution. **7 research institutes** (CONV, SAL, VIF, VTT, EDI, Fraunhofer, ITRI) that will boost knowledge and innovation and contribute to the specification of new technologies, with a special focus on AI in emergent systems, new material, and new methods, so as to be designed and developed in the context of ***Cynergy4MIE.*** To support the efficient focusing of ***Cynergy4MIE*** 's R&D activities, an external advisory board will be established. It represents important stakeholders in ***Cynergy4MIE's*** results and provides valuable advice to maintain activities towards high-value exploitable results.

1.1 Cynergy4MIE Project Motivation, Challenges & Vision

Motivations and Challenges: ***Cynergy4MIE*** tackles the pressing demands of global competition, especially in mobility and complex product domains such as human-collaborating robots. Intense competition from international players and vertically integrated firms is pushing into new markets, fuelled by cutting-edge technologies and interconnected ecosystems.

Challenges for Europe's Industry: Europe's competitiveness relies on software-driven strategies, common components, and collaborative tools in the mobility, infrastructure, and energy sectors. Transitioning to electric powertrains and energy storage technologies is crucial, requiring innovation in AI, digitalization, and core technologies.

Cynergy4MIE will facilitate a technology push by advanced ECS, to break down the silos and enable collaboration across technological boundaries, creating convergence of ecosystems.

Vision: ***Cynergy4MIE*** envisions a future where ***Mobility, Infrastructure, and Energy - MIE*** ecosystems grow together. The project seeks to guide the development of common core technologies, leverage synergies, and facilitate unparalleled technology exchange across key application areas.

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[1] BELGAN is in the process of leaving the Cynergy4MIE consortium.

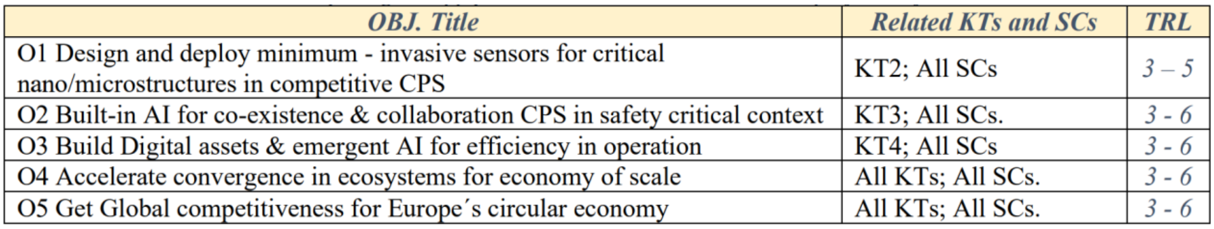
2 Introduction & Scope

Europe's industrial product competitiveness is under significant pressure, not only in the mobility sector with battery electric vehicles (BEVs) but also in complex products such as human collaborating robots. Strong competitors from the United States, Greater China, Japan, and Korea are entering the European market with highly competitive products in terms of cost and features. This is largely driven by influential global players and vertically integrated companies, such as Tesla, that possess adaptable core technologies suited for various markets and customer preferences and are eager to expand their presence in new regions (see also [2]).

2.1 Cynergy4MIE Goals and Objectives

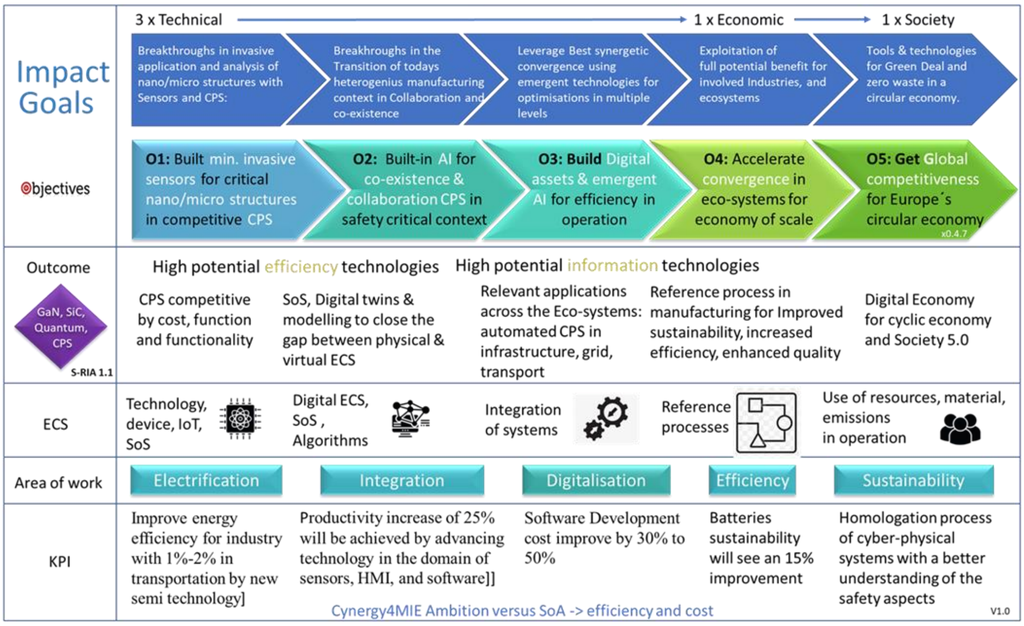
Cynergy4MIE's mission is supported by **five overall objectives**, each aligned with the expected outcomes of the project. These objectives are directly linked to **Key Targets (KTs)** and **Supply Chains (SCs)**, integrating them into the project execution process. Below follows an overview of how advanced efficiency and information technologies will be vital in achieving the project's objectives and impact goals. These technologies will be utilized to improve work electrification, integration, digitalization efficiency, and sustainability. To ensure close monitoring of progress, specific key performance indicators (KPIs) have been established, focusing on efficiency, overall CO_2 emissions reduction, and material savings through the ***Cynergy4MIE*** platform. The five project objectives are summarized in Table 1, and Figure 1 illustrates the relationship between impact goals, objectives, outcomes, areas of work, and KPIs. Further details on the objectives can be found in Section 2.2.1.

TABLE 1: KEY TARGET, SUPPLY CHAIN AND TRL CORRELATION TO THE PROJECT OBJECTIVES



OBJ. Title	*Related KTs and SCs*	*TRL*
O1 Design and deploy minimum - invasive sensors for critical nano/microstructures in competitive CPS	KT2; All SCs	*3 – 5*
O2 Built-in AI for co-existence & collaboration CPS in safety critical context	KT3; All SCs.	*3 - 6*
O3 Build Digital assets & emergent AI for efficiency in operation	KT4; All SCs	*3 - 6*
O4 Accelerate convergence in ecosystems for economy of scale	All KTs; All SCs.	*3 - 6*
O5 Get Global competitiveness for Europe´s circular economy	All KTs; All SCs.	*3 - 6*

Key Targets (KTs) encompass the technological components, methodologies, and tools used to implement the application layer within the technology stacks. These KTs act as foundational elements across different Supply Chains, ensuring the functionality and operational effectiveness of the applications.



2.2 Cynergy4MIE Expected Outcome & Impact

FIGURE 1: CORRELATION OF IMPACT GOALS TO THE OBJECTIVES; OUTCOME ECS, AREA OF WORK AND KPIS

Cynergy4MIE identifies four key challenges that capture both aspirational goals and current obstacles within the mobility, infrastructure, and energy ecosystems. These challenges not only reflect the ambitions of ***Cynergy4MIE*** but also highlight urgent issues that necessitate collaborative solutions. The interconnected nature of present demands and future visions drives these challenges forward.

The first challenge focuses on enhancing productivity through the software and applications used in MIE, establishing efficiency as the foundation of progress.

The second challenge revolves around the convergence of advanced technologies such as AI, IoT, and Cyber-Physical Systems (CPS), which hold the potential to transform everyday functions. By seamlessly intertwining these technologies, ***Cynergy4MIE*** can unlock novel paradigms of efficiency across various domains.

The third challenge emphasizes optimizing semiconductors through non-invasive sensors and efficient devices, representing a significant leap rather than just incremental improvements. This effort aligns with the broader concept of "More than Moore," indicating a pursuit that goes beyond traditional limits.

❶ More Productivity in software and applications

❷ More added value by AI, IoT, CPS for common functions

❸ More efficient semiconductors trough advanced ECS

❹ More than Moore functionality by European top technologies and heterogenous Integration

Finally, **the fourth challenge** calls for the integration of leading European technologies, akin to achieving a quantum leap in innovation. This idea embodies the aspiration to surpass current capabilities, laying the groundwork for a new era characterized by advancements in quantum sensing and simulation and their transformative potential.

2.2.1 Cynergy4MIE Objectives

The ***Cynergy4MIE*** project tackles the need for innovative approaches in converging ecosystems, emphasizing software complexity, trustworthiness, and composability. AI-assisted tools will improve software engineering efficiency by aligning methodologies and components. As domains merge, a cohesive strategy aims to identify synergies across the value chain, taking into account aspects such as ethical human-machine interaction, emergent AI learning, and non-invasive exploration at nano and micro scales.

Europe will leverage its strengths in non-invasive sensor technologies and quantum sensor technologies to enhance cyber-physical systems for safety-critical applications.

Mobility 2035: Europe's transition to electric vehicles is crucial for its industrial landscape, with electrification impacting both infrastructure and energy ecosystems. Three disruptive megatrends—electric vehicles (EVs), connected and automated vehicles (CAVs), and Mobility as a Service (MaaS)—are transforming mobility and fostering convergence among ecosystems. Achieving success hinges on a comprehensive integration of mobility, infrastructure, and energy, emphasizing the enablers that support this transition.

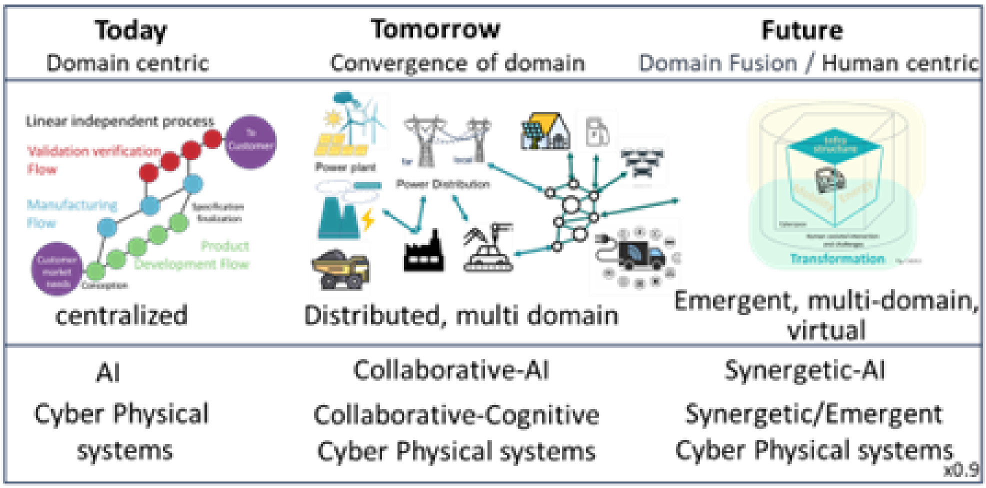


FIGURE 2: COMPLEXITY EVOLUTION BY MULTI DOMAIN REQUIREMENTS

In summary, ***Cynergy4MIE*** will accelerate ecosystem convergence for economies of scale (**O4**) and boost Europe's global competitiveness in the circular economy (**O5**). This will be achieved by designing and deploying minimally invasive sensors for critical nano/microstructures in competitive cyber-physical systems (CPS) (**O1**), integrating AI for coexistence and collaboration in safety-critical contexts (**O2**), and developing digital assets and emergent AI to enhance operational efficiency (**O3**):

Objective 1: *Cynergy4MIE* will design and deploy minimum- invasive sensors for critical nano/microstructures in competitive CPS, spanning multi-modal measurements, nano sensor advancement, in-situ testing, mm-wave sensor design, electromagnetic coupling materials, safe torque sensing, and e-motor development.

Objective 2: ***Cynergy4MIE*** **will build-in AI for coexistence & collaboration CPS in safety critical contexts.** Focusing on edge AI, leveraged learning, co-existence & emergence, human-robot collaboration, decentralized control of multi-agent systems, robot-robot collaboration, environmental interactions, safety, and formal verification, it strives for breakthroughs in collaborative manufacturing.

Objective 3: ***Cynergy4MIE*** **will aim to build digital assets & emergent AI for efficiency in operation.** Towards this direction, ***Cynergy4MIE*** aims to design and deliver an open Edge AI continuum platform for SoS.

Objective 4: ***Cynergy4MIE*** **will accelerate convergence in ecosystems for economy of scale.** ***Cynergy4MIE*** will achieve synergy through CPS that leads to economic benefits for businesses as well as society. By optimizing the use of energy and resources, reducing waste, and improving efficiency and safety, CPS can help drive innovation, create new business opportunities, and foster economic growth and development.

Objective 5: ***Cynergy4MIE*** **will support global competitiveness for Europe´s circular economy.** ***Cynergy4MIE*** will implement best practices, methodologies and procedures applied in EU industrial ecosystems to facilitate synergies based on circular economy principles aiming at advancing global competitiveness and resilience.

2.2.2 Cynergy4MIE Expected Outcome

The expected results of ***Cynergy4MIE*** are outlined in **22 demonstrators** (as shown in Figure 3, which illustrates how they address the four key MIE challenges) implemented across **five Supply Chains** (summarized in Table 2).

- **SC1** focuses on AI-enabled cooperative operations for machinery and transport applications in adverse weather conditions.
- **SC2** will develop novel human-robot interaction technologies for constructing low-emission buildings.
- **SC3** aims to create innovative minimally invasive sensors to enhance electric powertrain capabilities.
- **SC4** will provide solutions for efficient, safe, and inclusive collaborative automated future mobility.
- **SC5** is dedicated to improving efficiency in Search and Rescue (SAR) missions and energy distribution through cooperative multi-agent systems.
- Finally, **SC6** will explore methods to manage the complexity, affordability, trustworthiness, and reliability of the software used across all Systems of Systems.

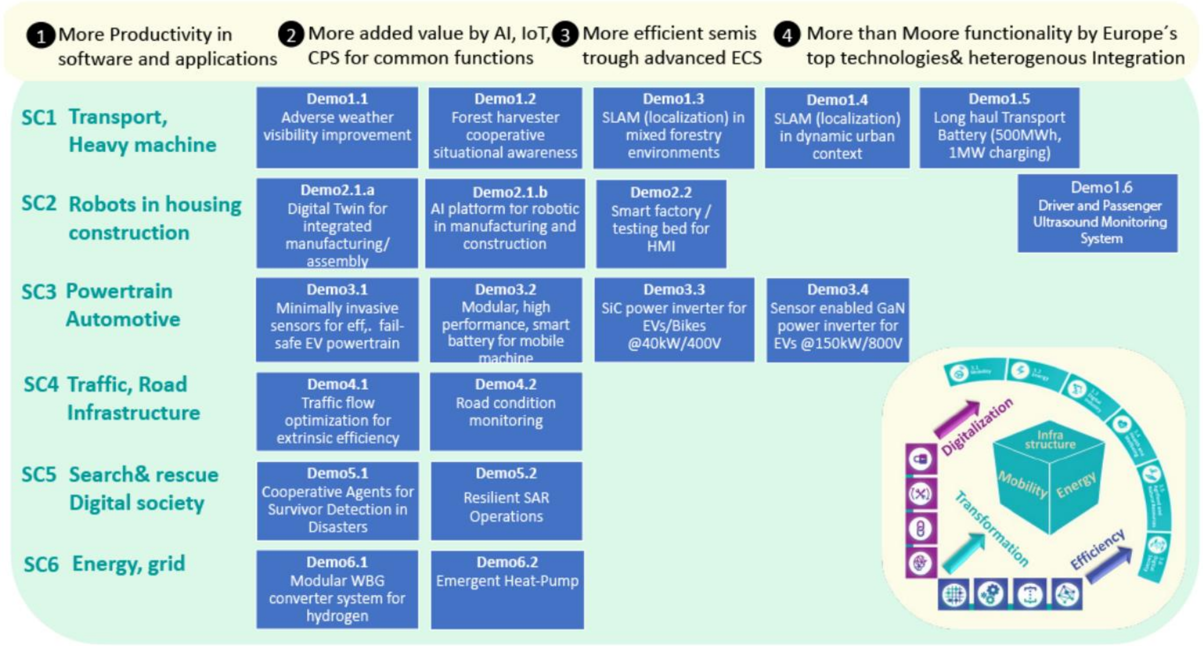


FIGURE 3: SC DEMONSTRATORS & 4 KEY MIE CHALLENGES

Table 2 summarises the main information per SC.

TABLE 2: CYNERGY4MIE SUPPLY CHAINS AT A GLANCE

Short Name	*Supply Chain Name*	*Partners*	*Key offering*
SC1	All-Weather Automated Machinery and Transportation	**VTT**, GIM, MEV, MURATA, VAISTO	Enhancement of performance, safety, and efficiency of automated machinery and transportation in all weather conditions
SC2	Digital manufacturing, robotics, and AI for the construction of low-emission buildings	GRO, THRO, IMA, NXP-NL, VER, BUT, UNEV	Inclusiveness of robots and workers in order to approve manufacturing processes
SC3	Precise measurements for efficient, reliable and safe electric powertrains in transportation	**BUT**, AVL, IFAT, ST-I, BELGAN[2], ZF, EDI, FAU, I&M, SAL, VER, TU/e, TUG	Improvement of existing components and develop substantially new ones using novel multi-physics sensors
SC4	Emergent Automated Driving Systems for extrinsic efficiency in mobility	**AVL**, VIF, TUG, IFAT, IOTAM, FHG, XENOMATIX, DRIVEU, TUD, TAAT	Advance Vehicle-to-Everything (V2X) communication, Artificial Intelligence (AI), and Advanced Driver Assistance Systems (ADAS).
SC5	Multi-agent and Cooperative Sensing & Control in Emergency Response Applications	**VIF**, IFAT, AVL, INSAR, KFU, KTH, DRIVEU, MEDISYS, POLITO, SAT, STRIKERSOFT	Realisation of multi-agent and Cooperative Sensing & Control in Emergency Response Applications
SC6	ECS for energy efficiency and distributed intelligent control	**PRODRIVE,** TU/e, ITRI, RECHI	Application of WBG semiconductor technology for energy efficient production and consumption of hydrogen and collaborative energy management systems

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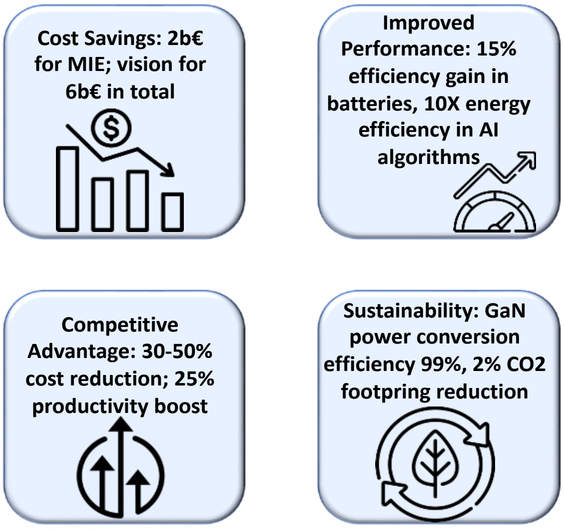
[2] BELGAN is in the process of leaving the Cynergy4MIE consortium.

			for heat pump systems for heating and cooling.

2.2.3 Cynergy4MIE – Key Impacts

The technological readiness levels across various Supply Chains differ based on their goals and initial readiness. ***Cynergy4MIE*** 's Supply Chains (SCs) are focused on reaching results around TRL 4. ***Cynergy4MIE*** strives to align closely with the objectives outlined in the ECS-SRIA. ***Cynergy4MIE*** 's efforts are organized within these Supply Chains, as previously mentioned.

All six Supply Chains make substantial contributions to key challenges, particularly in foundational technology layers such as components, models, and system integration. They drive innovative advancements in areas like SiC/GaN technologies, sensors and quantum sensors, micro-manufacturing in Cyber-Physical Systems (CPS), and emerging AI applications.

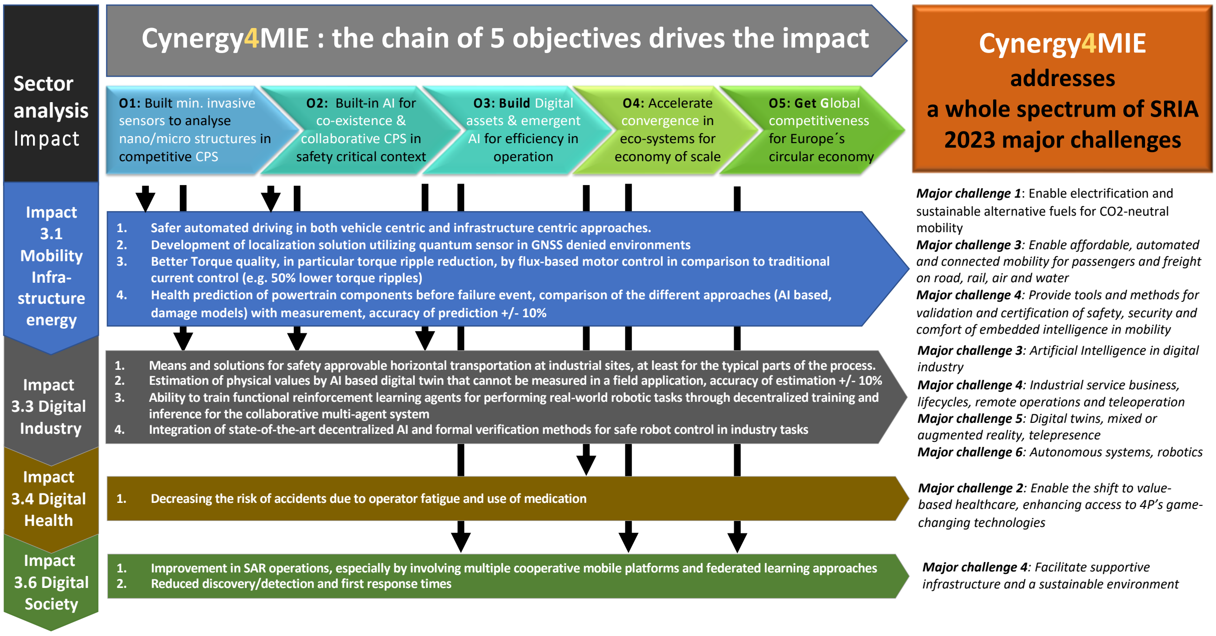


Cynergy4MIE will integrate, validate, and verify the achievements of various Supply Chains. Supply Chain demonstrators will address and cover the specific needs of multiple key application areas showcasing the generality and wide applicability of the developed platform towards Society5.0, aiming at significant impact in four complementary pillars (Figure on the right).

1. Cost savings: Synergistic technologies such as SiC and GaN enhance energy efficiency, minimize waste, and boost component durability, leading to reduced production costs. By leveraging human-machine collaboration, manufacturing processes can be optimized, further decreasing production time and expenses. ***Cynergy4MIE*** aims to achieve a **1% energy savings** and plans to directly apply its solutions in the transport, mobility, and industrial infrastructure sectors.

2. Improved performance: The adoption of innovative sensor technologies, including quantum and mm-wave sensors, enhances the performance and efficiency of products, resulting in improved e-motor and battery system efficiency. This advancement also contributes to saving critical materials used in batteries, thereby strengthening Europe’s supply chain resilience. Within this framework, Cynergy4MIE aims to advance battery technology by implementing power-efficient AI systems for error-proofing that consume less than 5 watts, achieving 10X better efficiency compared to current commercial off-the-shelf (COTS) solutions, bolstering sustainability.

3. Competitive advantage: By harnessing synergistic technologies and human-machine collaboration, European companies will achieve a competitive edge in the global market, leading to increased market share and profitability. In this context, ***Cynergy4MIE*** envisions revolutionizing software development through formal verification, targeting a **cost reduction of 30-50%.** The initiative will focus on innovations in low-code solutions and system-of-systems architecture, while also enhancing sensors, human-machine interfaces (HMIs), and software to drive a **25% productivity boost** across the entire value chain.



Impact 3.1 Mobility Infra-structure energy:

1. Safer automated driving in both vehicle centric and infrastructure centric approaches.
2. Development of localization solution utilizing quantum sensor in GNSS denied environments
3. Better Torque quality, in particular torque ripple reduction, by flux-based motor control in comparison to traditional current control (e.g. 50% lower torque ripples)
4. Health prediction of powertrain components before failure event, comparison of the different approaches (AI based, damage models) with measurement, accuracy of prediction +/- 10%

Major challenge 1: Enable electrification and sustainable alternative fuels for CO2-neutral mobility
Major challenge 3: *Enable affordable, automated and connected mobility for passengers and freight on road, rail, air and water*
Major challenge 4: *Provide tools and methods for validation and certification of safety, security and comfort of embedded intelligence in mobility*

Impact 3.3 Digital Industry:

1. Means and solutions for safety approvable horizontal transportation at industrial sites, at least for the typical parts of the process.
2. Estimation of physical values by AI based digital twin that cannot be measured in a field application, accuracy of estimation +/- 10%
3. Ability to train functional reinforcement learning agents for performing real-world robotic tasks through decentralized training and inference for the collaborative multi-agent system
4. Integration of state-of-the-art decentralized AI and formal verification methods for safe robot control in industry tasks

Major challenge 3: *Artificial Intelligence in digital industry*
Major challenge 4: *Industrial service business, lifecycles, remote operations and teleoperation*
Major challenge 5: *Digital twins, mixed or augmented reality, telepresence*
Major challenge 6: *Autonomous systems, robotics*

Impact 3.4 Digital Health:

1. Decreasing the risk of accidents due to operator fatigue and use of medication

Major challenge 2: *Enable the shift to value-based healthcare, enhancing access to 4P's game-changing technologies*

Impact 3.6 Digital Society:

1. Improvement in SAR operations, especially by involving multiple cooperative mobile platforms and federated learning approaches
2. Reduced discovery/detection and first response times

Major challenge 4: *Facilitate supportive infrastructure and a sustainable environment*

FIGURE 4: CYNERGY4MIE - 5 OBJECTIVES TO DRIVE THE IMPACT

4. Sustainability: The integration of emerging technologies such as SiC and GaN, along with human-machine collaboration, will foster a more sustainable production process by reducing waste and energy consumption. ***Cynergy4MIE*** aims to enhance energy efficiency in bulk converter systems, electrolysers, and fuel cells, improving efficiency from around **95% to over 97%.** Additionally, GaN power conversion efficiency is expected to rise from the current state-of-the-art **95-96% to 98.5%-99%** using proposed techniques. This effort will also contribute to a CO2 footprint reduction, estimated at 2% for specific applications utilizing SiC or GaN-based power converters.

Cynergy4MIE aims to build on the project's "stack of synergy" to create significant impacts along the value chain in the targeted sectors of Mobility, Digital Industry, and Energy. This will be driven by the ECS foundational layer, the ECS cross-sectional layers, and the fundamental functions and applications layers.

Figure 4 demonstrates the links between the project's chain of 5 objectives and how these drive the impact with respect to specific SRIA major challenges.

2.3 Legal Documents

The legal documents, *i.e.* Project Grant Agreement (PGA), National Grant Agreement (NGA, if applicable), Project Consortium Agreement (PCA), as well as this Project Handbook (PH) form the basis for the management of the ***Cynergy4MIE*** project. In case of any conflicts, the rules defined in the GA overrule any rules or recommended practices in the CA and/or PH. The CA only concerns the consortium internal obligations, while the PH complements the legal documents by defining and describing the overall project management process, rules and tools applied during the project execution. The PH is providing guidelines for the day-to-day execution of the ***Cynergy4MIE*** project from the management point of view. In particular, the PH is relevant for the administrative bodies in the project. Finally, the PH is supporting the Description of Action (Annex 1) of the PGA.

3 Management Bodies and their Roles

3.1 Organizational Structure

To achieve the project objectives in a timely manner the project organization was carefully selected so that responsibilities are spread among different bodies and experts. The tracking of the corresponding project progress is ensured by the definition of project deliverables and milestones to be achieved during the three years of ***Cynergy4MIE***. For the monitoring of project progress the following bodies are established:

- General Assembly (GA)
- Project Coordinator (PC)
- Project Management Team (PMT)
- Work Package Management Team (WPMT)
- Supply Chain Management Team (SCMT)
- Country Coordinators (CC)

The legal basis for the ***Cynergie4MIE*** management structure will be the PGA and PCA, defining the rules and regulations.

All defined bodies interact with each other on certain levels. Therefore, the management works on different levels:

- **Strategic level:** The GA decides about the overall strategy and major issues concerning the PCA, such as partner fluctuations.
- **Technical and operational level:** The PC, Supply Chain Leaders and Technical Experts are coordinating all technical activities and ensure qualitatively high results.
- **Day-to-day project operation:** The PC together with the PMT are responsible to take care of everyday project activities.

The CC are responsible for overseeing the national interests and to build the bridge between the project and the national funding authorities. By project definition, the SCMT is responsible for the technical execution of the project by defining, developing, deploying and demonstrating the project goals and results for SC1-SC6. The WPMT is responsible for overseeing the advancement of the activities and timely deliverable of Work Package specific results, i.e., the Work Package 1 is responsible for coordinating the gathering and consolidation of the requirements and specifications for the demonstrators and corresponding use cases for each SC (see also Figure 6). In addition, the PC and WPMT are managing the use of resources of the beneficiaries in the project.

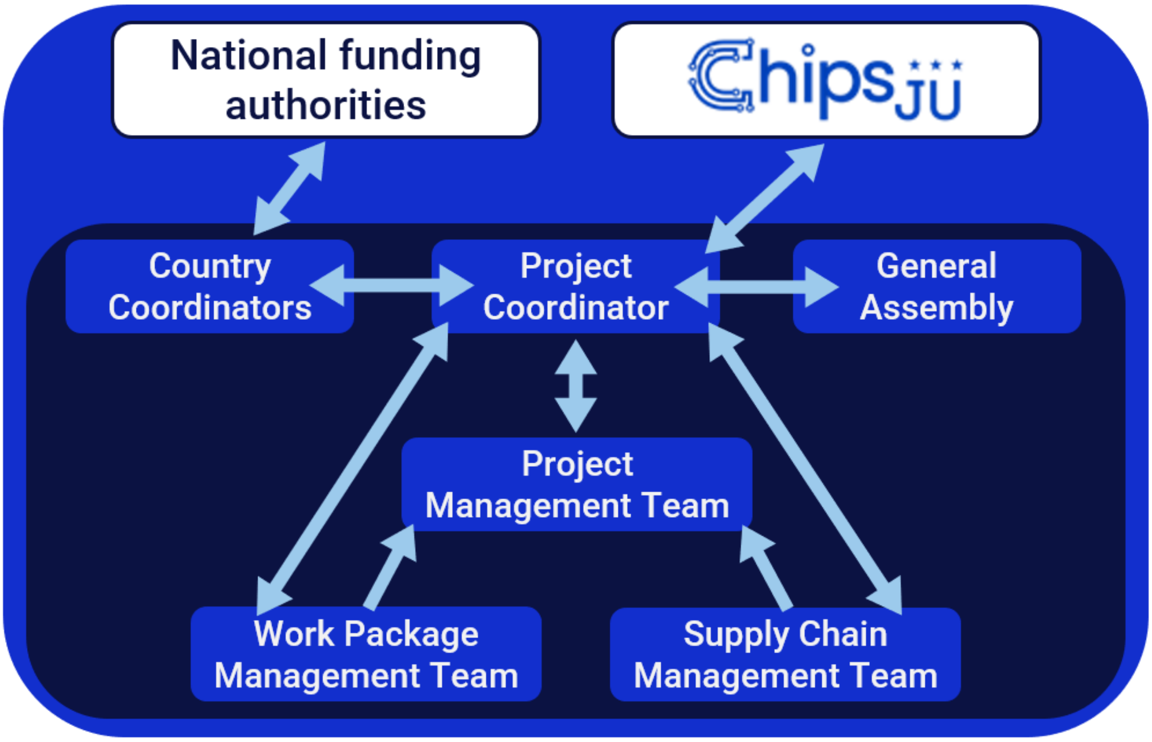


FIGURE 5: CYNERGY4MIE PROJECT MANAGEMENT STRUCTURE

3.1.1 Cynergy4MIE Supply Chains & Work Packages

To achieve the complex and ambitious vision of ***Cynergy4MIE***, its objectives with the related KPI´s and Key Targets (KTs) should be realized in a very structured way. For this purpose, ***Cynergy4MIE*** is using an already proven and stable matrix structure as presented in Figure 6.

The matrix structure is defined through the so-called Supply Chains (SCs). A SC clusters common research topics according to the application area by the industry in which the SC partners are working in. In this sense, SC1, SC3-SC5 are mainly contributing to Mobility, SC2 to Infrastructure (Digital Industry) and SC6 is contributing to Energy topics. This leads to numerous combined results (i.e., Demonstrators) for each specific industry with its particular background. The Work Packages are aligned horizontally and are the connection between the different SCs. The WPs reflect the classical V-cycle that facilitates the exchange across the SCs (see also Figure 7 in section 3.5 of this handbook). The exchange is controlled via Tasks that are assigned to all required SCs so that the completion of the WP objective is assured.

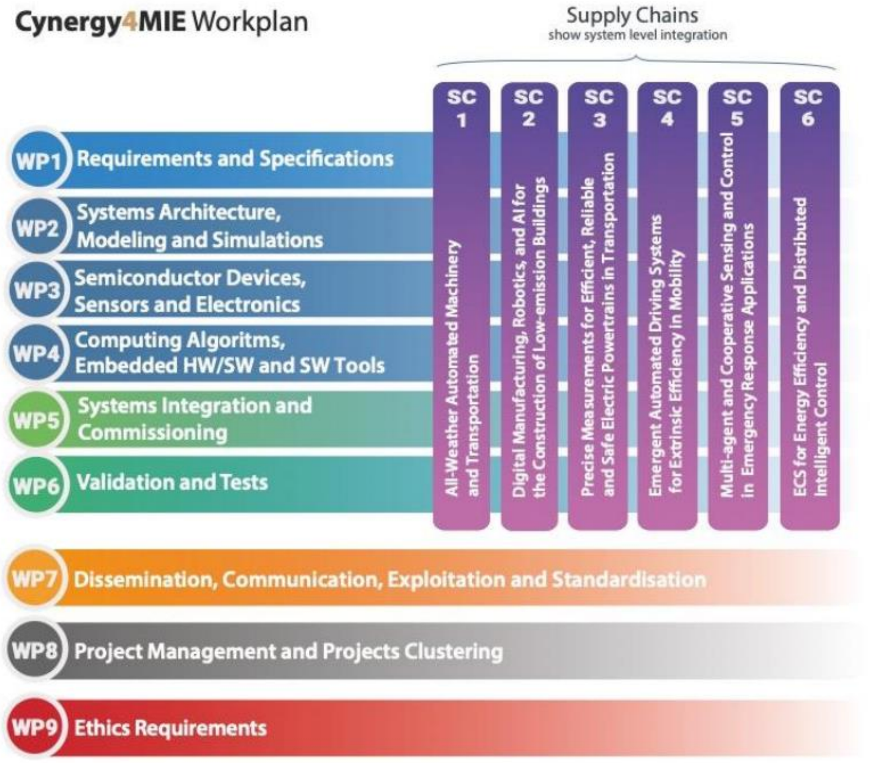


Figure 6: Cynergy4MIE Matrix Structure

3.2 Summary of Project Management Activities

In summary, the project management is bound to the following activities:

- Coordination of the scientific and technical activities of the project at the consortium level.
- Ensuring timely provision of high-quality project results and their further exploitation.
- Ensuring a smooth day-to-day operation of the project.
- Support an efficient financial and administrative execution.
- Provision of decision making, quality control and conflict resolution mechanisms to enable a smooth evolution of the project.
- Provide a platform enabling smooth communication and data exchange between the consortium members.
- Overseeing, coordinating and implementing any changes regarding activities and the consortium.
- Liaison with Chips JU, national authorities and other projects.
- Presenting the project at the regular and final review meetings.

The ***Cynergy4MIE*** partners agree that all issues concerning a successful implementation of the project that are not covered by the PGA are included in the principles of the project's management. These principles are formalized in the PCA.

The defined management structure and its principles are necessary to make timely decisions about potential project bottle necks and to avoid potentially biased views.

3.3 Management Bodies and Procedures

Regarding the before defined organizational structure the detailed roles of the different bodies are explained in the following:

3.3.1 Project Coordinator (PC)

The Project Coordinator (PC) of ***Cynergy4MIE*** – AVL List GmbH – is the legal entity that is responsible for the appropriate, timely and efficient execution of the ***Cynergy4MIE*** project. Besides its responsibilities as a beneficiary, the PC is responsible for the tasks assigned to it within the PGA and PCA. Generally, the project management and its activities in ***Cynergy4MIE*** are laid out in WP8.

AVL as the PC has the following basic responsibilities:

- Organiser, chair and secretary of GA meetings
- Responsible for the execution of GA decisions
- Communication with the Chips JU office
- Liaison with other projects and organisations outside of ***Cynergy4MIE***
- Day-to-day management of the project

In detail the PC is performing the following tasks during the project:

- Ensuring overall project coordination with timely execution, with the aim to meet the project objectives.
- Regular contact with the project partners.
- Encourage and maintain technical and scientific collaboration between the partners within the Work Packages as well as Supply Chains so that the project goals and deliverables are met in time.
- Organisation and chairmanship for the different project management bodies (i.e., GA, PMT, etc.).
- Monitoring of the beneficiary activities and their compliance with the obligations set forth in the PGA and PCA.
- Management of the PGA and its changes over time.
- Implementation of changes to the PGA, e.g., changes in the technical description of work, termination of parting partners, on-boarding and inclusion of new project partners etc.
- Management of the funds and distribution according to the PGA and PCA.
- Collection, consolidation and submission of project related reports and deliverables to the Chips JU.
- Provide an interface with the Program Officer (PO) assigned by the Chips JU.
- Organise and be the main representative of the consortium for the annual project review held by the Chips JU and the assigned project reviewers, including collection and consolidation of the periodic report, preparation of review documentation, advisory for the use of resources.
- Constant discussion with the PMT about the day-to-day operations in the project, risk assessment and definition of mitigation measures to prevent major project delays.
- Provide a platform for information, data and documentation sharing between the partner organisations.

3.3.2 General Assembly (GA)

The GA is structured as follows:

- **Participants:** Project Coordinator and one authorized representative from each partner organisation
- **Chair:** Project Coordinator
- **Periodic meetings:** At least once a year or upon request by a participant

The GA consists of the representatives from all consortium partners including the PC. The GA is the highest decision making and conciliation body within the ***Cynergy4MIE*** project. It shall provide a platform where all partners are attending, discussing and deciding about actions required to be taken regarding strategic aspects on scientific issues as well as potential project management issues within the project.

The GA meets regularly once a year, starting with the project kick-off and the PC is chairing those meetings. In unusual circumstances and upon request by any PMT member, additional GA meetings can be organized between the regular ones. However, a reasonable justification by the requesting party has to be presented to the PC, PMT as well as to the GA and the organisation of an irregular GA meeting has to be subject to a voting decision.

The GA is addressing any scientific, management, contractual and financial issues. In this sense, any high impact changes to the project are made within the GA. Examples may be changes in the consortium (be it partner termination or inclusion), changes in the Work Package and/or Supply Chain structure and content.

Decisions that are made based on a voting, have a positive result in case of a 2/3 majority vote in favour of the proposed action.

3.3.3 Project Management Team (PMT)

The PMT is structured as follows:

- **Participants:** Project Coordinator, Work Package Leaders, Supply Chain Leaders, Selected Experts
- **Chair:** Project Coordinator
- **Periodic meeting:** Monthly

The Project Management Team consists of the PC, WP and SC leaders and any additional project member with special expertise that is significantly supporting the management of the ***Cynergy4MIE*** project. The PMT is responsible for constant monitoring of project progress, risk assessment and definition of risk mitigation measures. Within the PMT potential project changes with respect to the technical description of work or beneficiary changes are discussed. With respect to the above-mentioned responsibilities the PMT is also responsible to take decisions about those matters. Following that, the PMT with the PC as their head consults with the GA about the decision to take final decisions based on the opinion of all partners in the consortium. In this way a transparent and smooth execution of the project is possible.

PMT activities during the project:

- Periodic discussion and alignment regarding project progress and timely execution of project tasks.
- Risk assessment and risk mitigation measure definition for timely execution of the project.
- Discussion and decision making about requested and/or required changes in the description of work of the project or the termination and/or addition of project partners.

- Support the PC with the organisation of project wide events and representation of the GA at those events (e.g., GA, review meetings, etc.).
- Management of technical and scientific collaboration between the partners within the Work Packages as well as Supply Chains so that the project goals and deliverables are met in time.
- Support the PC with appropriate and timely delivery of project Deliverables and Reports to the Chips JU.
- Analyse scientific results from all Work Packages as well as Supply Chains and make recommendations for new scientific tasks and collaborations and for best exploitation of results inside and outside the project.

3.3.4 Work Package Management Teams (WPMT)

The WPMT is structured as follows:

- **Participants:** 1 WP leader plus Task leaders
- **Chair:** WP leader
- **Periodic meetings:** Monthly

In ***Cynergy4MIE*** the WPMTs are responsible for the organization, coordination and consolidation of the technical development from all relevant Supply Chains within the specified timeframe of the respective Work Package (see also Table 7: Work Package Details) in the project. This means that the WPMTs are responsible for the timely provision of results that are required for a successful conclusion of Work Package related tasks, fulfilment of the Work Package objectives and the corresponding consolidation of results into project Deliverables. The task leaders are reporting their achievements to the WP leaders. The WP leaders report to the PMT. In the PMT, the WP leader reports the Work Package progress to the PC.

3.3.5 Supply Chain Management Team (SCMT)

The SCMT is structured as follows:

- **Participants:** 1 SC leader plus Demonstrator leaders
- **Chair:** SC leader
- **Periodic meetings:** Monthly

For the timely provision of results, the SCMT follows the proposed timeline of the ***Cynergy4MIE*** project execution plan in periodic meetings. In the SCMT meetings, the SC- and demonstrator leaders align on the status and make sure that the project timeline is met. Any potential risks are identified and mitigated on time. The SC leader reports to the PMT. In the PMT, the SC leader reports the supply chain progress to the PC.

3.3.6 Country Coordinators (CC)

Country Coordinators oversee the national interests and keep the project in touch with the national funding organizations, see Figure 5.

- **Composition:** Project Coordinator, one authorized representative from each country (Country Coordinator)
- **Chair:** Country Coordinator

- **Periodic meetings:** At least once a year or upon request by participant

The Country Coordinators keep the contact between the PC and the national funding agencies. Thus, they play an important role, for instance when partners enter or leave the consortium, or in the quality control and reporting with respect to the national funding authorities. Each of the numerous countries represented in the ***Cynergy4MIE*** project sends one representative to the group of Country Coordinators.

Task list:

- Liaison to national funding authorities.
- Manage national partner changes.
- Monitor the adherence to national contracts and rules in the project.
- Solve country-specific issues like funding issues, dissemination and reporting.

3.4 Processes for Decision Making

Decision making processes as part of the overall management process should facilitate resolutions of technical and administrative issues and tasks with a minimal overhead in terms of effort and delay, while ensuring fair and impartial treatment of project partners. Escalation of issues to project management bodies that have more participants and convene less frequently should be avoided if possible.

Along the course of the project, IPR issues, non-performance of partners, etc., concerning the success of ***Cynergy4MIE*** could arise. To handle such situations, the following procedures will be undertaken:

- As soon as a project member becomes aware of any issue or problem that could be related to the project, he or she will notify the PC. The PC will bring it to the attention of the GA when necessary, but after first trying to resolve the issue with the help of the partner and/or the CC and/or the WPL. If necessary, a task force either within or discretionally outside the project will be nominated. The problem will be analyzed and solved as soon as possible.
- The PC will be responsible for notifying on the progress of the task force. If no graceful solution can be found, the GA can, by majority vote, take appropriate actions, including the reduction of funds or the exclusion of a partner.

In general, ***Cynergy4MIE*** strives to reach a consensus on technical decisions, which is especially important for work package internal decisions. When consensus decisions are not possible, the WP leader is responsible for escalating the issue without further delay via the Project Coordinator (PC) to the Project Management Team (PMT).

The PMT will make decisions according to the following rules:

- **Decision making: consensus or live voting**
    - The PC may initiate a call for consensus during a meeting and ask for objections.
    - If there are no objections, the consensus can be recorded in the minutes.
    - The PC may alternatively initiate a live voting during a meeting.
    - Other PMT members may initiate a live voting during a meeting.

  - PMT decisions are made on a majority basis. For decision making at least 50% of the PMT members should give a vote.
- **Decision making: electronic voting**
  - The Project Coordinator may initiate an electronic voting (over email) at any time.
  - If anonymous electronic voting is chosen (votes not emailed to all PMT members), the PC keeps records on the votes to allow an oversight to JU.
  - Voting eligibility: all PMT members in attendance are eligible in decision making.
- **Meeting types: face-to-face (F2F) or teleconference (telco)**
  - F2F meetings are done by default alongside GA meetings and project wide events.
  - Teleconferences are done by default every third month.
- **Preparation: the PC announces arrangements and agenda 5 business days prior to the meeting**
  - For F2F meetings, a 10 business days lead time is needed.
  - The announcement is done over the PMT email reflector.
  - Recurring PMT meetings have default arrangements.
  - Other PMT members may also request the PC to set up additional meetings.
  - Other PMT members may suggest a proposal for voting.
  - The announcement of issues likely to result in voting should be mentioned.
  - For complex decisions, the delivery of sufficient materials 5 business days prior to the meeting is strongly recommended.
- **Minutes: the PC is responsible for keeping minutes of all PMT meetings and decisions**
  - The PC must include meeting attendance records.
  - Draft minutes need to be distributed 5 business days after the meeting.
  - The distribution is done over the PMT email list and published via AVL Extranet Cloud, where all partners have access and thus can read the minutes.
  - Minutes need to be approved prior to or at the subsequent PMT meeting.

The GA will make decisions according to the following rules:

- **Decision making: consensus, live voting or electronic voting**
  - The PC may initiate a call for consensus during meeting and ask for objections.
  - If there are no objections, the consensus can be recorded in the minutes.
  - The PC may alternatively initiate a live or electronic voting during a meeting.
  - Other GA member may initiate a live voting during a GA meeting.
  - If anonymous electronic voting is chosen (votes not emailed to all GA members), the PC keeps records on the votes to allow an oversight to JU.

  - Voting eligibility: all project members in attendance are eligible in decision making.
- **Meeting types: face-to-face (F2F) or teleconference (telco) o F2F meetings are done by default once per year**
  - Teleconferences are intended only for urgent decisions.
  - Preparation: the PC announces arrangements and agenda 10 business days prior to the meeting.
  - For F2F meetings, a 1-month lead time is needed.
  - Materials need to be distributed 10 business days prior to meeting.
  - The announcement is done over the project email reflector.
  - The PC prepares meetings together with other PMT members.
- **Minutes: the PC is responsible for keeping minutes of all GA meetings and decisions**
  - The PC must include meeting attendance records.
  - Draft minutes need to be distributed 10 business days after the meeting.
  - The distribution is done over the GA email reflector or project website.
  - Minutes need to be approved prior to or at the subsequent GA meeting.
- **Deliverable submission**
  - The Task leader produces a deliverable "Table of Contents" to the PMT and to the PC two months before the due date (see also section 5.4).
  - PMT members suggest changes to the Task leader. The Task leader produces the deliverable draft to the PMT and to the PC one month before the due date.
  - WP leaders name an internal deliverable reviewer and monitor the review process.
  - WP leaders provide review comments to the Task leader and provide the Deliverable Responsible two weeks before the due date.
  - The Deliverable Responsible modifies the deliverable based on comments.
  - The Task leader provides the final deliverable to the WP leader 5 Working days before the due date.
  - The WP leader provides the final deliverable 3 working days before the due date to the PC, PMT and PC
  - The PC submits the final deliverable to JU.
- **Publication of project results**
  - A WP member identifies the need to publish project content.
  - The WP member drafts the content outline and informs the PC.
  - The PC distributes the proposed outline to all project partners.
  - Project partners indicate any concerns to the PC within two weeks.

  - The PC collects any concerns and anonymously provides them to the WP member.
  - The WP member prepares the publication or press release and sends it to the PC.
  - The PC distributes the proposed publication to all project partners.
  - Project partners indicate any objections to the PC within two weeks.
  - If there are no objections, the PC gives the permission to publish to the WP member.
- **Delay, change of content or technical conflict**
  - A WP member identifies a potential issue and immediately informs the WP leader.
  - WP leaders inform the PC and the PMT and decide together with the PC if the issue must be resolved within the WP or at project level.
  - The PMT may decide on impacts and remedial actions.
  - Otherwise, the PC presents the issue to the PMT.
  - The PMT determines impacts to WPs and remedial actions.
  - Affected WP leaders plan and re-allocate work with the other WP members.
  - The PC reminds the WP leaders of the needed Periodic activity report six weeks before due date.
  - WP leaders prepare and send WP Periodic activity reports two weeks before the due date to the PC.
  - The PC compiles and submits a Summary Periodic activity report to JU one working day before the due date.
- **Defaulting party**
  - Project partners provide a written report to the PC on contract breach.
  - The PC determines the severity of the breach and informs the PMT.
  - The PMT formulates a proposal to the General Assembly to decide on the defaulting party.
  - The General Assembly decides on the defaulting party with a 75% majority.
  - The General Assembly sends a notice to the defaulting party requesting it to remedy the default.
  - If the default is not remedied within one month of notice, the contract is terminated.

It is essential that the participants, especially those involved in the same work packages, communicate on an almost daily basis.

3.5 Work Package Structure

The work plan has been designed according to the widely adopted V-cycle model, see Figure 7. After working out detailed requirements and specifications as well as systems architectures and models in WPs 1 and 2, the main research and implementation work is conducted in WPs 3 and 4 before an integration phase in WP5 and the final validation and verification actions in WP6 are conducted. In parallel and over the whole duration of the project, WPs 7 and 8 cover dissemination, exploitation, communication, standardization, and project management respectively. WP9 covers preparation of ethics requirements.

Besides WPs, ***Cynergy4MIE*** is also structured into SCs, yielding the matrix organization as shown in Figure 6. The idea of SCs is to group research activities around common topics. Put differently, each SC concentrates on the development of one sub-topic addressed by ***Cynergy4MIE***. For doing so, each SC defines specific tasks in WPs of ***Cynergy4MIE***. These tasks will be worked off according to the V-cycle shown in Figure 7. This setup allows "locked, stepwise execution" between SCs and, hence, cross SC synchronization in each phase, e.g., when elaborating requirements or validating the project results with respect to the requirements and KPIs. At the same time, SCs improve the manageability of ***Cynergy4MIE*** as there are defined leaders for each sub-topic, that would not be available in a WP-only structure. Every SC starts with the definition of specifications and requirements derived from the project key targets with respect to the defined KPIs. Next, new technology is researched/developed based on these specifications and requirements. After the development and integration, the integrated (sub) systems are tested to verify their functionalities, and their behavior/performance is compared/validated according to the original specification and requirements. The benefits of this approach were already proved in previous projects, e.g., 3Ccar, AutoDrive, NewControl, AI4CSM or A-IQ Ready.

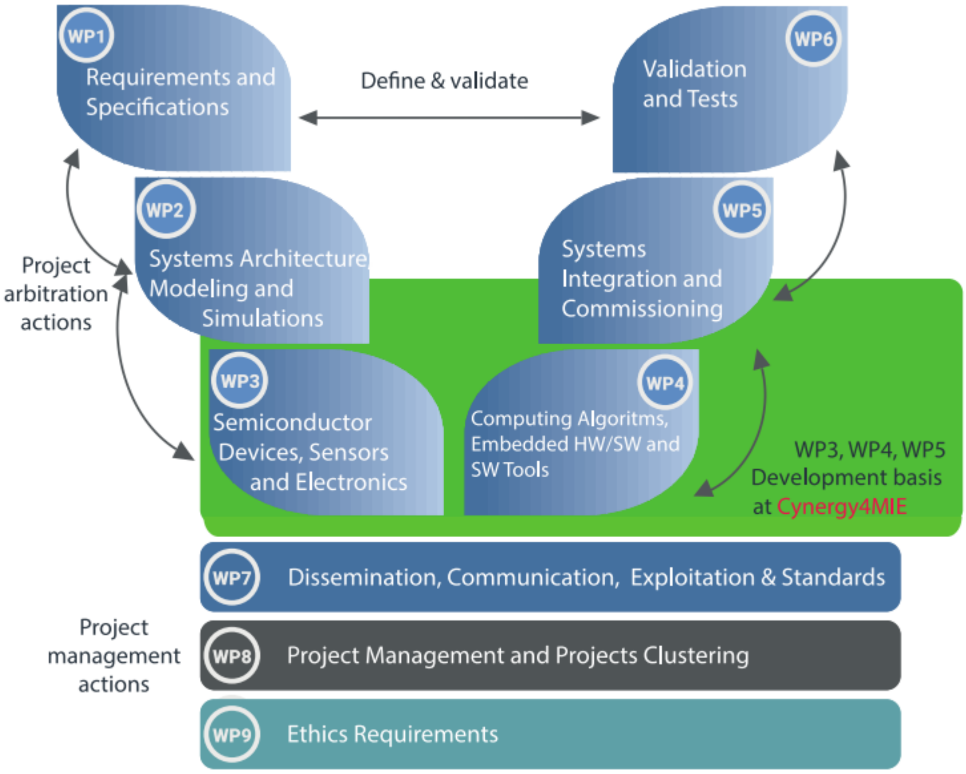


FIGURE 7: CYNERGY4MIE WORK PACKAGES STRUCTURE: V-CYCLE MODEL

Cynergy4MIE comprises 6 SCs dedicated to several automotive and industrial applications of emergent systems based on novel semiconductors solutions. A careful partitioning of work and the definition of clear interfaces between the different Work Packages (WPs) and SCs is required for the success of the ***Cynergy4MIE*** project. As discussed, the ***Cynergy4MIE*** project will provide an approach where WPs represent the R&D domains with a focus on technologies and methodology, while SCs represent real implementation, demonstrators, experimental work, and implementation efforts leading to the integration of the (sub)systems and their verification and validation. The relation of the SCs and the WPs is depicted in Figure 7, whereas the interrelation of the ***Cynergy4MIE*** WPs is shown in Figure 8.

WP1 defines the system requirements as well as the use cases and validation methodologies, also making sure research results of ***Cynergy4MIE*** are aligned with targets set by the Green Deal, Ethics guidelines, and relevant upcoming standards. WP2 is dedicated to analysis and definition of emergent systems architecture as well as their modelling and simulation to obtain early knowledge on systems behavior necessary for individual HW and SW development steps. WP3 is dedicated to development and manufacturing of new components, including novel quantum sensors and related electronic circuits for sensing, signals processing and power-electronics. WP4 will evaluate and design computing platforms and embedded HW/SW necessary for individual SCs. WP4 also includes development and implementation of embedded AI to support emergent behavior of systems in individual SCs as well as other algorithms to be implemented in embedded SW covering control, diagnostics, and fault mitigation in emergent systems as well as qualification related topics linked specially to stress conditions specific for automotive and industrial applications.

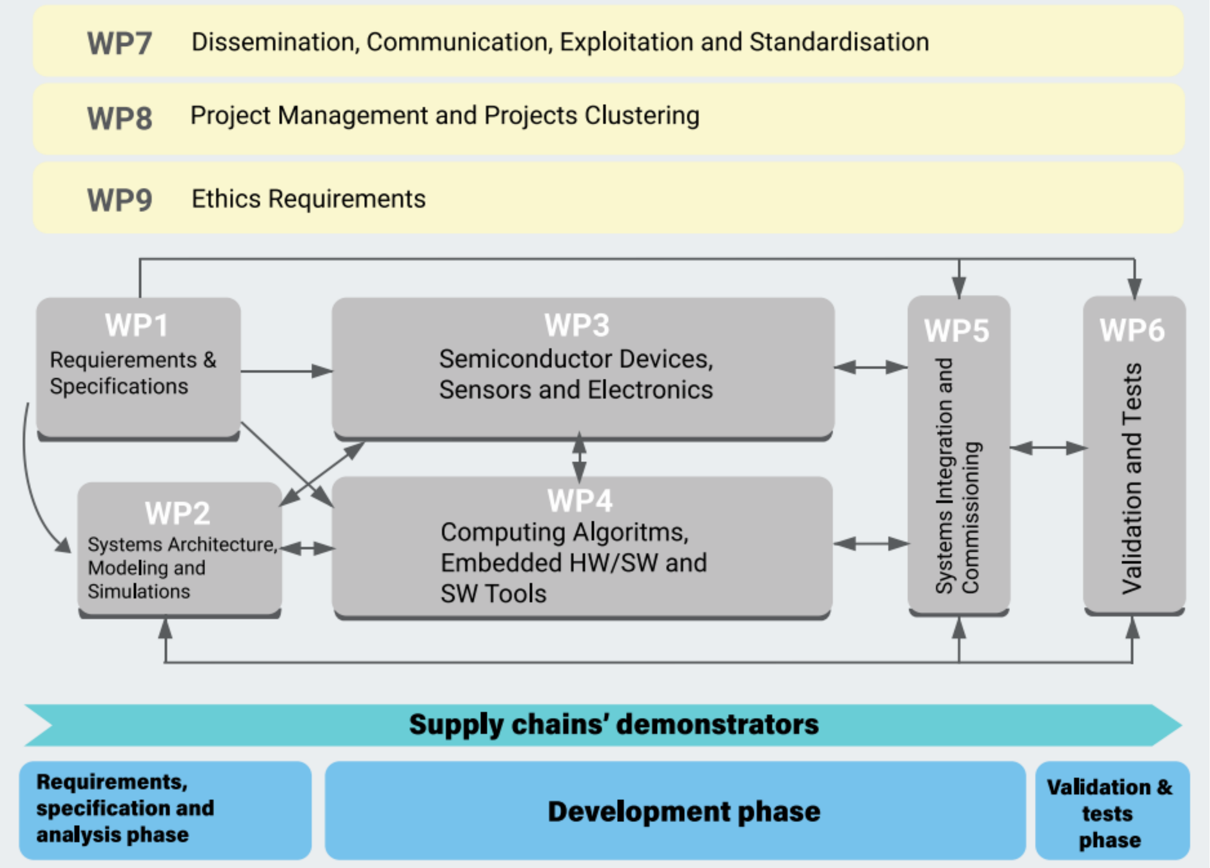


FIGURE 8: CYNERGY4MIE WORK PACKAGES RELATIONS

WP5 cares about the system integration for each supply chain. Outcome of WP5 will be set of commissioned demonstrators ready for in-depth testing. Within the frame of WP6, validation and testing of the SC demonstrators takes place. It focuses on behavior validation of the developed subsystems with the goal to demonstrate the properties, safety, flexibility, and performance of the developed solutions in relation to the requirements defined in WP1. WP7 covers exploitation, dissemination, communication, standardization, and also market trends monitoring to analyse the solutions developed by competitors. WP8 performs the overall project management, including monitoring and all financial & contractual aspects.

4 Management of Communication

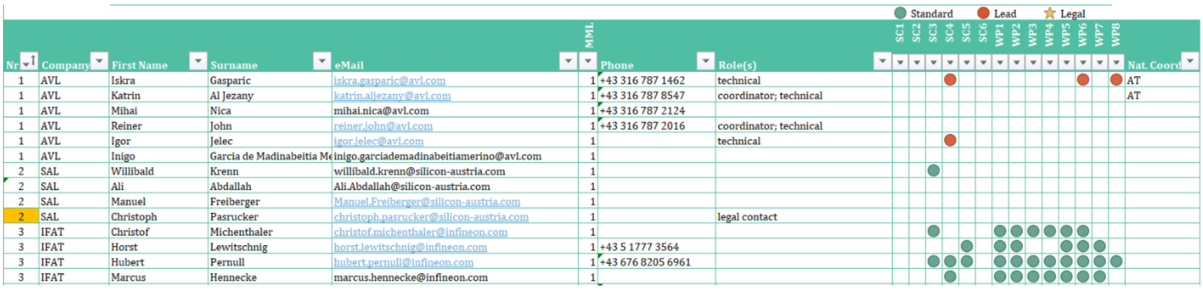
4.1 Project Internal Communication

Effective communication is the key in all complex projects. Project decisions will be taken either at regular or extraordinary meetings, through email or teleconference voting. It is essential that the participants, especially those involved in the same work packages, communicate on a regular basis.

4.1.1 Cynergy4MIE Contact & E-Mail Lists

Mailing and contact lists for efficient communication among project partners were set-up. Part of a Contact/E-Mail list shown in Table 3 as an example.

TABLE 3: CYNERGY4MIE CONTACT & E-MAIL LIST



🟢 Standard 🔴 Lead ☆ Legal

Nr	Company	First Name	Surname	eMail	MML	Phone	Role(s)	SC1	SC2	SC3	SC4	SC5	SC6	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	Nat. Coord
1	AVL	Iskra	Gasparic	iskra.gasparic@avl.com	1	+43 316 787 1462	technical				🔴								🔴		🔴	AT
1	AVL	Katrin	Al Jezany	katrin.aljezany@avl.com	1	+43 316 787 8547	coordinator; technical															AT
1	AVL	Mihai	Nica	mihai.nica@avl.com	1	+43 316 787 2124																
1	AVL	Reiner	John	reiner.john@avl.com	1	+43 316 787 2016	coordinator; technical															
1	AVL	Igor	Jelec	igor.jelec@avl.com	1		technical				🔴											
1	AVL	Inigo	Garcia de Madinabeitia Me	inigo.garciademadinabeitiamerino@avl.com	1																	
2	SAL	Willibald	Krenn	willibald.krenn@silicon-austria.com	1					🟢												
2	SAL	Ali	Abdallah	Ali.Abdallah@silicon-austria.com	1																	
2	SAL	Manuel	Freiberger	Manuel.Freiberger@silicon-austria.com	1																	
2	SAL	Christoph	Pasrucker	christoph.pasrucker@silicon-austria.com	1		legal contact															
3	IFAT	Christof	Michenthaler	christof.michenthaler@infineon.com	1					🟢				🟢	🟢	🟢	🟢	🟢	🟢			
3	IFAT	Horst	Lewitschnig	horst.lewitschnig@infineon.com	1	+43 5 1777 3564						🟢		🟢	🟢			🟢	🟢	🟢		
3	IFAT	Hubert	Pernull	hubert.pernull@infineon.com	1	+43 676 8205 6961				🟢	🟢	🟢		🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	
3	IFAT	Marcus	Hennecke	marcus.hennecke@infineon.com	1						🟢			🟢	🟢	🟢	🟢	🟢	🟢	🟢		

In the ***Cynergy4MIE*** contact & e-mail list, the contact persons are sorted by company. Each company is assigned an individual number and an acronym (a list of project participants can also be found in Section 10.1 of this document). The e-mail address, phone number, project role, supply chain and work package responsibilities/affiliations as well as the information for the national coordination are indicated. The full ***Cynergy4MIE*** contact and e-mail lists can be found on the project SharePoint. Also, for all project members, PMT, Supply Chain Leaders and Work Package Leaders, individual mailing lists will be provided for easier communication processes.

4.1.2 Document management system AVL Extranet Cloud

To facilitate all project-internal communication, a centralized document management system based on AVL Extranet Cloud was set up and will be maintained throughout the project duration. All participants in the contact list (see Section 4.1.1) have received login data to the ***Cynergy4MIE*** cloud. The use of AVL Extranet Cloud is very intuitive and straight forward. Basically, there are two modes for the use of the document system – using an internet browser or using a desktop client.

4.1.2.1 AVL Extranet Cloud – use with an internet browser

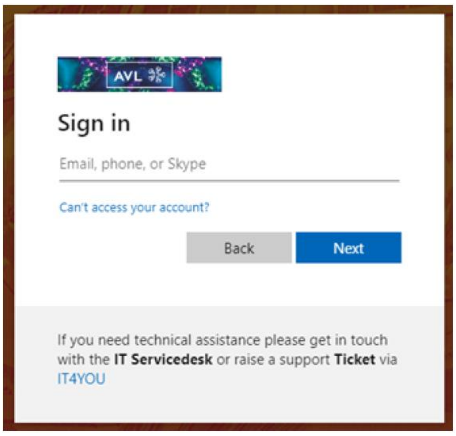
4.1.2.1.1 Sign In to AVL Extranet Cloud

The use of AVL Extranet Cloud is very intuitive and straight forward:

First, start the browser and enter the AVL Extranet Cloud URL.

AVL Extranet Cloud – Home (sharepoint.com)

Then, please Sign In with the email address you were invited by your AVL contact person. You will be redirected to a login window.



If you need technical assistance please get in touch with the **IT Servicedesk** or raise a support **Ticket** via IT4YOU

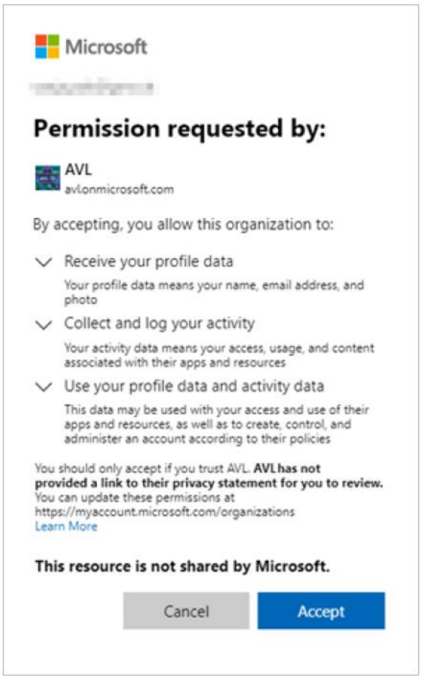
FIGURE 9: AVL EXTRANET CLOUD – SIGN IN WINDOW

Enter your email address. If your account is a Microsoft account or a Microsoft 365 account use your corresponding password. Otherwise, you will receive a one-time password by email for login.

PLEASE NOTE:

These are not the same credentials as you are using for the former AVL Extranet (projects.avl.com).

At your first login you have to accept the Terms & Conditions of avl.sharepoint.com and to register for the 2-step authentication at AVL (please see **Activation of 2-step Authentication**).



[redacted]

Permission requested by:

AVL
avl.onmicrosoft.com

By accepting, you allow this organization to:

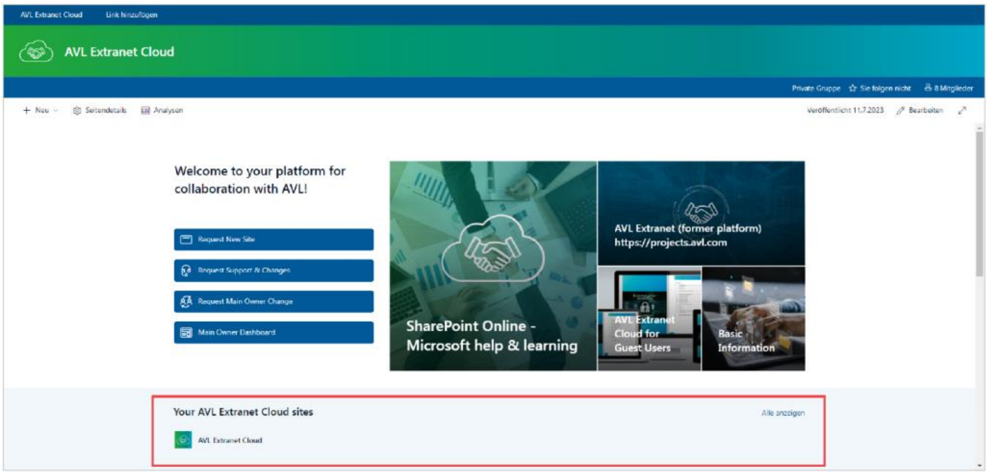
- Receive your profile data
  Your profile data means your name, email address, and photo
- Collect and log your activity
  Your activity data means your access, usage, and content associated with their apps and resources
- Use your profile data and activity data
  This data may be used with your access and use of their apps and resources, as well as to create, control, and administer an account according to their policies

You should only accept if you trust AVL. **AVL has not provided a link to their privacy statement for you to review.** You can update these permissions at https://myaccount.microsoft.com/organizations
Learn More

This resource is not shared by Microsoft.

FIGURE 10: ACCEPTANCE WINDOW FOR TERMS AND CONDITIONS OF AVL EXTRANET CLOUD

After the successful login you will be redirected to the AVL Extranet Cloud start page automatically. The section Your AVL Extranet Cloud sites shows a list of all sites you have access to.



Welcome to your platform for collaboration with AVL!

FIGURE 11: AVL EXTRANET CLOUD – WELCOME WINDOW

Click on the title of any AVL Extranet Cloud site to open it. The folder structure of the ***Cynergy4MIE*** project is shown in Figure 12.

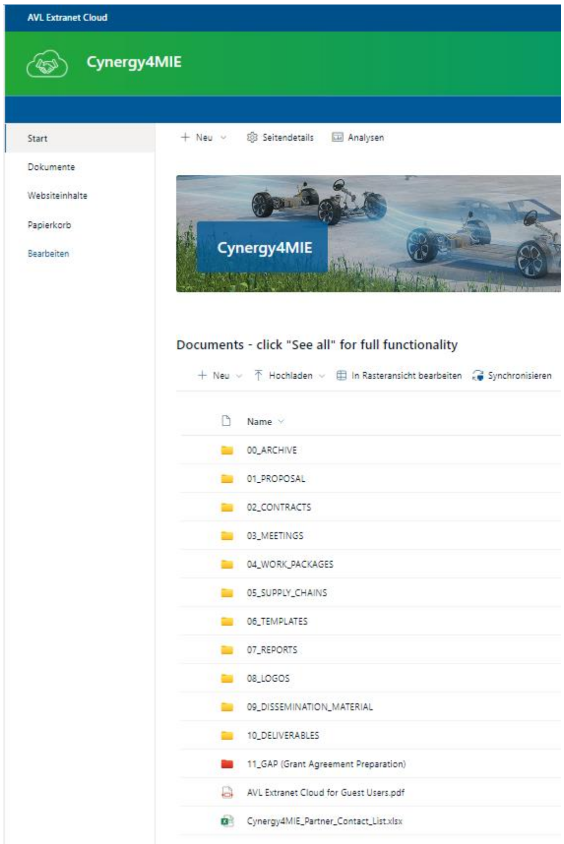
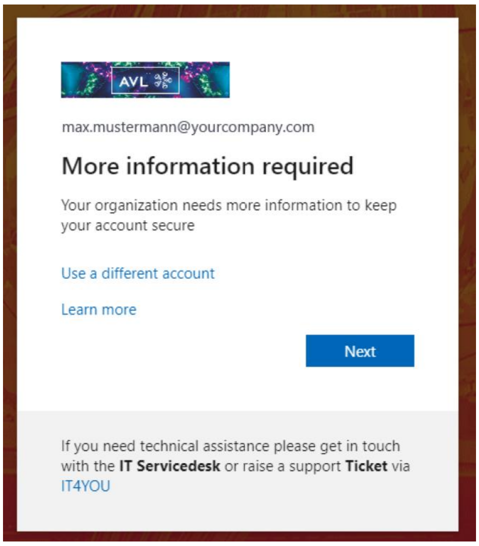


FIGURE 12: AVL EXTRANET CLOUD – CYNERGY4MIE FOLDER STRUCTURE

4.1.2.1.2 Activation of 2-step Authentication at AVL

To access the AVL Extranet Cloud and its sites (URL starting with https://avl.sharepoint.com/sites/ext …) you have to activate the 2-step authentication at AVL for your account. Please follow this guide to activate it. At your first login an information box will pop up informing you that more information is required to access the AVL Extranet Cloud.



AVL

max.mustermann@yourcompany.com

More information required

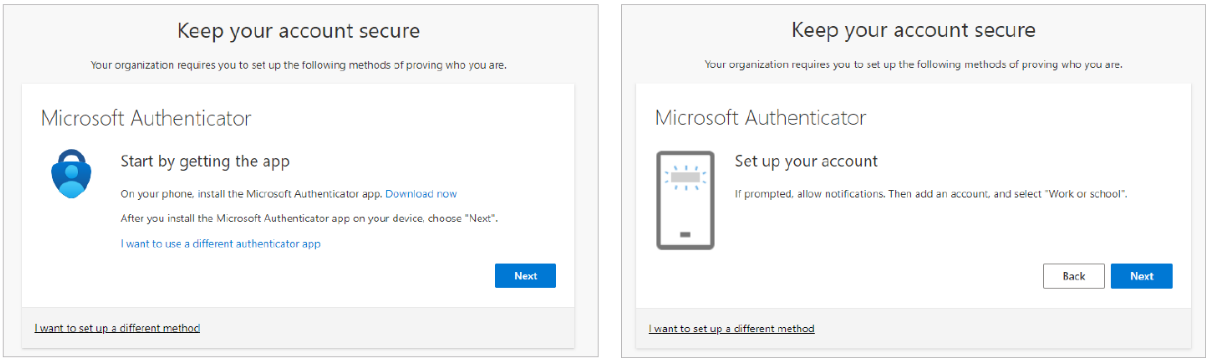
Your organization needs more information to keep your account secure

If you need technical assistance please get in touch with the **IT Servicedesk** or raise a support **Ticket** via IT4YOU

FIGURE 13: AVL EXTRANET CLOUD – INFORMATION BOX FOR 2 STEP AUTHENTICATION

Please click on Next.

Follow the steps to activate the 2-step authentication for your account at AVL (Extranet Cloud).



Keep your account secure

Your organization requires you to set up the following methods of proving who you are.

Microsoft Authenticator

Start by getting the app

On your phone, install the Microsoft Authenticator app. Download now

After you install the Microsoft Authenticator app on your device, choose "Next".

Keep your account secure

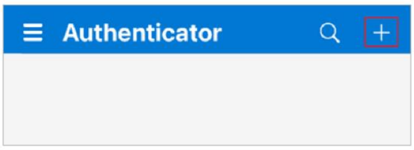
Your organization requires you to set up the following methods of proving who you are.

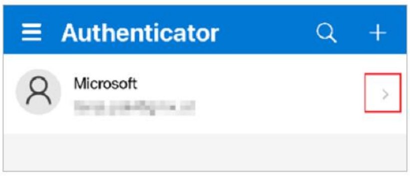
Microsoft Authenticator

Set up your account

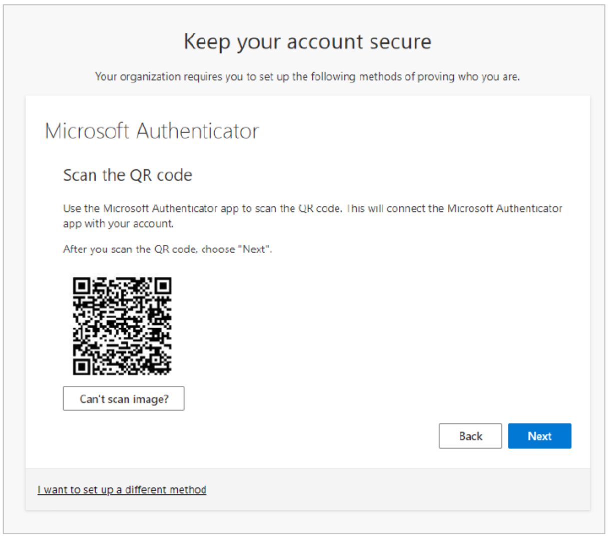
If prompted, allow notifications. Then add an account, and select "Work or school".

FIGURE 14: AVL EXTRANET CLOUD – ACCOUNT SECURITY





[redacted]



Keep your account secure

Your organization requires you to set up the following methods of proving who you are.

Microsoft Authenticator

Scan the QR code

Use the Microsoft Authenticator app to scan the QR code. This will connect the Microsoft Authenticator app with your account.

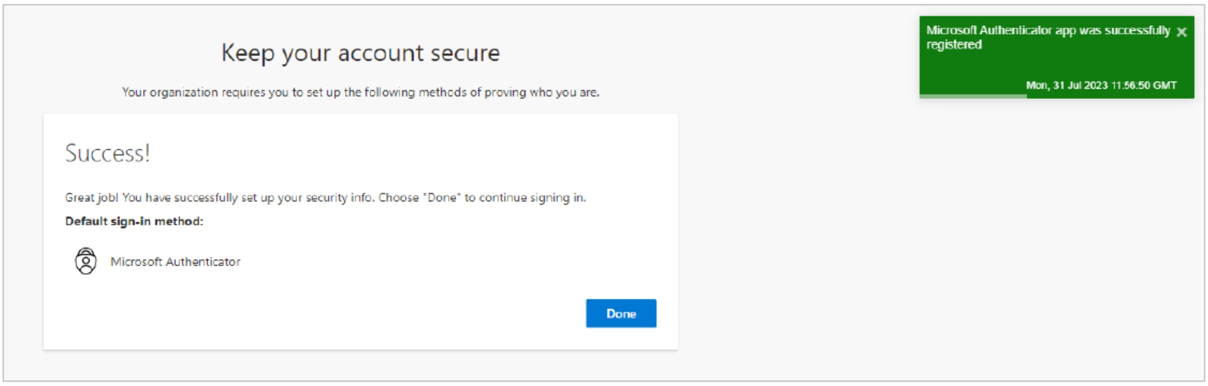
After you scan the QR code, choose "Next".

FIGURE 15: AVL EXTRANET CLOUD – ACCOUNT SECURITY

Please open the app on your mobile phone after installing it and click on „+“ on the top right corner and select „Work or school“.

Scan the QR code with the help of the mobile phone and follow the steps on the screen.

After the successful activation of your 2-step authentication you will be redirected to the AVL Extranet Cloud automatically where you can proceed with the login.



Keep your account secure

Your organization requires you to set up the following methods of proving who you are.

Success!

Great job! You have successfully set up your security info. Choose "Done" to continue signing in.

Default sign-in method:

Microsoft Authenticator

Microsoft Authenticator app was successfully registered

Mon, 31 Jul 2023 11:56:50 GMT

FIGURE 16: AVL EXTRANET CLOUD WINDOW – MICROSOFT AUTHENTICATOR APP SUCCESSFULLY REGISTERED

4.1.3 Cynergy4MIE Templates

Following the Technical Annex, ***Cynergy4MIE*** has developed report and presentation templates to ensure a coherent appearance of all project-related documentation. The project templates / slide master documents are in AVL Extranet Cloud:
06_TEMPLATES.

The folder contains templates for Word and Excel Files (*e.g*. Minutes of Meetings, Interim Reports and Deliverables).

4.1.4 Question regarding AVL Extranet Cloud, Contact, Email List or Project Templates

Please address any question regarding the tools used for consortium internal communication to:

Katrin Al Jezany, katrin.aljezany@avl.com.

4.2 Project Meetings

Cynergy4MIE will make extensive use of electronically supported virtual meetings to ensure frequent updates and synchronization between all partners. The partners will be using virtual desktop and file share systems along with video and phone conferences, which have already been put in place during the ***Cynergy4MIE*** proposal preparation. It is envisaged that all project partners will meet at least once per year, however depending on overall requirements and progress. Work package meetings and task meetings will be more frequent, e.g. WP meetings will take place at least every month (virtual or physical).

4.2.1 Face-to-Face Communication

There will also be annual meetings with the General Assembly and the Advisory Board, where any participant may raise issues for discussion and resolution. As the WP and SC leaders have major common technical interests, additional communication and joint ownership of technical issues will be achieved. Finally, the leaders of each task and demonstrator will ensure the regular communication among the partners in each task. Emergency face-to-face meetings in case of unforeseen circumstances may be scheduled if the timeframe and availability of participants allows it. Otherwise, these shall take place in form of telephone conferences to allow a quick decision-making process.

4.2.2 Time Schedule of Management Meetings

The following table (Table 4: Management Meetings) provides an overview on the management meetings foreseen during the lifetime of the project.

TABLE 4: MANAGEMENT MEETINGS

Meetings	Project Management Team	Advisory Board	General Assembly
Kick-off	X	X	X
Month 1	X		
Month 2	X		
Month 3	X		
Month 4	X		
Month 5	X		
Month 6	X		
Month 7	X		
Month 8	X		
Month 9	X		
Month 10	X	X	X
Month 11	X		
Month 12	X		

Month 13	X		
Month 14	X		
Month 15	X		
Month 16	X		
Month 17	X		
Month 18	X		
Month 19	X		
Month 20	X		
Month 21	X		
Month 22	X	X	X
Month 23	X		
Month 24	X		
Month 25	X		
Month 26	X		
Month 27	X		
Month 28	X		
Month 29	X		
Month 30	X		
Month 31	X		
Month 32	X		
Month 33	X		
Month 34	X	X	X
Month 35	X		
Month 36	X	X	X

Annual meetings and/or the final meeting will - if possible and feasible - take place at a location where demonstration activities will be carried out.

4.3 Project External Communications

The strategy to communicate the project’s achievement to the interested community and to the public is described in section 2.2.2 of the Technical Annex as well as in the dedicated Deliverables D7.3 (Annual Dissemination Reports & Plan Updates – Year 1), D7.4 (Annual Dissemination Reports & Plan Updates – Year 2) and D7.5 (Annual Dissemination Reports & Plan Updates – Year 3). The rules are described in section 8.4 of the PCA, making reference to the confidentiality regulations in section 10 of the PCA.

4.3.1 Rules set in the PCA

For the avoidance of doubt, no contents of this document have impact on the confidentiality obligations set out in section 10 of the PCA.

4.3.1.1 *Dissemination of Results*

During the Project and for a period of 1 year after the end of the Project, the Dissemination of own Results by one or several Parties including but not restricted to publications and presentations, shall be governed by the procedure of Article 17.4 of the Grant Agreement and its Annex 5, Section Dissemination, subject to the following provisions.

Prior notice of any planned Dissemination shall be given to the other Parties at least **30 calendar days** before the publication. Any objection to the planned publication shall be made in accordance with the Grant Agreement by written notice to the Coordinator and to the Party or Parties proposing the dissemination within **14 calendar** days after receipt of the notice. If no objection is made within the time limit stated above, the publication is permitted.

By exception to the 30 calendar days notice, the prior notice period shall be reduced to **14 calendar** days only for the following dissemination activities: poster presentations, slides and abstracts for oral presentations at scientific meetings. In this case, any objection to the planned dissemination shall be made in writing to the Coordinator and to the Party or Parties proposing the dissemination within 10 calendar days after receipt of the notice. If no objection is made within the time limit stated above, the dissemination is permitted.

An objection is justified if

a) the protection of the objecting Party's Results or Background would be adversely affected, or

b) the objecting Party's legitimate interests in relation to its Results or Background would be significantly harmed, or

c) the proposed publication includes Confidential Information of the objecting Party.

The objection has to include a precise request for necessary modifications.

If an objection has been raised the involved Parties shall discuss how to overcome the justified grounds for the objection on a timely basis (for example by amendment to the planned publication and/or by protecting information before publication) and the objecting Party shall not unreasonably continue the opposition if appropriate measures are taken following the discussion.

The objecting Party can request a publication delay of not more than 60 calendar days from the time it raises such an objection. After 60 calendar days the publication is permitted, provided that the objections of the objecting Party have been addressed. Unless otherwise agreed between the objecting and the requesting Party, this shall mean that any Confidential Information, unpublished Background or Results of the objecting Party have been removed from the publication as indicated by the objecting Party.

4.3.1.2 *Dissemination of another Party's unpublished Results or Background*

A Party shall not include in any dissemination activity another Party's Results or Background without obtaining the owning Party's prior written approval, unless they are already published.

4.3.1.3 *Cooperation obligations*

The Parties undertake to cooperate to allow the timely submission, examination, publication and defense of any dissertation or thesis for a degree that includes their Results or Background subject to the confidentiality and publication provisions agreed in this Consortium Agreement.

4.3.1.4 *Use of names, logos or trademarks*

Nothing in this Consortium Agreement shall be construed as conferring rights to use in advertising, publicity or otherwise the name of the Parties or any of their logos or trademarks without their prior written approval.

4.3.2 Process Handling the Rules set in the PCA

Please note: The following dissemination process is compatible with the rules set in the consortium agreement. The rules are quite strict. The PMT has already started working on a suitable process to suit the needs of all partners (i.e. both from academia and from industry). This process description will be included in the next update of the project handbook.

4.3.2.1 *How to disseminate the intended publication 30 days in advance to publication*

The intended presentation/publication needs to be uploaded by the persons intending to publish to AVL Extranet Cloud into the folder „09_DISSEMINATION_MATERIAL "

09_DISSEMINATION_MATERIAL

Please make sure that the uploaded intended publication includes the name of the main contact person and the conference/journal where it shall be published.

4.3.2.2 *Duties of the partner intending to publish*

The partner having uploaded a new publication sends a notification email to Katrin Al Jezany (Katrin.aljezany@avl.com) and to the dissemination leaders Siranush Akarmazyan (siranush@itml.gr) and Athanasia Thraskia (athraskia@itml.gr).

This notification email shall include:

- Title of the publication
- Main author and email
- Intended conference/magazine and date
- Link to the publication file in AVL Extranet Cloud

The dissemination leader will forward the notification email to all partners via the members list (The full ***Cynergy4MIE*** contact and e-mail lists can be found here).

In case intervention is needed, the intervening ***Cynergy4MIE*** partner indicates his objections to the main author and in copy to the PC as soon as possible (in any case within four weeks after receiving the notice). If there are any objections, the publication or press release will be reworked by the partner intending to publish. Both parties shall seek in good faith to agree a solution on a timely basis whereby such objection is resolved. The project management should be involved in this case. If potential objections are resolved, the PC gives the partner intending to publish permission to go ahead. In cases where no solution can be found, the publication must not take place.

Paper approval and publication

Upon publication of a research paper in a journal or conference proceeding, the paper should also be uploaded and archived within the Cynergy4MIE Zenodo Community.

Process for uploading to Zenodo:

- Open Cynergy4MIE “New Upload” form that can be found here: https://zenodo.org/uploads/new?community=cynergy4mie
- Upload minimum one file and fill-in required fields (marked with a red star).
- Click "Save" to save your upload for later editing.
- When ready, click “Publish” to finalize the upload and submit it for curation to the dissemination leaders.

4.3.3 Patent Applications

The rules for ownership of IPR are set in the PCA.

4.3.4 Acknowledgement and Disclaimer

Any dissemination material (including publications) needs to include the following acknowledgment:

Acknowledgement

The Cynergy4MIE project is supported by the Chips Joint Undertaking and its members, including the top-up funding by National Authorities under Grant Agreement No 101140226.

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or National Authorities. Neither the European Union nor the granting authority can be held responsible for them. (Art. 17.3 of the GA).

5 Project Reporting

Reports are submitted electronically via the Participant Portal (SYGMA). In general, continuous reporting (e.g. deliverables) and periodic reporting (interim and periodic reports) need to be distinguished.

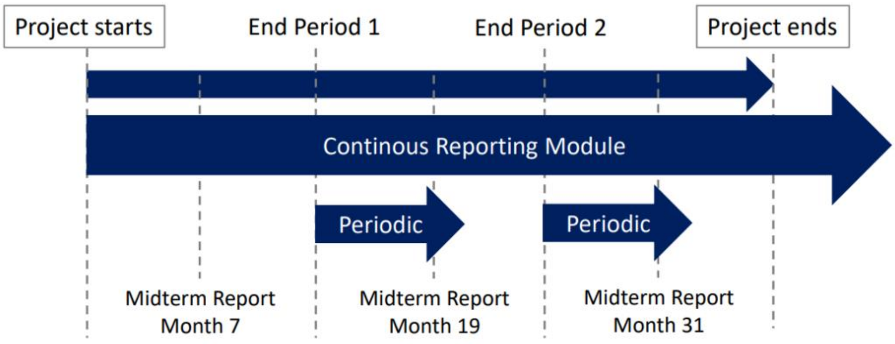


FIGURE 17: PROJECT REPORTING TIMELINE – CONTINUOUS REPORTING & PERIODIC REPORTING

5.1 Project Reporting Obligations

The following project reports are mandatory:

- Deliverables (as described in DoA, due according to date set in DoA)
- Interim report (see deliverables list)
- Periodic Report (within 60 days following the end of each reporting period)
  - Periodic technical report
  - Periodic financial report
- Final Report (in addition to the periodic report for the last reporting period)
  - Final technical report – summary for publication
  - Final financial report – CFSs

5.2 Project Interim Reporting

Progress reports will be provided on a half-yearly basis. Interim reports will cover the first 6 months of each reporting period (see schedule above). Reporting will be done as a combination of a participant portal (SYGMA) and a report core (WORD document).

The interim reports shall exclude resource and cost reporting. A template for the interim report core will be provided by the PC. This template will take into account all Chips JU reporting requirements.

The intermediate reports shall be sufficiently smaller compared with the periodic reports. The focus will be on the progress reports provided by each of the WP and SC leaders. The intermediate reports are composed of two major parts:

- Publishable summary (SYGMA)
- Progress report (per work package, including dissemination and standardization)

5.3 Periodic Project Reporting

The periodic reports will cover both, progress documentation, resources and cost reporting. A template for the report core will be provided by the PC. This template will consider all Chips JU reporting requirements. Periodic reporting is done via the participant portal (SYGMA), while project progress needs to be explained in a core report (WORD). A template for the core report will be available via the participant portal.

The periodic reporting includes:

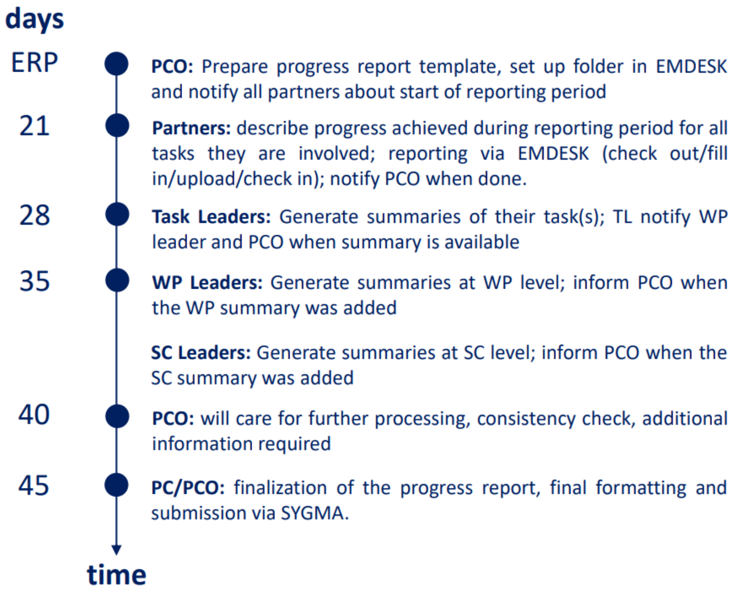
- Publishable summary (SYGMA)
- Submitted deliverables (SYGMA)
- Report progress in achieving milestones (WORD, report core)
- Follow-up critical risks (SYGMA)
- Questionnaire on horizontal issues
  - Publications (SYGMA)
  - Communication activities (SYGMA)
  - Rest of questionnaire on horizontal issues (SYGMA)

The periodic reports must be provided within 60 days after the end of each reporting period. The review meeting could then take place around the same timeframe. In many projects, the review meeting took place towards the end of the 60 days period, which led to the situation that the reporting needed to de performed in 45 days.

The following timeline is proposed for the periodic reporting (PPR = Periodic Project Report, ERP = End of Reporting Period):

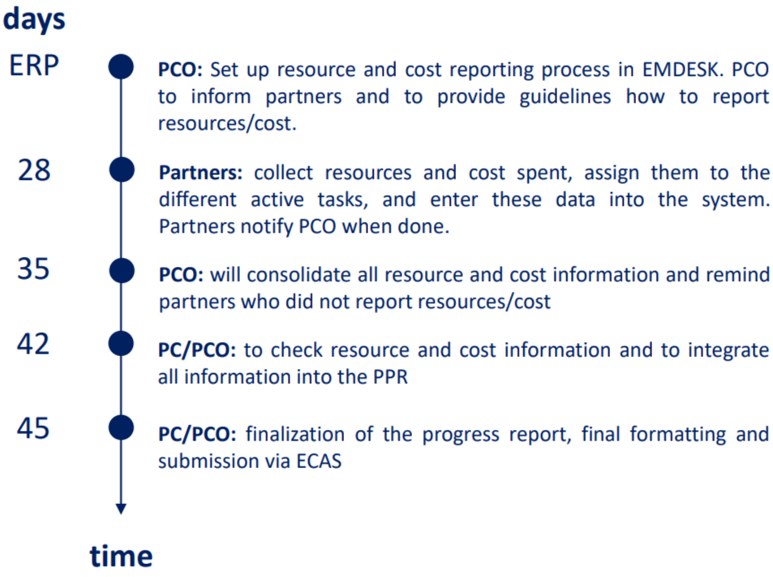
a. **Part A: to be entered in SYGMA**
   - Publishable summary: To be written by PC and PC (45 days after ERP)
   - Deliverables, milestones, risks, etc.: WP leaders and PC (45 days after ERP)
   - Publications etc.: All partners (30 days after ERP)

b. **Narrative Part: Progress report (WORD document according to Chips JU template)**



ERP	**PCO:** Prepare progress report template, set up folder in EMDESK and notify all partners about start of reporting period
21	**Partners:** describe progress achieved during reporting period for all tasks they are involved; reporting via EMDESK (check out/fill in/upload/check in); notify PCO when done.
28	**Task Leaders:** Generate summaries of their task(s); TL notify WP leader and PCO when summary is available
35	**WP Leaders:** Generate summaries at WP level; inform PCO when the WP summary was added
	SC Leaders: Generate summaries at SC level; inform PCO when the SC summary was added
40	**PCO:** will care for further processing, consistency check, additional information required
45	**PC/PCO:** finalization of the progress report, final formatting and submission via SYGMA.

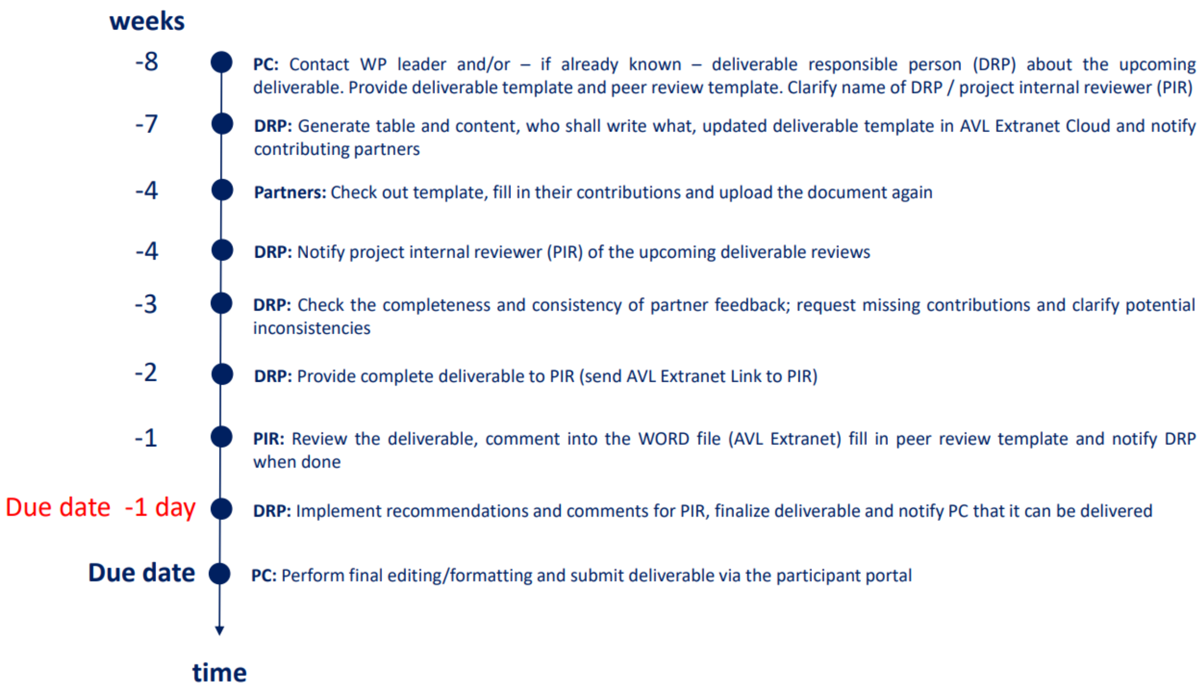
c. **Management of resources: financial reporting (efforts and cost)**



days	
ERP	**PCO:** Set up resource and cost reporting process in EMDESK. PCO to inform partners and to provide guidelines how to report resources/cost.
28	**Partners:** collect resources and cost spent, assign them to the different active tasks, and enter these data into the system. Partners notify PCO when done.
35	**PCO:** will consolidate all resource and cost information and remind partners who did not report resources/cost
42	**PC/PCO:** to check resource and cost information and to integrate all information into the PPR
45	**PC/PCO:** finalization of the progress report, final formatting and submission via ECAS

5.4 Writing Project Deliverables

Deliverables need to be submitted via the participant portal. The following time schedule shall be applied. Based on this schedule, the start of writing is recommended two months ahead of the due date. As mentioned above, this 2-months period is considered already in the project calendar.



weeks	
-8	**PC:** Contact WP leader and/or – if already known – deliverable responsible person (DRP) about the upcoming deliverable. Provide deliverable template and peer review template. Clarify name of DRP / project internal reviewer (PIR)
-7	**DRP:** Generate table and content, who shall write what, updated deliverable template in AVL Extranet Cloud and notify contributing partners
-4	**Partners:** Check out template, fill in their contributions and upload the document again
-4	**DRP:** Notify project internal reviewer (PIR) of the upcoming deliverable reviews
-3	**DRP:** Check the completeness and consistency of partner feedback; request missing contributions and clarify potential inconsistencies
-2	**DRP:** Provide complete deliverable to PIR (send AVL Extranet Link to PIR)
-1	**PIR:** Review the deliverable, comment into the WORD file (AVL Extranet) fill in peer review template and notify DRP when done
Due date -1 day	**DRP:** Implement recommendations and comments for PIR, finalize deliverable and notify PC that it can be delivered
Due date	**PC:** Perform final editing/formatting and submit deliverable via the participant portal

8 weeks (2 months) before the due date: The deliverable responsible partner shall be reminded of the upcoming deliverable by the PC. The deliverable template and peer review document will be provided in a corresponding deliverable folder in AVL Extranet Cloud. If not yet available, the names of the deliverable responsible person (DRP) and the project internal reviewer (PIR) shall be clarified.

7 weeks before the due date: The table of contents including expected partner contributions (and their expected length) shall be added by the deliverable responsible person (DRP) and the adapted template shall be copied to AVL Extranet Cloud. The DRP must inform contributing partners to provide their input.

Latest 4 weeks before the due date: The partners have completed and filled in their contributions.

Latest 4 weeks before the due date: The deliverable responsible person informs the project internal reviewer (PIR) about the upcoming peer review.

Latest 3 weeks before the due date: The deliverable responsible person collects any missing partner contributions and checks for consistency (if necessary, the DRP clarifies inconsistencies with the contributing partners).

Latest 2 weeks before due date: The DRP will upload the complete and consistent deliverable into the particular AVL Extranet Cloud deliverable folder. Further, the DRP will notify the PIR so that she/he can start with the peer review.

Latest 1 week before due date: The PIR will complete her/his peer review:

- Comments/corrections shall be made into the WORD deliverable document
- An overall view on the deliverable shall be provided by filling in the peer review document
- Both the commented WORD and the filled peer review document will be uploaded to AVL Extranet Cloud by the PIR
- The PIR will notify the DRP when the review is done

Latest one day before the due date, the DRP will have considered/implemented the comments and recommendations from the PIR. The deliverable will be finalized and prepared for submission. The final version of the deliverable needs to be uploaded to AVL Extranet Cloud into the corresponding deliverable folder. The DRP will notify the PC when done.

Due date: The PC will upload the PDF of the deliverable in SYGMA after some minor final editing/formatting, if needed.

6 Quality Management and Assurance

Quality management will be performed through review of project outcomes (deliverables) by the team. As a standard procedure, deliverables are to be reviewed by partners not involved in the generation of that deliverable. The Project Coordinator has the right to have deliverables checked by external experts where appropriate and after signature of a non-disclosure agreement.

A Quality Plan will be set up for the consortium identifying an appropriate workflow between consortium partners and the various roles designed for the project. The goal is to ensure the detection of deviations as early as possible in the project’s life cycle and to provide measures how to handle such issues. This will enable the consortium to apply systematically corrective actions or contingency plans, if necessary.

The project progress and results will be assessed with a number of internal and external control procedures. Quality control and assurance will allow maximum flexibility while maintaining a clear distinction of roles and responsibilities of all partners involved. To this end, the project will establish appropriate mechanisms and procedures, which among others will be described in the Project Manual.

The Project Manual again, will be elaborated according to good practice quality procedures, e.g. ISO 9001:2000. It will carefully define all project tasks and corresponding schedules.

Cynergy4MIE is aiming at a high level of quality of its documents and other deliverables to fulfil the goals and milestone of the project. The scheduling of milestones and deliverables will allow for monitoring the project evolution, measuring the advancements made by qualitative and quantitative evaluations, defining priorities and optimizing project progress by corrective measures.

A Gantt chart of the project is shown in section 10.2, a list of deliverables in section 10.4 and a list of milestones in section 10.5.

6.1 Tracking of Progress and Resource Use

The regulations, goals and time schedules of ***Cynergy4MIE*** have to be complied with. It is important to see whether the objectives will be met in due time and for which tasks extended time or resources will be required. Therefore, progress and the use of resources in all work packages will be monitored by the Work Package Management Teams. At task level, the Task leaders will take care of it. At work package level, the relevant activities will be subjected to the monitoring through the WP leaders.

Cynergy4MIE is aiming at a high level of quality of its documents and other deliverables to fulfil the goals and milestones of the project. The scheduling of deliverables (see Table 8) and milestones (see Table 9) will allow for continuous monitoring the project evolution, measuring the advancements made by qualitative and quantitative evaluations, defining priorities and optimizing the project progress by corrective measures.

Activities in ***Cynergy4MIE*** will be synchronized over a period of three years by nine milestones (see also Table 9). With each milestone, the different work package teams with their tasks and partners will deliver individual results according to descriptions, rules and roadmaps. These key innovations from task level to work package level will be the basis for the others to continue with, until the next innovation marks a new milestone.

The Project Coordinator will generate and regularly update a project dashboard to track the project progress (GANTT chart and actual vs. planned deliverable availability) and resource use (Excel file comparing planned and actual person months spent). The project progress will be tracked at least on a half-yearly basis. Along with the progress and resource utilization, monitoring comprises also financial information. Tracking resource and budget data will be done on a yearly basis (in preparation of the review meetings).

As to the overall project, the Innovation and Technology Advisory Board, which is chaired by the Project Coordinator, will assess the general progress and advice on corrections or modifications in the project work. If necessary, it will suggest action items to be taken by the project.

The overall quality assurance and quality management of the project can be considered as a closed loop control, where a continuous project management performs actions to drive the project activities towards the desired objectives and impacts. The project monitoring acts as a feedback channel, ensuring that deviations of the results from the intended objectives are detected in time to enable the project management to perform corrective actions, if required. Main basis of the control process are the legal and contractual documents (at EU and national levels) that define both the required outputs (demonstrators, research results, deliverables, reports, etc.) and the conditions and resources of the work.

6.2 Quality Assurance - Bottom Up Approach

Quality assurance in Cynergy4MIE will follow a bottom-up process:

- Quality assurance of any deliverable reports by means of the project internal review process (described in section 5 of this document).
- Regular monitoring of the progress of each individual task of each work package and supply chain in the WP and SC meetings (almost every three months); each presentation shall include the following:
    - A summary of the achieved results
    - A self-assessment (traffic light) of the status in each task compared to the plan (please find the detailed WP GANTT charts and Task leaders in the appendix of this document)
        - Green: all objectives can be achieved; delay of maximum one month compared to the plan; no fallback solutions required
        - Yellow: all objectives can still be achieved; delay between 1-3 months compared with the plan; minor changes required and fallback solutions in place
        - Red: major changes required or delay larger than 3 months compared to the plan
    - WP meeting minutes shall summarize the status of the work package including the individual tasks
    - SC meeting minutes shall summarize the status of the supply chain including the individual demonstrator status
- Regular monitoring of the ***Cynergy4MIE*** project progress as a whole by means of the intermediate progress reports and the periodic progress report (every 6 months)
- Regular monitoring of the project status within the frame of the General Assembly meetings (on yearly basis)
- Regular monitoring of the project progress (including all deliverables due in a reporting period) and the resources used within the technical reviews organized by Chips JU (on a yearly basis)

7 Risk Management, Project Implementation Risks

General and specific risks are inherent in the organization and execution of a project. For a project of the size of ***Cynergy4MIE***, special care must be taken for risk management. Minor conflicts have to be resolved at WP level, major issues at project level and details to be regulated in the consortium agreement.

The project set up a project-internal Risk Management in order to:

- Identify and proactively manage all risks related to the project (both internal and external).
- Track and continuously review all project risks in a risk register.

- Implement and, if required, initiate suitable risk mitigation strategies.

Once a risk is identified, it will be analyzed for further decision processing. The following definitions will be used to indicate the individual risk status:

  - Low: not expected to have serious impact.
  - Medium: significant impact on tasks and/or work packages, but not expected to impact project milestones.
  - High: major impact on the project and possible serious consequences to tasks, work packages and/or the entire project; likely to affect a milestone.
  - Unacceptable: priority attention; no affected work package or task will be allowed to proceed, unless the WP leader or Project Coordinator manages to erase it or at least mitigate its potential impact or find a contingency plan.

During the proposal preparation phase, several project risks were identified, which could influence the success of the project. These were transferred into SYGMA during the contract preparation phase (see “Critical Risks” in Table 10). This list does not contain specific risks in the development processes within the different work packages and tasks. Those are associated with the appropriate milestones, where suitable decisions will be made. Nevertheless, any additional risk will be added to SYGMA within the frame of “continuous project reporting”.

As to the risk management, Cynergy4MIE will use a bottom-up approach:

- Task leaders collect a risk report for their activities after kick-off and two months prior to each GA meeting.
- The reports will be forwarded to the WP and SC leaders who will discuss them with the PMT and compile a SC risk report, which is submitted to the PC two working weeks later.
- The PC collects the individual risk reports and presents them to the PMT one working week later.
- The PC schedules a phone conference with the PMT where the risk report is being discussed and remedial actions are being decided. The conclusions are collected by the PC and added to the risk report. The PC presents the risk report at the GA and at the annual Project Board meetings, where actions might be decided.

In case of failure to manage the consortium, resources will be reallocated to strengthen certain efforts, and a change of consortium partners will be considered. In case a partner resigns from the consortium for his own reasons, the coordinator will in advance prepare a list of potential qualified partners and respond promptly to recruit another partner together with the respective Country Coordinator of the resigning partner. The PC will monitor the performance of the partners. In collaboration with the Work Package Management Team and Supply Chain Management Team, he will look for early signs of non-performance of any of the partners (i.e. he will check if partners fail to comply with their obligations to the consortium), and communicate the results with the respective Country Coordinator.

A list of critical risks can be found in Section 10.6 of this document, see also the list of deliverables provided in Section 10.4.

8 Conclusion

For a project with **about 43 partners, 9 work packages and 6 supply chains**, the precise definition of processes is mandatory for stringent execution of a successful project.

Management processes, decision processes, project monitoring and controlling go hand in hand with suitable risk management and quality assurance mechanisms. The processes described in this handbook show that ***Cynergy4MIE*** has developed suitable processes for successful project execution, risk assessment and quality assurance.

Also, it must be noted that this handbook is considered a living document. In case there is a need to define further processes or tools, the project handbook will be updated accordingly.

9 References

[1] Project Grant Agreement (PGA), Initial version, Project Grant Agreement, Annex 1, Part A (Administrative Data), Project Grant Agreement (PGA), Annex 1, Part B (Technical Annex), Effort table (per WP, per task, per partner), Cynergy4MIE Reporting Procedures can all be accessed on ECAS and on AVL Extranet Cloud.

[2] https://www.the-autonomous.com/news/unveiling-the-autonomous-safety-regulation-report/

10 Appendix

10.1 List of Participants

A list of the ***Cynergy4MIE*** Participants is shown in Table 5.

TABLE 5: LIST OF CYNERGY4MIE PARTICIPANTS

Nr.	Company Name	Company Short Name	Company Type	Country
1	AVL LIST GMBH	AVL	LE	AT - Austria
2	SILICON AUSTRIA LABS GMBH	SAL	RES	AT - Austria
3	INFINEON TECHNOLOGIES AUSTRIA AG	IFAT	LE	AT - Austria
4	VIRTUAL VEHICLE RESEARCH GMBH	VIF	RES	AT - Austria
5	VYSOKE UCENI TECHNICKE V BRNE	BUT	RES	CZ - Czechia
6	TECHNISCHE UNIVERSITAET GRAZ	TUG	RES	AT - Austria
7	IDEAS & MOTION SRL	I&M	SME	IT - Italy
8	VERUM SOFTWARE TOOLS B.V.	VER	SME	NL - Netherlands (the)
9	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT	RES	FI - Finland
10	TECHNISCHE HOCHSCHULE ROSENHEIM / TECHNICAL UNIVERSITY OF APPLIED SCIENCES	THRO	RES	DE - Germany
11	ELEKTRONIKAS UN DATORZINATNU INSTITUTS	EDI	RES	LV - Latvia
12	GIM OY	GIM	SME	FI - Finland
13	SYGKLISI ASTIKI MI KERDOSKOPIKI ETAIREIA	CONV	RES	GR - Greece
14	IOTAM INTERNET OF THINGS APPLICATIONS AND MULTI LAYER DEVELOPMENT LTD	IOTAM	SME	CY - Cyprus
15	NXP SEMICONDUCTORS NETHERLANDS BV	NXP-NL	LE	NL - Netherlands (the)
16	VAISTO SOLUTIONS OY	VAISTO	SME	FI - Finland
17	ZF FRIEDRICHSHAFEN AG	ZF	LE	DE - Germany
18	INSAR.SK SRO	INSAR	SME	SK - Slovakia
19	XENOMATIX	XENOMATIX	SME	BE - Belgium
20	SMARTSOL SIA	SSOL	SME	LV - Latvia
21	INSTITUT MIKROELEKTRONICKYCH APLIKACI SRO	IMA	LE	CZ - Czechia
22	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	Fraunhofer	RES	DE - Germany
23	PRODRIVE TECHNOLOGIES INNOVATION SERVICES B.V.	PRODRIVE	LE	NL - Netherlands (the)
24	UNIVERSITAET GRAZ	KFU	RES	AT - Austria
25	DRIVEU TECH LTD	DRIVEU	SME	IL - Israel
26	TECHNISCHE UNIVERSITEIT EINDHOVEN	TU/e	RES	NL - Netherlands (the)
27	STMICROELECTRONICS SRL	ST-I	LE	IT - Italy
28	BELGAN BV[3]	BELGAN	LE	BE - Belgium
29	TECHNISCHE UNIVERSITEIT DELFT	TUD	RES	NL - Netherlands (the)
30	GROPYUS TECHNOLOGIES GMBH	GRO	SME	DE - Germany
31	KUNGLIGA TEKNISKA HOEGSKOLAN	KTH	RES	SE - Sweden
32	STRIKERSOFT AB	STRIKERSOFT	LE	SE - Sweden
33	MURATA ELECTRONICS OY	MURATA	LE	FI - Finland

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[3] BELGAN is in the process of leaving the Cynergy4MIE consortium.

34	MEDISYS MONOPROSOPI IKE	MEDISYS	SME	GR - Greece
35	TTTECH AUTO AG	TAAT	LE	AT - Austria
36	POLITECNICO DI TORINO	POLITO	RES	IT - Italy
37	SLEEP ADVICE TECHNOLOGIES SRL	SAT	SME	IT - Italy
38	MEVEA OY	MEV	SME	FI - Finland
39	UAB TERAGLOBUS	TG	SME	LT - Lithuania
40	INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE INCORPORATED	ITRI	RES	TW - Taiwan
41	BOARD OF REGENTS OF NEVADA SYSTEM OF HIGHER EDUCATION	UNEV	RES	US - United States of America (the)
42	FRIEDRICH-ALEXANDER-UNIVERSITAET ERLANGEN-NUERNBERG	FAU	RES	DE - Germany
43	RECHI PRECISION CO.,LTD	RECHI	LE	TW - Taiwan

10.2 GANTT Chart of the Project

A Gantt Chart of the ***Cynergy4MIE*** project is shown in Table 6.

TABLE 6: GANTT CHART OF THE PROJECT

M 1 M 2 M 3 M 4 M 5 M 6 M 7 M 8 M 9

			Year 1				Year 2				Year 3			
WP1	**Requirements and Specifications**	**m01-m12**	▨	▨	▨	**m12**								
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 1.1 [SC1]	Requirements and Specifications for Automated Machinery and Transportation	m01 - m12	m01	▨	▨	D1.1								
Task 1.2 [SC2]	Requirements and Specifications for Smart Collaborative Robotics	m01 - m12	m01	▨	▨	D1.2								
Task 1.3 [SC3]	Requirements and Specifications for Powertrains	m01 - m12	m01	▨	▨	D1.3								
Task 1.4 [SC4]	Requirements and Specifications for Automated Driving System	m01 - m12	m01	▨	▨	D1.4								
Task 1.5 [SC5]	Requirements and Specifications for Multi-agent Sensing and Control	m01 - m12	m01	▨	▨	D1.5								
Task 1.6 [SC6]	Requirements and Specifications for ECS for energy efficiency and distributed intelligent control	m01 - m12	m01	▨	▨	D1.6								
WP2	**System Architecture, Modelling and Simulations**	**m03-m22**	▨	▨	▨	▨	▨	▨	▨	**m22**				
Tasks	***Title***	***Task duration***	**3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 2.1 [SC1]	System Architecture, Models and Simulations for Automated Machinery	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.1				
Task 2.2 [SC2]	System Architecture, Models and Simulations for Smart Collaborative Robotics	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.2				
Task 2.3 [SC3]	System Architecture, Models and Simulations for Powertrains	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.3				
Task 2.4 [SC4]	System Architecture, Models and Simulations for Automated Driving Systems	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.4				
Task 2.5 [SC5]	System Architecture, Models and Simulations for Multi-agent Sensing and Control	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.5				
Task 2.6 [SC6]	System Architecture, Models and Simulations for ECS for Energy Efficiency and Distributed Intelligent Control	m03-m22	m03	▨	▨	▨	▨	▨	▨	D2.6				
WP3	**Semiconductor Devices, Sensors, and Electronics**	**m03-m27**	▨	▨	▨	▨	▨	**m16**	▨	▨	**m27**			
Tasks	***Title***	***Task duration***	**3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 3.1 [SC2]	Electronic Components and Circuits for Smart Collaborative Robotics	m03-m27	m03	▨	▨	▨	▨	D3.1	▨	▨	D3.2			
Task 3.2 [SC3]	Electronic Components and Circuits for Powertrains	m03-m27	m03	▨	▨	▨	▨	D3.3	▨	▨	D3.4			
Task 3.3 [SC4]	Electronic Components and Circuits for Automated Driving Systems	m03-m27	m03	▨	▨	▨	▨	D3.5	▨	▨	D3.6			
Task 3.4 [SC5]	Electronic Components and Circuits for Multi-agent Sensing and Control	m03-m27	m03	▨	▨	▨	▨	D3.7	▨	▨	D3.8			
Task 3.5 [SC6]	Electronic Components and Circuits for ECS for energy efficiency and distributed intelligent control	m03-m27	m03	▨	▨	▨	▨	D3.9	▨	▨	D3.10			
WP4	**Computing Algorithms, Embedded HW/SW, and SW Tools**	**m10-m33**				▨	▨	▨	▨	**m22**	▨	**m29**	**m33**	
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 4.1 [SC1]	Algorithms, Embedded HW and SW for Automated Machinery	m10-m33				m10	▨	▨	▨	D4.1	▨	D4.2	D4.3	
Task 4.2 [SC2]	Algorithms, Embedded HW and SW for Smart Collaborative Robotics	m10-m33				m10	▨	▨	▨	D4.4	▨	D4.5	D4.6	
Task 4.3 [SC3]	Algorithms, Embedded HW and SW for Powertrains	m10-m33				m10	▨	▨	▨	D4.7	▨	D4.8	D4.9	
Task 4.4 [SC4]	Algorithms, Embedded HW and SW for Automated Driving Systems	m10-m33				m10	▨	▨	▨	D4.10	▨	D4.11	D4.12	
Task 4.5 [SC5]	Algorithms, Embedded HW and SW for Multi-agent Sensing and Control	m10-m33				m10	▨	▨	▨	D4.13	▨	D4.14	D4.15	
Task 4.6 [SC6]	Algorithms, Embedded HW and SW for ECS for energy efficiency and distributed intelligent control	m10-m33				m10	▨	▨	▨	D4.16	▨	D4.17	D4.18	
WP5	**System Integration and Commissioning**	**m12-m36**				▨	▨	▨	▨	**m24**	▨	▨	**m33**	**m36**
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 5.1 [SC1]	Integration and Commissioning of Systems for Automated Machinery	m12-m36				m12	▨	▨	▨	D5.1	▨	▨	D5.2-4	D5.5
Task 5.2 [SC2]	Integration and Commissioning of Systems for Smart Collaborative Robotics	m12-m36				m12	▨	▨	▨	D5.6	▨	▨	D5.7-8	D5.9
Task 5.3 [SC3]	Integration and Commissioning of Systems for Powertrains	m12-m36				m12	▨	▨	▨	D5.10	▨	▨	D5.11-13	D5.14
Task 5.4 [SC4]	Integration and Commissioning of Systems for Automated Driving Systems	m12-m36				m12	▨	▨	▨	D5.15	▨	▨	D5.16-17	D5.18
Task 5.5 [SC5]	Integration and Commissioning of Systems for Multi-agent Sensing and Control	m12-m36				m12	▨	▨	▨	D5.19	▨	▨	D5.20-21	D5.22
Task 5.6 [SC6]	Integration and Commissioning of Systems for ECS for energy efficiency and distributed intelligent control	m12-m36				m12	▨	▨	▨	D5.23	▨	▨	D5.24-25	D5.26
WP6	**Validation and Tests**	**m25-m36**									▨	▨	▨	**m36**
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 6.1 [SC1]	Validation and Tests of Systems for Automated Machinery	m25-m36									m25	▨	▨	D6.1
Task 6.2 [SC2]	Validation and Tests of Systems for Smart Collaborative Robotics	m25-m36									m25	▨	▨	D6.2
Task 6.3 [SC3]	Validation and Tests of Systems for Smart Powertrains	m25-m36									m25	▨	▨	D6.3
Task 6.4 [SC4]	Validation and Tests of Systems for Smart Automated Driving Systems	m25-m36									m25	▨	▨	D6.4
Task 6.5 [SC5]	Validation and Tests of Systems for Multi-agent Sensing and Control	m25-m36									m25	▨	▨	D6.5
Task 6.6 [SC6]	Validation and Tests of Systems for ECS for energy efficiency and distributed intelligent control	m25-m36									m25	▨	▨	D6.6
WP7	**Dissemination, Communication, Exploitation and Standardization**	**m01-m36**	**m03**	▨	▨	**m12**	▨	**m18**	▨	▨	▨	▨	▨	**m36**
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 7.1 [all SCs]	Strategies for impact via wide engagement, requirements for viable business cases and adaptation of use cases and technologies	m01-m36	D7.1	▨	▨	D7.3	▨	▨	▨	D7.4	▨	▨	▨	D7.5
Task 7.2 [all SCs]	Results dissemination and communication	m01-m36	D7.1-2	▨	▨	D7.3	▨	▨	▨	D7.4	▨	▨	▨	D7.5
Task 7.3 [all SCs]	Project results exploitation	m01-m36	D7.1	▨	▨	▨	▨	D7.6	▨	▨	▨	▨	▨	D7.7
Task 7.4 [all SCs]	Maximizing the Cynergy4MIE exploitation potential via Standardization, certification, human-in-the-loop approaches and ethical aspects' considerations towards Society5.0	m01-m36	m01	▨	▨	D7.8	▨	▨	▨	D7.9	▨	▨	▨	D7.10
WP8	**Project Management and Projects Clustering**	**m01-m36**	**m01**	**m06**	**m07**	▨	▨	▨	**m19**	**m24**	▨	▨	**m31**	**m36**
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 8.1	Consortium, contracts and legal management	m01-m36	D8.1	D8.2	D8.5	▨	▨	▨	D8.6	D8.7	▨	▨	D8.8	m36
Task 8.2	Operational Project Management, administrative and financial coordination	m01-m36	m01	D8.2	D8.5	▨	▨	▨	D8.6	D8.7	▨	▨	D8.8	m36
Task 8.3	Quality and change management – continuous risk assessment	m01-m36	m01	D8.3	▨	▨	▨	▨	▨	▨	▨	▨	▨	m36
Task 8.4	Management of intellectual property rights	m01-m36	D8.1	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	m36
Task 8.5	Liaison with other projects – project clustering and partner-project interfaces	m01-m36	m01	▨	▨	▨	▨	▨	▨	D8.4	▨	▨	▨	m36
WP9	**Ethics Requirements**	**m01-m36**	**m03**	▨	▨	**m12**	▨	▨	▨	**m24**	▨	▨	▨	**m36**
Tasks	***Title***	***Task duration***	**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**	**19-21**	**22-24**	**25-27**	**28-30**	**31-33**	**34-36**
Task 9.1	Ethics requirements	m01-m36	D9.1	▨	▨	D9.2	▨	▨	▨	D9.3	▨	▨	▨	D9.4

Deliverable Task titles can be shortened, see full titles in WPs description

Remark - all WP8 tasks are finished in m36 with final reporting. Periodic reports required by GA are not considered to be deliverables and so not marked in Gantt chart

10.3 Work Packages – Task Leaders – Task Timing

TABLE 7: WORK PACKAGE DETAILS

WP	*Name*	*Lead Beneficiary*	*PMs*	*Start Month*	*End Month*
1	Requirements and Specifications	DriveU	288,8	1	12
2	System Architecture, Modelling and Simulations	VIF	666,0	3	22
3	Semiconductor Devices, Sensors, and Electronics	IFAT	309,3	3	27
4	Computing Algorithms, Embedded HW/SW, and SW Tools	BUT	1010,5	10	33
5	System Integration and Commissioning	NXP-NL	479,9	12	36
6	Validation and Tests	AVL	550,0	25	36
7	Dissemination, Communication, Exploitation and Standardization	IOTAM	248,4	1	36
8	Project Management and Projects Clustering	AVL	78,0	1	36
9	Ethics Requirements	AVL	0,0	1	36

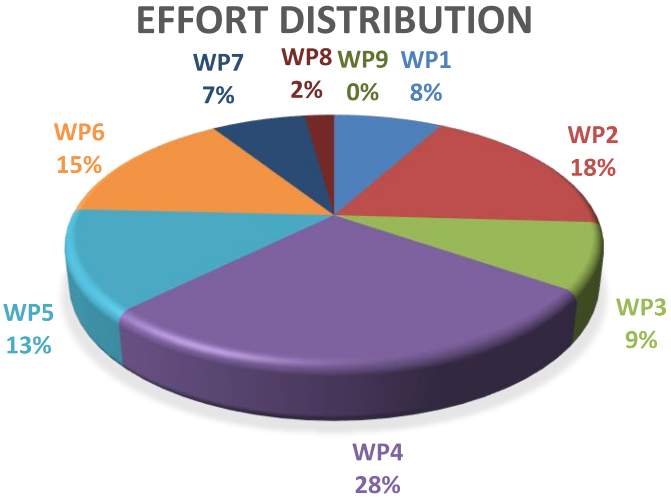

FIGURE 18: WORK PACKAGE EFFORT DISTRIBUTION

10.4 List of Deliverables

TABLE 8: LIST OF DELIVERABLES

Nr.	***Rel. Nr. WP***	***Name***	***Lead Beneficiary***	***Type***	***Dissemi-nation Level***	***Due Date (in months)***
D1	D1.1	Report on Requirements and Specifications for Automated Machinery and Transportation	VTT	R	SEN	12
D2	D1.2	Report on Requirements and Specifications for the robotics and AI in construction of low-emission buildings and industrial manufacturing	GRO	R	SEN	12
D3	D1.3	Report on Requirements and Specifications for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	ZF	R	SEN	12
D4	D1.4	Report on Requirements and Specifications for Automated Driving Systems	AVL	R	SEN	12
D5	D1.5	Report on Requirements and Specifications for Multi-agent Sensing and Control	VIF	R	SEN	12
D6	D1.6	Report on Requirements and Specifications for Energy Domain	PRODRIVE	R	SEN	12
D7	D2.1	Report on System Level Architecture and Modelling for Automated Machinery	GRO	R	SEN	22
D8	D2.2	Report on System Level Architecture and Modelling for the robotics and AI systems in construction of low-emission buildings and industrial manufacturing	NXP-NL	R	SEN	22
D9	D2.3	Report on System Level Architecture and Modelling for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	VER	R	SEN	22
D10	D2.4	Report on System Level Architecture and Modelling for Automated Driving Systems	INSAR	R	SEN	22
D11	D2.5	Report on System Level Architecture and Modelling for Multi-agent Sensing and Control	DRIVEU	R	SEN	22
D12	D2.6	Report on System Level Architecture and Modelling for Energy Domain	PRODRIVE	R	SEN	22
D13	D3.1	Intermediate report on MEMS devices, and control electronics for HMI and automated transportation	MURATA	R	SEN	16
D14	D3.2	Report on MEMS devices, and control electronics for HMI and automated transportation	MURATA	R	SEN	27
D15	D3.3	Components and Circuits for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	BELGAN[4]	DEM	PU	16
D16	D3.4	Report on Design and Manufacturing of Components and Circuits for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	BELGAN[5]	R	SEN	27
D17	D3.5	Components and Circuits for Automated Driving Systems	IFAT	DEM	PU	16
D18	D3.6	Report on Design and Manufacturing of Components and Circuits for Automated Driving Systems	IFAT	R	SEN	27
D19	D3.7	Methods for Multi-agent Sensing and Control	IFAT	OTHER	SEN	16
D20	D3.8	Report on Design and Implementation of Methods for Multi-agent Sensing and Control	IFAT	R	SEN	27
D21	D3.9	Components and Circuits for Energy Domain	TU/e	DEM	PU	16
D22	D3.10	Report on Design and Manufacturing of Components and Circuits for Energy Domain	TU/e	R	SEN	27

[4,5] BELGAN is in the process of leaving the Cynergy4MIE consortium.

D23	D4.1	Intermediate report on Algorithms, Tools, and Embedded SW Development for Automated Machinery	SSOL	R	SEN	22
D24	D4.2	Implemented Algorithms, Tools, and Embedded SW for Automated Machinery	SSOL	OTHER	SEN	29
D25	D4.3	Report on Algorithms, Tools, and Embedded SW Development for Automated Machinery	SSOL	R	SEN	33
D26	D4.4	Intermediate report on development of Algorithms, Tools and Embedded SW for robotics and AI systems in the construction of low-emission buildings and industrial manufacturing	BUT	R	SEN	22
D27	D4.5	Implemented Algorithms, Tools and Embedded SW for robotics and AI systems in the construction of low-emission buildings and industrial manufacturing	BUT	OTHER	SEN	29
D28	D4.6	Report on development of Algorithms, Tools and Embedded SW for robotics and AI systems in the construction of low-emission buildings and industrial manufacturing	BUT	R	SEN	33
D29	D4.7	Intermediate report on Algorithms, Tools and Embedded SW Development for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	TU/e	R	SEN	22
D30	D4.8	Implemented Algorithms, Tools and Embedded SW for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	TU/e	OTHER	SEN	29
D31	D4.9	Report on Algorithms, Tools and Embedded SW Development for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	TU/e	R	SEN	33
D32	D4.10	Intermediate report on Algorithms, Tools, and Embedded SW Development for Automated Driving Systems	XENO-MATIX	R	SEN	22
D33	D4.11	Implemented Algorithms, Tools, and Embedded SW for Automated Driving Systems	XENO-MATIX	OTHER	SEN	29
D34	D4.12	Report on Algorithms, Tools, and Embedded SW Development for Automated Driving Systems	XENO-MATIX	R	SEN	33
D35	D4.13	Intermediate report on Algorithms, Tools, and Embedded SW Development for Multi-agent Sensing and Control	INSAR	R	SEN	22
D36	D4.14	Implemented Algorithms, Tools and Embedded SW for Multi-agent Sensing and Control	INSAR	OTHER	SEN	29
D37	D4.15	Report on Algorithms, Tools, and Embedded SW Development for Multi-agent Sensing and Control	INSAR	R	SEN	33
D38	D4.16	Intermediate report on Algorithms, Tools, and Embedded SW Development for Energy Domain	PRODRIVE	R	SEN	22
D39	D4.17	Implemented Algorithms, Tools, and Embedded SW for Energy Domain	PRODRIVE	OTHER	SEN	29
D40	D4.18	Report on Algorithms, Tools, and Embedded SW Development for Energy Domain	PRODRIVE	R	SEN	33
D41	D5.1	Intermediate report on Integration and Commissioning of Systems for Automated Machinery	VTT	R	SEN	24
D42	D5.2	Visibility Improvement Demonstrator	VTT	DEM	PU	33
D43	D5.3	Forest Rover Simulator Demonstrator	MEV	DEM	PU	33
D44	D5.4	SLAM Demonstrations for Accurate Positioning in Adverse Conditions	GIM	DEM	PU	33
D45	D5.5	Report in Integration and Commissioning of Systems for Automated Machinery	VTT	R	SEN	36
D46	D5.6	Intermediate report on Systems for Smart Collaborative Robotics and AI implementation in the construction of low-emission buildings and industrial manufacturing	THRO	R	SEN	24
D47	D5.7	Digital manufacturing and assembly for sustainable housing construction demonstrator	GRO	DEM	PU	33

D48	D5.8	Secure and safe fence-free human-machine interaction within a smart factory demonstrator	IMA	DEM	PU	33
D49	D5.9	Report on Integration and Commissioning of Systems for Smart Collaborative Robotics and AI implementation in the construction of low-emission buildings and industrial manufacturing	THRO	R	SEN	36
D50	D5.10	Intermediate report on Integration and Commissioning of Systems for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	I&M	R	SEN	24
D51	D5.11	Demonstrator of minimally invasive sensors for fail-safe and optimal operation of electric powertrain	ZF	DEM	PU	33
D52	D5.12	Demonstrator of WBG SiC power inverter system	I&M	DEM	PU	33
D53	D5.13	Demonstrator of WBG GaN power inverter system	I&M	DEM	PU	33
D54	D5.14	Report in Integration and Commissioning of Systems for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	I&M	R	SEN	36
D55	D5.15	Intermediate report on Integration and Commissioning of Systems for Automated Driving	Fraunhofer	R	SEN	24
D56	D5.16	Demonstrator of Traffic flow optimization	AVL	DEM	PU	33
D57	D5.17	Road condition monitoring demonstrator	IFAT	DEM	PU	33
D58	D5.18	Report in Integration and Commissioning of Systems for Automated Driving	Fraunhofer	R	SEN	36
D59	D5.19	Intermediate report on Integration and Commissioning of Systems for Multi-agent Sensing and Control	VIF	R	SEN	24
D60	D5.20	Demonstrator of Cooperative Agents for Survivor Detection in Natural/Manmade Disasters	VIF	DEM	PU	33
D61	D5.21	Resilient SAR Operations Demonstrator	DRIVEU	DEM	PU	33
D62	D5.22	Report in Integration and Commissioning of Systems for Multi-agent Sensing and Control	VIF	R	SEN	36
D63	D5.23	Intermediate report on Integration and Commissioning of Systems for Energy Domain	TU/e	R	SEN	24
D64	D5.24	Demonstrator of Emergent Heat-Pump and Energy Usage Management systems	ITRI	DEM	PU	33
D65	D5.25	Demonstrator of Modular wide bandgap-based bulk converter system	PRODRIVE	DEM	PU	33
D66	D5.26	Report in Integration and Commissioning of Systems for Energy Domain	TU/e	R	SEN	36
D67	D6.1	Report on Validation and Tests of Systems for Automated Machinery	VTT	R	PU	36
D68	D6.2	Report on Validation and Tests of Systems for the robotics and AI systems in construction of low-emission buildings and industrial manufacturing	NXP-NL	R	PU	36
D69	D6.3	Report on Validation and Tests of Systems for safe and efficient e-drives, high performance battery with advanced BMS and WBG power inverter systems	ZF	R	PU	36
D70	D6.4	Report on Validation and Tests of Systems for Automated Driving	VIF	R	PU	36
D71	D6.5	Report on Validation and Tests of Systems for Multi-agent Sensing and Control	AVL	R	PU	36
D72	D6.6	Report on Validation and Tests of Systems for Energy Domain	PRODRIVE	R	PU	36
D73	D7.1	Initial Dissemination, Communication and Exploitation Plan	IOTAM	R	PU	3
D74	D7.2	Communication Channels and Project Website	IOTAM	DEC	PU	3
D75	D7.3	Annual Dissemination Reports & Plan Updates – Year 1	IOTAM	R	PU	12
D76	D7.4	Annual Dissemination Reports & Plan Updates – Year 2	IOTAM	R	PU	24
D77	D7.5	Annual Dissemination Reports & Plan Updates – Year 3	IOTAM	R	PU	36
D78	D7.6	Updated Exploitation Plans Including Individual Plans	IOTAM	R	SEN	18
D79	D7.7	Final Exploitation Plans Including Individual Plans	IOTAM	R	SEN	36

D80	D7.8	Standardization State-of-the-Art and Analysis of Gaps	CONV	R	PU	12
D81	D7.9	Standards and Processes in Relation to Cynergy4MIE' Chosen Scenarios	CONV	R	PU	22
D82	D7.10	Standardisation Proposals Based on Identified Cynergy4MIE Demonstrators	CONV	R	PU	36
D83	D8.1	Project Handbook	AVL	R	PU	1
D84	D8.2	Data Management Plan	AVL	DMP	PU	6
D85	D8.3	Risk Mitigation Plan	AVL	R	SEN	6
D86	D8.4	Report on Project Clustering and Synergies	AVL	R	PU	24
D87	D8.5	Mid Term Report M6	AVL	R	SEN	7
D88	D8.6	Mid Term Report M18	AVL	R	SEN	19
D89	D8.7	Updated Data Management Plan	AVL	DMP	PU	24
D90	D8.8	Mid Term Report M30	AVL	R	SEN	31
D91	D9.1	EPQ - POPD - NEC - H - AI - Requirement No. 1	AVL	ETHICS	SEN	3
D92	D9.2	EPQ - POPD - H - NEC - AI - Requirement No. 2	AVL	ETHICS	SEN	12
D93	D9.3	AI - NEC - EPQ - POPD - H - Requirement No. 3	AVL	ETHICS	SEN	24
D94	D9.4	H - AI - NEC - POPD - EPQ - Requirement No. 4	AVL	ETHICS	SEN	36

10.5 List of Milestones and Criteria

Table 9: List of Milestones

Number	***Name***	***Lead Beneficiary***	***Due Date (in months)***	***Means of Verification***
M1	Launch of project website	IOTAM	3	Project website available.
M2	Operational project management established	AVL	7	Deliverables from WP8 planned in period m01 to m07 provided.
M3	Requirements and specifications available	VIF	12	All WP1 deliverables submitted, acknowledged by WP leader, and supported by WP1 deliverables.
M4	Preliminary results from WP3 finalized	IFAT	16	Intermediate deliverables (D3.1, D3.3, D3.5, D3.7, D3.9) from WP3 submitted.
M5	Architecture, models, and simulation framework available	VIF	22	All WP2 deliverables submitted, acknowledged by WP leader, and supported by WP2 deliverables. All intermediate deliverables (D4.1, D4.4, D4.7, D4.10, D4.13 and D4.16) from WP4 submitted.
M6	Components designs available	IFAT	27	All WP3 deliverables available, acknowledged by WP leader and supported by WP3 deliverables. All intermediate deliverables (D5.1, D5.6, D5.10, D5.15, D5.19 and D5.23) from WP5 submitted. Data management plan updated in D8.7.
M7	Algorithms implemented and computing platform available	BUT	29	Algorithm and platform/s available and validated by users in the SCs. Core WP4 deliverables (D4.2, D4.5, D4.8, D4.11, D4.14 and D4.17) available, supported by the deliverables mentioned above.
M8	Systems integrated and available for validation and testing	NXP-NL	33	Systems integrated and commissioned. All WP4 and core WP5 deliverables (D5.2, D5.3, D5.4, D5.7, D5.8, D5.11, D5.12, D5.13, D5.16, D5.17, D5.20, D5.21, D5.24, D5.25) available, supported by the deliverables mentioned above.
M9	Validated demonstrators available	AVL	36	All WP5 and WP6 deliverables submitted, project results validated and demonstrated, acknowledged by WP leaders, and supported by WP5 and WP6 deliverables.

10.6 List of Critical Risks

TABLE 10: LIST OF CRITICAL RISKS

Nr.	Description	Risk Mitigation Measures	WP No.
1	Overly ambitious requirements could lead to scope creep, making implementation challenging in subsequent work packages. i) Moderate, (ii) Moderate	Collaborative requirement-setting sessions with stakeholders, continuous monitoring, and prioritization of requirements, maintain a clear project scope.	1
2	The modelling might not accurately represent real-world scenarios or user behaviours, leading to system inefficiencies or unexpected challenges during implementation. i) Moderate, (ii) Moderate	Use real-world data wherever possible in the modelling phase.	2
3	Algorithms not optimized for specific hardware platforms, causing lag or malfunction. i) Moderate, (ii) Moderate	Iterative testing and optimization; alignment between software and hardware teams.	4
4	Incompatibilities during system integration, causing delays. (i) Moderate, (ii) High	Modular design approach, early prototyping, and integration testing	5
5	Demonstrators not meeting real-world conditions leading to validation failures. (i) Moderate, (ii) High	Real-world scenario testing, iterative feedback, engaging end-users for realistic test cases.	6
6	Potential collision hazards during testing may pose risks to participants. (i) Low, (ii) Critical:	Conduct safety assessments for each test, utilize a safety operator during tests, and manage access to the testing environment when necessary.	6
7	Existing safety-relevant regulations regarding the implementation of HRC in the context of heavy-duty robots complicate or prevent the compilation of practicable requirements for the use cases in the construction industry. (i) medium (ii) medium	The requirements are not restricted despite the existing regulations. Implementation of individual requirements may have to be carried out later with a lower TRL in a laboratory environment.	1
8	The defined architectures could have a high level of complexity, which represents a high implementation hurdle for the end users in the SC2, who are characterised by small and medium-sized enterprises. (i) medium (ii) medium	The end users are involved in the early design stage. If there are concerns about complexity, elements are divided into necessary and optional	2
9	Individual frameworks and toolsets (e.g., robotics, AI, or blockchain) are still in a very immature stage and at first glance promise more than they deliver. (i) medium (ii) low	If necessary, existing frameworks and toolsets should be further developed or new ones provided by the versatile and professional partners.	3
10	The sensor technology developed for HRS does not meet the requirements in terms of sensitivity, speed, or robustness. (i) medium (ii) low	It may be necessary to use an existing sensor system that can provide meaningful support at least with reduced requirement profiles up to TRL 5.	4
11	The calculation processes for the AI are too complex to implement them in embedded form. (i) medium (ii) low	All use cases are designed in such a way that they can also be carried out with an external computer or at the control station.	4
12	There may be hardware and/or software problems implementing the use cases in the construction company's shop floor environments. (i) medium (ii) high	Interoperability requirements are already taken into account in the conception phase and, if necessary, individual preliminary tests are carried out together with the end users in the early phases of the project.	5
13	The human-robot collaboration can prove too cumbersome, time-consuming, or even dangerous for the workers in the construction company. (i) high (ii) low	The work processes in assembly and/or logistics will be divided into dedicated sub-activities, from which individual disruptive activities can be removed if necessary	6
14	Existing safety-relevant regulations regarding the implementation of HRC in the context of heavy-duty robots complicate or prevent the compilation of practicable requirements for the use cases in the construction industry. (i) medium (ii) medium	The requirements are not restricted despite the existing regulations. Implementation of individual requirements may have to be carried out later with a lower TRL in a laboratory environment.	1

15	Failure in the definition of the system's preliminary specifications. (i) medium (ii) medium	An iterative methodology is used to develop the various components in order to maximise the outcome of the overall solutions. Preliminary specifications are revised and optimised throughout the project until final integration and validation	1
16	Project complexity delaying requirements. (i) low (ii) medium	The involvement of industry together with research partners reduces the likelihood of this risk.	1
17	Delayed functional safety analysis of specific components. (i) high (ii) low	Due to lower TRL levels, the functional safety concept and analysis will be planned to be completed at the end of the project, which should allow sufficient time to achieve the expected result.	2
18	The quantities measured with the quantum sensor (temperature, magnetic field) do not correspond with simulated values. Medium (ii) medium	Perform sensitivity analysis in the simulation and test sensor systems on several identical servodrive motors in order to evaluate the spread	2
19	Models, modelling methods or system designs are not available on time. (i) medium (ii) medium	In some cases, use of state-of-the-art models, methods, simulation frameworks and simulated data to minimise delay.	3
20	Bigger modifications of servodrive necessary to install quantum-based sensor system. Medium (ii) medium	Early discussion with involved partners (especially FAU), identification of positions where modifications will have the smallest impact on the original design	3
21	Availability of components required for prototypes. (i) medium (ii) medium	Anticipating needs very early in the process	4
22	Potential delays in completing sensor and drive components with the planned modifications and developments. (i) medium (ii) high	Use of over-the-shelf products, where possible and start the developments early on in the project. When newly developed sensor (i.e., quantum sensor) is delayed, shift focus more on conventional components based on MEMs.	4
23	Supply chain shortages for components, not only on the most innovative GaN components, but on whole BOM needed (i) medium (ii) high	Early definition of needed components & selection with suppliers of the most suitable & available components to meet schedule targets	4
24	Calibration of the torque sensor in rotation not feasible (i) medium (ii) low	Implement alternative calibration concepts in the system design	4
25	Manufacturing accuracies for the metamaterial structures not sufficient (i) medium (ii) low	Early evaluation of test structures. Screening of alternative manufacturing tools	4
26	Hardware integration of the metamaterial targets impossible. (i) medium (ii) medium	Early involvement of system design. Development of alternative integration concepts	5
27	Software not running in the demonstrators due to hardware incompatibilities. (i) low (ii) medium	Close collaboration between software function developers and demonstrator developers. Risk mitigation by using common prototyping environment.	5
28	Potential delays in integration of demonstrators. (i) medium (ii) high	Assignment of demonstrator leader early on in the project and preparation of the detailed time plan for tracking the integration status on time.	5
29	Missing to reach some qualification / validation requirement. (i) low (ii) high	Taking margin in the design process and taking into account during the process the gap identified	6
30	Potential delays in validation and testing of the demonstrators. (i) high (ii) medium	Upon the start of the integration phase, get the demonstrator leaders to prepare a detailed validation and test plan with an achievable time-plan, which shall be used to keep track of the progress.	6
31	Requirements might be delayed due to complexity of demonstrators. (i) low (ii) medium	Discussion with all involved partners to define the challenging requirements will provide deeper insight and different perspectives, resulting in defining relevant expectations.	1
32	Difficulties to meet the predefined expectations throughout the project, due to the challenge of defining requirements for innovative technologies that are being developed. (i) medium (ii) medium	Requirements will be reviewed by all partners, and refined based on simulation experience that will be gained within WP2.	1
33	Due to the novelty of the approach, models and system design may not be available on time. (i) high (ii) medium	In order to minimize the delay, state-of-the-art methods for system architecture and modelling will partly be used.	2

34	Reference real-world data about traffic situation is not available to involved partners. (i) high (ii) low	Required data will be recorded by the partners or purchased from the third party.	2
35	Delayed delivery of sensing technologies due to compatibility issues with other system components. (i) medium (ii) medium	Simulations from WP2 will be used to derive precise specifications and potentially propose a backup solution with existing hardware.	3
36	Implementation of algorithms is delayed. (i) high (ii) medium	Reduce the risk of delay through collaboration and communication with other partners and supply chains.	4
37	Developed and planned components are not successfully integrated into the demonstrators. (i) medium (ii) high	Industrial partners with expertise about included technologies will be involved to reduce this possibility. Separate components, models and algorithms will be verified and assessed separately in WP4. Final demonstrators will, if necessary, be of reduced complexity.	5
38	Validation of some involved systems is not successful, or the system isn't ready in time, therefore, validation of one of the demonstrators cannot be executed. (i) medium (ii) high	Use state-of-the-art components or systems to implement at least minimum functionality and test the system.	6
39	Difficulties to meet the predefined expectations throughout the project, due to the challenge of defining requirements for innovative technologies involving swarm of robotic vehicles for SAR missions. (i) medium (ii) medium	All partners will review the requirements and make refinements based on the simulation experience gained during WP2	1
40	Difficulties in modelling swarm of robotic agents, including potentially multitudes UAVs and UGVs, with sufficient fidelity levels. (i) medium (ii) low	The requirements will be specified in WP1 for the typical mission profile and configuration with input from all the partners. Depending on the mission profile and the configuration, the number of agents to be simulated will be adjusted to find a balance between computational feasibility and the demonstration goals for the SAR mission.	2
41	Carrying capacity for the mission payload (a set of sensors for survivor detection) is too much for the robotic UAV platform. (i) high (ii) low	While the use of a uniform setup for each agent in the swarm has benefits, alternatives for the utilization of different payload configurations for each agent in a joint mission will also be investigated.	3
42	Implementation of algorithms for SAR use cases is delayed. (i) high (ii) medium	Reduce the risk of delay through collaboration and communication with other partners and supply chains. Also, start with the development as soon as possible.	4
43	Difficulties and potential delays in the integration of the developed components into the demonstrator platforms. (i) medium (ii) high	We will engage industrial partners who possess expertise in the relevant technologies to mitigate this potential issue. In WP4, we will independently verify and assess distinct components, models, and algorithms. If needed, the final demonstrators may have reduced complexity.	5
44	Validation for certain systems involved may not succeed, or the system may not be ready within the expected timeframe, consequently preventing the execution of validation for one or more test cases of the demonstrators. (i) medium (ii) high	The validation of some use cases or the corresponding subtest cases can be limited to pure simulation. The real-life demonstration will be limited to a very small number of cooperative agents, reducing the risk of complexity and the validation objectives.	6
45	Design of converter should be generic enough for multiple applications (customers, grid-connections, etc.) but focused enough to work optimally. (i) medium (ii) medium	Constant connection to the market and talks with (potential) customers to make sure specifications and requirements match with real world needs	1
46	Selection of power per module and how many converter modules can be connected in parallel. (i) low (ii) medium	Determine and confirm situations in which converters will be used and applications in practice to make optimal choice	1
47	Simulations not complete, including wrong assumptions or not taking into account the right parameters. (i) medium, (ii) high	Apply 4 eyes principle and make sure experienced employees are involved to reduce simulation mistakes. Monitor performance vs. simulation results closely to react promptly.	2

48	Wide bandgap semiconductor lifetime models not in time for decisions that need to be taken in hardware design phase (i) medium (ii) medium	Develop wide bandgap semiconductor lifetime models based on existing models in literature and do accelerated lifetime testing with high acceleration factor.	3
49	Insufficient or too much computing power included in design w.r.t. algorithms developed. (i) medium (ii) medium	Use experienced personnel during selection, start algorithm development early on to avoid surprises and to quickly be able to determine required computing performance.	4
50	Error in hardware preventing commissioning of full converter system. (i) medium (ii) high	Do extensive review of requirements, system concept, detailed design with a review board of senior architects and engineers.	5
51	Gathering reliability data with statistical relevance not feasible within project timeline (i) low (ii) medium	Do pre-test on small scale to ensure final design of test setup allows testing within proper timeframe.	6

10.7 Abbreviations

A list of the abbreviations used in this document can be found in Table 11. A list of participants and their company affiliation (legal company name and company short name used in the ***Cynergy4MIE*** project) can be found in Table 5.

TABLE 11: ABBREVIATIONS

Abbreviation	Meaning
ADAS	Advanced Driver Assistance Systems
AI	Artificial Intelligence
BEV	Battery Electric Vehicle
CAV	Connected & Automated Vehicles
CC	Country Coordinators
CPS	Cyber Physical Systems
EV	Electric Vehicle
GA	General Assembly
HW	Hardware
IoT	Internet of Things
IPR	Independent Project Review
KPI	Key Performance Indicator
KT	Key Target
MaaS	Mobility as a Service
MIE	Mobility, Infrastructure, Energy
NGA	National Grant Agreement
PC	Project Coordinator

PCA	Project Consortium Agreement
PGA	Project Grant Agreement
PMT	Project Management Team
SAR	Search and Rescue
SC	Supply Chain
SCMT	Supply Chain Management Team
SoS	System of Systems
SW	Software
TRL	Technology Readiness Level
V2X	Vehicle to Everything (Connectivity)
WBG	Wide Band Gap (Semiconductor)
WP	Work Package
WPMT	Work Package Management Team

11 List of Figures

Co-funded by the European Union

12 List of Tables

13 Project Internal Review

	Reviewer 1:			Reviewer 2: Optional		

1. Is the deliverable in accordance with:

	Answer	Comments	Type*	Answer	Comments	Type*
(i) the description of work?	yes		M/m/a	yes/no		M/m/a
(ii) the international state of the Art?	yes/no	n/a	M/m/a	yes/no		M/m/a

2. Is the quality of the deliverable in a status that:

	Answer	Comments	Type*	Answer	Comments	Type*
allows to send it to Chips JU?	yes		M/m/a	yes/no		M/m/a
(ii) needs improvement of the writing by the originator of the deliverable?	yes/no	The document is in good quality. Only minor typos and some suggestions are provided	m	yes/no		M/m/a
(iii) needs further work by the partners responsible for the deliverable?	no		M/m/a	yes/no		M/m/a

* Type of comments: M = major comment; m = minor comment; a = advise

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