



ICT-56-2020 - Next Generation Internet of Things

D 8.4

Dissemination plan and report

Document information	
Contract number	957197
Project website	www.vedliot.eu
Dissemination Level	PU (Public)
Nature	R
Contractual Deadline	31.01.2024
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The VEDLIoT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957197.	

Changelog		
V 0.1	2023-12-015	ToC
V 0.2	2024-01-18	Final Draft
V 1.0	2024-01-26	Final version, after review
V 1.1	2024-01-29	Small updates to include missing items.
V 1.2	2024-01-31	Another small update.

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Executive Summary

This deliverable provides the final report on dissemination plans and the dissemination activities performed during the project. This includes several kinds of activities that involved all project partners, and which were essential to make the results available, known to relevant parties, and increase the likelihood that they are used beyond the project. These activities targeted several audiences, as initially planned. The last part of the deliverable provides a performance analysis, considering the key performance indicators set forth in Deliverable D8.1, leading us to the conclusion that VEDLIoT dissemination activities were vast and successful.

1 Introduction

This document presents the final update to VEDLIoT's dissemination plans and dissemination activities and materials, previously presented in Deliverables D8.1 and D8.2. All project partners contributed to the work reported in this deliverable, which was done in the scope of Task 8.2 (Dissemination). Exploitation activities, which are done in the context of Task 8.3, are covered in Deliverable D8.5. The dissemination activities include results from all technical work packages. A summary of the project structure is provided in Figure 1.

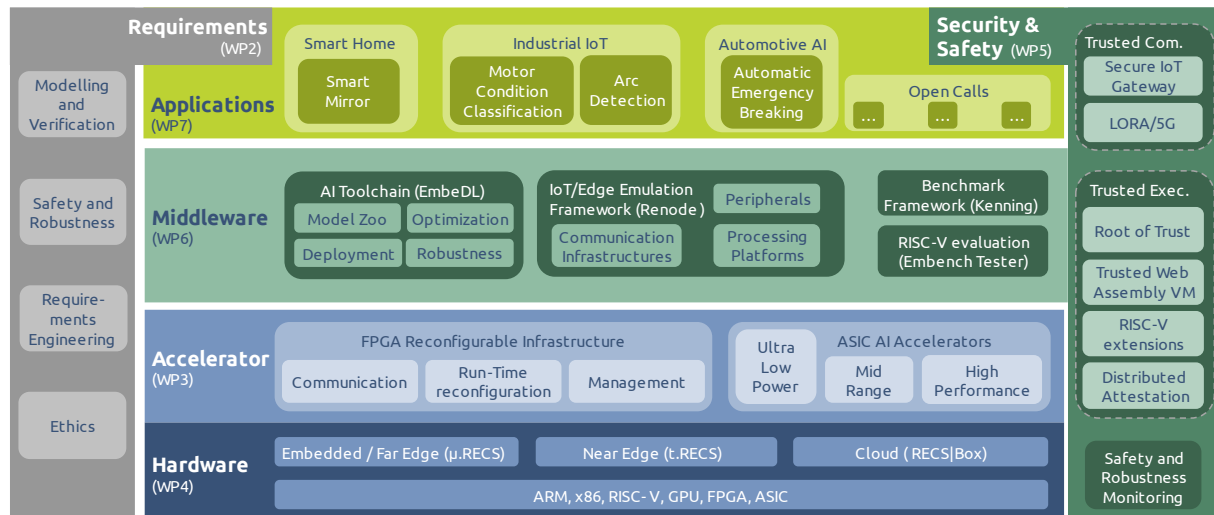


Figure 1: VEDLIoT project overview of the technical work packages

We review here the dissemination activities planned for the project, which have been done during the project, and which make use of several channels that were set up. To a certain extent, dissemination activities will continue beyond the project end, for instance the project website will be maintained, to ensure that several project results will continue to be publicly accessible. The website will be kept as is (updatable) for at least 5 more years, and then a static copy will be kept online for as long as necessary. In addition, some partners have papers in submission to peer-reviewed conferences and journals.

Several audiences have been targeted in the dissemination activities. For instance, while the website is a general-purpose channel to target all kinds of audience, from the scientific community to the general public, the presentations prepared and given at selected events were prepared to target industrial stakeholders and the scientific community specifically.

In Section 2 we briefly review the objectives for the dissemination activities in Task 8.2. In Section 3 we describe the activities performed during the project. This includes setting up and continuously maintaining dissemination channels, continuously preparing and publishing news about project activities, preparing other dissemination materials, making videos, publishing, and presenting scientific articles, participating and presenting the project at several events, preparing the participation in exhibitions, which includes setting up physical demonstrators, participating in activities of the NG-IoT CSA, and organizing an Open Call. Finally, the performance of the project concerning dissemination is discussed in Section 4, considering the key performance indicators defined in Deliverable D8.1.

2 Objectives

The main objectives of the dissemination task (Task 8.2), which spanned the entire duration of the VEDLIoT project, were the following:

- Organise technical workshops within the project, to provide broad and in-depth overviews of the project results and findings, and include interactive sessions to capture potential feedback from experts outside of the consortium;
- Present project results by giving talks at conferences and trade shows and by writing articles for technical and academic publications;
- Engage all partners in a wide range of different dissemination activities, including the use of closed forums that project partners have access to, involving affiliated industry partners and the general public;
- Exploit additional important communication channels for the dissemination of project results, like press releases, project leaflets, university lectures and invited talks;
- Exploit social media like Twitter or LinkedIn as communication channels to keep interested parties updated about VEDLIoT project work.

As described in the following section, the performed activities addressed all the above points.

3 Dissemination activities

3.1 Web-related channels

Several dissemination channels were used to perform the dissemination activities, some of which will be maintained after the project end. In this section we specifically describe the web-related channels that we created to make the project permanently visible to the several audiences.

3.1.1 Website

When the project started a dedicated website was created, which was used during the initial 6 months. However, the technology used for setting up this website was not very user friendly and hence a new website was prepared and put online in June 2021. This second version of the website was used throughout the project, fully meeting the dissemination objectives. The website is available through multiple URLs, namely <http://vedliot.eu>, <http://vedliot.io>, <http://vedliot.ai>, and the respective versions with "www." preceding the name and with secure http (<https://>).

The website provides the main project presence on the Internet and hence required a continuous effort to update it with news, event announcements, project results and other materials and pages. In particular, the website was used to support the VEDLIoT Open Call, from the initial announcements and provision of call information to the dissemination of the results achieved by the 10 accepted projects. The website plays a fundamental role as a central repository on which project results are shared, by means of publications, deliverables, videos, and open-source software developed in the project, or to which the project contributed. This role will be kept beyond the project end, contributing to increase the visibility and impact of the results. The website will be maintained and updated whenever necessary, for instance, if papers acknowledging the project are accepted.

A recent screenshot illustrating how events are announced on the project landing page is provided in Figure 2.

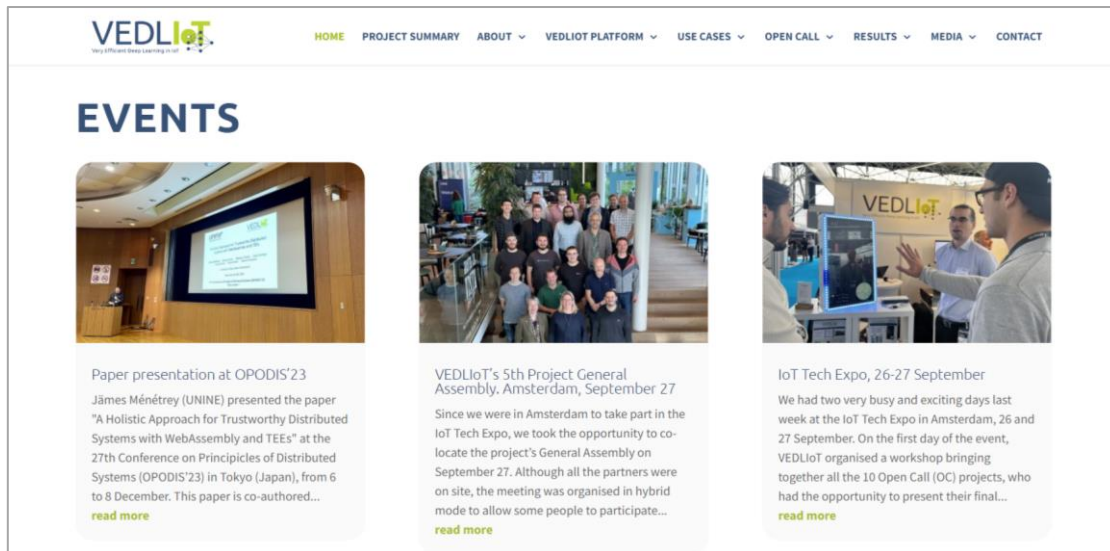


Figure 2: VEDLIoT website, events on landing page.

Being one of the main channels for the dissemination of information about project activities and achievements, access statistics are collected using Google Analytics. In fact, Google changed the collection process around August 2023, so we provide two different views of the collected data, one concerning a period of one year (Figure 3, between August 2022 and July 2023), and another for the last 3 months of 2023 (Figure 4).

Considering the information available, it is possible to conclude that the average website visitors, sessions and pageviews per month tends to the following:

- New visitors / month (average): 50
- Sessions / month (average): 100
- Pageviews / month (average): 250

Considering yearly numbers, they were in the following ranges:

- New visitors / year: 450 - 600
- Sessions / year (average): 900 - 1200
- Pageviews / year (average): 2400 - 3000

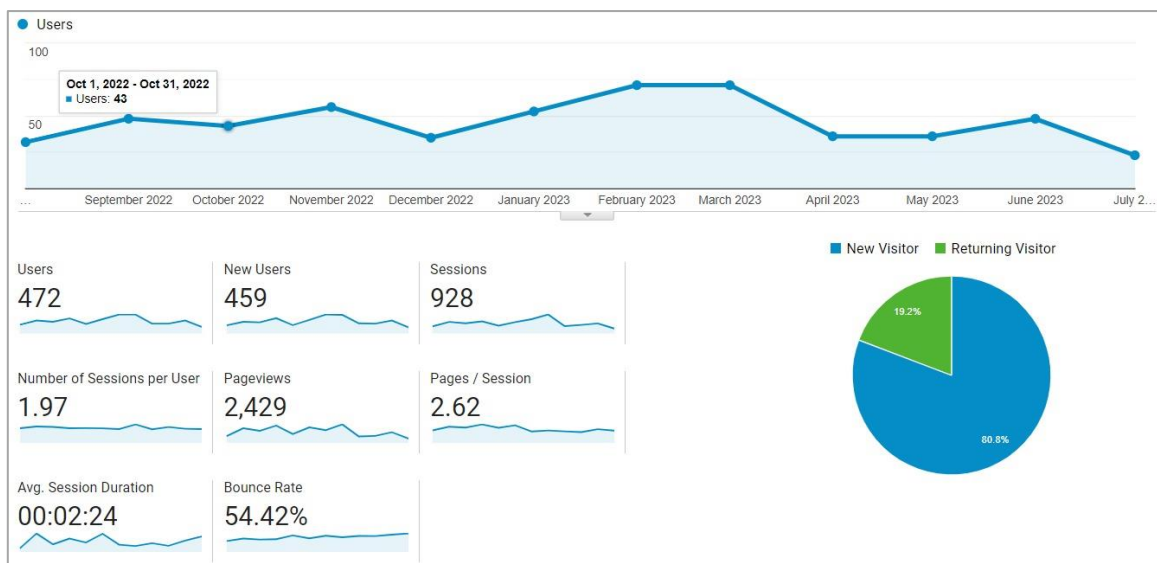


Figure 3: VEDLIoT website statistics for one year (Aug 2022 – July 2023).

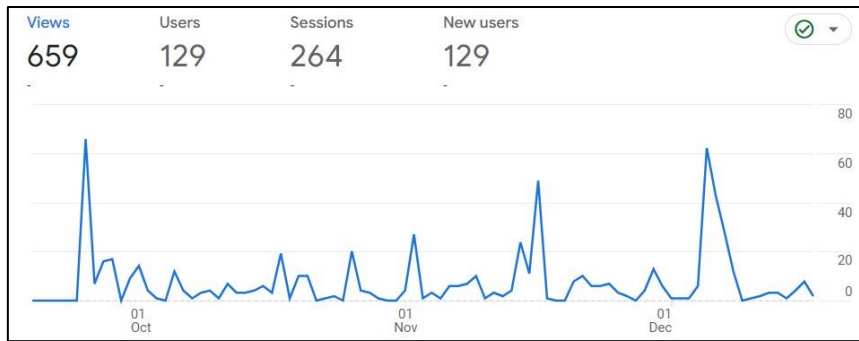


Figure 4: VEDLIoT website access statistics for the last 3 months of 2023.

3.1.2 LinkedIn

VEDLIoT has been maintaining a presence on the LinkedIn social network (<https://www.linkedin.com/company/vedliot/>), periodically making posts to announce events and providing news about the project. Figure 5 illustrates 2 perspectives of this presence.

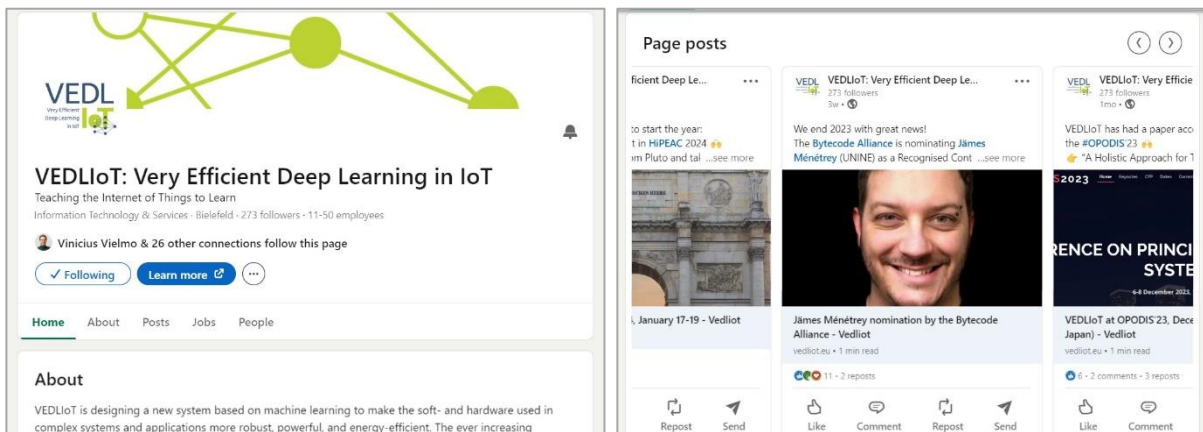


Figure 5: VEDLIoT presence on LinkedIn.

The left part of Figure 5 shows that there are currently 273 users following the project. The total number of posts made on the page was nearly 140. Concerning page view statistics, the numbers in Figure 6 reveal an average of about 70 page views per month, with a peak in September 2023 (likely due to the project presence at IoT Tech Expo).

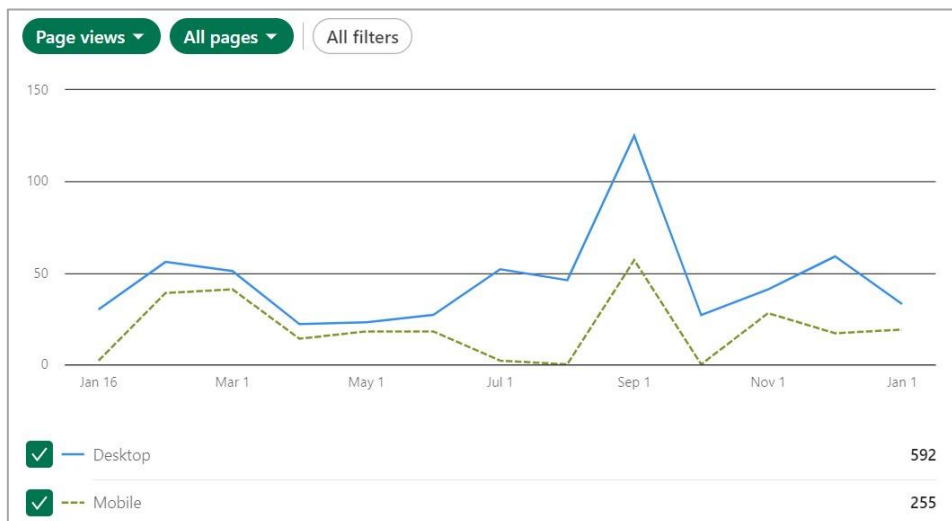


Figure 6: Page views of VEDLIoT LinkedIn presence (Jan 16, 2023 – Jan 15, 2024).

3.1.3 X / Twitter

VEDLIoT is also present on X, formerly Twitter (<https://twitter.com/VEDLIoT>), through which LinkedIn posts are also disseminated. The number of followers in this case is 142, and a total of 152 posts have been made. Figure 6 provides a view of the VEDLIoT presence on Twitter.



Figure 7: VEDLIoT presence on Twitter.

3.1.4 YouTube and SlideShare

VEDLIoT is also present on YouTube (<https://www.youtube.com/@vedlioteuproject>) and on SlideShare (<https://www.slideshare.net/vedliotproject>). However, differently from LinkedIn and Twitter, these channels were mostly used to store materials produced in the project, namely videos and presentations, rather than to create a user base to follow them. Figures 8 and 9 illustrate the presence of VEDLIoT on SlideShare and on YouTube. As expected, the number of subscribers is comparatively small, because the contents stored on these platforms are made available through links embedded in news articles on the project website, and posts on LinkedIn and Twitter.

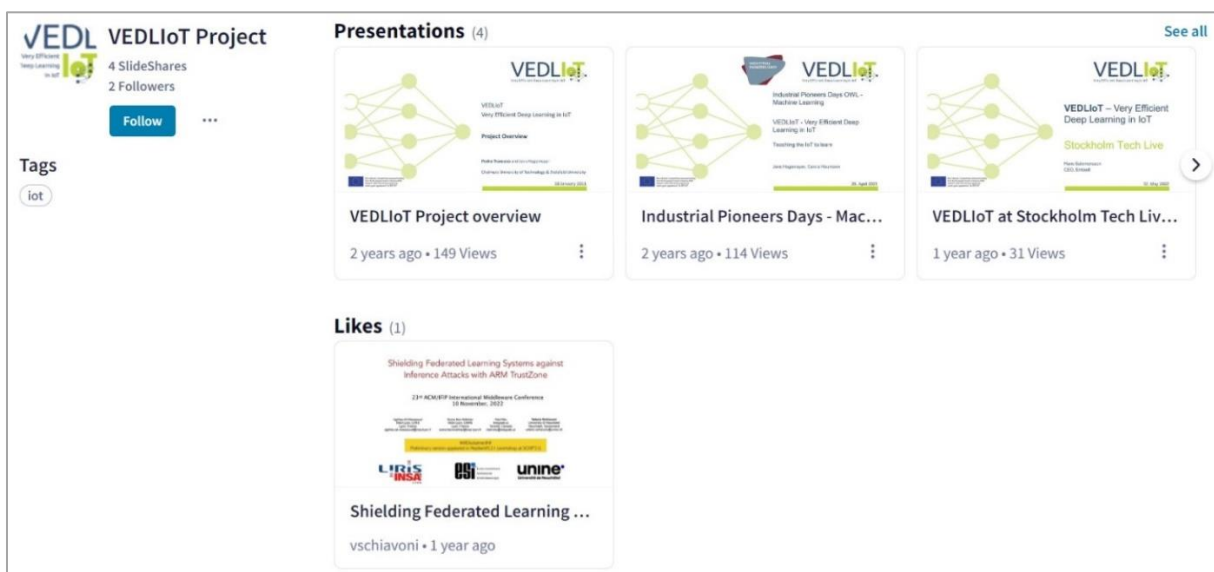


Figure 8: VEDLIoT presence on SlideShare.

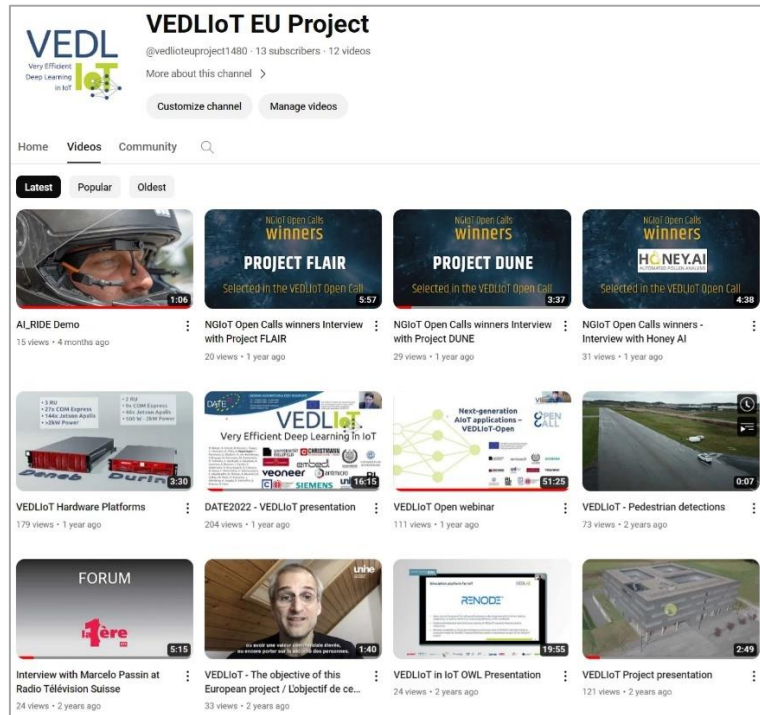


Figure 9: VEDLIoT presence on YouTube.

It is nevertheless possible to observe the number of views of each content, videos or presentations, to conclude that there is an average of about 70 views per video or presentation, with two videos having about 200 views. It is important to note, however, that several of these videos were originally made available in other platforms (Radio Télévision Suisse website, Industrial Pioneers online exhibit), and still are, and we have no means to precisely know the total number of views on these platforms. They may also have been copied and distributed through other channels that we do not control. Therefore, the real number of average views is certainly higher than 70. Given that a total of 12 videos and 4 presentations are available on these platforms, we estimate that these VEDLIoT materials have been viewed, in total, more than 1400 times.

3.1.5 Social media plan

To keep users informed and following the progress of the project and its dissemination channels, news articles and posts for LinkedIn and Twitter were continually created during the project. To keep up with this continuity, a social media plan was established early in the project, and was kept and updated until the end, aiming at assuring that at least three news articles would be prepared every month, with the help of all project partners. Figure 10 provides an illustration of this plan for the last 6 months of 2023. Given that nearly 150 posts were made, we conclude that the objective was successfully achieved.

	July	August	September	October	November	December
Content	Project news and progress	Project news and progress	Project news and progress	Project news and progress	Project news and progress	Project news and progress
Partners	UGOT UOS FC.ID	SIEMENS CHRISTMANN FC.ID	EMBEDL RISE FC.ID	UNIBI FC.ID	CHALMERS UNINE FC.ID	Antmicro VEONEER FC.ID

Figure 10: VEDLIoT social media plan for a 6-month period.

3.2 Flyers and posters

A project flyer was prepared, which was distributed in project booths during all exhibitions in which the project was present, and it was also distributed by partners whenever possible. Other materials, like roll-ups and posters, were also prepared to be used in exhibitions. All of these branding material and posters are made available on the project website. Figure 11 shows some examples, including the project flyer, and latest versions of the roll-up and of the motor monitor use case poster.



Figure 11: Examples of VEDLIoT dissemination material (flyer, roll-up and poster).

3.3 Videos

As already mentioned, VEDLIoT has produced or involved in the production of 17 videos, which are stored on YouTube (under VEDLIoT's or other accounts) and linked from several posts and pages on the website. The complete list is the following:

- AI_RIDE Demo: 1'06" video reporting the event that took place at the Pontedera track, in Pisa, Italy, to demonstrate the final results of the AI_RIDE (Artificial Intelligence – driven Riding Distributed Eye) VEDLIoT Open Call project.
<https://www.youtube.com/watch?v=m4mpOemlt7k>
- NGIoT Open Calls winners – Interview with FLAIR: 5'57" video presenting the work of the FLAIR VEDLIoT Open Call project.
<https://www.youtube.com/watch?v=yyLSSsrczWQ>
- NGIoT Open Calls winners – Interview with DUNE-RCO: 3'37" video presenting the work of the DUNE-RCO VEDLIoT Open Call project.
<https://www.youtube.com/watch?v=BWNZXwssvM>
- NGIoT Open Calls winners – Interview with Honey AI: 4'38" video presenting the work of the Honey AI VEDLIoT Open Call project.
<https://www.youtube.com/watch?v=hbV61qe-kUM>
- The IoT Radar interview with Jens Hagemeyer on VEDLIoT: 18'55" video of an interview that Jens Hagemeyer gave to IoT Radar.
<https://www.youtube.com/watch?v=ALK96k9d08k>
- Faster, smarter machine learning from the edge to the cloud: Talking VEDLIoT with Jens Hagemeyer: 6'34" video of an interview given to HiPEAC TV, in which Jens Hagemeyer talks about VEDLIoT.
<https://www.youtube.com/watch?v=ACNSBQT6WsM>

- VEDLIoT Hardware Platforms - 3'29" video specifically prepared to highlight the work done in VEDLIoT concerning the development of the hardware platforms to support deep learning over the continuum, from the edge to the cloud.
<https://www.youtube.com/watch?v=UG877aBqkdU>
- CSW 2022 - VEDLIoT hardware platforms: 19'39" video of the presentation given at the CSW 2022 workshop, by Kevin Mika.
<https://www.youtube.com/watch?v=ZLYs5ruHsGs>
- CSW 2022 - Performance evaluation and benchmarking in VEDLIoT: 25'24" video of the presentation given at the CSW 2022 workshop, by Mario Porrmann.
<https://www.youtube.com/watch?v=aHWa-dLJpzg>
- CSW 2022 - Introduction to VEDLIoT: 26'35" video of the presentation given at the CSW 2022 workshop, by Pedro Trancoso.
<https://www.youtube.com/watch?v=kfOVH-MVTqs>
- DATE2022 - VEDLIoT presentation: 16'15" video of the presentation given at the DATE 2022 conference, about the VEDLIoT paper accepted at that conference.
<https://www.youtube.com/watch?v=ckJI1dPQ2nE>
- VEDLIoT Open webinar: 51'25" video of the webinar session that took place on March 25, 2022, to introduce and address several questions concerning the VEDLIoT-Open call for cascaded funding.
<https://www.youtube.com/watch?v=uzQWXbfo2vg>
- VEDLIoT - Pedestrian detections: 0'07" video to highlight the real experimental setting for pedestrian detection by autonomous vehicles,
https://www.youtube.com/watch?v=3TJ_Hulz9yq
- VEDLIoT in IoT OWL Presentation: 19'55" video of a presentation given at the OWL event (the slides are in English, but presentation was given in German).
https://www.youtube.com/watch?v=cG_n3BYfXF0
- VEDLIoT - The objective of this European project / L'objectif de ce projet européen, 1'39" video prepared by the University of Neuchâtel (in French).
<https://www.youtube.com/watch?v=Jw4SBSZwUJw>
- TV interview: Forum des idées - comment rendre les objets connectés plus sûrs?, Interview with Marcelo Pasin at Radio Télévision Suisse (in French).
<https://www.youtube.com/watch?v=QJwS9tVregY>
- VEDLIoT - Very Efficient Deep Learning in IoT: project presentation, 2'48" video prepared by the University of Bielefeld.
<https://www.youtube.com/watch?v=HWLeRkrqRf8>

3.4 Publications

A proper dissemination of VEDLIoT results is important to bring awareness of the project progresses and create exploitation opportunities. Therefore, considerable effort was put in preparing, submitting, and presenting research papers at international workshops, conferences, and journals. The complete lists of project publications in conferences and workshops, journals, as book chapters, and as articles in on-line magazines, are provided in the following sections.

The total number of published papers and articles over the full project duration is the following (we include the publications achieved in the scope of the Open Call projects, listed in Section 3.10):

- Conference and workshop papers: 33
- Journal papers: 13
- Book chapters: 2
- Articles in on-line magazines: 5

In addition to papers, several academic works in relation and/or supported by VEDLIoT were completed or will be completed soon. The list of the completed theses is also provided ahead, and we note that we do not consider works still in progress, which will eventually enlarge the list at some point in the future. The total number of defended theses is the following:

- Theses: 6 (PhD), 12 (MSc), 13 (BSc)

3.4.1 Conference and workshop papers

- P. Yuhala, J. Ménétrey, P. Felber, M. Pasin, V. Schiavoni, **Fortress: Securing IoT Peripherals with Trusted Execution Environments**. 39th ACM/SIGAPP Symposium On Applied Computing, 2024.
<https://doi.org/10.48550/arXiv.2312.02542>
- J. Ménétrey, A. Grueter, P. Yuhala, J. Oeftiger, P. Felber, M. Pasin, V. Schiavoni, **A Holistic Approach for Trustworthy Distributed Systems with WebAssembly and TEEs**. OPODIS'23: 27th Conference on Principles of Distributed Systems, 2023.
<https://doi.org/10.48550/arXiv.2312.00702>
- Mateo Vázquez, Muhammad Waqar Azhar, Pedro Trancoso, **Exploiting the Potential of Flexible Processing Units**. SBAC-PAD 2023, 2023.
<https://doi.org/10.1109/SBAC-PAD59825.2023.00013>
- Kevin Mika, Florian Porrman, Nils Kucza, René Griesl and Jens Hagemeyer, **RECS: A Scable Platform for Heterogeneous Computing**. IEEE SOCC, 2023.
<https://doi.org/10.1109/SOCC58585.2023.10256982>
- Simon Queyrut, Valerio Schiavoni, Pascal Felber, **Mitigating Adversarial Attacks in Federated Learning with Trusted Execution Environment**. ICDCS 2023, 2023.
<https://doi.org/10.1109/ICDCS57875.2023.00069>
- Marc Rothmann and Mario Porrman, **STANN: Synthesis Templates for Artificial Neural Network Inference and Training**. IWANN 2023, 2023.
https://doi.org/10.1007/978-3-031-43085-5_31
- Hasan Heydari, Guthemberg Silvestre, Alysson Bessani, **How Hard is Asynchronous Weight Reassignment?**. ICDCS 2023, 2023.
<https://doi.org/10.1109/ICDCS57875.2023.00038>
- Pascal Gerig, Jämes Ménétrey, Baptiste Lanoix, Florian Stoller, Pascal Felber, Marcelo Pasin, Valerio Schiavoni, **Preventing Efail Attacks with Client-Side WebAssembly: The Case of Swiss Post's IncaMail**. DEBS'23, June 2023.
<https://doi.org/10.1145/3583678.3596899>
- Robin Vassantlal, Hasan Heydari, Alysson Bessani, **On the Minimal Knowledge Required for Solving Stellar Consensus**. ICDCS 2023, 2023.
<https://doi.org/10.1109/ICDCS57875.2023.00016>
- Kevin Mika, René Griesl, Nils Kucza, Florian Porrman, Martin Kaiser, Lennart Tigges, Jens Hagemeyer, Pedro Trancoso, Muhammad Waqar Azhar, Fareed Qararyah, Stavroula Zouzoula, Jämes Ménétrey, Marcelo Pasin, Pascal Felber, Carina Marcus, Oliver Brunnegard, Olof Eriksson, Hans Salomonsson, Daniel Ödman, Andreas Ask, Antonio Casimiro, Alysson Bessani, Tiago Carvalho, Karol Gugala, Piotr Zierhoffer, Grzegorz Latosinski, Marco Tassemeier, Mario Porrman, Hans-Martin Heyn, Eric Knauss, Yufei Mao, Franz Meierhöfer, **VEDLIoT — Next generation accelerated AIoT systems and applications**. Computing Frontiers 2023, May 2023.
<https://doi.org/10.1145/3587135.3592175>
- Muhammad Waqar Azhar, Stavroula Zouzoula, Pedro Trancoso, **ARADA: Adaptive Resource Allocation for Improving Energy Efficiency in Deep Learning Accelerators**. Computing Frontiers 2023, May 2023.
<https://doi.org/10.1145/3587135.3592207>

- I. Zenden, H. Wang, A. Iacovazzi, A. Vahidi, R. Blom, S. Raza, **On the Resilience of Machine Learning-Based IDS for Automotive Networks**, 2023 IEEE Vehicular Networking Conference (VNC), Istanbul, Turkiye, April 2023.
<https://10.1109/VNC57357.2023.10136285>
- Hans-Martin Heyn, Eric Knauss, Iswarya Malleswaran, Shruthi Dinakaran, **An investigation of challenges encountered when specifying training data and runtime monitors for safety critical ML applications**. Part of the Lecture Notes in Computer Science book series (LNCS, volume 13975), April 2023.
https://doi.org/10.1007/978-3-031-29786-1_14
- Stavroula Zouzoula, Muhammad Waqar Azhar, Pedro Trancoso, **RAINBOW: Multi-Dimensional Hardware-Software Co-Design for DL Accelerator On-Chip Memory**. ISPASS 2023, 2023.
<https://doi.org/10.1109/ISPASS57527.2023.00050>
- Bakary Badjie, José Cecílio, António Casimiro, **Denoising Autoencoder-based Defensive Distillation as an Adversarial Robustness Algorithm**. 27th Ada-Europe International Conference on Reliable Software Technologies (AeiC 2023), 2023.
<https://doi.org/10.48550/arXiv.2303.15901>
- R. Griessl, F. Porrmann, N. Kucza, K. Mika, J. Hagemeyer, M. Kaiser, M. Porrmann, M. Tassemeier, M. Flottmann, F. Qararyah, M. Waqar, P. Trancoso, D. Ödman, K. Gugala, G. Latonsinski, **Evaluation of heterogeneous AioT Accelerators within VEDLIoT**. DATE Conference 2023, April 2023.
<https://doi.org/10.23919/DATE56975.2023.10137021>
- Mateo Vazquez Maceiras, Muhammad Waqar Azhar, Pedro Trancoso, **VSA: A Hybrid Vector-Systolic Architecture**. ICCD 2022, October 2022.
<https://doi.org/10.1109/ICCD56317.2022.00061>
- Fareed Qararyah, Muhammad Waqar Azhar, Pedro Trancoso, **FibHA: Fixed Budget Hybrid CNN Accelerator**. IEEE SBAC-PAD, November 2022.
<https://doi.org/10.1109/SBAC-PAD55451.2022.00029>
- Aghiles Ait Messaoud, Vlad Nitu, Sonia Ben Mokhtar, Valerio Schiavoni, **Shielding Federated Learning Systems against Inference Attacks with ARM TrustZone**. MIDDLEWARE 2022, November 2022.
<https://doi.org/10.1145/3528535.3565255>
- M. Rothmann and M. Porrmann, **FAQ: A Flexible Accelerator for Q-Learning with Configurable Environment**. 2022 IEEE 33rd International Conference on Application-specific Systems, Architectures and Processors (ASAP), Gothenburg, Sweden, October 2022.
<https://doi.org/10.1109/ASAP54787.2022.00026>
- Jämes Ménétrey, Marcelo Pasin, Pascal Felber, Valerio Schiavoni, **WaTZ: A Trusted WebAssembly Runtime Environment with Remote Attestation for TrustZone**. ICDCS'22, July 2022.
<https://doi.org/10.1109/ICDCS54860.2022.00116>
- Jämes Ménétrey, Marcelo Pasin, Pascal Felber, Valerio Schiavoni, **WebAssembly as a common layer for the cloud-edge continuum**. 2nd workshop on Flexible Resource and Application Management on the Edge (FRAME'22), co-located with HPDC'22, June 2022.
<https://doi.org/10.1145/3526059.3533618>
- Jämes Ménétrey, Christian Göttel, Anum Khurshid, Marcelo Pasin, Pascal Felber, Valerio Schiavoni and Shahid Raza, **Attestation Mechanisms for Trusted Execution Environments Demystified**. DAIS'22, June 2022.
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https://doi.org/10.1007/978-3-030-98464-9_16
- Robin Vassantlal, Eduardo Alchieri, Bernardo Ferreira, Alysson Bessani, **COBRA: Dynamic Proactive Secret Sharing for Confidential BFT Services**. SP'22, San Francisco, CA, USA, May 2022.
<https://doi.org/10.1109/SP46214.2022.9833658>
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<https://doi.org/10.23919/DATE54114.2022.9774653>
- Aghiles Ait Messaoud, Vlad Nitu, Sonia Ben Mokhtar, Valerio Schiavoni, **GradSec: a TEE-based Scheme Against Federated Learning Inference Attacks**. ResilientFL'21, October 2021.
<https://doi.org/10.1145/3477114.3488763>
- Christian Berger, Hans P. Reiser, Alysson Bessani, **Making Reads in BFT State Machine Replication Fast, Linearizable, and Live**. SRDS'21, September 2021. Best paper award.
<https://doi.org/10.1109/SRDS53918.2021.00010>
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3.4.2 Journal papers

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- Fareed Qararyah, Muhammad Waqar Azhar, Pedro Trancoso, **An Efficient Hybrid Deep Learning Accelerator for Compact and Heterogeneous CNNs**. *ACM Transactions on Architecture and Code Optimization*, Vol. 21, No. 1, 2024.
<https://doi.org/10.1145/3639823>
- J. Ménétrey, M. Pasin, P. Felber, V. Schiavoni, G. Mazzeo, A. Hollum, D. Vaydia, **A Comprehensive Trusted Runtime for WebAssembly with Intel SGX**. *IEEE Transactions on Dependable and Secure Computing*, 2023.
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- Han Wang, David Eklund, Alina Oprea, Shahid Raza, **FL4IoT: IoT Device Fingerprinting and Identification Using Federated Learning**. *ACM Trans. Internet Things*, Vol 4, Number 3, August 2023.
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- S. Pradhan, H.-M. Heyn, E. Knauss, **Identifying and Managing Data Quality Requirements: A Design Science Study in the Field of Automated Driving**, *Software Quality*, May 2023.
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- Hans-Martin Heyn, Eric Knauss, Patrizio Pelliccione, **A compositional approach to creating architecture frameworks with an application to distributed AI systems**. *Journal of Systems and Software*, January 2023.
<https://doi.org/10.1016/j.jss.2022.111604>
- Anum Khurshid, Shahid Raza, **AutoCert: Automated TOCTOU-secure Digital Certification for IoT with combined Authentication and Assurance**. *Computers & Security*, Volume 124, October 2022.
<https://doi.org/10.1016/j.cose.2022.102952>
- A. Khurshid, S. D. Yalaw, M. Aslam and S. Raza, **ShieLD: Shielding Cross-zone Communication within Limited-resourced IoT Devices running Vulnerable Software Stack**. *IEEE Transactions on Dependable and Secure Computing*, February 2022.
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<https://doi.org/10.1109/ACCESS.2022.3146518>
- F. Porrman, S. Pilz, A. Stella, A. Kleinjohann, M. Denker, J. Hagemeyer and U. Rückert, *Acceleration of the SPADE Method Using a Custom-Tailored FP-Growth Implementation*. *Frontiers in Neuroinformatics*, Vol. 15, 2021.
<https://doi.org/10.3389/fninf.2021.723406>

3.4.3 Book chapters

- R. Griessl, F. Porrman, N. Kucza, K. Mika, J. Hagemeyer, M. Kaiser, M. Porrman, M. Tassemeier, M. Flottmann, F. Qararyah, M. Waqar, P. Trancoso, D. Ödman, K. Gugala and G. Latosinski, **A Scalable, Heterogeneous Hardware Platform for Accelerated AioT based on Microservers**. *Shaping the Future of IoT with Edge Intelligence – How Edge Computing Enables the Next Generation of IoT Applications*, 2023.
<https://doi.org/10.13052/rp-9788770040266>
- Marcelo Pasin, Jämes Ménétrey, Pascal Felber, Valerio Schiavoni, Hans-Martin Heyn, Eric Knauss, Anum Khurshid, and Shahid Raza, **Methods for Requirements Engineering, Verification, Security, Safety, and Robustness in AioT Systems**. *Shaping the Future of IoT with Edge Intelligence - How Edge Computing Enables the Next Generation of IoT Applications*, 2023.
<https://doi.org/10.13052/rp-9788770040266>

3.4.4 Articles in on-line magazines

- **The VEDLIoT project – Next-generation accelerated IoT**, HiPEACinfo71, pp.24-25, January 2024. Access the article through the following link:
<https://www.hipeac.net/magazine/7167.pdf#page=24>
- **VEDLIoT: Next generation AioT applications**, Innovation News Network, Issue 16, pages 388-389, December 2023. Access the article through the following link:
<https://edition.pagesuite.com/html5/reader/production/default.aspx?pubname=&did=cb14cb34-23c6-4d38-8efe-3eb2cee1c0da&pnum=388>

- **Unlocking the potential of IoT systems: The role of deep learning and AI**, Innovation News Network, Issue 15, pages 318-319, September 2023. Access the article through the following link:
<https://edition.pagesuite.com/html5/reader/production/default.aspx?pubname=&did=cd75110b-474f-4ef0-908e-3a3c8f744a46&pnum=318>
- **Using WebAssembly for a more interoperable, secure cloud-edge continuum**. Jämes Ménétrety, Pascal Felber, Marcelo Pasin and Valerio Schiavoni (Université de Neuchâtel), HiPEACinfo 68, pp.24-25, January 2023. Access the article through the following link:
<https://www.hipeac.net/magazine/7164.pdf#page=24>
- **Teaching the IoT to learn with VEDLIoT**, HiPEACinfo67, pp.18-19, November 2022. Access the article through the following link:
<https://www.hipeac.net/magazine/7163.pdf#page=18>

3.4.5 Theses

PhD

- Jämes Ménétrety, (tentative title) **Shaping the Future of Abstraction in Trusted Execution Environments: Unleashing the Potential of WebAssembly for Secure and Efficient Computing**, University of Neuchâtel, 2024.
- Peterson Yuhala, **Enhancing Security and Performance in Trusted Execution Environments**, University of Neuchâtel, 2024.
- Sébastien Vaucher, **Exploring the potential of modern hardware-assisted security and networking technologies**, University of Neuchâtel, 2023.
- Rémi Dulong, **Towards New Memory Paradigms: Integrating Non-Volatile Main Memory and Remote Direct Memory Access in Modern Systems**, University of Neuchâtel, 2023.
- Christian Göttel, **On the challenges of energy efficiency, scalability and security for internet of things services**, University of Neuchâtel, 2022.
- Anum Khurshid, **Towards Trustworthy and Secure Internet of Things Devices: Using hardware-assisted Trusted Execution and Automated Certification**, Uppsala University, 2022.

MSc

- Sebastian Rahn, **Development of a Memory Management Unit and Hardware Extensions that Enable Linux on a Superscalar RISC-V Processor**, University of Osnabrück, 2024.
- Tiago Carvalho, **Distributed Attestation Service for IoT**, University of Lisbon, 2023.
- Pascal Gerig, **Cryptography in IncaMail: Utilizing WebAssembly for Client-Side Cryptography**, University of Neuchâtel, 2023.
- Julius Oeftiger, **Remote Attestation in TLS using WolfSSL: Design and Implementation of a new TLS Extension for RA**, University of Neuchâtel, 2023.
- Aeneas Grüter, **Trusted publish/subscribe with MQTT and Mosquitto: Establishing trust in the broker**, University of Neuchâtel, 2023.
- David Rolfes, **Accelerating Deep Reinforcement Learning with the Xilinx Versal Architecture**, University of Osnabrück, 2023.
- Marcel Flottmann, **An Out-of-Order Vector Processing Unit for a Superscalar RISC-V Processor**, University of Osnabrück, 2023.
- Luca Costantino, **Safety and Robustness Framework for Machine Learning Solutions**, University of Udine, 2022.

- Iswarya Malleswaran and Shruthi Dinakaran, **Challenges in Specifying Safety-Critical Systems with AI-Components**, Chalmers University of Technology and University of Gothenburg, 2022.
- Nils Affing, **VHDL-based Design of a Superscalar RISC-V Processor with Reconfigurable Execution Units Targeting FPGAs**, University of Osnabrück, 2022.
- Jennifer Linder and Padmini Subbiah, **Deriving Contextual Definition and Requirements from Use Cases of Autonomous Drive**, Chalmers University of Technology and University of Gothenburg, 2021.
- Shameer Kumar Pradhan and Sagar Tunggal, **Quality Attributes of Data in Distributed Deep Learning Architectures**, Chalmers University of Technology and University of Gothenburg, 2021.

BSc

- Dennis Konkol, **Benchmarking of Deep Reinforcement Learning Algorithms on Embedded GPUs**, University of Osnabrück, 2024.
- Jan-Matthis Niermann, **Resource-efficient Training of Convolutional Neural Networks on FPGAs**, University of Osnabrück, 2024.
- Lena Brüggemann, **FPGA-based Object Detection for Autonomous Drone Control**, University of Osnabrück, 2023.
- Kauter Matthias, **Entwurf eines FPGA-Beschleunigers für ML-basierte Objekterkennung in Smart-Home-Systemen mit ROS-2-Middleware**, University of Osnabrück, 2023.
- Simon Garske, **Gleitkommadarstellungen mit geringer Wortbreite für Maschinelles Lernen auf FPGAs**, University of Osnabrück, 2023.
- Emil Galwas, **Automatisierte Entwurfsraumexploration für maschinelles Lernen auf eingebetteten FPGAs**, University of Osnabrück, 2023.
- Luka Vukusic, **Optimization of Reconfigurable Hardware Accelerators for Embedded Machine Learning**, University of Osnabrück, 2023.
- Titus Abele, **Privacy Preserving OAuth Service with TEEs**, Haute École Spécialisée de Suisse Occidentale, 2023.
- Vincent Jeannin, **UAuth, Une étude d'authentifications**, Haute École Spécialisée de Suisse Occidentale, 2023.
- Deniz Kruppe, **Optimizing the Energy Efficiency of YOLO-based Object Detection on FPGAs**, University of Osnabrück, 2022.
- Torben Bietendüvel, **Ressourceneffizientes Training von Convolutional Neural Networks auf FPGAs**, University of Osnabrück, 2022.
- Claudia Bruhn, **A Flexible FPGA-based Accelerator for Double Q-Learning**, University of Osnabrück, 2021.
- Matthieu Barbot, **WebAssembly File System**, Haute École Spécialisée de Suisse Occidentale, 2022.

3.5 Open-Source Software

Besides publishing scientific results in several venues, as listed in Section 3.4, software artifacts developed in VEDLIoT were also made available to developers and contributed to dissemination efforts. These software artifacts were made available on GitHub as open-source packages, under MIT or Apache 2.0 licence agreements. The complete list of these packages, which is also available on the VEDLIoT website, is the following:

- **GradSec** - GradSec is a proof-of-concept prototype specialized for IoT devices with Arm TrustZone enclaves, designed to shield Deep-Neural Networks against privacy attacks. GradSec is provided/owned by UNINE.
https://github.com/aghiles-ait/Static_GradSec/tree/master

- **Kenning** - Kenning is an open-source framework for creating deployment flows and runtimes for DNN applications on various target hardware. Kenning offers an API for deploying deep learning applications on edge devices by leveraging various model training and compilation frameworks. Kenning is provided/owned by Antmicro.
<https://github.com/antmicro/kenning>
- **Renode** - Renode is a development framework which accelerates IoT and embedded systems development by letting you simulate physical hardware systems – including both the CPU, peripherals, sensors, environment and wired or wireless medium between nodes. It lets you run, debug and test unmodified embedded software on your PC – from bare System-on-Chips, through complete devices to multi-node systems. Renode is provided/owned by Antmicro.
<https://github.com/renode/renode>
- **Renode Verilator Integration** - Renode provides an environment to build complex and flexible simulations that can be easily integrated with other open-source tools like Verilator, a fast and open-source HDL simulator, to co-simulate complex systems. The renode-verilator-integration project contains examples of co-simulated peripherals and is a go-to place for users aiming to create their own co-simulation scenarios. Renode Verilator Integration is provided/owned by Antmicro.
<https://github.com/antmicro/renode-verilator-integration/>
- **RISC-V PMP** - RISC-V PMP is a highly optimized implementation of a Physical Memory Protection unit, configurable in the RISC-V's highest privilege level, i.e., machine mode (M), to control memory access by software running in supervisor (S) and user (U) modes. RISC-V PMP is provided/owned by RISE.
<https://lindemer.github.io/VEDLIoT/>
- **SIRE** - SIRE is a replicated infrastructure supporting remote attestation, application membership management, auditable integrity-protected storage and coordination primitives. SIRE is provided/owned by FCUL.
<https://github.com/tiagorncarvalho/SIRE>
- **Twine** - Twine embeds WebAssembly-compiled applications within Intel SGX enclaves and provides access to TEE facilities by leveraging WASI, a POSIX-like standard. Typically, secure applications may compute and interact with a protected file system with minimal overheads. Twine is provided/owned by UNINE.
<https://github.com/JamesMenetrey/unine-twine>
- **WaTZ** - WaTZ embeds WebAssembly-compiled applications within Arm TrustZone, a TEE technology available on IoT devices. Based on the open standard GlobalPlatform and the open OS implementation OP-TEE, it executes secure applications with minimum overheads. WaTZ also increases the security guarantees by drafting a remote attestation mechanism to attest that executing WebAssembly applications are trustworthy since remote attestation is missing by default in TrustZone.
<https://github.com/JamesMenetrey/unine-watz>

3.6 Datasets

Complementing open-source software, the production, preparation, and provision of public datasets also represents a valuable project output. The following dataset was produced in the scope of the VEDLIoT Open Call DUNE-RCO project:

- **A Direction Finding (DF) Bluetooth Low Energy (BLE) indoor data set for angle of arrival (AOA) and position estimation** – This is a set of three experiments collected in different days that consist of features of BLE packets received by several BLE receivers with AOA capabilities matched to the ground truth XYZ positions and azimuth and elevation angles from where the packets were transmitted. The intended usage for the data is AOA estimation through the processing (MUSIC, Deep

Learning, etc.) of features (IQ samples, RSSI, frequency channel) of the received BLE packets, and position estimation using the estimated angles. The dataset is available on: <https://bitbucket.org/wineuoc/aoa-ble-dataset/src/master>

3.7 Organization of events

One of the objectives of the dissemination task is to organize project events and workshops, not only to further disseminate research results to academic and industrial stakeholders, but to foster interactions and exchange of ideas with other projects working in related topics, namely under the same ICT-56-2020 call on Next Generation Internet of Things. Therefore, VEDLIoT organized the following events:

- **DL4IoT: Workshop on Deep Learning for IoT (workshop series).** The objective of this series of three workshops, which took place always with HiPEAC, was to bring together other RIA projects in the same or related areas to present their activities in relation to machine learning aspects.
 - 3rd Workshop on Deep Learning for IoT, with HiPEAC 2024, January 19, 2024, Munich, Germany.
<https://www.hipeac.net/2024/munich/#/program/sessions/8114/>
 - 2nd Workshop on Deep Learning for IoT, with HiPEAC 2023, January 17, 2023, Toulouse, France.
<https://www.hipeac.net/2023/toulouse/#/program/sessions/8021/>
 - Workshop on Deep Learning for IoT, with HiPEAC 2022, June 20, 2022, Budapest, Hungary.
<https://www.hipeac.net/2022/budapest/#/program/sessions/7935/>
- **HACcloT: Heterogeneous Hardware Acceleration for Edge and IoT.** The event took place with HiPEAC Computing Systems Week (CSW), Tampere, Finland, April 27, 2022.
<https://www.hipeac.net/csw/2022/tampere/#/program/sessions/7972/>

3.8 Participation in events

In addition to organizing events, VEDLIoT also participated in many events in which more than 30 presentations were given over the project duration. The complete list of presentations, indicating the event in which they were given, is provided below. When available, the slides and or the videos of these presentations are available on SlideShare and/or YouTube, and the corresponding links are provided on the VEDLIoT website.

- **VEDLIoT project overview and results.** Jens Hagemeyer. 3rd Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2024, Munich, Germany, January 2024.
- **VEDLIoT Overview and Standardization activities.** Jens Hagemeyer. NGIoT standardisation workshops, November 2023 and January 2024.
- **Introduction to VEDLIoT highlights.** Jens Hagemeyer. VEDLIoT Conference Track co-located with IoT Tech Expo, Amsterdam, Netherlands, September 2023.
- **Requirement Engineering methods and Architecture Framework.** Hans-Martin Heyn. VEDLIoT Conference Track co-located with IoT Tech Expo, Amsterdam, Netherlands, September 2023.
- **Security and Robustness for VEDLIoT Components, from Cloud through Edge.** Marcelo Pasin. VEDLIoT Conference Track co-located with IoT Tech Expo, Amsterdam, Netherlands, September 2023.
- **VEDLIoT Cognitive IoT Hardware Platform, Accelerators and Co-Design.** Pedro Trancoso. VEDLIoT Conference Track co-located with IoT Tech Expo, Amsterdam, Netherlands, September 2023.

- **VEDLIoT Next Generation AIoT Applications.** Micha vor dem Berge. VEDLIoT Conference Track co-located with IoT Tech Expo, Amsterdam, Netherlands, September 2023.
- **Accelerators for Heterogenous Computing in AIoT.** René Griesl. Research Projects Event session, co-located with FPL 2023, Gothenburg, Sweden, September 2023.
- **Reconfigurable Accelerators for Heterogenous Computing in AIoT.** René Griesl and Mario Porrmann, Special Session on hardware acceleration co-located with IWANN 2023, Ponta Delgada, Portugal, June 2023.
- **VEDLIoT – Accelerated AIoT.** Kevin Mika and Piotr Zierhoffer. CPS&IoT’2023 Summer School on Cyber-Physical Systems and Internet-of-Things, Budva, Montenegro, June 2023.
- **Next generation accelerated AIoT systems and applications.** Pedro Trancoso. Special Session on EU Projects, co-located with Computing Frontiers 2023, Bologna, Italy, May 2023.
- **Evaluation of heterogeneous AIoT Accelerators within VEDLIoT.** Rene Griesl. DATE Conference 2023, April 2023.
- **Heterogeneous hardware platform for accelerated AIoT.** Rene Griesl. NGIoT Sustainability Workshop – Use Cases, February 2023.
- **Methods for requirements engineering in AIoT systems.** Hans-Martin Heyn. NGIoT Sustainability Workshop – Use Cases, February 2023.
- **VEDLIoT – Accelerated AIoT.** Jens Hagemeyer. 2nd Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2023, Toulouse, France, January 2023.
- **VEDLIoT Project presentation.** Jens Hagemeyer. EU-IoT/EFPP Hackathon co-located with CONASENSE 2022, Munich, Germany, June 2022.
- **Very Efficient Deep-Learning in IoT (VEDLIoT).** Jens Hagemeyer. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **VEDLIoT Cognitive IoT Hardware Platform.** René Griesl. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **Reconfigurable ML Accelerators in VEDLIoT.** Marco Tassemeier. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **Co-design of DL Accelerators in VEDLIoT.** Muhammad Waqar Azhar. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **Security for VEDLIoT Components, from Cloud through Edge to IoT.** Marcelo Pasin. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **ML Robustness in VEDLIoT.** Antonio Casimiro. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **VEDLIoT Next Generation AIoT Applications.** Nils Kucza. Workshop on Deep Learning for IoT (DL4IoT), co-located with HiPEAC 2022, Budapest, Hungary, June 2022.
- **VEDLIoT Use Cases.** Micha vor dem Berge. NGIoT session at IoT Week, Dublin, Ireland, June 2022.
- **Challenges in developing cost and energy efficient deep learning systems in embedded system.** Hans Solomonsson, AI & Big Data summit, co-located with Stockholm Tech Live, Stockholm, Sweden, May 2022.

- **Introduction to VEDLIoT.** Pedro Trancoso, HiPEAC Computing Systems Week, Tampere, Finland, April 2022.
- **VEDLIoT Hardware Platforms.** Kevin Mika. HiPEAC Computing Systems Week, Tampere, Finland, April 2022.
- **Performance Evaluation and Benchmarking in VEDLIoT.** Mario Porrman. HiPEAC Computing Systems Week, Tampere, Finland, April 2022.
- **VEDLIoT: Very Efficient Deep Learning in IoT.** Jens Hagemeyer. Design, Automation and Test in Europe Conference (DATE 2022), March 2022.
- **VEDLIoT Toolchain for Efficient Deep Learning on heterogeneous hardware,** Hans Salomonsson, EU-IoT Training Workshops Series – "Next Generation IoT Architectures", November 2021.
- **VEDLIoT – A heterogeneous hardware platform for next-gen AIoT applications,** Jens Hagemeyer, EU-IoT Training Session on "Machine Learning at the Edge and the FarEdge", IoT Week (online event), August 2021.
- **IoT - Accelerated Deep Learning for Cognitive Edge Computing,** Jens Hagemeyer, EU-IoT Training Workshops Series – "AIoT and Edge Machine Learning", May 2021.
- **VEDLIoT – Very Efficient Deep Learning in IoT,** Jens Hagemeyer, Industrial Pioneers Days OWL event – "Machine Learning", April 2021.
- **VEDLIoT – Very Efficient Deep Learning in IoT,** Pedro Trancoso, 3rd Workshop on Accelerated Machine Learning (AccML), co-located with HiPEAC 2021 Conference, January 2021.

3.9 Exhibitions and demonstrations

VEDLIoT committed many efforts to participate in several exhibitions, setting up dedicated project booths whenever possible, or using space in shared booths (for instance when participating in the Hannover fair, at Bielefeld University's booth). These exhibitions made it possible to show off project results through physical demonstrators, always attracting many visitors and gaining many contacts. Overall, VEDLIoT was present in the following 11 events, with exhibition of project demonstrators:

- HiPEAC 2024: International Conference on High Performance and Embedded Architectures and Compilers, January 17-19, 2024, Munich, Germany.
- IoT Tech Expo, September 26-27, 2023, Amsterdam, Netherlands.
- Hannover Messe, April 17-21, 2023, Hannover, Germany.
- DATE Conference 2023, April 2023.
- Embedded World 2023, March 14-16, 2023, Nuremberg, Germany.
- HiPEAC 2023: International Conference on High Performance and Embedded Architectures and Compilers, January 16-18, 2023, Toulouse, France.
- HiPEAC 2022: International Conference on High Performance and Embedded Architectures and Compilers, June 20-22, 2022, Budapest, Hungary.
- Embedded World 2022, June 21-23, 2022, Nuremberg, Germany.
- IoT Week 2022, June 20-23, 2022, Dublin, Ireland.
- Hannover Messe, May 30 to June 2, 2022, Hannover, Germany.
- Stockholm Tech Live, Stockholm, Sweden, May 2022.

3.10 Open Call projects

The Open Call projects, which were selected with the objective of employing VEDLIoT technologies in additional use cases, also played a relevant role in terms of dissemination of project results. A complete report on the execution and results of these projects is provided in Deliverable D7.8. Here we specifically refer to aspects related to dissemination, to which these Open Call projects contributed.

A dedicated part of the VEDLIoT website was devoted to the 10 Open Call projects that were selected in the call, with each project having its own page. An example of one of such pages is provided in Figure 12.

More significantly, several of these projects ended up publishing results on research papers, therefore further expanding the visibility of VEDLIoT technologies. The list of publications resulting from Open Call projects is the following:

- G. R. Leone, M. Righi, D. Moroni, F. Paolucci, **Towards Multi-camera System for the Evaluation of Motorcycle Driving Test**. 16th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), 2022.
<https://doi.org/10.1109/SITIS57111.2022.00090>
- A. Sujatanagarjuna, S. Kia, D. F. Briechle & B. Leiding, **MushR: A Smart, Automated, and Scalable Indoor Harvesting System for Gourmet Mushrooms**. Agriculture. Special Issue Digital Innovations in Agriculture, 13(8):1533, 2023.
<https://doi.org/10.3390/agriculture13081533>
- S. Zhang, O. Wallscheid and M. Porrmann, **Machine Learning for the Control and Monitoring of Electric Machine Drives: Advances and Trends**. IEEE Open Journal of Industry Applications, Volume 4, 2023.
<https://doi.org/10.1109/OJIA.2023.3284717>
- M. Schenke, B. Haucke-Korber, and O. Wallscheid, **Finite-Set Direct Torque Control via Edge Computing-Assisted Safe Reinforcement Learning for a Permanent Magnet Synchronous Motor**. IEEE Transactions on Power Electronics, Volume 38, Issue 11, 2023.
<https://doi.org/10.1109/TPEL.2023.3303651>
- F. Book, A. Traue, M. Schenke, B. Haucke-Korber and O. Wallscheid, **Gym-Electric-Motor (GEM) Control: An Automated Open-Source Controller Design Suite for Drives**. 2023 IEEE International Electric Machines & Drives Conference, 2023.
<https://doi.org/10.1109/IEMDC55163.2023.10239044>

Finally, as mentioned in Section 3.6, the VEDLIoT Open Call DUNE-RCO project also produced a dataset, which has been made publicly available on <https://bitbucket.org/wineuoc/aoable-dataset/src/master>.



Figure 12: Example Open Call project page on the VEDLIoT website.

3.11 Collaboration with other projects

VEDLIoT participated and worked in close collaboration with the related Coordination & Support Actions (**CSAs**). Initially with the NGIoT initiative (run by the EU-IoT CSA), and more recently with the European Cloud, Edge & IoT Continuum initiative (supported by the Open Continuum and the UNLOCK-CEI CSAs). VEDLIoT also worked with other relevant RIAs, namely under the umbrella of the mentioned initiatives.

The Technical Manager (TM) and Project Manager (PM) attended meetings of these CSAs (e.g. "EU-IoT Coordination Task Force" meetings) on a regular basis. These coordination meetings served the purpose of coordinating dissemination activities, newsletters, regular calls with RIAs, including:

- Strategic political networking
- Support of open calls
- The organisation of common events (e.g. workshops, hackathons)
- Contributions to open-source, pre-normative and standardisation initiatives

These activities especially supported VEDLIoT dissemination at the European level.

3.12 Advisory Board

An External Expert Advisory Board (EEAB) has been established, comprising several highly recognised experts from the industry, covering the following sectors: technology provisioning, telecommunications, automotive, automation and manufacturing. Although not directly measurable, dissemination of project activities and results was implicitly made also through EEAB members, who participated in several VEDLIoT meetings and helped promoting the project on their respective communities, for instance through their own social channels.

4 Performance analysis

In Section 3 we described the several activities that were done concerning dissemination of project work and results. We also provided some "Social" related indexes (i.e., number of website page views, number of followers on social networks, number of posts, etc.) that are important to measure the success of our dissemination efforts, and implicitly provided information that serves as "Dissemination" indexes (i.e., number of accepted publications, number of videos, number of events being organized, etc.) that is important to assess the extent to which dissemination objectives are being achieved.

Table 1 provides the key performance indicators, including a column with the defined target for each indicator as initially defined in Deliverable D8.1, and a column with the current values, reflecting the situation near the end of the project.

Overall, considering the indicators provided in Table 1, it is clear that the dissemination objectives were successfully met, with most of the performance indicators clearly above the defined target, and with some simply reaching the target or being quite close to it.

We should note the following. The number of page views on the VEDLIoT website, which is the first indicator in the table, was about 2500 per year, despite the estimated average number of visitors being 500 per year. We also included the numbers for page views and visitors to the LinkedIn page, which clearly also contributed to the visibility and dissemination aims of the project. Concerning publications, we must say that there are still some papers in submission to journals, which may possibly be accepted and hence slightly increase the number above the target. We would also like to note that a significant part of the conference papers was published in top tier venues (more competitive than many journals), as can be easily recognized from the full list of publications, which makes us proud

of the high-quality research work that was done in the project. Concerning the number of participants in events, it is not possible to provide exact numbers, so what we provide is an estimate. Nevertheless, given that the total number of events that were organized by VEDLIoT or in which VEDLIoT had a strong presence was much higher than planned, the total number of persons that we were able to reach through events was very high. A similar comment must be made concerning the number of contacts gathered. The provided number is an estimate, based on the number of persons visiting VEDLIoT booths at events. Finally, concerning the number of videos and views per video, the fact that the three most viewed videos did not reach 200 views is compensated by the large number of produced videos, contributing to a total number of views of all those videos clearly about 600 (which would be the target sum).

Performance indicator	Target	Current
# of page views on the VEDLIoT website	> 1,000 visitors / year	Website: 500 visitors, 2500 pageviews / year LinkedIn: 350 visitors, 850 pageviews / year
Approved consensually by all partners	visible in all project dissemination and communication materials	Acknowledgments to VEDLIoT in all materials
# of followers in different social media accounts	> 200 followers per platform	LinkedIn: 273 Twitter: 142
# of published blog posts on the project website	~60 blog posts	~140 (news + events)
# of published papers	> 12 journal publications	13 (more papers currently submitted)
# of presented papers	> 30 published papers in conferences and/or workshops	33 + 2 (book chapters) + 5 (online magazines)
# of events	ca. 10 presentations & demos	> 30 presentations & > 10 demos
# of participants in events	50 -100 persons / events	100 (avg. per event)
# of events	ca. 6 exhibitions	11
# of contacts gathered	100 - 500 persons / exhibition	> 100 / exhibition
# of videos; # of views	3 videos; 200 views / video	17 videos, with > 70 views / video (average) of which, 3 videos with > 120 views / video

Table 1: Key performance indicators – target and current values.

Overall, and given the planned targets were reached, we conclude that the dissemination objectives, measured from these KPIs, were successfully achieved.

5 Summary

In this deliverable we presented the several dissemination activities performed during the project. These activities have been planned to meet the objectives of the dissemination task. They included the exploitation of several dissemination channels to make the project visible and to share project results, the preparation of many sorts of materials that were employed in the dissemination activities, the publication of papers and other documents, directly targeting research and industry, the preparation of demonstrations, directly highlighting the employment of technologies developed in VEDLIoT, and the active participation in many events, constantly presenting the project and project results.

We also provided, explicitly or implicitly, several measures of the impact of dissemination activities, which in the end we used to analyse the dissemination performance, according to the key performance indicators and respective targets set forth in Deliverable D8.1. We conclude, based on these indicators, that the dissemination objectives activities were successfully achieved.

List of Abbreviations

AI: Artificial Intelligence

CSA: Coordination and Support Action

EC: European Commission

EEAB: External Expert Advisory Board

HPC: High-Performance Computing

IoT: Internet of Things

NG-IoT: Next Generation IoT

WP: Work Package