# D7.7 FINAL VERSION OF CPSOSAWARE DISSEMINATION PLAN & MATERIAL

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|---|---|
| Work Package | WP7 Exploitation and dissemination plan including standardisation activities |

## Abstract

This report constitutes an output of the Task 7.1 "Dissemination planning and activities" and represents the D7.7 "Final Version of CPSoSaware Dissemination Plan & Material".  Therefore, this document provides detailed information regarding the activities and initiatives carried on in the second half of the project and outlines the channels through which results and key messages have been communicated to the stakeholders and audiences that have been identified to benefit from the CPSoSaware project. The basic aim of dissemination and communication is to effectively transmit information of the CPSoSaware project activities and its outcomes to multiple stakeholders and audiences, in order to support and maximize the impact of CPSoSaware.

## Deliverable Information

| | |
|---|---|
| *Work Package* | WP7 |
| *Task* | T7.1 Dissemination planning and activities |
| *Deliverable title* | Final Version of CPSoSaware Dissemination Plan & Material |
| *Type* | Public |
| *Dissemination Level* | PU |
| *Status* | Final |
| *Version Number* | 1.0 |
| *Due date* | M36 |

## Project Information

| | |
|---|---|
| *Project start and duration* | 01/01/2020 – 31/12/2023, 36 months |
| *Project Coordinator* | Industrial Systems Institute, ATHENA Research and Innovation Center<br>26504, Rio-Patras, Greece |
| *Partners* | 1. ATHINA-EREVNITIKO KENTRO KAINOTOMIAS STIS TECHNOLOGIES TIS PLIROFORIAS, TON EPIKOINONION KAI TIS GNOSIS (ISI) - Coordinator |
| | 2. FUNDACIO PRIVADA I2CAT, INTERNET I INNOVACIO DIGITAL A CATALUNYA (I2CAT), |
| | 3. IBM ISRAEL - SCIENCE AND TECHNOLOGY LTD (IBM ISRAEL |
| | 4. ATOS SPAIN SA (ATOS), |
| | 5. PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH (PASEU) |
| | 6. EIGHT BELLS LTD (8BELLS) |
| | 7. UNIVERSITA DELLA SVIZZERA ITALIANA (USI), |
| | 8. TAMPEREEN KORKEAKOULUSAATIO SR (TAU) |
| | 9. UNIVERSITY OF PELOPONNESE (UoP) |
| | 10. CATALINK LIMITED (CATALINK) |
| | 11. ROBOTEC.AI SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA (RTC) |
| | 12. CENTRO RICERCHE FIAT SCPA (CRF) |
| | 13. PANEPISTIMIO PATRON (UPAT) |
| *Website* | www.cpsosaware.eu |

## Control Sheet

| VERSION | DATE | SUMMARY OF CHANGES | AUTHOR |
|---|---|---|---|
| 0.1 | 14/10/2022 | Initial ToC defined and circulated to the consortium for approval | Konstantina Papachristopoulou (8BELLS) |
| 0.2 | 15/11/2022 | Addition of content in Section 2 | Konstantina Papachristopoulou (8BELLS) |
| 0.3 | 13/12/2022 | Additional input and updates in Section 2 | Konstantina Papachristopoulou (8BELLS) |
| 0.4 | 22/12/2022 | Final input and updates in all Sections. Document ready for Internal Review | Konstantina Papachristopoulou (8BELLS) |
| 0.5 | 10/01/2023 | Internal Review | Alessandro Zanella (CRF) |
| 0.6 | 11/01/2023 | Internal Review | Francesco Regazzoni (USI) |
| 1.0 | 12/01/2023 | Integration of internal review comments. Deliverable ready for submission | Konstantina Papachristopoulou (8BELLS) |

| | NAME |
|---|---|
| Prepared by | 8BELLS |
| Reviewed by | CRF, USI |
| Authorised by | ISI |

| DATE | RECIPIENT |
|---|---|
| 12/01/2023 | Project Consortium |
| 12/01/2023 | European Commission |

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## Executive Summary

This report constitutes an output of the Task 7.1 "Dissemination planning and activities" and represents the D7.7 "Final Version of CPSoSaware Dissemination Plan & Material".  Therefore, this document provides detailed information regarding the activities and initiatives carried on in the second half of the project and outlines the channels through which results and key messages have been communicated to the stakeholders and audiences that have been identified to benefit from the CPSoSaware project. The basic aim of dissemination and communication is to effectively transmit information of the CPSoSaware project activities and its outcomes to multiple stakeholders and audiences, in order to support and maximize the impact of CPSoSaware.

# 1   Introduction

## 1.1   Summary

The present deliverable is prepared in the context of Work Package 7 "Exploitation and dissemination plan including standardization activities" and in particular, it is associated with the task T7.1 "Dissemination planning and activities".

T7.1 focused on the development and execution of a viable plan for the CPSoSaware communication and dissemination activities. In this context, we identified the suitable promotional material and dissemination activities. The aim of WP7 has been to achieve high measurable impact of the project results and to ultimately lead to a successful adoption of the CPSoSaware capabilities and innovative features into the European ecosystem.

This deliverable is the final of two deliverable revisions within WP7, (namely D7.1 [1] and the present D7.7). This document, produced at the end of the project, provides:

- The approach taken based on the set Communication and Dissemination Strategy, as documented in D7.1.
- A detailed report on activities taken place for the Dissemination of the project, during the second reporting period.
- A report regarding the Communication activities that have taken place and the channels used, building upon the report of D7.2 [2].
- A list of all scientific publications as well as information on liaison/collaboration with other projects.
- The activities plan and the monitoring process of all Dissemination and Communication activities with their KPIs and tools.
- CPSoSaware's participation in two different Horizon Results Booster Modules.

## 1.2   Document Structure

The document is divided in three parts, first being the introductory section (Section 1) and last being the conclusions and future work (Section 3). The main part of the current report is Section 2, where a detailed account of all activities and achievements towards dissemination and communication is presented as follows:

- Subsection 2.1 presents a summary of dissemination activities.

- Social media and virtual communication channels are demonstrated in Subsection 2.2.

- In subsection 2.3 promotional material that have been produced during the second half of the project are presented.

- A detailed account on events that the consortium partners either participated or organised is available at subsection 2.4.

- Subsection 2.5 includes all information related to peer-reviewed publications stemming from CPSoSaware in journals and conference/workshop proceedings.

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▪ A description of clustering activities with other projects and initiatives is included in subsection 2.6.

▪ Finally, all dissemination and communication activities are measured against the set Key Performance Indicators (KPIs) in subsection 2.7.

## 1.3    List of terms and abbreviations

Table 1: List of terms and abbreviations

| Acronym /abbreviation | Explanation |
|---|---|
| 3D | Three dimensional |
| 5G/6G | Fifth/Sixth Generation |
| AI | Artificial Intelligence |
| ASIP | Application-specific instruction-set processor |
| AVs | Autonomous vehicles |
| CAV | Connected Autonomous Vehicles |
| CPC | Customized Parallel Computing research group |
| CPSoS | Cyber-Physical System of Systems |
| CPU | Central Processing Unit |
| DoA | Description of the Action |
| FPGA | Field-Programmable Gate Array |
| GPU | Graphics Processing Unit |
| GUI | Graphical User Interface |
| HRB | Horizon Results Booster |
| ICT | Information and Communication Technologies |
| IoT | Internet of Things |
| KPI | Key Performance Indicator |
| NITYMED | Nighttime-Yawning-Microsleep-Eyeblink-Distraction |
| OA | Open Access |
| OEM | Original Equipment Manufacturer |
| PG | Project Group |
| SoA | Service Oriented Architecture |
| SoC | System on Chip |
| TCE | TTA-based Co-design Environment |
| TRL | Technology Readiness Level |
| TTA | Transport Triggered Architecture |

## 2   Dissemination Activities

### 2.1   Summary of dissemination activities

Within this deliverable we aim to provide a detailed account of all dissemination and communication efforts carried out by the CPSoSaware project partners during the second half of the project. Therefore, dissemination material produced during these months, events organised and/or attended by project partners, accepted scientific papers, social media and project website updates are presented in detail. The performance of dissemination activities is measured against the metrics in the form of Key Performance Indicators (KPIs) set early in the project and as documented in Preliminary Version of CPSoSaware Dissemination Plan & Material [1], build upon the Dissemination and Communication strategy formulated during the Grant Agreement preparation phase. According to the Description of the Action (DoA) [3], the strategy for promoting the project and creating an impact consists of the following communication processes:

- *Creation of the CPSoSaware public web portal that is going to operate as a forefront of the CPSoSaware ecosystem. Apart from the CPSoSaware ecosystem support, the portal will act as a dynamic database centralizing the scientific results, standard documents, market information relative to the context of the CPSoSaware project.*
  STATUS: Website designed, developed and frequently updated according to the requirements ☑

- *To support online and offline dissemination, a leaflet, a poster, and presentation slides will be created and updated upon major developments in the course of the project including project deliverables, dissemination materials and other project-related material. Project branding will provide a uniform graphic layout.*
  STATUS: A variety of dissemination material developed, followed a common graphical design ☑

- *Creation of a social media strategy (including Twitter, Facebook, LinkedIn, and the likes) to be used to broadcast announcements of the project participation in public events, key achievements, publications, etc.*
  STATUS: Project social media (Linked In, Twitter, Facebook, YouTube channel) created and frequently updated ☑

- *Publication of CPSoSaware newsletter. Such news will be distributed taking into account the identified needs.*
  STATUS: Newsletters published periodically throughout the course of the project ☑

- *Publications in major international peer-reviewed scientific conferences, specialized journals and magazines in project related areas.*
  STATUS: A wealth of scientific publications have been accepted for publication in several international conferences and well-known journals ☑

- *Workshop organization. CPSoSaware will organize two (ISI, UPAT) workshops or co-locate our workshops with international events (e.g., EU meeting, conferences, industrial events).*
  STATUS: CPSoSaware workshops have been organised ☑

- *Training organization. CPSoSaware will organize three training seminars*
  STATUS: One physical training seminar (Archimedes) and 2 video training seminars available ☑

Table 2 below presents the status of the performed dissemination activities at M36, also presenting the status at M18, as a brief summary of activities per category during the whole duration of the project.

Table 2: Status of CPSoSaware dissemination activities at M36

| Type | Description | Status at M18 | Status at M36 |
|---|---|---|---|
| Publication in Conferences | *Participation to or organization of scientific events, conferences, and workshops as well as participation to industry interest groups, venues, associations, and standards' bodies events.* | 20 accepted publications for various type of conferences and symposiums | 49 accepted publications for various type of conferences and symposiums, plus 1 submitted |
| Publication in Journals | *Publication of papers in journals and magazines.* | 6 accepted journal publications (another 2 pending) | 15 accepted journal publications (plus 3 submitted) |
| Survey papers and whitepapers | *Whitepapers available on social media platforms and the project's website.* | Whitepaper #1 to be released on M20-M22  Survey paper based on D1.1 to be submitted on M18 | Survey paper & White paper available and promoted through communication channels |
| Workshop organization | *The project consortium will be organized 2 workshops* | Some workshops were already organized by consortium members but of course the project will organize 2 dedicated CPSoSaware workshops | - MLPS2022 - Archimedes - WASOS (HiPEAC2023) - #NextGenCPSoS Cluster, joint event (tbc) |
| Participation in events | *Participation in various project related events* | Events participated by project partners are listed below. Currently we have participated in 15 events of various types | Events participated by project partners are listed below and amounts to 12 for the $2^{nd}$ reporting period, not including conferences/workshops where partner have submitted papers, amounting to 27 events total |
| Marketing Material | *Leaflets, Posters. Brochures, Press Releases, Videos* | Leaflet, Brochure, teaser video - available | Posters, infographic, videos - available |
| Project Website | *Raising awareness of CPSoSaware* | Website available | Website updated and continuously populated with available material |
| Social Media | *Facebook, Twitter and LinkedIn with relevant project news.* | AVAILABLE: Facebook, LinkedIn, Twitter, YouTube | Social media frequently updated with relevant project news |

## 2.2  Social Media and Website

In the following sections we present the current status of the project website along with visitor analytics and statistics, in addition to all the project's social media (Linked In, Facebook, Twitter) with their respective analytics, as well.

### 2.2.1  Website

CPSoSaware project website (Figure 1) is accessible under the domain https://cpsosaware.eu  and was created during the first three months of the project. The website remained the basic channel for disseminating the project objectives, activities, and results, throughout the whole project duration. All dissemination materials are available for download (i.e., peer-reviewed papers, newsletters, media material, etc.). The website kept the original design and Graphical User Interface (GUI), being simple, functional, and intuitive for all the targeted project stakeholders' and different types of audiences. The website is hosted by the dissemination leader 8BELLS and has been frequently updated with the support and in collaboration with all partners who also contribute to different sections of the website, such as publications, events, and news.



**Figure 1: Website homepage**
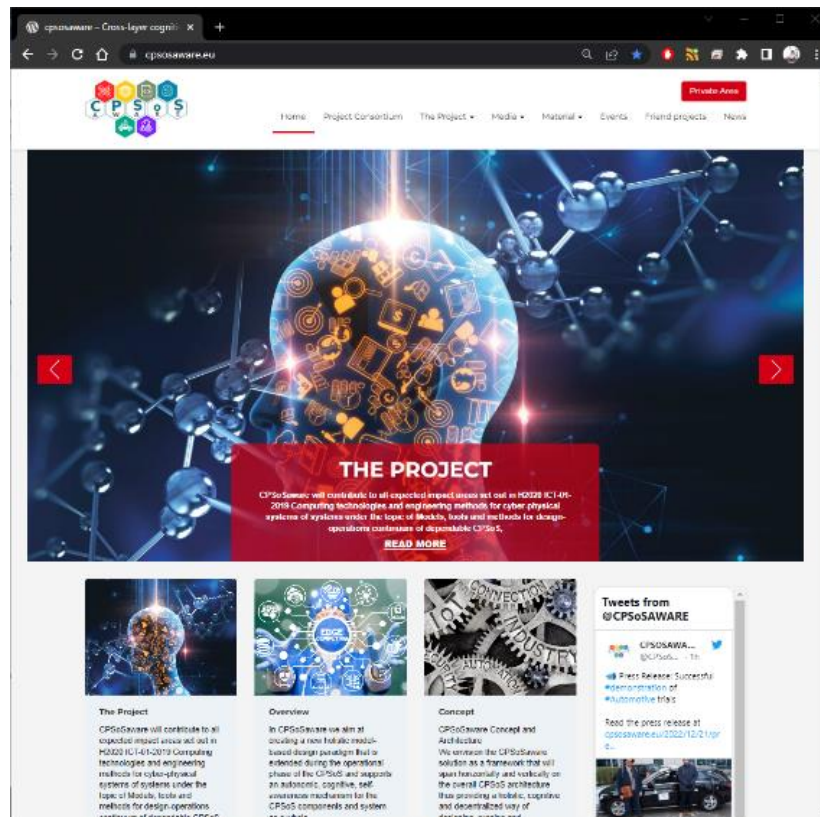
The CPSoSAware website has being monitored through various statistics and KPIs. By the end of project, we had 5.168 unique visitors and 13.791 visits. Figure 2 below presents website statistics (unique visitors and total visits) from June 2020 to December 2022 in the left side of the image, while the right side of the picture presents visitors and visits during all months of 2022.
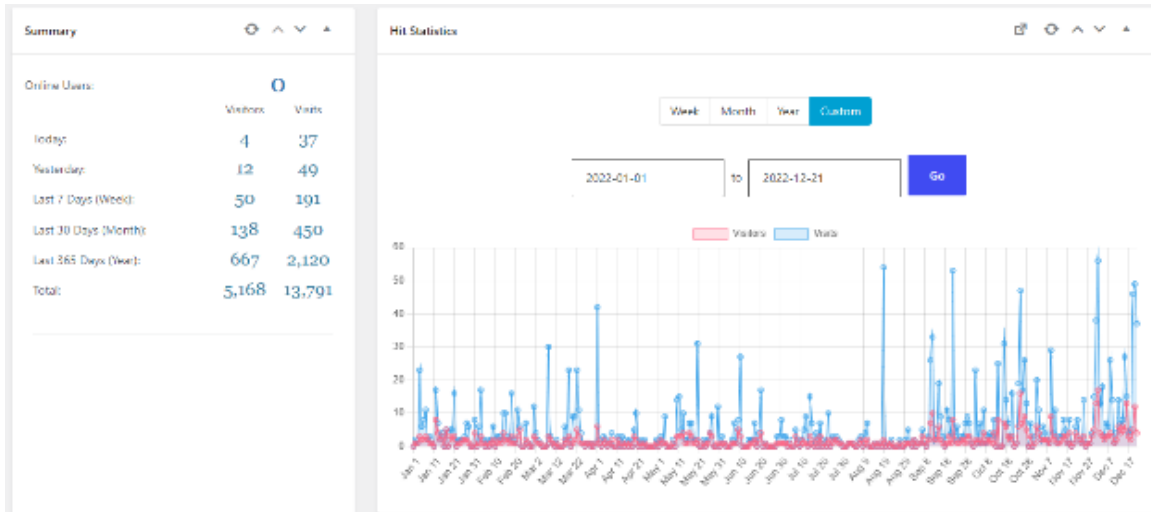
**Figure 2: Indicative CPSoSaware website analytics by 21/12/2022**

Figure 3 displays the top ten pages according to the accumulative visits per website section.

| ID | Title | Link | Visits |
|---|---|---|---|
| 1 | Home Page | / | 4,473 |
| 2 | Project Consortium | /project-consortium/ | 484 |
| 3 | The Project | /the-project/ | 253 |
| 4 | Concept | /concept/ | 250 |
| 5 | Publications | /publications/ | 209 |
| 6 | Overview | /overview/ | 205 |
| 7 | Use Cases | /use-cases/ | 198 |
| 8 | News | /news/ | 193 |
| 9 | Events | /event/ | 184 |
| 10 | Deliverables | /deliverables/ | 157 |

**Figure 3: Visits per website page**

Updates during the second half of the project include the addition of new webpages containing information and guidelines for download of open-source code (Figure 4) and datasets (Figure 5) derived from work performed in the project.

Figure 4: New section at website for Open-Source code



Figure 5: New section at website for datasets

## 2.2.2   Social media

Besides the project website and as part of the WP7's activities, several social media channels were created early in the project to establish a link between the possible stakeholders and the latest news about the project. In this way, the project's online presence has been complemente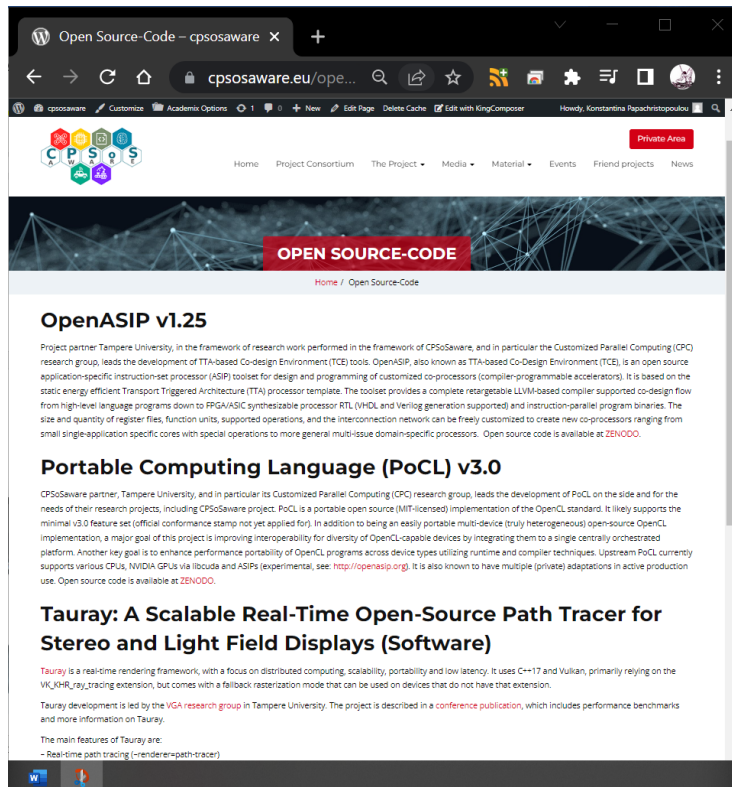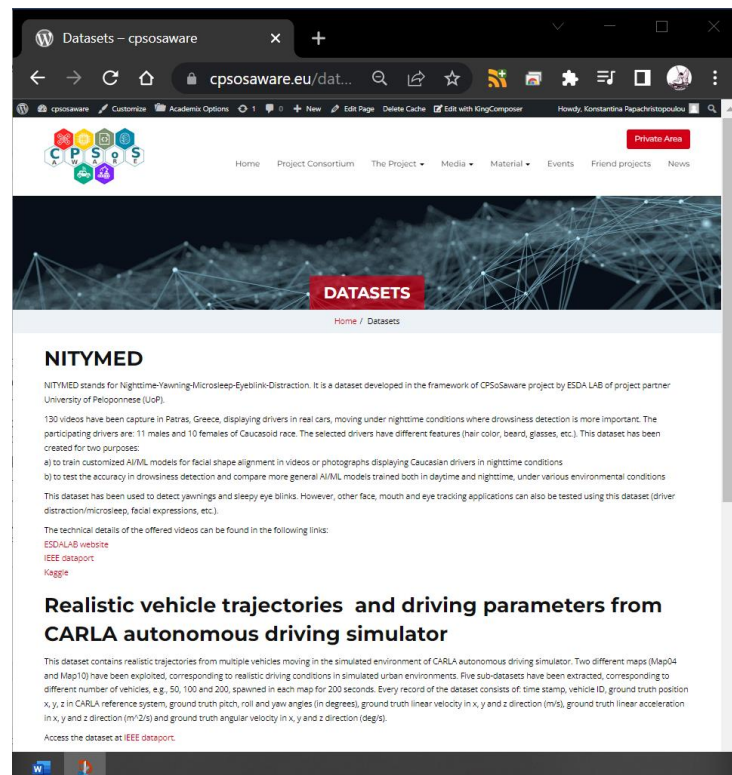d via a strong social media presence and an extended network of contacts (followers and visitors). As mentioned, a LinkedIn page, a Twitter account and a Facebook page have been created to promote the project to the general audience and to reach potential key stakeholders such as software suppliers, technology suppliers, Tiers and OEMs in value chain for automotive (use case connected and automated vehicles) and industrial manufacturing (use case manufacturing processes). Through the use of social networks, virtual channels and project promotional media it was made possible to increase the visibility of CPSoSaware and create a strong network among the different stakeholders involved in this knowledge sharing process. The social media allowed us to reach a variety of professionals interested on the topics addressed by the project. It can be said that the use of such online communication tools, has facilitated an effective and fast communication means to spread the latest news, helping us to reach an audience around the world.

### 2.2.2.1   Linked In

CPSoSaware LinkedIn page is appropriate for providing updates on the project progress targeting mainly the professional networks and communities of the medium. Linked In project page is accessible at https://www.linkedin.com/company/CPSoSaware-eu-funded-project and is currently being followed by 135 persons as of 21/12/2022. Linked In provides statistics and analytics functionality that gives a deeper insight of this social media account posts impact. Figure 6 presents the LinkedIn CPSoSaware page.
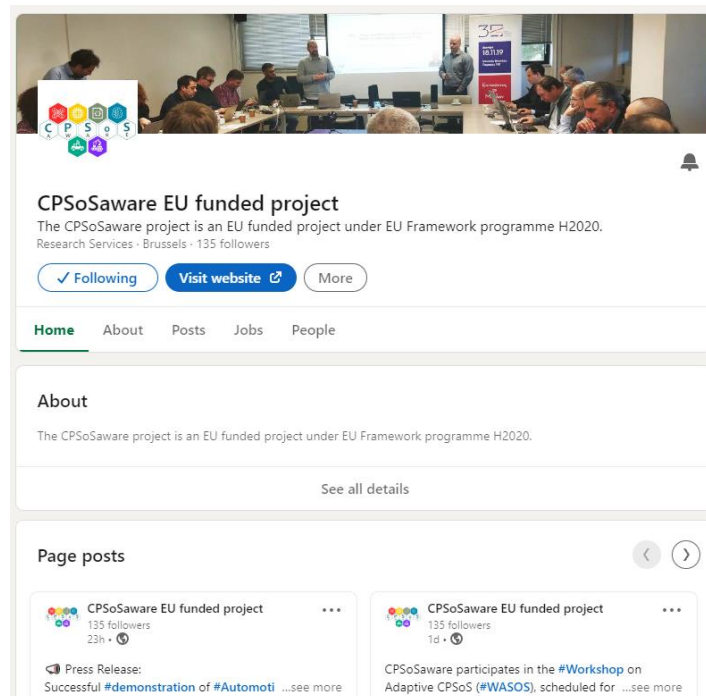


Figure 6: CPSoSaware @ LinkedIn

Figure 7 provides an overview of the impressions CPSoSaware posts had during the last year of the project.
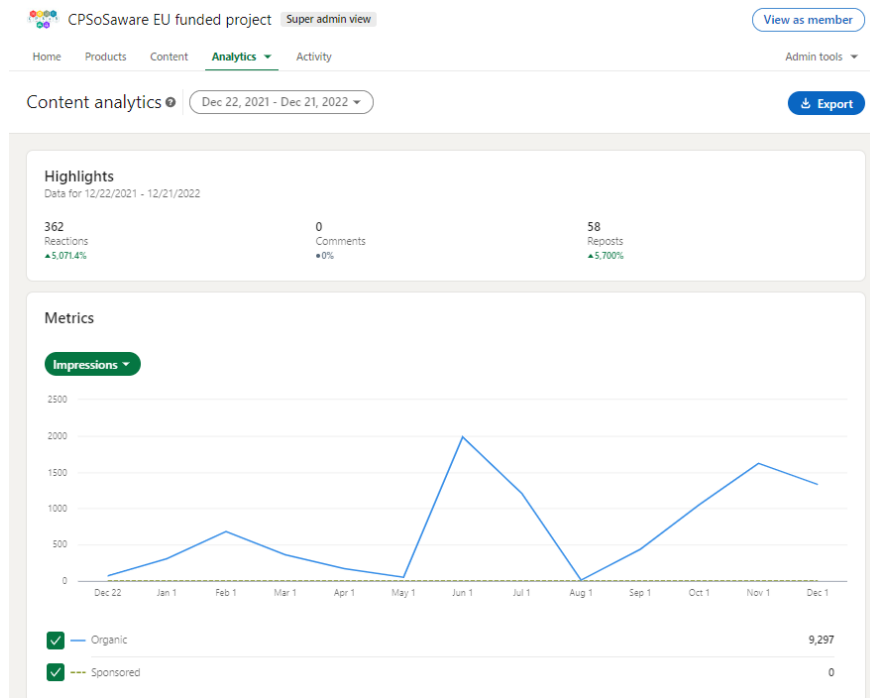
**Figure 7: CPSoSaware Linked In impressions analytics for 2022**

### 2.2.2.2   Twitter

CPSoSaware Twitter page is being used for communication with related stakeholders and actors through networking, short updates on project news (tweets) and announcement of upcoming or completed activities. It is available at https://twitter.com/CPSoSaware and has been created in order to share with the large twitter community all the news related to the project. The CPSoSaware Twitter account is currently being followed by 800 persons as of 21/12/2022. Figure 8 displays CPSoSaware Twitter account.
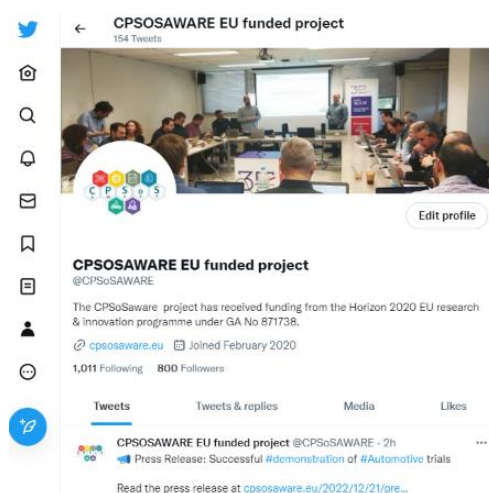


**Figure 8: CPSoSaware Twitter account**

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Figure 9 presents an overview of the analytics for December 2022. It is evident that Twitter is the most popular of the CPSoSaware Social media accounts, creating the maximum impact, as can been seen by the number of impressions and profile visits. All "tweets" are being posted by the dissemination leader and they are normally combined with updates on the project website (i.e., new media material available, or new peer-reviewed paper published, etc.)



Figure 9: CPSoSaware Twitter feed analytics for December 2022
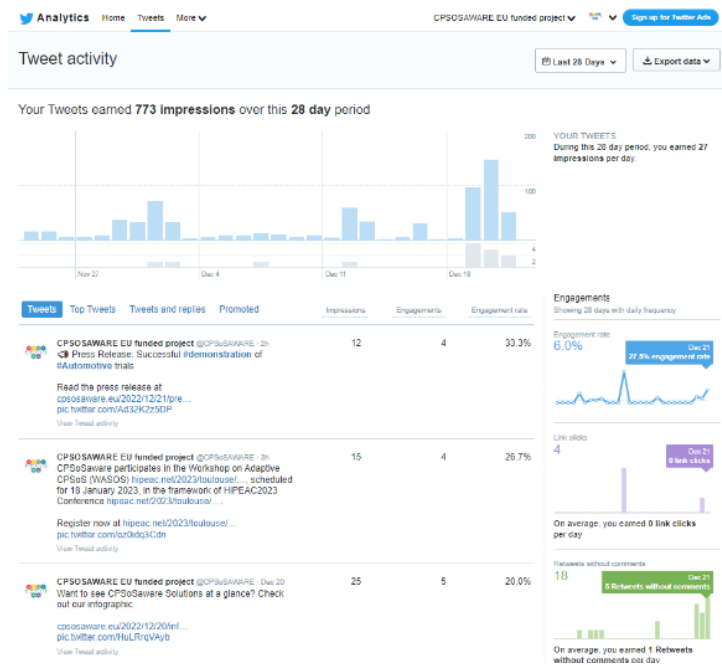


Figure 10: Twitter December 2022 analytics

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### 2.2.2.3    Facebook

The Facebook page (https://www.facebook.com/CPSoSaware ) has currently 75 followers as of 21/12/2022. Facebook provides an analytics functionality that gives a deeper insight of user activities and the impact that posts have to followers. Figure 11 presents CPSoSaware Facebook page.



Figure 11:  CPSoSaware Facebook page

Figure 12 provides an overview of Facebook statistics, of the last 90 days. More specifically it displays the number of people we managed to reach per specific post produced during this period.
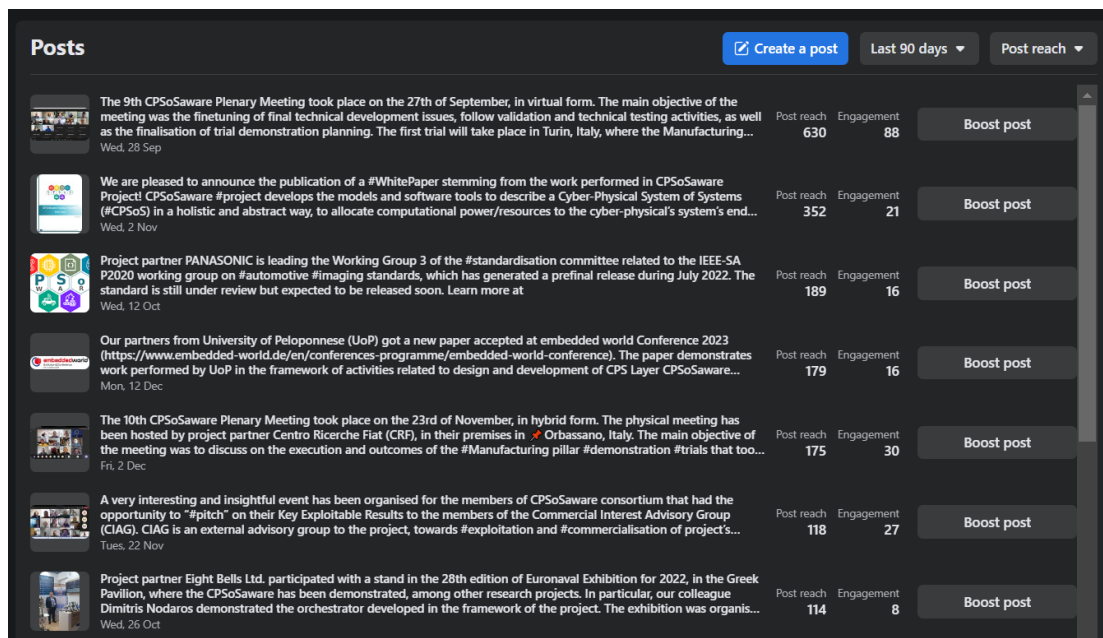


Figure 12: CPSoSaware Facebook posts reach (Last 90 days)

## 2.3 Material Produced

### 2.3.1 Posters, Infographic

Rollup banner and infographic were also created during the second reporting period, to match the look and feel of the website and the overall project design concept and meet the needs of the project. They have both been prepared in English language to raise the awareness of the stakeholders and a variety of audiences about the project with succinct textual and graphical information.

The partners were encouraged to use the roll-up banner and the posters during conferences, workshops, trade fairs/exhibitions, pilot site demonstrations, and other relevant events. They are uploaded on the CPSoSaware website and high-quality print-ready versions were provided to partners, so that they could print it and use at the events they participate in.

The infographic is only used in a virtual form, utilised as a high-level introduction to the CPSoSaware solutions and use cases, directly linked to the White Paper on CPSoSaware solutions essentials. It has been used to communicate project results through virtual channels (website and social media).



Figure 13: Roll up banner, Poster and infographic

## 2.3.2 Newsletters

Newsletters provided regular updates on what was happening on the project, highlighting its major achievements. The newsletters were circulated periodically based on the project's developments/news and activities (e.g., events organisation) schedule. Project partners provided information for the Newsletter and ensured that the content is accurate. All the Newsletter issues are uploaded at the project website. Five (5) issues of the CPSoSaware newsletter are online [4] to communicate and explain the project updates and developments. Links to the project website and the social media channels are provided both (all are clickable leading directly to the requested page) in order to make it easier for the interested reader to look for more information at our website and follow our social media accounts. During the second half of the project, three Newsletters have been published, namely Issue #3, Issue #4 and Issue #5.



Figure 14: CPSoSaware newsletters published during the second half of the project

## 2.3.3 Videos

During the second half of the project, three videos have been produced. The first one concerns a video demo of Connected and Autonomous Vehicles.



Figure 15: Screenshot of demo video for Connected and Autonomous Vehicles

The second video is about CPSoSaware approached for Cooperative scene analysis and localization.
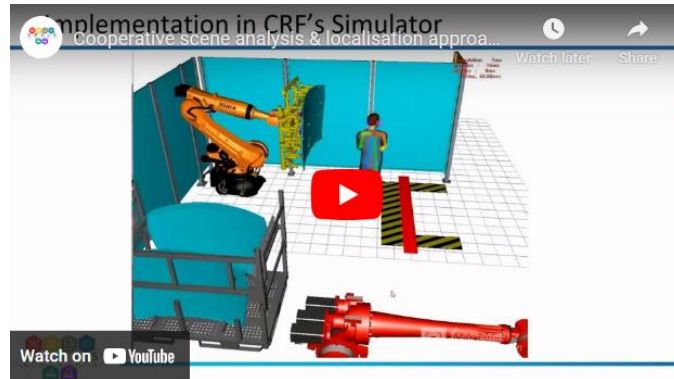


Figure 16: Screenshot of demo video for cooperative scene analysis and localisation approaches

Finally, an easy-to-follow project video has been produced in the second half of the project, presenting in high level the project solutions and use cases, targeting the wider public. Specifically, the promo video presents an overview of solutions developed in the framework of CPSoSaware project and tested during the demonstration trials of the pilots in Automotive and Manufacturing pillars, based on the contents of the White Paper



Figure 17: CPSoSaware promo video on project solutions essentials

All videos have been uploaded to the project's YouTube channel, available at https://www.youtube.com/@cpsosaware, while they are also featured at the CPSoSaware website at https://cpsosaware.eu/videos/.
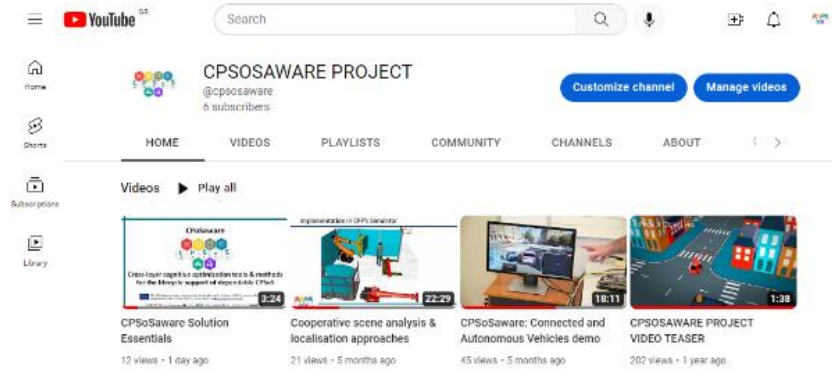
Figure 18: CPSoSaware YouTube channel

### 2.3.4    White paper on CPSoSaware Solution Essentials

CPSoSaware White Paper on Solutions Essentials collects all achievements stemming from the project implementation. It has been prepared during the last year of the project based on the delivery of key technological outcomes and results. The purpose of this White Paper is to provide an overview of the novel holistic sensitive approach to cyber-physical systems. It is available for view or download at the project website, at https://cpsosaware.eu/wp-content/uploads/2022/11/20221031_CPSoSaware-White-Paper.pdf



Figure 19: White Paper on CPSoSaware solutions essentials

### 2.3.5    Press Releases

As planned, CPSoSaware produced three press releases, following the planning and deployment of pilot site demonstrations. Press releases have published at the project website and social media channels, but also at external platforms and websites (i.e., EuropaWire [5], which is a pan-European press release distribution and newswire service).

### 2.3.5.1 Press Release #1: CPSoSaware trials for Automotive and Manufacturing pillars

The first Press Release informed about the execution of the pilot trials for Cyber-Physical Systems of Systems (CPSoS) demonstrations during the 4th quarter of 2022, for both pillars: Automotive, for semi-autonomous cars and Manufacturing, for Human-Robot Collaboration. The first Press Release is available at the website at https://cpsosaware.eu/wp-content/uploads/2022/11/CPSoSaware_Press-Release-1.pdf, also available in Greek https://cpsosaware.eu/wp-content/uploads/2022/11/CPSoSaware_Press-Release-1_gr.pdf. Images below are screenshots of the published 1st Press Release at EuropaWire's channels.
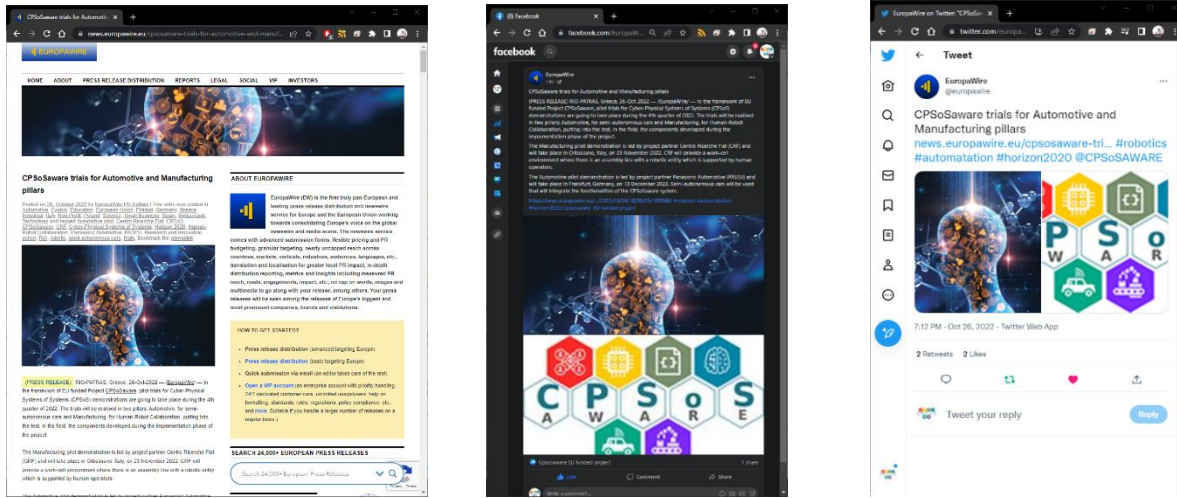


Figure 20: Press Release #1 published at EuropaWire's channels

### 2.3.5.2 Press Release #2: Successful demonstration of Manufacturing trials

The second press release informed about the successful results of the pilot trials for Cyber-Physical Systems of Systems (CPSoS) demonstrations for the Manufacturing Pillar. The site demonstrations took place during 21-22 of November, in the premises of project partner and Manufacturing Pillar leader Centro Ricerche Fiat (CRF), at Orbassano, Italy. Press Release #2 is available at the project website at https://cpsosaware.eu/wp-content/uploads/2022/12/CPSoSaware_Press-Release-2.pdf. Images below are screenshots of the 2nd Press Release published at EuropaWire's channels.
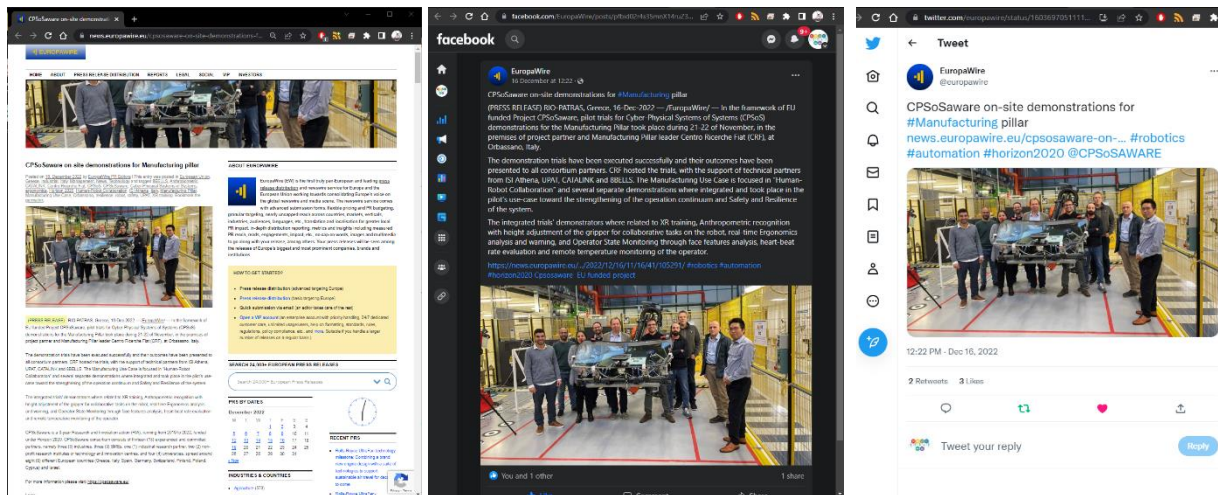


Figure 21: Press Release #2 published at EuropaWire's channels

### 2.3.5.3    Press Release #3: Successful demonstration of Automotive trials

The third and final Press Release informed about the successful deployment of pilot trials for Cyber-Physical Systems of Systems (CPSoS) demonstrations for the Automotive Pillar. Onsite demonstrations took place during 13-14 of December, in the premises of project partner and Automotive Pillar leader Panasonic Automotive (PASEU), at Frankfurt, Germany. View the third Press Release at CPSoSaware website at https://cpsosaware.eu/wp-content/uploads/2022/12/CPSoSaware_Press-Release-3.pdf. Images below are screenshots of the 3rd Press Release published at EuropaWire's channels.
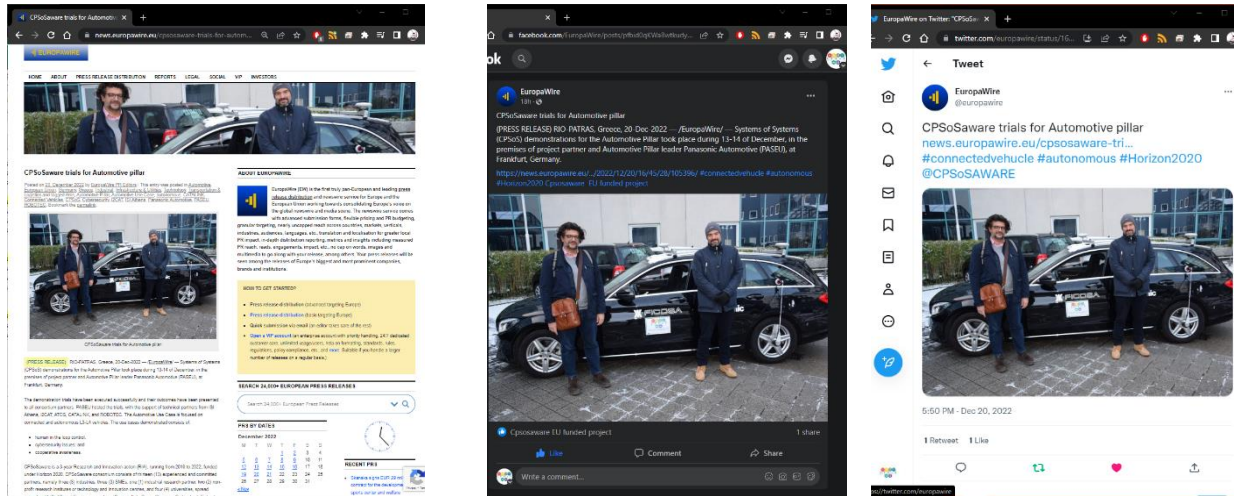


Figure 22: Press Release #3 published at EuropaWire's channels

## 2.4    Activities and Events

Awareness-raising on CPSoSaware has been impacted positively by the project representation in relevant events, but also through the organisation or co-organisation of such events. Events are an important means for CPSoSaware to communicate and disseminate the objectives, outcomes and results of its work. CPSoSaware has been involved in a variety of event formats, ranging from conferences and workshops to industrial events and clustering webinars. In this section, the dissemination events that the CPSoSaware consortium participated or organised over the second half of the project, are reported.

### 2.4.1    Organisation of events

#### 2.4.1.1    Workshop "Intelligent, Secure, Efficient Cyber-Physical Systems on Heterogeneous System on Chips"

Industrial Systems Institute, Athena Research Center (ISI), CPSoSaware project coordinator, attended, on behalf of the CPSoSaware consortium, the 29th – IFIP/IEEE International Conference on Very Large Scale Integration, that took place during 4-8 October 2021, organised by Nanyang Technological University Center, Singapore. The theme of the conference was about "Intelligent and Secure Edge Computing".

ISI organised a Special Session entitled "Intelligent, Secure, Efficient Cyber-Physical Systems on Heterogeneous System on Chips". The special session provided insight in one of the latest trends of System on Chip design, which is the SoCs heterogeneity. Latest SoCs, provide CPUs, GPUs as well as FPGA fabrics

within the SoC structure and this opens the potentials for a broad range of intelligent and secure applications that can be implemented in a highly efficient manner.

The session consisted of three talks:

- Talk 1: Accelerating 3D scene analysis for autonomous driving on embedded AI, computing platforms (Speaker: Nousias Stavros, University of Patras)
- Talk 2: High-Level Synthesis design approach for Number-Theoretic Transform Implementations (Speaker: Alexander El-Kandy, University of Patras)
- Talk 3: Challenges Towards Hardware Acceleration of the Deformable Shape Tracking Application (Speaker: Georgios Keramidas, University of Thessaloniki)

## 2.4.1.2   Multimodal Sensing for Localization, Planning and Scene Understanding

Partners from ISI ATHENA, PASEU and UoP co-organised the workshop entitled "Multimodal Sensing for Localization, Planning and Scene Understanding" [6], as invited session in the Technical Program of the 30th Mediterranean Conference on Control and Automation (MED2022) [7]. The conference took place in Athens, Greece from June 28th to July 1st, 2022.

Technical topics discussed during the workshop, related to CPSoSaware technical developments, included the following:

- A Resilient to Faults Auto-Encoder Enabled Kalman Based Multi-Sensorial Fusion

- Alternating Optimization for Multimodal Collaborating Odometry Estimation in CAVs

- Implementation and Motion Control of a Microrobot Using Laser Sensors

- Control Barrier Navigation Functions for STL Motion Planning

- Vanishing Point Detection Based on the Fusion of Lidar and Image Data

A dedicated site has been created to provide information of the related Call for Papers, available at https://sites.google.com/view/mlps2022/home, while the event has been thoroughly communicated through CPSoSaware channels.
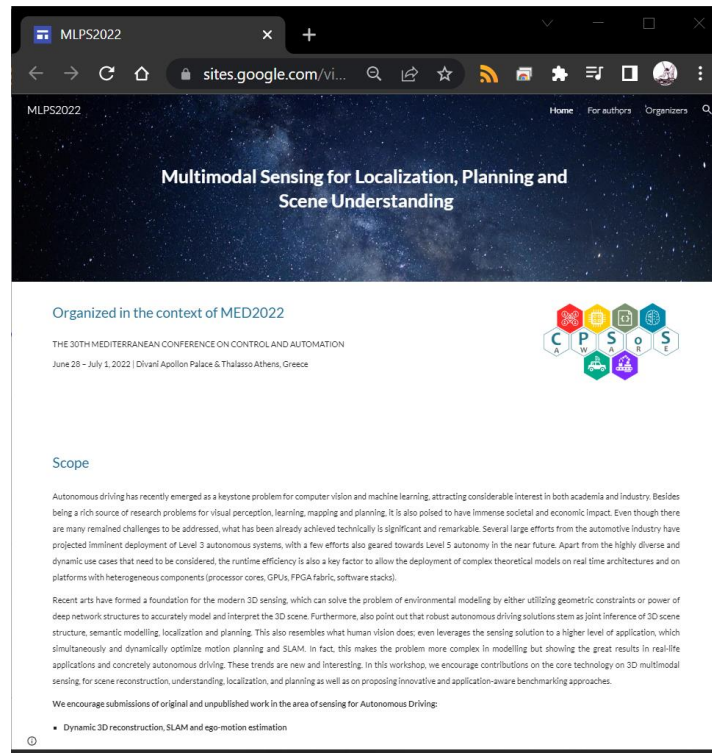
Figure 23: Screenshot of MSLP workshop's dedicated site [6]

Dr. Aris Lalos, CPSoSaware coordinator from ISI ATHENA gave a presentation on the topic "Alternating optimization for multimodal collaborating odometry estimation in CAVs". The related slides are available for download at CPSoSaware website.

### 2.4.1.3   CPSoSaware @ WASOS, HiPEAC2023

CPSoSaware will participate in the Workshop on Adaptive CPSoS (WASOS) [8] scheduled for 18 January 2023, in the framework of HiPEAC2023 Conference [9].

The HiPEAC 2023 conference will take place in Toulouse, France, from 16 to18 January. Associated workshops, tutorials, special sessions, several large poster session and an industrial exhibition will run in parallel with the conference.

WASOS is organised by ADMORPH Project [10], jointly with CPSoSaware, SELENE [11], TEACHING [12], and UP2DATE [13] projects. The program of the workshop is available at https://www.hipeac.net/2023/toulouse/#/program/.

Figure 24: WASOS Workshop site

## 2.4.2 Participation in Conferences, Workshops, events, exhibitions, etc.

### 2.4.2.1 International Conference on Advances in Semantic Processing

Catalink project partner, presented the deployment of CASPAR Framework for Semantic Data Integration in Autonomous Vehicles, during the 15th International Conference on Advances in Semantic Processing – SEMAPRO 2021, which took place from October 03, 2021, to October 07, 2021, in a hybrid form (combination of a virtual/physical event), at Barcelona, Spain. Catalink presented the work that is taking place within the context of the CPSoSaware on October 5th, 2021.

### 2.4.2.2 1st Open Workshop on Future ICT

CPSoSaware was presented at the "1st Open Annual Workshop on Future ICT" [14] by Dr. Aris Lalos, from project coordinator ISI-ATHENA, and represented in bilateral discussions with stakeholders by Mrs. Konstantina Papachristopoulou, from project partner EIGHT BELLS Ltd. The event took place physically in Athens, Greece, on May 25th, 2022, organised and promoted by project partner EIGHT BELLS Ltd. A total of 50 physical attendees in addition to 5 presenters that connected virtually had the opportunity to explore State of the Art technologies, results and outcomes of cutting-edge research as realised through EU Research Projects, among other very interesting presentations. The Workshop focused on exploring the State of the Art related to ICT, covering aspects such as 5G/6G, Cybersecurity, IoT and Cloud. Fruitful

discussions took place between the participants, regarding current EU Funded research and future developments of State of the Art ICT, thus making an impact and setting the basis for research debate and constructive dialogue regarding ICT evolution. The extended agenda included 4 sessions accordingly (5G/6G, Cybersecurity, IoT and Cloud) and gathered experts and researchers from all Future ICT disciplines. The "1st Open Annual Workshop on Future ICT" had a great effect in supporting international dialogue, cooperation and knowledge sharing.



Figure 25: Photo from Dr. Lalos presentation of CPSoSaware at the 1st Open Annual Workshop on Future ICT

### 2.4.2.3    ITS European Congress 2022

Mrs. Christina Michailidou from project partner CATALINK, presented CPSoSaware at the 14th ITS European Congress [15]. The event took place in Toulouse, France, from May 30th to June 1st, 2022. Mrs. Michailidou presented a technical paper on the work that is currently under development for the use cases of the Automotive Pillar, entitled "On Intelligent Driver Monitoring based on smart-devices". Her presentation took place on June 1st, during TP23 session on "Technologies for Automated Driving".

### 2.4.2.4 ESWC 2022

A new technical paper, presenting work that is being performed in the framework of CPSoSaware has been accepted at European Semantic Web Conference (ESWC) 2022 [16]. The paper entitled "Data Integration for Monitoring Operators' Ergonomics in an Automotive Manufacturing Setting" was a joint effort between consortium partners CATALINK, UPAT, CRF and ISI, led by CATALINK. The event took place in Crete, between May 29th and June 2nd, 2022.

### 2.4.2.5 Athena RC-Archimedes 2nd joint workshop

CPSoSaware has been featured in the Athena RC and Archimedes 2nd joint workshop on modern applications in Artificial Intelligence, Data Science, and Algorithms. The event took place in a physical form on July 18th 2022. Dr. Aris Lalos, project coordinator, presented outcomes of CPSoSaware research on data science and algorithms in a related training session. The "Archimedes" Center for Research in Artificial Intelligence, Data Science and Algorithms [17] was founded in January 2022 and operates as a Research Unit of the Athena Research Center. "Archimedes" serves both basic and applied research and is connected with Greek, but also foreign University institutes and research centers. Its main mission is the funding of visiting researchers (faculty members and researchers in Greece and abroad) as well as PhD candidates in the areas of Artificial Intelligence, Data Science and Algorithms. "Archimedes" organizes systematic training and educational programs, building bridges of systematic communication with important institutions abroad and offers an opportunity to participate in high quality research to talented young scientists, thus dramatically accelerating their scientific development and offering them a promising career path.



**Figure 26: Photo from Athena RC-Archimedes 2nd joint workshop**

### 2.4.2.6 Thessaloniki International Fair 2022

Project Coordinator ISI Athena participated with a stand in the 86th Thessaloniki International Fair 2022 [18], where the CPSoSaware offer has been demonstrated. In particular, our colleagues Nikos Piperigkos and Christos Anagnostopoulos demonstrated the integrated simulator developed in the framework of the project, accompanied by the project coordinators Dr. Aris Lalos and Dr. Apostolos Fournaris. Among thousands of visitors of the exhibition, deputy minister of Agriculture Mr. George Stylios, deputy minister

of Research and Technology, Mr. Christos Dimas, as well as deputy minister of Transport Mr. George Karagiannis, stopped by our stand and were introduced to the project and the use and value of the developed integrated simulator. See below some photos from the demonstrations took place in CPSoSaware stand.



Figure 27: Photos from CPSoSaware stand at the 86th Thessaloniki International Fair 2022

### 2.4.2.7   CYRENE 3rd INFO Day

Dr. Apostolos Fournaris, project Coordinator, from ISI Athena, participated in the 3rd INFO Day of CYRENE project [19], entitled "Certifying the Security and Resilience of Supply Chain Services". The event, led by CRF, took place in hybrid form, physically in Turin and Virtual, on October 7th 2022. Dr. Fournaris gave a presentation about "Cybersecurity aspects in the CPSoSaware and EnerMan projects". More information on the event, including the agenda and brief presentation of the speakers, can be found at https://www.cyrene.eu/cyrene-info-day-by-crf/.



Figure 28: CYRENE 3rd Info Day

### 2.4.2.8    OntoCommons Workshop

CPSoSaware project has been invited to the Demo Workshop, organised by OntoCommons [20], on November 7-8 in Stuttgart, Germany. The workshop hosted by Bosch and participants were able to join both face to face and remotely, since the event was hybrid.

The Workshop focused on the Value of OntoCommons for Industry. It featured:

- Presentations of up to 22 demos: to gain from lessons learned and experts' feedback.
- Keynote talks: to learn practical pathways to gain value from OntoCommons.
- Tutorial: to show how to start with ontologies in a company in a standardized way and get the most value of it.
- Panel: with top specialists both from industry and ontology world.
- Networking session: with industrial and academic partners and collaborators of OntoCommons.

Our colleague Stelios Kontogiannis from project partner Catalink gave a presentation entitled "*CPSoSaware: Monitoring human operators' safety, well-being via semantic data integration in an automotive manufacturing setting*" in the framework of the "OntoCommons Demonstrators and Use Case Workshop" [21]. CPSoSaware has been presented during the 2nd day of the workshop virtually, in the framework of the participating demos.



**Figure 29: OntoCommons Demonstrators and Use Case Workshop**

### 2.4.2.9    Euronaval 2022

Project partner Eight Bells Ltd. participated with a stand in the 28th edition of Euronaval Exhibition for 2022 [22] in the Greek Pavilion, where the CPSoSaware has been demonstrated, among other research projects. In particular, our colleague Dimitris Nodaros demonstrated the MOZART orchestrator developed in the framework of the project. The exhibition was organised from 18th to 21st of October, in Paris, France and gathered thousands of visitors.

Figure 30: Photo from 8BELLS' stand at Euronaval Exhibition 2022

### 2.4.2.10  25th Development Forum

Project Coordinator, ISI Athena, participated successfully in the hybrid conference for the 25th Development Forum, organised in Patras, Greece, during 19 and 20 of November 2022. Dr. Aris Lalos gave a presentation on Advanced AI methods for smart vehicles and smart transport, based on the work performed in CPSoSaware project. In particular, Dr. Lalos pointed out that AI can support and enhance safety in vehicles. More than 90% of accidents are due to human error. AI systems can record, process and analyse a very large amount of data in a very short period of time. As long as the computing power available at the vehicles is sufficient to execute these algorithms, the technology can ensure safety.



Figure 31: Dr. Aris Lalos during his presentation at the 25th Development Forum

Figure 32: Members of ISI Athena in the stand of the organisation, posing in front of CPSoSaware banner



Figure 33: Article in local newspaper presenting results and takeaways from the speeches and presentations at the event

### 2.4.2.11  embedded world Conference 2023

Our partners from University of Peloponnese (UoP) got a new paper accepted at embedded world Conference 2023 [23]. The paper demonstrates work performed by UoP in the framework of activities related to design and development of CPS Layer CPSoSaware Deployment/Commissioning and Execution Mechanism. This works concerns the delivery of a dynamic and scalable mechanism for the management of two functionalities of the intra – communication layer:

1. the deployment / commissioning: This component is responsible to deliver to the target system the configurations of intra – communication wireless interfaces.

2. the execution mechanism: This component is responsible to handle RX/TX of data over the available intra – communication wireless interfaces.

The embedded world conference for 2023 is organised in Nürnberg, Germany, from 14 to 16 of March.



**Figure 34: embedded world conference for 2023**

## 2.5 Papers, Journal Articles and other publications

### 2.5.1 Peer reviewed publications in journals and conference/workshop proceedings

Publications in specialised journals and conferences are a conventional but effective way to disseminate project results and attract the attention of the scientific, business and public stakeholders. Our initial targets included at least 20 publications in journals and 20 papers presented in scientific conferences and workshops. Dissemination of research results was mainly performed through joint scientific publications between research and technology partners. The complete list of publications is featured on the CPSoSaware website (https://cpsosaware.eu/publications/).
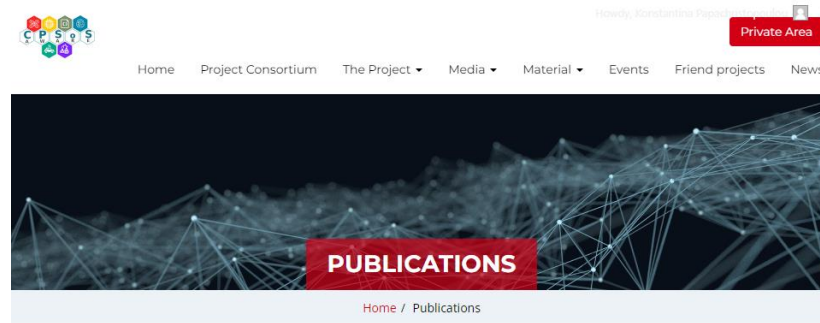
Figure 35: Publications section at CPSoSaware website

By the end of the project, the number of CPSoSaware publications is amounted to 62 accepted, and 6 submitted awaiting acceptance, as presented in Table 3 below.

Table 3: List of CPSoSaware peer reviewed publications

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 1 | 17/12/2019 | Journal paper | A. S. Lalos, E. Vlachos, K. Berberidis, A. P. Fournaris and C. Koulamas, "Privacy Preservation in Industrial IoT via Fast Adaptive Correlation Matrix Completion," in IEEE Transactions on Industrial Informatics, vol. 16, no. 12, pp. 7765-7773, Dec. 2020, doi: 10.1109/TII.2019.2960275. | ISI |
| 2 | 30/05/2020 | Journal paper | Fournaris, A.P.; Dimopoulos, C.; Lampropoulos, K.; Koufopavlou, O. Anomaly Detection Trusted Hardware Sensors for Critical Infrastructure Legacy Devices. Sensors 2020, 20, 3092. https://doi.org/10.3390/s20113092 | ISI |
| 3 | 09/06/2020 | Conference paper | Stavros Nousias, Gerasimos Arvanitis, Aris Lalos, & Konstantinos Moustakas. (2020, June 9). MESH SALIENCY DETECTION USING CONVOLUTIONAL NEURAL NETWORKS. 2020 IEEE International Conference on Multimedia and Expo (ICME), London/UK. https://doi.org/10.1109/ICME46284.2020.9102796 | ISI, UPAT |
| 4 | 18/06/2020 | Journal paper | G. Arvanitis, A. Lalos, and K. Moustakas. (2020). Robust and Fast 3-D Saliency Mapping for Industrial Modeling Applications. IEEE Transactions on Industrial Informatics, 17(2), 1307–1317. https://doi.org/10.1109/TII.2020.3003455 | UPAT, ISI |
| 5 | 07/07/2020 | Conference paper | A. P. Fournaris, A. Lalos, P. Kapsalas and C. Koulamas, "Decentralized, Secure and Cognitive Architecture for Automotive CyberPhysical System of Systems," 2020 9th Mediterranean Conference on Embedded Computing (MECO), 2020, pp. 1-5, doi: 10.1109/MECO49872.2020.9134336. | ISI, PASEU |
| 6 | 04/08/2020 | Symposium paper | G. Keramidas et al., "CPSoSaware: Cross-Layer Cognitive Optimization Tools & Methods for the Lifecycle Support of Dependable CPSoS," 2020 IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2020, pp. 470-475, doi: 10.1109/ISVLSI49217.2020.00-12. | UoP, TAU, I2CAT, UPAT |

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 7 | 30/09/2020 | Conference paper | Nikos Piperigkos, Aris S. Lalos, & Kostas Berberidis. (2020, September 30). Graph based Cooperative Localization for Connected and Semi-Autonomous Vehicles. 2020 IEEE 25th International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD), Pisa, Italy. https://doi.org/10.1109/CAMAD50429.2020.9209312 | ISI |
| 8 | 06/10/2020 | Journal paper | N. Mukhtar, A. Fournaris, T. Khan, C. Dimopoulos, and Y. Kong. (2020). Improved Hybrid Approach for Side-Channel Analysis Using Efficient Convolutional Neural Network and Dimensionality Reduction. IEEE Access, 8, 184298–184311. https://doi.org/10.1109/ACCESS.2020.3029206 | ISI |
| 9 | 07/10/2020 | Conference paper | Fournaris, Apostolos & Dimopoulos, Charis & Koufopavlou, Odysseas. (2020). Profiling Dilithium Digital Signature Traces for Correlation Differential Side Channel Attacks. 10.1007/978-3-030-60939-9_19. | ISI |
| 10 | 25/11/2020 | Conference paper | F. Regazzoni et al., "Machine Learning and Hardware security: Challenges and Opportunities -Invited Talk-," 2020 IEEE/ACM International Conference On Computer Aided Design (ICCAD), 2020, pp. 1-6. https://ieeexplore.ieee.org/document/9256522 | USI |
| 11 | 10/12/2020 | Journal paper | L. Muller, C. Chrysoulas, N. Pitropakis, and P. Barclay. (2020). A Traffic Analysis on Serverless Computing Based on the Example of a File Upload Stream on AWS Lambda. MDPI Big Data Cogn. Comput. 2020, (BDCC), 4(4), 38. https://doi.org/10.3390/bdcc4040038 | EIGHT BELLS |
| 12 | 04/02/2021 | Conference paper | O. Glamočanin, D. G. Mahmoud, F. Regazzoni and M. Stojilović, "Shared FPGAs and the Holy Grail: Protections against Side-Channel and Fault Attacks," 2021 Design, Automation & Test in Europe Conference & Exhibition (DATE), 2021, pp. 1645-1650, doi: 10.23919/DATE51398.2021.9473947. | USI |
| 13 | 04/04/2021 | Journal paper | Regazzoni, F., Palmieri, P., Smailbegovic, F., Cammarota, R. and Polian, I., 2021. Protecting artificial intelligence IPs: a survey of watermarking and fingerprinting for machine learning. CAAI Transactions on Intelligence Technology, 6(2), pp.180-191. | USI |
| 14 | 17/06/2021 | Journal paper | G. Arvanitis, E. Zacharaki, L. Vasa and K. Moustakas, "Broad-to-Narrow Registration and Identification of 3D Objects in Partially Scanned and Cluttered Point Clouds," in IEEE Transactions on Multimedia, doi: 10.1109/TMM.2021.3089838. | UPAT |
| 15 | 29/06/2021 | Symposium paper | J. Abella et al., "Security, Reliability and Test Aspects of the RISC-V Ecosystem," 2021 IEEE European Test Symposium (ETS), 2021, pp. 1-10, doi: 10.1109/ETS50041.2021.9465449. | USI |
| 16 | 29/06/2021 | Symposium paper | M. Mavropoulos, G. Keramidas and D. Nikolos, "Run Time Management of Faulty Data Caches," 2021 IEEE European Test Symposium (ETS), 2021, pp. 1-6, doi: 10.1109/ETS50041.2021.9465447. | UoP |
| 17 | 01/07/2021 | Conference paper | P. Mousouliotis et al., "Exploiting Vitis Framework for Accelerating Sobel Algorithm," 2021 10th Mediterranean Conference on Embedded Computing (MECO), 2021, pp. 1-5, doi: 10.1109/MECO52532.2021.9460221. | UoP |
| 18 | 01/07/2021 | Conference paper | E. Tiganourias, M. Mavropoulos, G. Keramidas, V. Kelefouras, C. P. Antonopoulos and N. Voros, "A Hierarchical Profiler of Intermediate Representation Code based on LLVM," 2021 10th Mediterranean Conference on Embedded Computing (MECO), 2021, pp. 1-5, doi: 10.1109/MECO52532.2021.9460203. | UoP |
| 19 | 05/07/2021 | Journal paper | S. Nousias, N. Piperigkos, G. Arvanitis, A. Fournaris, A. S. Lalos, and K. Moustakas, "Empowering cyberphysical systems of systems with intelligence : A survey," submitted for publication IEEE Internet Things J., vol. X, no. X, pp. 1–25, 2021. | ISI |
| 20 | 05/07/2021 | Conference paper | Nikos Piperigkos, Aris S. Lalos, & Kostas Berberidis. (2021, March 29). Graph Laplacian Extended Kalman Filter for Connected and Automated Vehicles Localization. IEEE International Conference on Industrial Cyber-Physical Systems ((ICPS 2021).), Online Conference, Victoria, BC, Canada. https://doi.org/10.5281/zenodo.4644085 | ISI |

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 21 | 12/07/2021 | Conference paper | Jan Solanti, Michal Babej, Julius Ikkala, Vinod Kumar Malamal Vadakital, & Pekka Jääskeläinen. (2021). PoCL-R: A Scalable Low Latency Distributed OpenCL Runtime. SAMOS XXI International Conference on Embedded Computer Systems: Architectures, Modeling and Simulation (SAMOS XXI), SAMOS ,GREECE / ONLINE. Zenodo. https://doi.org/10.5281/zenodo.5091763 | TAU |
| 22 | 16/07/2021 | Conference paper | A. Caforio, F. Balli, S. Banik and F. Regazzoni, "A Deeper Look at the Energy Consumption of Lightweight Block Ciphers," 2021 Design, Automation & Test in Europe Conference & Exhibition (DATE), 2021, pp. 170-175, doi: 10.23919/DATE51398.2021.9474018. | USI |
| 23 | 16/07/2021 | Conference paper | Nikos Piperigkos, Aris S. Lalos, Kostas Berberidis, & Christos Anagnostopoulos. (2021, February 1). Cooperative Multi-Modal Localization in Connected and Autonomous Vehicles. 2020 IEEE 3rd Connected and Automated Vehicles Symposium (CAVS), Victoria, BC, Canada. https://doi.org/10.1109/CAVS51000.2020.9334558 | ISI |
| 24 | 19/07/2021 | Conference paper | S. Nousias, E. V. Pikoulis, C. Mavrokefalidis, and A. S. Lalos, "Accelerating deep neural networks for efficient scene understanding in automotive cyber-physical systems," IEEE Int. Conf. Ind. Cyber-Physical Syst., 2021. | ISI |
| 25 | 20/07/2021 | Conference paper | J. Žádník, M. Mäkitalo, J. Iho and P. Jääskeläinen, "Performance of Texture Compression Algorithms in Low-Latency Computer Vision Tasks," 2021 9th European Workshop on Visual Information Processing (EUVIP), 2021, pp. 1-6, doi: 10.1109/EUVIP50544.2021.9484015. | TAU |
| 26 | 23/07/2021 | Conference paper | Dimitrios Chamzas, Constantinos Chamzas, & Konstantinos Moustakas. (2021, July 23). cMinMax: A Fast Algorithm to Find the Corners of an N-dimensional Convex Polytope. Proceedings of the 16th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - GRAPP, (GRAPP). https://doi.org/10.5220/0010259002290236 | UPAT |
| 27 | 11/08/2021 | Journal paper | Gao, S., Großschädl, J., Marshall, B., Page, D., Pham, T., & Regazzoni, F. (2021). An Instruction Set Extension to Support Software-Based Masking. *IACR Transactions on Cryptographic Hardware and Embedded Systems*, *2021*(4), 283–325 | USI |
| 28 | 04/10/2021 | Journal paper | J. I. Multanen, K. Hepola, A. A. Khan, J. Castrillon and P. Jaaskelainen, "Energy-Efficient Instruction Delivery in Embedded Systems with Domain Wall Memory," in IEEE Transactions on Computers, doi: 10.1109/TC.2021.3117439. | TAU |
| 29 | 05/10/2021 | Conference paper | Kontopoulos, Efstratios, Mitzias, Panagiotis, Avgerinakis, Konstantinos, Kosmides, Pavlos, Piperigkos, Nikos, Anagnostopoulos, Christos, Lalos, Aris S., Stagakis, Nikolaos, Arvanitis, Gerasimos, Zacharaki, Evangelia I., & Moustakas, Konstantinos. (2021). An Extensible Semantic Data Fusion Framework for Autonomous Vehicles. 5–11. https://doi.org/10.5281/zenodo.5560772 | CTL |
| 30 | 06/10/2021 | Conference Paper | Bellizia, Davide, Nadia El Mrabet, Apostolos P. Fournaris, Simon Pontié, Francesco Regazzoni, François-Xavier Standaert, Élise Tasso, and Emanuele Valea. "Post-Quantum Cryptography: Challenges and Opportunities for Robust and Secure HW Design." In *2021 IEEE International Symposium on Defect and Fault Tolerance in VLSI and Nanotechnology Systems (DFT)*, pp. 1-6. IEEE, 2021. | USI, ISI |
| 31 | 01/09/2021 | Conference Paper | Valencia, Felipe, Ilia Polian, and Francesco Regazzoni. "Extending Circuit Design Flow for Early Assessment of Fault Attack Vulnerabilities." In *2021 24th Euromicro Conference on Digital System Design (DSD)*, pp. 385-388. IEEE, 2021. | USI |
| 32 | 11/10/2021 | Conference paper | N. Petrellis et al., "High Speed Implementation of the Deformable Shape Tracking Face Alignment Algorithm," 2021 24th Euromicro Conference on Digital System Design (DSD), 2021, pp. 174-177, doi: 10.1109/DSD53832.2021.00035. | UoP |

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 33 | 12/10/2021 | Conference paper | Nikos Piperigkos, Aris Lalos, & Kostas Berberidis. (2021, July 8). Multi-modal cooperative awareness of connected and automated vehicles in smart cities. Multimodal Cooperative Awareness of connected and automated vehicles in smart cities IEEE international Conference on Smart Internet of Things (IEEEE SmartIoT2021), VIRTUAL CONFERENCE. https://doi.org/10.5281/zenodo.5083304 | ISI |
| 34 | 18/10/2021 | Conference paper | K. Antonopoulos, C. Panagiwtou, C. Antonopoulos, N. Voros and G. Keramidas, "Characterization of WiFi Modules Using an Open-Source Network Simulator," 2021 6th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA-CECNSM), 2021, pp. 1-8, doi: 10.1109/SEEDA-CECNSM53056.2021.9566223. | UoP |
| 35 | 13/11/2021 | Book chapter | Pikoulis, E.V., Mavrokefalidis, C., Nousias, S., Lalos, A.S. (2022). A New Clustering-Based Technique for the Acceleration of Deep Convolutional Networks. In: Wani, M.A., Raj, B., Luo, F., Dou, D. (eds) Deep Learning Applications, Volume 3. Advances in Intelligent Systems and Computing, vol 1395. Springer, Singapore. https://doi.org/10.1007/978-981-16-3357-7_5 | ISI |
| 36 | 13/11/2021 | Conference paper | Erion Vasilis Pikoulis, Christos Mavrokefalidis, & Aris S. Lalos. (2021, February 23). A New Clustering-Based Technique for the Acceleration of Deep Convolutional Networks. 2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA), ONLINE. https://doi.org/10.1109/ICMLA51294.2020.00222 | ISI |
| 37 | 16/11/2021 | Conference paper | T. Leppänen, P. Mousouliotis, G. Keramidas, J. Multanen and P. Jääskeläinen, "Unified OpenCL Integration Methodology for FPGA Designs," 2021 IEEE Nordic Circuits and Systems Conference (NorCAS), 2021, pp. 1-7, doi: 10.1109/NorCAS53631.2021.9599861. | TAU |
| 38 | 18/11/2021 | Conference paper | S. Nousias, E. -V. Pikoulis, C. Mavrokefalidis, A. S. Lalos and K. Moustakas, "Accelerating 3D scene analysis for autonomous driving on embedded AI computing platforms," 2021 IFIP/IEEE 29th International Conference on Very Large Scale Integration (VLSI-SoC), 2021, pp. 1-6, doi: 10.1109/VLSI-SoC53125.2021.9606990. | ISI |
| 39 | 18/11/2021 | Conference paper | N. Petrellis et al., "Challenges Towards Hardware Acceleration of the Deformable Shape Tracking Application," 2021 IFIP/IEEE 29th International Conference on Very Large Scale Integration (VLSI-SoC), 2021, pp. 1-4, doi: 10.1109/VLSI-SoC53125.2021.9606999. | UoP |
| 40 | 19/11/2021 | Conference paper | Petrellis Nikos, Zogas Stavros, Panagiotis Christakos, Mousouliotis Panagiotis, Georgios Keramidas, Voros Nikolaos, & Antonopoulos Christos. (2021, November 19). Software Acceleration of the Deformable Shape Tracking Application. https://doi.org/10.5281/zenodo.6281948 | UoP |
| 41 | 23/12/2021 | Conference paper | Mendoza, C.; Lopez, L.; Camps-Mur, D.; Casademont, J. "Benchmarking the Cooperative Awareness Service at Application Layer with IEEE 802.11p and LTE-PC5 Mode-4". IEEE International Mediterranean Conference on Communications and Networking (MeditCom). Athens (Greece) 7-10 September 2021. | i2CAT |
| 42 | 26/01/2022 | Journal paper | P. E. J. Kivi, M. J. Mäkitalo, J. Žádník, J. Ikkala, V. K. M. Vadakital and P. O. Jääskeläinen, "Real-Time Rendering of Point Clouds With Photorealistic Effects: A Survey," in IEEE Access, vol. 10, pp. 13151-13173, 2022, doi: 10.1109/ACCESS.2022.3146768. | TAU |
| 43 | 07/02/2022 | Journal paper | Jakub Žádník, Markku Mäkitalo, Jarno Vanne, and Pekka Jääskeläinen. 2022. Image and Video Coding Techniques for Ultra-Low Latency. ACM Comput. Surv. Just Accepted (January 2022). DOI:https://doi.org/10.1145/3512342 | TAU |
| 44 | 08/02/2022 | Conference paper | Joel Alanko, Markku Mäkitalo, Pekka Jääskeläinen: "TauBench: Dynamic Benchmark for Graphics Rendering." GRAPP 2022: 17th International Conference on Computer Graphics Theory and Applications (virtual, February 2022). | TAU |

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 45 | 16/03/2022 | Conference paper | E.-V. Pikoulis, C. Mavrokefalidis, A. S. Lalos, "A data-aware dictionary-learning based technique for the acceleration of deep convolutional networks", in Proc. of IEEE MMSP 2021 | ISI |
| 46 | 10/06/2022 | Conference paper | Anagnostopoulos, Christos, Koulamas, Christos, Lalos, Aris, & Stylios, Chrysostomos. (2022, June 10). Open-Source Integrated Simulation Framework for Cooperative Autonomous Vehicles. | ISI |
| 47 | 21/06/2022 | Conference paper | Piperigkos, Nikos, Nousias, Stavros, & Lalos, Aris. (2022, June 21). Robust 4D awareness via diffusion adaptation over Connected and Automated vehicles. IEEE 14th Image, Video, and Multidimensional Signal Processing Workshop (IVMSP), Nafplio, Greece | ISI |
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| 49 | 21/06/2022 | Conference paper | Piperigkos, Nikos, Nousias, Stavros, & Lalos, Aris. (2022, June 21). Robust 4D awareness via diffusion adaptation over Connected and Automated vehicles. IEEE 14th Image, Video, and Multidimensional Signal Processing Workshop (IVMSP), Nafplio, Greece. | ISI |
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| 54 | 20/07/2022 | Conference paper | Piperigkos, Nikos, Lalos, Aris, Berberidis, Konstantinos, "Alternating Optimization for Multimodal Collaborating Odometry Estimation in CAVs", in proc. of MED22, pp. 670-675. | TAU |
| 55 | 01/08/2022 | Journal paper | Nikos Piperigkos, Aris S. Lalos and Kostas Berberidis, "Graph Laplacian Diffusion Localization of Connected and Automated Vehicles," in IEEE Transactions on Intelligent Transportation Systems, doi: 10.1109/TITS.2021.3110650 | ISI |
| 56 | 31/08/2022 | Conference Paper | Guerrieri, Andrea, Gabriel Da Silva Marques, Francesco Regazzoni, and Andres Upegui. "Optimizing Lattice-based Post-Quantum Cryptography Codes for High-Level Synthesis." In *2022 25th Euromicro Conference on Digital System Design (DSD)*, pp. 777-784. IEEE Computer Society, 2022. | USI |
| 57 | 01/09/2022 | Conference paper | Kanishkan Vadivel, Barry de Bruin, Pekka Jääskeläinen, Roel Jordans and Henk Corporaal: "Prebypass: Software Register File Bypassing for Reduced Interconnection Architecture." DSD2022: Euromicro Conference on Digital Systems Design (virtual, September 2022). | TAU |
| 58 | 13/09/2022 | Conference paper | Kari Hepola, Joonas Multanen and Pekka Jääskeläinen: "Dual-IS: Instruction Set Modality for Efficient Instruction Level Parallelism." ARCS 2022: International Conference on Architecture of Computing Systems. | TAU |
| 59 | 26/09/2022 | Conference paper | Jakub Žádník, Markku Mäkitalo, Pekka Jääskeläinen: "Pruned Lightweight Encoders for Computer Vision." MMSP 2022: IEEE 24th International Workshop on Multimedia Signal Processing (virtual, September 2022). | TAU |

| # | Publication Date | Type | Citation | Partner(s) |
|---|---|---|---|---|
| 60 | 06/10/2022 | Conference Paper | Caforio, Andrea, Daniel Collins, Subhadeep Banik, and Francesco Regazzoni. "A Small GIFT-COFB: Lightweight Bit-Serial Architectures." In *International Conference on Cryptology in Africa*, pp. 53-77. Springer, Cham, 2022. | USI |
| 61 | 11/10/2022 | Conference paper | Julius Ikkala, Markku Mäkitalo, Tuomas Lauttia, Erwan Leria, Pekka Jääskeläinen: "Tauray: A Scalable Real-Time Open-Source Path Tracer for Stereo and Light Field Displays." The 15th ACM SIGGRAPH Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia (Daegu, South Korea, December, 2022). | TAU |
| 62 | 20/10/2022 | Journal paper | Leppänen, Topi & Lotvonen, Atro & Jääskeläinen, Pekka. (2022). Cross-vendor programming abstraction for diverse heterogeneous platforms. Frontiers in Computer Science. 4. 10.3389/fcomp.2022.945652. | TAU |
| 63 | | Journal paper | Nikos Piperigkos, Aris S. Lalos, Kostas Berberidis, "Extending Online 4D Situational Awareness in Connected and Automated Vehicles", IEEE Internet of Things Journal (IOTJ), 2022, submitted. | ISI |
| 64 | | Journal paper | Stavros Nousias et. al., "Accelerating deep neural networks for efficient scene understanding in multi-modal automotive applications", IEEE ACCESS, 2022, under review | ISI |
| 65 | | Journal paper | Gerasimos Arvanitis, Nikolaos Stagakis, Evangelia I. Zacharaki, and Konstantinos Moustakas. Cooperative Saliency-based Obstacle Detection and AR Rendering for Increased Situational Awareness, IEEE Intelligent Transportation Systems Transactions, (2022). under review | UPAT |
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| 67 | | Conference paper | N. Anatoliotakis, G. Paraskevopoulos, G. Michalakis, I. Michalellis, E.I. Zacharaki and K. Moustakas, "Octree-based representation of dynamic human-robot collision risk and AR rendering", submitted to the 31st IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), Aug 29 - Sept 2, 2022, Napoli, Italy. Rejected | UPAT |
| 68 | | Conference paper | N. Piperigkos, A. S. Lalos and K. Berberidis," Cooperative five degrees of freedom motion estimation for a swarm of autonomous vehicles," 2023 IEEE ICASSP, submitted. | ISI |

CPSoSaware acknowledges the importance of Open Access (OA) policies towards accelerating and broadening the dissemination of the publicly funded results of the project, as well as towards boosting the visibility of European research. To this end, CPSoSaware peer reviewed publications are available as Open Access mainly through ZENODO repository [24], but also through other open access repositories like arXiv.org, for example. Download links for CPSoSaware papers are available at the dedicated section of the website.

Figure 36: Screenshot of available open access CPSoSaware papers and open-source code at ZENODO [25].

## 2.5.2   Academic publications

In addition to the peer-reviewed publications presented above, a number of academic theses have been produced as an outcome of work performed in the framework of CPSoSaware, as per the table below.

Table 4: Academic publications

| # | Authors | Date | title | Type | Download |
|---|---------|------|-------|------|----------|
| 1 | Jan Solanti | 08/01/2021 | Distributed Low Latency Computing with OpenCL - A Scalable Multi-Access Edge Computing Framework | Master's thesis | https://urn.fi/URN:NBN:fi:tuni -202012088592 |
| 2 | Topi Leppänen | 10/03/2021 | Scalability Optimizations for Multicore Soft Processors | Master's thesis | https://urn.fi/URN:NBN:fi:tuni -202102122067 |
| 3 | Sander Ruben | 31/03/2021 | LLVM-based software pipelining for customizable exposed datapath processors | Master's thesis | https://urn.fi/URN:NBN:fi:tuni -202104263563 |
| 4 | Jussi Iho | 30/04/2021 | Low-Latency and High-Bandwidth Video Stream Delivery | Master's thesis | https://urn.fi/URN:NBN:fi:tuni -202104263673 |
| 5 | Alex Hirvonen | 30/04/2021 | Merge and Prune Based Automated Generation of Co-Processor Architectures | Master's thesis | https://urn.fi/URN:NBN:fi:tuni -202104263563 |
| 6 | Joonas Multanen | 26/11/2021 | Energy-Efficient Instruction Streams for Embedded Processors | Doctoral thesis | https://urn.fi/URN:ISBN:978- 952-03-2193-2 |

### 2.5.3    Datasets

Datasets produced during the project implementation phase have been made available through various repositories. A new section of CPSoSaware website contains all related information and links, available at https://cpsosaware.eu/datasets/, also presented below.

#### 2.5.3.1    NITYMED

NITYMED stands for Nighttime-Yawning-Microsleep-Eyeblink-Distraction. It is a dataset developed in the framework of CPSoSaware project by ESDA LAB of project partner University of Peloponnese (UoP).

130 videos have been captured in Patras, Greece, displaying drivers in real cars, moving under nighttime conditions where drowsiness detection is more important. The participating drivers are: 11 males and 10 females of Caucasoid race. The selected drivers have different features (hair color, beard, glasses, etc.). This dataset has been created for two purposes:

> a) to train customized AI/ML models for facial shape alignment in videos or photographs displaying Caucasian drivers in nighttime conditions

> b) to test the accuracy in drowsiness detection and compare more general AI/ML models trained both in daytime and nighttime, under various environmental conditions

This dataset has been used to detect yawnings and sleepy eye blinks. However, other face, mouth and eye tracking applications can also be tested using this dataset (driver distraction/microsleep, facial expressions, etc.).

The technical details of the offered videos can be found in the following links:

- ESDALAB website
- IEEE dataport
- Kaggle

#### 2.5.3.2    Realistic vehicle trajectories and driving parameters from CARLA autonomous driving simulator

This dataset contains realistic trajectories from multiple vehicles moving in the simulated environment of CARLA autonomous driving simulator. Two different maps (Map04 and Map10) have been exploited, corresponding to realistic driving conditions in simulated urban environments. Five sub-datasets have been extracted, corresponding to different number of vehicles, e.g., 50, 100 and 200, spawned in each map for 200 seconds. Every record of the dataset consists of: time stamp, vehicle ID, ground truth position x, y, z in CARLA reference system, ground truth pitch, roll and yaw angles (in degrees), ground truth linear velocity in x, y and z direction (m/s), ground truth linear acceleration in x, y and z direction (m^2/s) and ground truth angular velocity in x, y and z direction (deg/s). The dataset can be accessed at IEEE dataport.

#### 2.5.3.3    CarlaScenes: A synthetic dataset for odometry in autonomous driving

Despite the great scientific effort to capture adequately the complex environments in which autonomous vehicles (AVs) operate there are still use-cases that even SoA methods fail to handle. Specifically, in odometry problems, on the one hand, geometric solutions operate with certain assumptions that are often breached in AVs, and on the other hand, deep learning methods do not achieve high accuracy. To contribute to that we present CarlaScenes, a large-scale simulation dataset captured using the CARLA

simulator. The dataset is oriented to address the challenging odometry scenarios that cause the current state of art odometers to deviate from their normal operations. Based on a case study of failures presented in experiments we distinguished 7 different sequences of data. CarlaScenes besides providing consistent reference poses, includes data with semantic annotation at the instance level for both image and lidar. The full dataset is available at GitHub.

### 2.5.4    Open-source code

CPSoSaware consortium partners are aligned with the Open Source Software Strategy 2020-2023 of the European Commission [26]. Though this strategy, the European Commission sets out the vision for encouraging and leveraging the transformative, innovative and collaborative power of open source, its principles and development practices. Accordingly, CPSoSaware consortium promote the sharing and reuse of software solutions, knowledge and expertise, implemented and acquired throughout the project implementation, as presented below. Open source code, as an output of CPSoSaware is presented in a new section of the project website at https://cpsosaware.eu/open-source-code/, where links to code repositories and further details are offered to interested users.

#### 2.5.4.1    OpenASIP v1.25

Project partner Tampere University, in the framework of research work performed in the framework of CPSoSaware, and in particular the Customized Parallel Computing (CPC) research group, leads the development of TTA-based Co-design Environment (TCE) tools. OpenASIP, also known as TTA-based Co-Design Environment (TCE), is an open-source application-specific instruction-set processor (ASIP) toolset for design and programming of customized co-processors (compiler-programmable accelerators). It is based on the static energy efficient Transport Triggered Architecture (TTA) processor template. The toolset provides a complete retargetable LLVM-based compiler supported co-design flow from high-level language programs down to FPGA/ASIC synthesizable processor RTL (VHDL and Verilog generation supported) and instruction-parallel program binaries. The size and quantity of register files, function units, supported operations, and the interconnection network can be freely customized to create new co-processors ranging from small single-application specific cores with special operations to more general multi-issue domain-specific processors. Open source code is available at ZENODO.

#### 2.5.4.2    Portable Computing Language (PoCL) v3.0

CPSoSaware partner, Tampere University, and in particular its Customized Parallel Computing (CPC) research group, leads the development of PoCL on the side and for the needs of their research projects, including CPSoSaware project. PoCL is a portable open source (MIT-licensed) implementation of the OpenCL standard. It likely supports the minimal v3.0 feature set (official conformance stamp not yet applied for). In addition to being an easily portable multi-device (truly heterogeneous) open-source OpenCL implementation, a major goal of this project is improving interoperability for diversity of OpenCL-capable devices by integrating them to a single centrally orchestrated platform. Another key goal is to enhance performance portability of OpenCL programs across device types utilizing runtime and compiler techniques. Upstream PoCL currently supports various CPUs, NVIDIA GPUs via libcuda and ASIPs (experimental, see: http://openasip.org). It is also known to have multiple (private) adaptations in active production use. Open-source code is available at ZENODO.

### 2.5.4.3 Tauray: A Scalable Real-Time Open-Source Path Tracer for Stereo and Light Field Displays (Software)

Tauray is a real-time rendering framework, with a focus on distributed computing, scalability, portability and low latency. It uses C++ and Vulkan, primarily relying on the VK_KHR_ray_tracing extension, but comes with a fallback rasterization mode that can be used on devices that do not have that extension.

Tauray development is led by the VGA research group in Tampere University. The project is described in a conference publication [26], which includes performance benchmarks and more information on Tauray.

The main features of Tauray are:

- Real-time path tracing (–renderer=path-tracer)
- Offline rendering (–headless=output_file)
- DDISH-GI, as used in the DDISH-GI publication (–renderer=dshgi)
- Multi-GPU rendering (real-time and offline!)
- Light field rendering
- VR rendering (–display=openxr)

Open-source code is also available at ZENODO.

### 2.5.4.4 Multimodal-fusion-driven scene analysis and understanding

The repository, available at ZENODO, provides a plugin for the OpenPCDet object detection framework that facilitates fusion of 2D and 3D object detection.

## 2.6 Clustering and liaison activities

Collaboration with other EU research programs and initiatives frequently results in fresh insights or a head start in research and dissemination activities. As a result, collaboration with other projects and efforts in relevant disciplines is pursued and continuously monitored with the goal of exchanging information, ideas, and stimulating innovation by forming an extended knowledge pool. In this section we present the efforts towards clustering and liaison activities that took place during the second part of the project implementation.

### 2.6.1 OntoCommons

CPSoSaware has joined OntoCommons [20] demonstrators Partners Catalink Limited (CTL), Industrial Systems Institute, Athena Research Center (ISI), University of Patras (UPAT) and Centro Ricerche FIAT – C.R.F. S.C.p.A (CRF) jointly submitted an application to the OntoCommons project to include the semantic data fusion work for the manufacturing use case, as a demonstrator in their project. OntoCommons is a well-established H2020 CSA project dedicated to the standardisation of data documentation in domains related to materials & manufacturing. They already have 11 "in-house" demonstrators/use cases, involving

strong industrial players, like Airbus, Bosch and Siemens. Involvement of CPSoSaware partners with a well-established standardization effort like OntoCommons allowed us to work together with a strong consortium and exchange knowledge with renowned experts on the fields of semantic technologies, data sharing, and data-driven innovation.



**Figure 37: OntoCommons**

### 2.6.2   Horizon Results Booster

CPSoSaware project has been the lead project and a member of NextGenCPSoSs Cluster in Horizon Results Booster [27] since May 2022. Through NextGenCPSoSs Cluster, CPSoSaware made use of two modules from Service: Portfolio Dissemination & Exploitation Strategy, namely Module A: "Identifying and creating the portfolio of R&I project results" and Module B: "Helping projects from the portfolio to design and execute a portfolio dissemination plan" [28]. Apart from CPSoSaware, TEACHING [12], DIH4CPS [29], HiPEAC [30], SMART4ALL [31] and ADEPTNESS [32] are members of the PG. Joining forces for all six projects, along with the support of the experts appointed from HRB, led to a fruitful collaboration that had a positive impact in designing and planning joint activities aimed to reach a wider audience of targeted stakeholders.

The outcome of Module A concerned the availability of the *"Portfolio Dissemination and Exploitation Strategy (PDES)"* which identifies the collective results of the PG to be disseminated, their characteristics and the target stakeholders that can benefit from these results and are ultimately the target audience for the PG dissemination activities. The main objectives of the various projects that served in the PG dissemination effort are:

- Objective 1 - Increase awareness of the PG results.

- Objective 2 - Identify stakeholders potentially interested in the project and its outcomes, engage them in the projects' activities and encourage them to regularly interact with the involved projects.

- Objective 3 - Find new ways of dissemination to mitigate COVID-19 restrictions and ensure an effective engagement.

The portfolio, following an in-depth analysis of the Project Group, provided the following conclusions/ recommendations:

- The Project Group's results deliver innovations in the field of Cyber physical systems of systems.

- The Project Group's stakeholders are:

  • Research & Academia

  • Large enterprises

  • Start-ups & SMEs

  • Civil Society, NGOs, and Citizens

- Policy makers, Funding Agencies including EU & national digital agencies
- ICT Operators/Service Providers

▪ The barriers to dissemination are:

- The COVID-19 pandemic is a real obstacle, as it affects many types of interactions
- It is hard to reach SMEs with our research results, which are still at relatively low TRL
- To reach the end users to increase our visibility and provide the Portal to be used by them. We need to have more end users to validate the Portal and to identify we are able to support them to find the best DIH for them.
- The results generated within the HiPEAC community are often at the stage of basic research and are often very technical / niche in nature. It can be challenging to communicate the benefit of these technologies to a more general audience.

▪ The recommended dissemination channels to be used by the Project Group to reach its newly identified common stakeholders are:

- Demos and Videos
- Website Pages and Blogs
- Newsletters
- Social: Twitter
- Social: LinkedIn
- Press Releases and Kits
- Collaterals: Flyers, Banners, Posters
- Events and Workshops
- Presentations
- Infographics
- Datasets and insights
- Policy Briefs

The HRB service delivery team recommended to continue the collaboration between the projects and to carry out the recommendations of Module A report, by applying for HRB Service 1 Module B. NextGenCPSoSs Cluster's projects has opted by Module B during December 2022 and are currently preparing their portfolio for joint activities.

## Horizon Results Booster – Project Group



## NextGenCPSoSs Cluster: Building the future of cyber physical systems of systems

Figure 38: HRB Project Group: NextGenCPSoSs Cluster: Building the future of cyber physical systems of systems

## 2.7 Dissemination & Communication KPIs

The monitoring of dissemination and communication activities is an essential process to evaluate the success and efficiency of the plan. A set of Key Performance Indicators (KPIs) that are relevant for the activities pertaining WP7 were defined in the DoA that helped the consortium to monitor the progress and impact of the dissemination and communication activities and acted as guidance in order to help the consortium to take corrective measures when was needed.

The next figure presents the KPIs that were introduced in DoA (Figure 39) whereas Table 5 provides an update on the final achieved status. We have also added 2 KPIs measuring the number of newsletters, and the number of leaflets and brochures produced for the project.

| Metric | KPI |
|---|---|
| CPSoSaware website | 2000+ unique visitors |
| Peer-reviewed journal publications | 20+ (10+ as make Open Access) |
| Active participation in conferences and other events | 20+ |
| Organization of workshops/tutorials | 2+ |
| On-site demonstrations | 3+ |
| Professional videos, infographics and webinars | 7+ |
| Co-operation with other initiatives | 3+ |
| Number of posts to the social media pages | 100+ |
| Number of followers to the social media pages | 100+ |

Figure 39 : KPIs defined in the CPSoSaware DoA

The status of each KPI can be categorized as follows:

Table 5: Dissemination KPIs

| ACTIVITY /CHANNEL | KPI | AUDIENCE | Values at M18 | Values at M36 |
|---|---|---|---|---|
| CPSoSaware WEBSITE | Number of distinct Visitors >=2000 (throughout project lifetime) | Industry, general public, scientific & research community, public sector | 2105 unique visitors and 5385 visits. | 5.168 unique visitors and 13.791 visits |
| NUMBER OF FOLLOWERS SOCIAL MEDIA - TWITTER | Twitter followers >= 150 | Industry, general public, scientific & research community, public sector | 415 Followers | 800 Followers |
| NUMBER OF FOLLOWERS SOCIAL MEDIA - FACEBOOK | Facebook followers >= 100 | Industry, general public, scientific & research community, public sector | 62 Followers | 75 Followers |
| NUMBER OF FOLLOWERS SOCIAL MEDIA - LINKEDIN | LinkedIn Group Members >=100 | Industry, general public, scientific & research community, public sector | 50 Followers | 135 Followers |
| VIDEOS INFOGRAPHICS WEBINARS | Videos, infographics, webinars >7 | Industry, general public, scientific & research community, public sector | 1 teaser video | 2 demo /training videos<br><br>1 promo video<br><br>1 infographic<br><br>2 training sessions |
| Brochures and leaflets | Number of brochures or leaflets produced >=2 | Industry, general public, scientific & research community, public sector | 1 leaflet produced<br><br>1 brochure produced | 1 roll-up banner<br><br>1 poster |
| Number of newsletters | Number of newsletters produced >=4 | Industry, general public, scientific & research community, public sector | 2 | 5 |
| On site demonstrations | On site demonstrations > 3 | Industry and research | 0 | 3 for Manufacturing pillar<br><br>4 for Automotive pillar |

| ACTIVITY /CHANNEL | KPI | AUDIENCE | Values at M18 | Values at M36 |
|---|---|---|---|---|
| Active participation in conferences and other events | Number of conferences and events >20 | All CPSoSaware partners will participate in European and international conferences. Academic partners will organise special sessions and workshops in EU and Int. conferences | PAPERS ACCEPTED IN CONFERENCES: 20<br><br>EVENTS attended by consortium members as far: 15 | Papers accepted in conferences: 49<br><br>Events attended: 27 |
| Peer reviewed journal publications | Number of peer reviewed journal publications ≥ 20<br><br>Number of Open Access publications ≥ 10 | Articles on magazines, technology roadmaps, and industry-led journals. The scientific publications will facilitate the efforts of professionals and researchers. | Papers accepted in journals: 6<br><br>Pending journal papers: 2 | Papers accepted in journals: 15<br><br>Pending acceptance: 3 |
| Organization of workshops /tutorials | Organisation of workshops/ tutorials ≥ 2 | Organisation of industry focused events (i.e., workshops, symposiums, demonstrations, trainings, etc.) to disseminate project outcomes. | 2 | 3 |
| Co-operation with other initiatives | Number of collaborations with other projects and initiatives≥ 3 | | 5<br><br>▪ XANDAR<br>▪ CARAMEL<br>▪ nIoVe<br>▪ Cyber-watching<br>▪ Heterogeneity Alliance | 3<br><br>▪ PG at HRB (6 projects)<br>▪ HiPEAC<br>▪ OntoCommons |

# 3   Conclusions

Deliverable D7.7 reported on the main dissemination and communication activities performed during the second reporting period of the project.  As it has been shown, the CPSoSaware project consortium put substantial effort towards reaching out to the scientific and industrial communities so as to raise awareness of the involved stakeholders for the project's developed solutions.

The initial strategy for dissemination and communication had to be modified in light of the pandemic's unprecedented circumstances, but we believe that overall, we were able to reach a larger audience thanks to consortium members' participation in a number of online gatherings and clustering activities as well as the creation of digital content to share on the project website and social media accounts.

CPSoSaware partners are willing to keep up their efforts in creating an impact, as can been seen by events and activities that are already planned (i.e., co-organisation and participation in WASOS HiPEAC 2023, participation in embedded world Conference 2023), or are going to be planned (i.e., execution of the joint portfolio of NextGen CPSoSs Cluster, from HRB) for the next period, even after project's end. Along these lines, efforts towards dissemination will continue beyond the end of the project: website will be maintained, papers under submission that will be presented when accepted, other papers as outcome of the last months of work will be submitted soon, while datasets will be maintained.

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