DETERMINISTIC6G

Final report on the impact and dissemination to scientific venues, industry stakeholders, and standardization synergies

D5.3

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Executive summary

This deliverable reports the achievements of the DETERMINISTIC6G project on the dissemination, standardization, and exploitation activities carried out during the project, from January 2023 to September 2025.

DETERMINISTIC6G adopted a systematic communication and dissemination approach aimed at achieving a high impact on the project activities and results. DETERMINISTIC6G prepared and attended a significant number of workshops, conferences and events, all based on the main technical objective of the performed research, i.e., enabling end-to-end deterministic 6G communication for visionary use cases.

The DETERMINISTIC6G project has achieved the goals that were outlined at the start in the exploitation and dissemination plans of the consortium and all the partners. More than 24 scientific papers have been published while some are under review process. The paper titled "First analysis of time synchronization for TSN networks with hot standby GM" received the Best work in progress paper award at the IEEE International Conference on Factory Communication Systems, 2025. The high impact of the project is also demonstrated through contributions to standardization activities. DETERMINISTIC6G made 17 contributions to 3GPP, 9 to IEEE, and 5 to IETF. A major achievement was the initiation of a new IEEE project authorization request on a wireless-aware extension of IEEE 802.1Q standard. The goal of this amendment (P802.1Qee) is to specify procedures and YANG data models for traffic engineering in bridged networks that incorporate wireless technologies with stochastic delay characteristics.
Furthermore, dissemination was also made via 29 keynotes and talks in various industry and scientific conferences. Participation was also made to 9 panel discussions exploring emerging trends, challenges, and opportunities with a particular focus on 6G deterministic communication and their potential impact on industry and society.

In addition, 7 workshops, a special session, and 2 tutorials were organized. Dissemination of project results was also influenced towards academia through inclusion of the research content and outcomes of the project in 7 Master courses, and organized a training day and a summer school. A demonstration of the concepts developed in the project was showcased at booth set ups at EuCNC & 6G Summit 2025. A wrap up of the project showing key results in end-to-end dependable, time-critical communication enabled by 6G was made through a series of presentations and demos at the final DETERMINISTIC6G project summit.

Contents

1 Introduction

This document presents the main achievements of the DETERMINISTIC6G project in terms of communication and dissemination activities carried out during the project. Communication, dissemination, and exploitation on the outcomes of the DETERMINISTIC6G project have been of high importance to create awareness on the technological developments to a wide range of stakeholders. In this report, important events, publications, contributions to standardization, and workshops organized and participated in by the consortium are presented.

In this deliverable, the following distinctions are made between communication, dissemination, and exploitation tasks.

The *communication activities* describe the efforts and channels by which the DETERMINISTIC6G project is reaching out to relevant stakeholders, including industry, academia, sister SNS projects, society, and standardization bodies. The goal was to reach out to society and show the impact and benefits of the project. This is achieved through different activities and communication channels, which are used to inform on and promote the project and its results to different audiences. Details on the communication channels and activities are provided in this deliverable.

The *dissemination activities* present how knowledge and results obtained in DETERMINISTIC6G are transferred to potential users such as the scientific community, industrial partners, policymakers, and standardization bodies. In addition, key performance indicators, their corresponding targets, and achievements so far have been identified.

The *exploitation activities* provide a strategy on how the project results can be effectively used. The purpose of exploitation is to ensure the sustainability of the project research activities. DETERMINISTIC6G paid special emphasis on assuring a high impact of the project through standardization, publication of project results, and dissemination through various activities.

1.1 DETERMINISTIC6G approach

In the past, time-critical communication has been prevalent in industrial automation scenarios with specialized computing hardware such as programmable logic controllers (PLCs). Communication usually relies on wired communication systems, such as Powerlink and EtherCat, which are limited to local and isolated network domains configured for specific local applications. With the standardization of time-sensitive networking (TSN) and Deterministic Networking (DetNet), similar capabilities are being introduced into the Ethernet and IP networking technologies. This advancement provides a converged multi-service network that supports time-critical applications in a managed network infrastructure, allowing for consistent performance with zero packet loss and guaranteed low, bounded latency. The underlying principles are that the network elements (i.e., bridges or routers) and the PLCs can provide a consistent and known performance with negligible stochastic variation, which allows to manage the network configuration to the needs of time-critical applications with known traffic characteristics and requirements.

It has been observed that several elements in the digitalization journey introduce characteristics that deviate from the baseline assumptions typically considered in the planning of deterministic networks. A common assumption for computing and communication elements, as well as applications, is that any stochastic behavior can be minimized such that the time characteristics of these elements can be clearly associated with tight minimum and maximum bounds. Cloud computing provides efficient and scalable computing but introduces uncertainty in execution times. Wireless communications provide flexibility and simplicity, but with inherently stochastic components that lead to packet delay variations exceeding significantly those found in wired counterparts. Lastly, applications embrace

novel technologies (e.g., machine-learning-based or machine-vision-based control) where the traffic characteristics deviate from the strictly deterministic behavior of traditional control systems. In addition, there will be an increase in dynamic behavior, where the characteristics of computing, communication and application elements may change over time, in contrast to a static behavior that does not change during runtime. These deviations of stochastic characteristics highlight shortcomings in traditional approaches to planning and configuration of end-to-end time-critical communication networks, such as TSN or DetNet, specifically in terms of service performance, scalability, and efficiency. Instead, a revolutionary approach to the design, planning and operation of time-critical networks is needed to fully embrace the variability, but also the dynamic changes introduced by wireless connectivity, cloud computing and application innovation. DETERMINISTIC6G has the objective to address these challenges, including the planning of resource allocation for diverse time-critical end-to-end services over multiple domains, providing efficient resource usage and a scalable solution [SPS+23].

DETERMINISTIC6G adopts a novel approach towards future converged infrastructures for the deployment of scalable cyber-physical systems. Compared to networked infrastructures, DETERMINISTIC6G advocates for the acceptance and integration of stochastic elements (like wireless links and computational elements), considering their stochastic behavior captured through either short-term or longer-term envelopes. Monitoring and prediction of KPIs, such as latency or reliability, can be leveraged to make individual elements plannable, despite a remaining stochastic variance. System enhancements to mitigate stochastic variances in communication and computing elements are also developed. In addition, DETERMINISTIC6G attempts to manage the entire end-to-end interaction loop (e.g., the control loop) with its underlying stochastic characteristics, particularly focusing on the integration of computing elements. Finally, due to unavoidable stochastic degradations of individual elements, DETERMINISTIC6G advocates for enabling adaptation between applications running on top of such converged and managed network infrastructures. The idea is to introduce flexibility into application operation, such that its requirements can be adjusted at runtime based on prevailing system conditions. This encompasses a larger set of application requirements that can also accept stochastic end-to-end KPIs and adapt end-to-end KPI requirements at run-time in harmonization with the networked infrastructure. DETERMINISTIC6G builds on a notion of time-awareness, by ensuring accurate and reliable time synchronicity while also ensuring security-by-design for such dependable time-critical communications. Generally, we extend a notion of deterministic communication (where the behavior of network, computing nodes and applications is pre-determined) towards dependable time-critical communication, where the focus is on ensuring that the communication and computing characteristics are managed to meet the KPIs and provide the reliability levels required by the application.

In summary, DETERMINISTIC6G facilitates architectures and algorithms for scalable and converged future network infrastructures that enable dependable time-critical communication end-to-end across domains, including 6G.

1.2 Relation to other work packages

This deliverable is part of WP5 on impact and dissemination. WP5 gets inputs from all technical WPs of the project contributing to communication, dissemination, and exploitation activities.

1.3 Objective of the document

This document is the final report on communication, dissemination, and exploitation activities with the purpose of providing a thorough overview of such activities from the beginning till the end of the project. The document shows the dissemination of project outcomes through various channels as a result of a close collaboration between all consortium partners and interlinked project tasks.

1.4 Target audience of DETERMINISTIC6G

The communication and dissemination activities involve several measures to promote project developments and the results achieved during the project. The objective is to reach out to a wide range of audiences and show the benefits of the research outcomes of the project. Therefore, communication campaigns are designed and implemented throughout the project lifetime, capitalizing on the multilingual nature of the consortium to reach an international audience. Such campaigns utilize multiple channels, including digital, print, scientific, and non-scientific media to raise awareness about the project. Table 1 presents a summary of the communication channels and mechanisms to target different audiences. The target audiences of DETERMINISTIC6G can be divided into five potentially overlapping categories. Communication channels related to each category have been identified.

Table 1: Target audience and channels to disseminate DETERMINISTIC6G activities

Target audience	**Mechanisms**	**Channels**
Academia, Public R&D	Peer reviewed scientific and technology conferences	Journal and conference publications
Advanced vertical industries	Industry workshops, industrial alliances	White papers, industry blogs, talks
General public	Press releases, social media	LinkedIn, X, YouTube
Sister SNS project	Common white paper and workshop	6G IA working groups
Standardization bodies and 6G technical forums	Standards contribution	Means to reach standards development organization (SDO), and 6G global forums

The overall efficiency and impact of the DETERMINISTIC6G communication activities are being maximized by a coordinated approach. Emphasis is given to joint activities, including joint publication in world-class conferences, journals, keynote speeches, invited talks to expert groups, contribution towards standardization, and organization of joint events.

1.5 Dissemination goals

The dissemination targets proposed for the DETERMINISTIC6G project are presented in Table 2. In relation to the target audience and channels presented in Table 1, the dissemination goals indicate ways the consortium intends to create an impact of the project along with corresponding target values and attributes. The measures identified by the project to achieve high impact include promotion of the project technical activities towards standardization bodies and industrial alliances, dissemination of the project outcomes towards academic groups, and communication towards a wider audience.

Table 2: DETERMINISTIC6G dissemination goals

Category	KPI	Target
Standard contributions	Standards and impact to standards groups including 3GPP (SA1, SA2, RAN1, RAN2), future revision of IEC/IEEE 60802, new amendment to IEEE 802.1Q, and OPC UA FX framework	30
Industry and scientific community	Keynotes and panels in major conferences	at least 6 keynotes at least 2 panels
	Number of publications (journals, conferences)	30
	Workshops in major conferences	at least 2
	5GPPP/6GIA activities	Contribution to steering board, technology board, pre-standardization, architecture, vision, and societal challenges
Influence towards academia	Training activities (summer schools)	2
	Graduate, PhD courses	3
Communication towards the general public	Website visits outside consortium	1000+
	Press release, research blog	10+
	Social media channel used	Twitter, LinkedIn, YouTube

1.6 Structure of the document

The structure of the document is as follows. Section 1 introduced the document specifying the relation with other work packages, objectives, and target audience of the DETERMINISTIC6G project. Section 2 explains the followed outreach strategy focusing on communication and exploitation activities. The exploitation activities correspond to scientific publications, contributions to standardizations, organization of workshops, special session, tutorial, and talks at industrial and academic events. Section 3 presents the exploitation strategies followed and their outcomes.

2 Outreach strategy

The DETERMINISTIC6G outreach and communication strategy aimed to share the activities, goals, and outcomes of the project with the targeted audience. Table 1 lists the target audience and the mechanisms used to disseminate the project results and activities. Communication towards a wider audience is important to ensure visibility of project vision, aims, and activities. DETERMINISTIC6G developments are communicated towards a wide range of audiences including academia, standardization bodies, industry verticals, sister SNS projects, and public to promote knowledge exchange and dissemination of project results. The following considerations were made in designing the communication strategy:

- Communicate relevance of DETERMINISTIC6G results to a wider audience.
- Gain project visibility through dissemination of activities and results at all levels.
- Promote knowledge exchange with sister SNS projects and beyond.
- Raise public awareness about the project's key facts and findings.
- Reach targeted audience where the project results are most relevant.
- Create liaisons and relationships with other projects in Europe and abroad with special focus on 6GIA and SNS projects.

In the following, activities, communication channels, and the material for communication and dissemination of the project are presented.

2.1 Communication activities

The communication activities outlined in this section aimed at promoting the project activities and results attained during the project. The objective of the proposed communication activities is to reach out to a critical mass and show the benefits of the research and innovation performed by the partners involved in the DETERMINISTIC6G project. The widespread knowledge sharing about the project helped support the adoption of the project results and ideas at various research and industrial organizations. In addition, it helped the public understand newer technological advancements applicable to various use case scenarios. Joint webinar sessions were organized in conjunction with sister SNS projects to communicate the project outcomes to a wider audience. Workshops, tutorials, and special sessions were also organized, highlighting the importance and relevance of the project topics targeting their need for future visionary use cases. Furthermore, summer / training schools were organized to have an in-depth discussion of the project targeting young PhD students and researchers. We expect that the Master's and PhD students found newer research ideas and topics during these events and that these dissemination activities will help them steer their research and career toward 6G technologies and beyond. The exploitation and innovation manager coordinated the communication activities of DETERMINISTIC6G. The planned communication activities were closely aligned with the dissemination activities and are described further in Section 2.2. To summarize, the following goals were set as part of the communication strategy:

- To gain visibility of the project vision, aims, activities and results
- To promote the exchange of knowledge regarding E2E deterministic communication with 6G
- To raise public awareness about the project key facts and findings
- To build a project network that involves relevant stakeholders
- To attract audience to project's online platform for dissemination
- To facilitate the transferability and applicability of the project results for organizations and stakeholders outside of the project

2.1.1 Communication channels

To communicate the project outcomes and activities, several communication means were used. As presented in Table 1, corresponding to the communication activity, a particular channel was used. All project activities are updated on the project webpage and disseminated via social media platforms. The technical outcomes are published in the form of project deliverables as well as in the form of peer-reviewed scientific publications. In addition, contributions in the form of white papers towards industrial alliances were carried out. Communication and dissemination of the project activities and outcomes were also carried out via talks at scientific and industrial workshops, panel discussions, poster presentations, and customer meetings. Furthermore, contributions towards 3GPP, IEEE, and

IETF standardization are made. Lastly, collaboration activities through 6G IA working groups were targeted. Details on the progress of dissemination activities using these communication channels are formulated in Section 2.2.

2.1.2 Communication material

At the start of the project, a basic set of communication material was prepared including the project logo, a general project presentation, poster, and leaflet. The project is identified by its name "DETERMINISTIC6G" and its logo. Figure 1 presents the logo of the project.

Figure 1: DETERMINISTIC6G project logo

The project logo was created for better recognition and visibility, as well as for branding purposes. Therefore, all dissemination tools and activities refer to or include the name and logo of the project. In addition, an EU emblem and the following funding text is included in all presentations, deliverables, and scientific publications:

"The DETERMINISTIC6G project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no 1010965604".

For the sake of project branding and visibility, templates for project slides, reports, and deliverables were prepared. These templates were used, wherever possible, for the representation and dissemination of the project activities. Moreover, press news disseminating the scope and objectives of the project have been released for dissemination to a larger audience. Newsletters were also published that included information on the latest achievements, links to recent public deliverables, and forthcoming events. Newsletters were made available on the project website and social media channels.

2.1.3 Website

The project webpage was set up at the start of the project. The webpage was regularly updated presenting information on DETERMINISTIC6G vision, objectives, work plan, consortium description, public deliverables, simulation frameworks, publications, newsletters, and latest updates. The webpage served as the central hub for disseminating DETERMINISTIC6G project activities. Information about the project was provided on different levels of technical detail, thus addressing multiple audiences at the same time.

A snapshot of the project webpage is presented in Figure 2. The website is accessible at "www.deterministic6g.eu". Since the launch of the webpage, it has received 3275 hits from unique visitors.

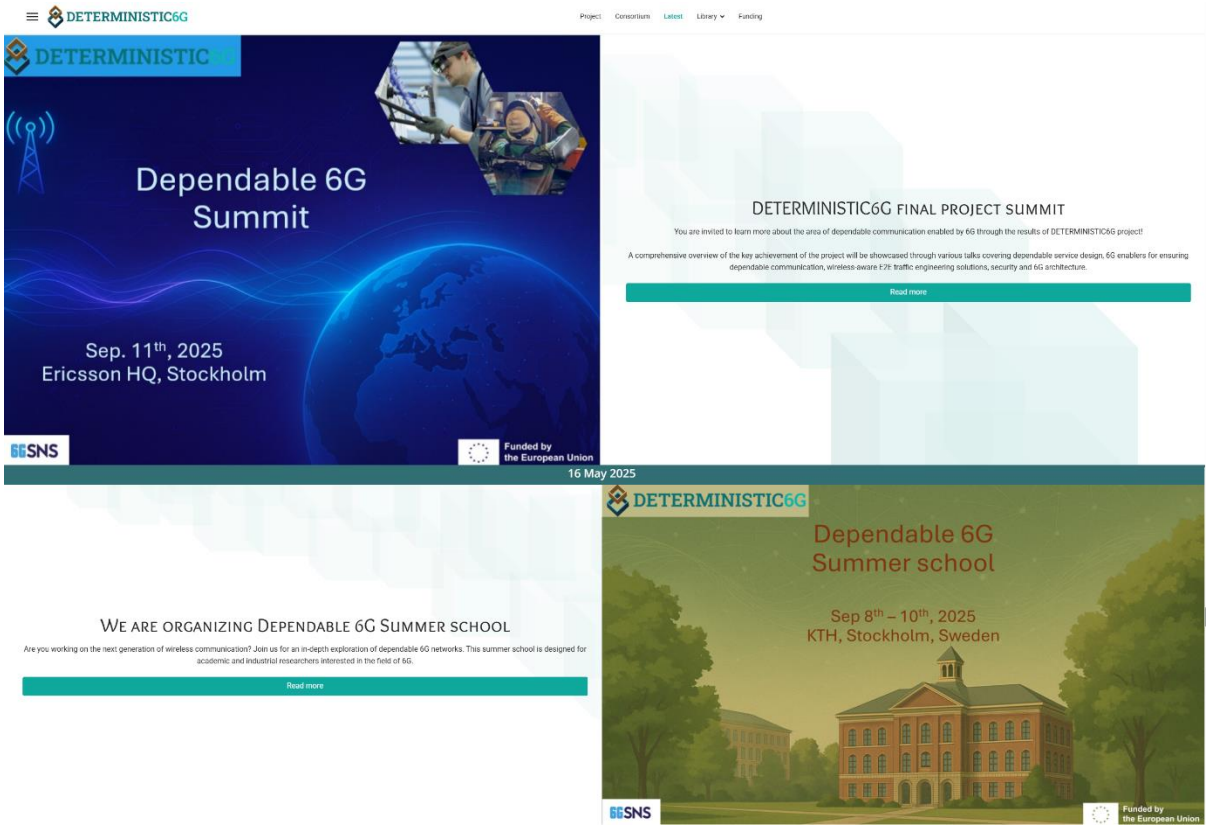

Figure 2: A screenshot of the DETERMINISTIC6G webpage

The project webpage was updated and upgraded regularly by addition of new features and add-ons. To increase visibility and accessibility of the project's webpage, search engine optimizations were also performed. The "Library" tab contains different sections where tutorial presentations, deliverables, publications, standards, software releases, blogs, newsletters, and software frameworks are available as open access. In compliance with the European Commission open access policy, open access to all scientific publications created in the project are available through the website, in compliance with the publisher's rules. All public project deliverables are also easily accessible openly via the project webpage. The webpage is GDPR complaint. After the completion of the project, the project webpages will be archived and will be available for at least 5 years.

2.1.4 Social media

Social media and networking tools (LinkedIn, X) were used to maximize exposure of the project. The social media platforms were used to disseminate the project activities to a wide audience, and to build a community with similar interests. Social media accounts are interconnected with the project website to improve the search engine ranking. A YouTube channel was also created to capture presentations from webinars, workshops, and online conferences. The YouTube channel is accessible at https://www.youtube.com/@DETERMINISTIC6G.

The success of the social media presence of DETERMINISTIC6G is being regularly monitored and evaluated using both quantitative (e.g., by X Analytics) and qualitative measures (e.g., by evaluating comments). The chosen media and networking tools allowed two-way interaction with the project.

The activity in DETERMINISTIC6G social media platforms is summarized in Table 3 and 4. It also presents inputs, interactions, and impressions expressed in numbers. Inputs refer to the number of posts or tweets made during the project. Interactions measure the effectiveness of social media campaigns through likes and comments. Impressions suggest the number of times the content was displayed for at least 300 milliseconds to the social media platform user. Clicks measure how many times a signed-in member has clicked on your content, company name, or logo to learn more.

Table 3: Activity on DETERMINISTIC6G X platform

Platform	Inputs	Interactions	Impressions
X	47	386	7.5k

Table 4: Activity on DETERMINISTIC6G Linked Platform during the past one year

Platform	Clicks	Reactions	Impressions
LinkedIn	2937	475	19k

LinkedIn

The LinkedIn account was managed with the aim of disseminating official project information among a professional audience and the research community. LinkedIn channel was used as a key tool for communication. The channel can be accessed via https://www.linkedin.com/company/deterministic6g. Partners regularly contribute to disseminate project activities via LinkedIn posts to raise awareness of the project among their networks. Currently, the profile has 493 followers. A high number of impressions have been generated, suggesting that the contents are mostly reaching relevant users. Figure 3 shows the current view of the LinkedIn profile.

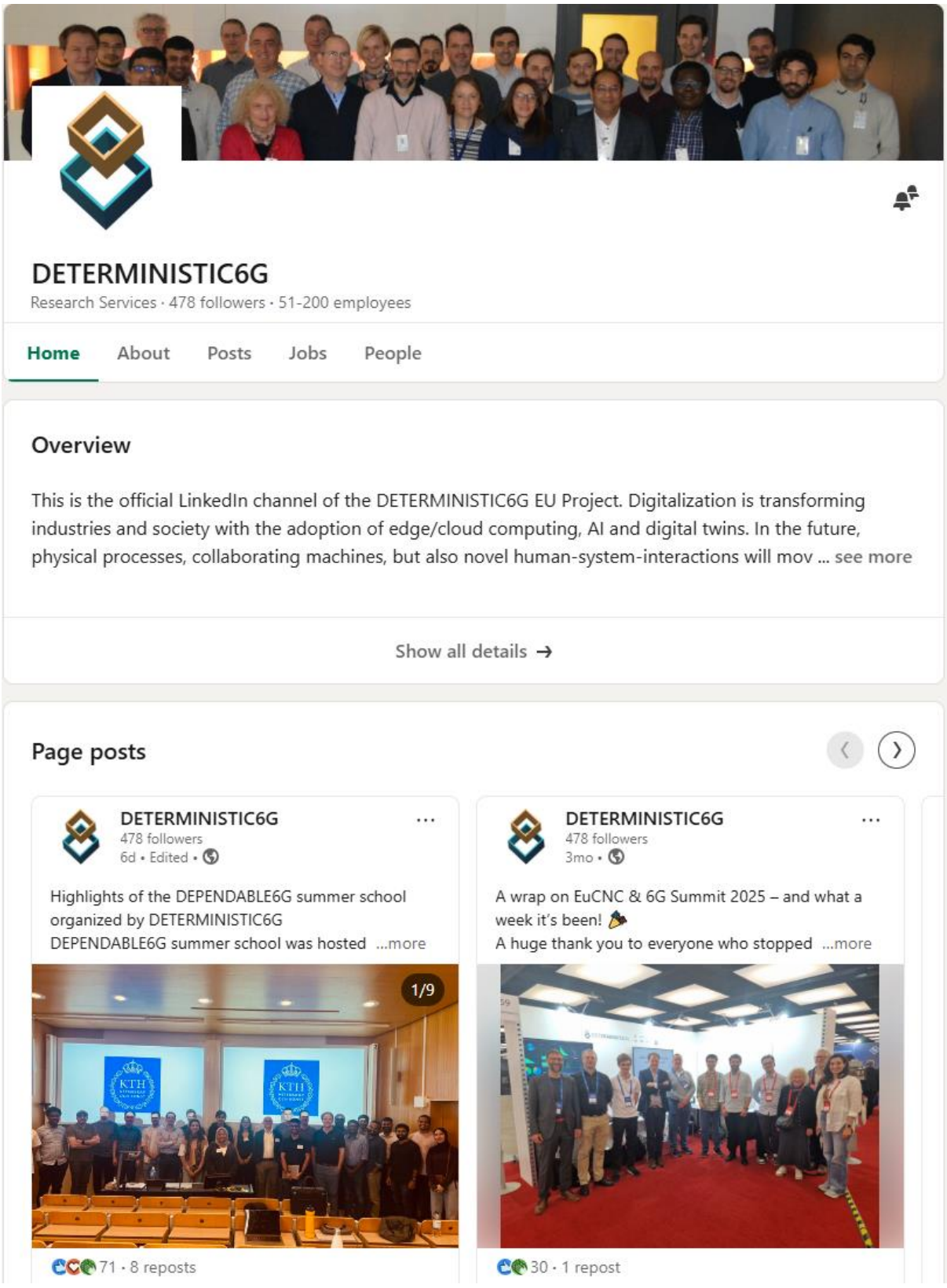

Figure 3: A screenshot of DETERMINISTIC6G LinkedIn page

X

X was also used as a tool for the dissemination of DETERMINISTIC6G activities. The X account can be accessed at https://x.com/DETERMINISTIC6G. Similar to LinkedIn, X is used to disseminate DETERMINISTIC6G news, events, and relevant information on a regular basis targeting a professional audience. The engagement rate on X compared to LinkedIn is relatively low. DETERMINISTIC6G has 189 followers on the X platform. Figure 4 shows the current view of the DETERMINISTIC6G X profile.

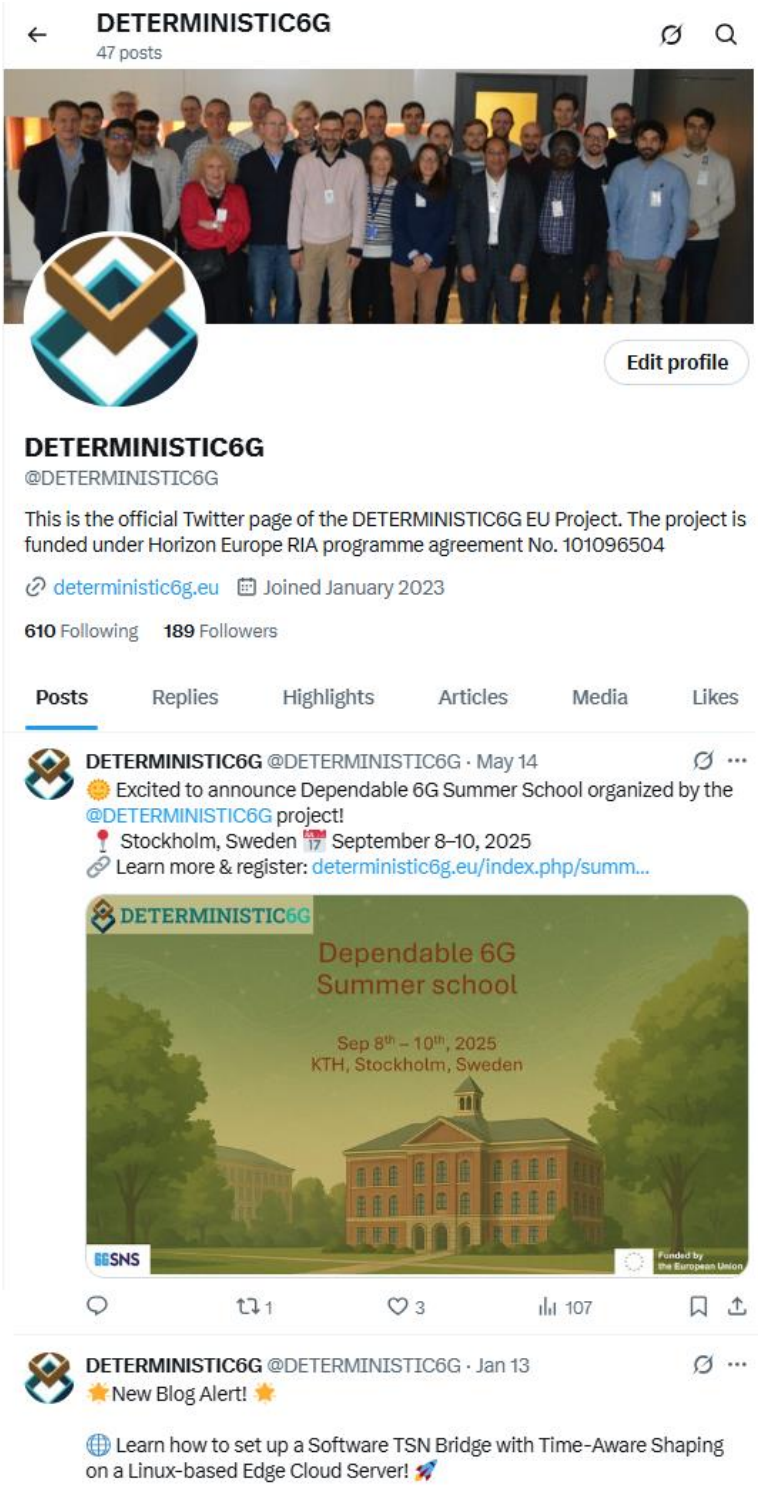

Figure 4: A screenshot of DETERMINISTIC6G X profile

2.2 Dissemination activities

In the following subsections, the status of the dissemination activities of the project are presented.

DETERMINISTIC6G defined a multi-fold dissemination, exploitation, and communications strategy to provide relevant information to all stakeholders and facilitate market adoption of the project's result. The dissemination plan was constantly monitored, evaluated, and potentially adjusted.

The dissemination status shows good progress. In most cases, DETERMINISTIC6G overachieved compared to the planned targets. Dissemination activities were focused on scientific publications, standardization, keynotes, talks, panel discussions, organization of workshops, white papers, webinars, etc. So far 24 scientific papers have been published while 5 publications are under review.

Lectures and training activities to disseminate the project outcomes towards Bachelor's and Master's university courses have also been conducted. Both academic and industrial partners have contributed to these dissemination activities.

Another aspect of the dissemination activities included interacting with other SNS projects. Apart from organizing joint workshops, a joint "6G programmable deterministic webinar series" was organized. The online webinar series was organized by DETERMINISTIC6G, DESIRE6G, and PREDICT-6G projects.

Furthermore, a training day and a summer school were organized to disseminate the results and outcomes of the project to a wider audience including academic and industrial participants. As a concluding event, a final project summit was also organized to disseminate the learnings and results of the project.

2.2.1 Accepted publications

The contribution of technical outcomes to scientific venues in the form of scientific publications was targeted during the project. Table 5 presents the list of accepted publications and the corresponding venues. Table 6 presents the venue and details of the publications under review.

Table 5: List of accepted publications and venues

Venue	Authors and title	Citations
IEEE Access, 2023	Gourav Prateek Sharma, Dhruvin Patel, Joachim Sachs, Marilet De Andrade, Janos Farkas, Janos Harmatos, Balazs Varga, Hans-Peter Bernhard, Raheeb Muzaffar, Mahin K. Atiq, Frank Duerr, Dietmar Bruckner, Edgardo Montes de Oca, Drissa Houatra, Hongwei Zhang and James Gross, "Towards Deterministic Communications in 6G Networks: State of the Art, Open Challenges and the Way Forward"	47
IEEE Globecom, 2023	Samie Mostafavi, Neelabhro Roy, Gyorgy Dan, James Gross, "Active Queue Management with Data-Driven Delay Violation Probability Predictors"	2
IEEE Globecom, 2023	Samie Mostafavi, Gourav Prateek Sharma, James Gross, "Data-Driven Latency Probability Prediction for Wireless Networks: Focusing on Tail Probabilities"	14
EuCNC special session, 2023	Gourav Prateek Sharma and James Gross, "Challenges and Directions for Deterministic Communication in 6G"	0
EuCNC special session, 2023	Mahin K. Atiq and Raheeb Muzaffar, "Time synchronization for deterministic communication"	2

INFOCOM CNERT, 2024	Samie Mostafavi, Marius Tillner, Gourav Prateek Sharma, James Gross, “EDAF: An End-to-End Delay Analytics Framework for 5G-and-Beyond Networks”	7
EuCNC, 2024	Amy Sokhna Sidibe´, Saimanoj Katta, Jose Costa Requena, "Performance Study of 5G Indoor Small Cells for Industrial MEC"	0
ARES STAM workshop, 2024	Huu Nghia Nguyen, Manh-Dung Nguyen and Edgardo Montes de Oca, “A Framework for In-network Inference using P4”	3
VTC Fall, 2024	Damir Hamidovic, Armin Hadziaganovic, Mahin Ahmed, Raheeb Muzaffar, Marilet De Andrade, Joachim Sachs, Hans-Peter Bernhard, "6G Schedule and Application Traffic Alignment for Efficient Radio Resource Utilization"	0
MobiCom workshop (6G-PDN), 2024	Fjolla Ademaj-Berisha, Roya Khanzadeh, Hans-Peter Bernhard, Andreas Springer, "Environmental-aware Reinforcement Learning-based Scheduling Strategy considering Trustworthines s in Factory Floor"	0
IEEE Communications standards Magazine, 2025	Mahin Ahmed, Raheeb Muzaffar, Damir Hamidovic, Armin Hadziaganovic, Hans-Peter Bernhard, Oliver Höftberger, Franz Profelt, Emilio Trigili, Giulia Bigoni, Marilet De Andrade, János Farkas, “Resilient time synchronization in 5G-TSN networks: A Hot-standby solution”	3
IEEE Transactions on Vehicular Technolo gy, 2025	Samie Mostafavi, Simon Egger, György Dán, James Gross, "Predictability of Performance in Communication Networks Under Markovian Dynamics”	0
IWQoS, 2025	Simon Egger, James Gross, Joachim Sachs, Gourav P. Sharma, Christian Becker, Frank Durr, "End-to-End Reliability in Wireless IEEE 802.1Qbv Time-Sensitive Networks", arXiv:2502.11595. doi: 10.48550/arXiv.2502.11595.	2
IEEE ICUFN, 2025	Roya Khanzadeh, Fjolla Ademaj-Berisha, Andreas Springer, and Hans-Peter Bernhard, "Environmental-Aware Scheduler for Trustworthy 6G Communication"	0
ETFA, 2025	Armin Hadziaganovic, Joachim Sachs, James Gross, Damir Hamidovic, Mahin Ahmed, Raheeb Muzaffar, Andreas Springer, Hans-Peter Bernhard, "Digital Twins of Industrial and 6G Systems: Enablers Towards Situational Awareness",	0
IEEE Network, 2025	Simon Egger, Frank Dürr, Balázs Varga, Marilet De Andrade, Goruav Prateek Sharma, Joachim Sachs, János Harmatos, James Gross, “Wireless-aware TSN Engineering: Implications for 5G and Upcoming 6G Networks”	1

MDPI Electronics, special issue 5G and Beyond Technologies in Smart Manufacturing, 2025	Leefke Grosjean, Joachim Sachs, Junaid Ansari, Norbert Reider, Aitor Hernandez Herranz, Christer Holmberg, “A framework for communication-compute-control co-design in cyber-physical systems”	6
Netdev 0x19, THE Technical Conference on Linux Networking, 2025	Ferenc Orosi and Ferenc Fejes, "Enable Time-Sensitive Applications in Kubernetes with CNI Plugin Agnostic eBPF Based Metadata Proxy"	0
NOMS Workshop on Management of the Industry 5.0, 2025	Alessia Tarozzi, Mahin Ahmed, Hans-Peter Bernhard, Roberto Verdone, "Reinforcement Learning based Backoff Management for Industry 5.0"	0
4th GI/ITG KuVS Fachgespräch "Network Softwarization", 2025	Lucas Haug, Frank Durr, Simon Egger, Lorenz Grohmann, James Gross, Gourav Prateek Sharma, Joachim Sachs, "Simulating and Emulating the Characteristic Packet Delay of Logical 5G TSN Bridges"	0
ICCCN, 2025	Huu Nghia Nguyen, Edgardo Montes de Oca, Frank Durr, Jose Costa Requena, and Marilet De Andrade "A Security Framework leveraging Programmable Data Planes for Detecting PTP Time-delay Attacks"	0
ICCCN International Workshop on "HRLLC in 6G", 2025	Mahin Ahmed, Lucas Haug, Raheeb Muzaffar, Damir Hamidovic, Armin Hadziaganovic, Hans-Peter Bernhard, Marilet De Andrade, and János Farkas, "Analysis of Time Synchronization in 6G-TSN Networks with Hot Standby"	0
WFCS, 2025	Mahin Ahmed, Lucas Haug, Raheeb Muzaffar, Damir Hamidovic, Armin Hadziaganovic, Hans-Peter Bernhard, "First Analysis of Time Synchronization for TSN networks with Hot Standby" (Best paper award)	1
NetSys, 2025	Lucas Haug, Frank Dürr, Simon Egger, Elena Mostovaya, James Gross, Gourav Prateek Sharma, Joachim Sachs, "A Data-driven Simulation Framework for Logical 5G-TSN Bridges"	0

Table 6: Publications under review

Venue	**Authors and title**
CoNEXT, 2025	Simon Egger, Robin Ladig, Heiko Geppert, Lucas Haug, Jona Herrmann, Frank Dürr, Christian Becker," An (m, k)-firm Elevation Policy to Bridge Unstable Network Conditions in Industrial 5G and Time-Sensitive Networks"
RTNS conference, 2025	Marilet DeAndrade, Joachim Sachs, Lucas Haug, Simon Egger, Frank Dürr, Balázs Varga, Janos Farkas, György Miklós, "Packet Delay Variation Compensation in 6G Integrated with IEEE Time-Sensitive Networking"
EURASIP	Amy Sokhna Sidibe, Saimanoj Katta, and Jose Costa-Requena, "Evaluation of 5G MEC Testbed for Indoor Small Cells in Industry 4.0: Comparative Study of Best-Effort vs. Guaranteed QoS Services"

IEEE JSAC Special Issue on Co-Design of Communication, Computing, and Control in Industrial Cyber-Physical Systems	Sándor Rácz and Norbert Reider, "Potential gains of communication-compute-control co-design based performance optimization methods in cyber-physical systems"
IEEE Transactions on Machine Learning in Communications and Networking	Samie Mostafavi, Gourav Prateek Sharma, James Gross, "Probabilistic Delay Forecasting in 5G Using Recurrent and Attention-Based Architectures"

2.2.2 Technical reports and White Papers

The work item at 5G-ACIA on DetNet-5G integration was published as a white paper. In addition, contributions towards SNS JU white papers were also made from DETERMINISTIC6G project. Details of the contributions towards white papers are presented in Table 7.

Table 7: DETERMINISTIC6G white paper contributions

Date	**Venue**	**Title and details**	**Status**
Sep. 2024	5G-ACIA	Marilet De Andrade (Rapporteur) " DetNet-based deterministic IP communication over 5G network for industrial applications " Supporters: Ericsson, Fraunhofer, Silicon Austria Labs, Siemens, Volkswagen, ABB, Rockwell Automation, Verizon	White paper published
May 2025	SNS JU	Contribution to SNS JU 6G Architecture working group white paper "Towards 6G architecture: Key concepts, challenges, and building blocks"	White paper published
May 2025	SNS JU	Contribution to SNS JU Test measurement and validation working group white paper "6G KVIS – SNS projects initial survey results 2025"	White paper published

2.2.3 Panels, workshops, events, and fora

Table 8 presents a list of events where DETERMINISTIC6G was presented as part of the keynote, talk, poster, or panel discussion.

Table 8: DETERMINISTIC6G presentations and talks

Date	**Event**	**Presenter and Title**
06-08 Feb. 2023	ETSI research conference, Sophia Antipolis, France	Dhruvin Patel, DETERMINISTIC6G poster presentation https://www.etsi.org/events/2130-etsi-research-conference#pane-6/

09-10 May 2023	IEEE 6G Summit Dresden, Dresden, Germany	Joachim Sachs, “With 6G towards a Digitalized, Programmable and Intelligent World http://5gsummit.org/dresden/
11-12 May 2023	Aachen Machine Tool Colloquium AWK’23, Aachen, Germany	Joachim Sachs, “Towards 6G - A Cyber-Physical Continuum for Industry 5.0” https://www.awk-aachen.com/?lang=en
06 Jun. 2023	EuCNC 2023	Panel discussion on Future deterministic programmable networks for 6 https://www.eucnc.eu/2023/www.eucnc.eu/programme/workshops/workshop-10/index.html
22 Jun. 2023	O-RAN for Vertical Industry Workshop, Osaka, Japan	Joachim Sachs, “Connecting the cyber-physical world with 6G” https://www.o-ran.org/blog/o-ran-for-vertical-industry-workshop-osaka-june-2023
22 Jun. 2023	O-RAN for Vertical Industry Workshop, Osaka, Japan	Panel discussion on 6G for vertical industries, Joachim Sachs https://www.o-ran.org/blog/o-ran-for-vertical-industry-workshop-osaka-june-2023
04-07 Sep. 2023	NetSys, Potsdam, Germany	Joachim Sachs, Keynote on "Creating a digitalized, programmable and intelligent world" https://www.kuvs.de/netsys/2023/program/
04-07 Sep. 2023	NetSys, Potsdam, Germany	James Gross, "Dependable Performance Guarantees for 6G Networks: Model-driven vs Data-driven?”, in Future of Networking expert symposium https://www.kuvs.de/netsys/2023/program/zdn/
14-15 Sep. 2023	Fuseco Forum, Berlin, Germany	Hans-Peter Bernhard, “Deterministic Communication in 6G, Where We Are and Where To Go”, https://fokus-fraunhofer.lineupr.com/fuseco-forum-2023/
27-28 Sep. 2023	TSN/A Conference, Stuttgart, Germany	Joachim Sachs, Frank Dürr, “Towards Wireless End-to-end Deterministic Communication” https://events.weka-fachmedien.de/tsna-conference/home/
19-23 Feb. 2024	Lecture at the EU Marie-Curie Doctoral Network TOAST	Joachim Sachs, "Fundamentals of 5G Wireless Communications" https://sites.google.com/unisi.it/toastts/home-page
24-25 Feb. 2024	Pre-MWC GTI workshop, Barcelona, Spain	Joachim Sachs, "Deterministic Communication - Technology evolution and typical scenarios", invited talk, https://www.gtigroup.org/work_detail/20519.html
18 Mar. 2024	5G-TSN workshop, Berlin, Germany	Joachim Sachs, “5G and TSN – status and way forward"

18 Mar. 2024	IETF 119, Brisbane, Australia /Online participation	Balázs Varga, Joachim Sachs, Frank Dürr, Samie Mostafavi, “Latency Analysis of Mobile Transmission”, https://datatracker.ietf.org/meeting/119/materials/slides-119-detnet-sessb-04-latency-analysis-of-mobile-transmission-00.pdf
21 Mar. 2024	IETF 119, Brisbane, Australia/Online participation	János Farkas, “Updates in draft-ietf-raw-architecture-17” https://datatracker.ietf.org/doc/slides-119-detnet-sessb-02-raw-architecture/
05-06 Sep. 2024	One6G Summit, Valencia, Spain	Hans-Peter Bernhard, “About the possibility of having deterministic 6G”, https://summit2024.one6g.org/agenda/
01-02 Oct. 2024	TSN/A conference, Stuttgart, Germany	Frank Dürr, Simon Egger, Lucas Haug, Marilet De Andrade, and Joachim Sachs, "To schedule, or not to schedule: the big question on optimal TSN communication over 5G"
01-02 Oct. 2024	TSN/A conference, Stuttgart, Germany	Balázs Varga, Ferenc Fejes, and Ferenc Orosi, “FRER-aware Ethernet OAM”
01-02 Oct. 2024	TSN/A conference, Stuttgart, Germany	János Harmatos, Dávid Jocha, Frank Dürr, Simon Egger, and Lucas Haug, “ Integration Aspects of Edge Cloud and TSN for Time-Critical Services"
07-08 Nov. 2024	Fuseco Forum, Berlin, Germany	Raheeb Muzaffar, “What 6G and beyond can do for industrial automation use cases?” https://fokus-fraunhofer.lineupr.com/fuseco-forum-2024/
06 Feb. 2025	6G4Society & TrialsNet Workshop (virtual)	Emilio Trigili, "KVIs of DETERMINISTIC6G" https://6g4society.eu/event/6g4society-trialsnet-workshop/
10-13 Mar. 2025	14th International ITG Conference on Systems, Communications and Coding (SCC), Karlsruhe, Germany	Invited talk: Joachim Sachs, "Dependable Communication for Critical Applications" https://scc2025.net/program
20 May 2025	29th ITG Conference on Mobile Communications, Osnabrück, Germany	Keynote: Joachim Sachs, Differentiated Connectivity and Dependable Communication - Enablers in future Mobile Networks”
03-06 Jun. 2025	EuCNC 2025, Poznan, Poland	Armin Hadziaganovic, "Situational awareness via Digital twinning", in workshop on Integrating Network Digital Twinning into Future AI-based 6G Systems https://www.eucnc.eu/programme/workshops/workshop-3/

03-06 Jun. 2025	EuCNC 2025, Poznan, Poland	Invited Talk: Joachim Sachs, "*Reliable and Dependable Communication*", in 6G Architecture Blueprint and Key Innovations: A European Perspective https://www.eucnc.eu/programme/special-sessions/special-session-2/
03-06 Jun. 2025	EuCNC 2025, Poznan, Poland	Panel participation: Joachim Sachs in panel on "What will be the key elements of the future 6G System" Special Session: "6G Architecture Blueprint and Key Innovations: A European Perspective" https://www.eucnc.eu/programme/special-sessions/special-session-2/
03-06 Jun. 2025	EuCNC 2025, Poznan, Poland	Panel participation: Joachim Sachs in "Panel of the future of dependable networking" Special Session "PREDICT-6G Final event: a special session on PREDICT-6G main results and highlights" https://www.eucnc.eu/programme/special-sessions/special-session-13/
01-03 Jul. 2025	Berlin 6G Conference, Berlin, Germany	Joachim Sachs, "6G Private Networks - architecture & migration" Session on 6G: The Future of Industrial Radio?
01-03 Jul. 2025	Berlin 6G Conference, Berlin, Germany	Joachim Sachs, "Addressing IIoT with a Dependable 6G Network" Session on 6G-Powered Industrial Internet of Things: Advancing Reliability, Security, and Sustainable Connectivity
01-03 Jul. 2025	Berlin 6G Conference, Berlin, Germany	Panel participation: Joachim Sachs in "Panel on Industrial IoT with 6G" Session on 6G-Powered Industrial Internet of Things: Advancing Reliability, Security, and Sustainable Connectivity
07-15 Jul. 2025	IEEE International Mediterranean Conference on Communications and Networking (MeditCom), Nice, France	Joachim Sachs "Providing dependable mobile network connectivity" in MeditCom
07-15 Jul. 2025	IEEE International Mediterranean Conference on Communications and Networking (MeditCom), Nice, France	Panel participation: Joachim Sachs and Drissa Houatra in MeditCom, Panel on "Can Wireless Networks with Channel Uncertainty Provide Deterministic Experience Service? Challenges and Opportunities"
23-24 Sep. 2025	TSN/A conference, Stuttgart, Germany	Mahin Ahmed, Lucas Haug, Raheeb Muzaffar, Damir Hamidovic, Armin Hadziaganovic, Hans-

		Peter Bernhard, and Marilet De Andrade, "*Fault-Tolerant Time Synchronization for 6G-TSN Networks: BTCA or Hot Standby?*"
23-24 Sep. 2025	TSN/A conference, Stuttgart, Germany	Simon Egger, Frank Dürr, Lucas Haug, Balázs Varga, Joachim Sachs, "On Multi-Domain TSN Systems"
23-24 Sep. 2025	TSN/A conference, Stuttgart, Germany	Simon Egger, Frank Dürr, Lucas Haug, Balázs Varga, Marilet De Andrade, Gourav Prateek Sharma, Joachim Sachs, János Harmatos, James Gross, "Wireless-aware TSN Engineering: Implications for 5G and Upcoming 6G Networks"

2.2.4 Organization of events

Several joint workshops, a special session, and tutorial sessions have been organized under the DETERMINISTIC6G project. Tables 9 - 12 present the list of these events.

Table 9: DETERMINISTIC6G organized workshops

Date	**Event**	**Title**
06-09 Jun. 2023	EuCNC 2023, Gothenburg, Sweden	Joint workshop on "Future deterministic programmable networks for 6G" organized by PREDICT-6G, DESIRE6G, and DETERMINISTIC6G https://www.eucnc.eu/programme/workshops/workshop-10/
05-08 Sep. 2023	PIMRC 2023, Toronto, Canada	Joint workshop on "Vision and challenges on Sustainable and Intelligent Future IoT" organized by DETERMINISTIC6G and COST INTERACT https://pimrc2023.ieee-pimrc.org/program/workshops/vision-and-challenges-of-wireless-communication-for-future-industrial-iot/
25-28 Jun. 2024	ECC 2024, Stockholm, Sweden	European Control Conference workshop on "Control with 6G" https://www.ericsson.com/en/events/ecc-ws-control-6g
30 – Jul. 02 Aug. 2024	ARES 2024, Vienna, Austria	Joint workshop on “Safety and security testing and monitoring (STAM)" organised by several EU projects including DETERMINISTIC 6G. https://www.ares-conference.eu/stam
07 Oct. 2024	VTC Fall 2024, Washington DC, US	Joint workshop on "Dependable wireless 6G communication" organized by DETERMINISTIC6G and COST INTERACT https://events.vtsociety.org/vtc2024-fall/conference-sessions/call-for-workshops/w6-dependable-wireless-6g-communication/
18 Nov. 2024	MobiCom 2024, Washington DC, US	Joint workshop on "6G programmable deterministic networking with AI (6GPDN)" organized by DETERMINISTIC6G, DESIRE6G, and PREDICT-6G https://6g-pdn2.netcom.it.uc3m.es/

12 – 16 May, 2025	NOMS 2025, Honolulu, USA	6th Workshop on management for industry 5.0 in IEEE/IFIP Network Operations and Management Symposium

Table 10: DETERMINISTIC6G organized special session

Date	Event	Title
06-09 Jun. 2023	EuCNC 2023, Gothenburg, Sweden	Dependable wireless communication systems and deterministic 6G communication https://www.eucnc.eu/programme/special-sessions/special-session-3/

Table 11: DETERMINISTIC6G organized tutorial sessions

Date	Event	Title
02-04 Oct. 2023	European Wireless 2023, Rome, Italy	An overview of time-bounded and deterministic communication https://ew2023.european-wireless.org/
10 Jul. 2023	IEEE 802 Plenary, Berlin, Germany	IETF Reliable available wireless (RAW) https://www.ieee802.org/1/files/public/docs2023/tutorial-bernardos-farkas-RAW-0723-v02.pdf

Table 12: DETERMINISTIC6G booth at EuCNC 2025

Date	Event	Title
03-06 Jun. 2025	EuCNC and 6G Summit, Poznan, Poland	Enabling Dependable and Time-Critical Communication for 6G Networks https://www.eucnc.eu/patrons-exhibitors/exhibitions-and-demos/

DETERMINISTIC6G showcased essential aspects and enablers of dependable and time-critical 6G communication at EuCNC and 6G Summit 2025. The following enablers were demonstrated during the event.

Latency Measurement & Prediction Framework

First live network latency prediction demo using machine learning, capturing detailed 5G/6G latency components and associated network conditions to develop realistic latency models for 6G-DetCom bridges.

Packet Delay Correction & Wireless-friendly Scheduling

6GDetCom simulator is the first framework to enable the realistic simulation of characteristic stochastic packet delay of 6G-DetCom nodes implementing wireless Time-Sensitive Networking (TSN) bridges as well as processing delay for applications and services on the edge.

5G-TSN Time Synchronization

Demonstrated 5G-TSN-integrated time synchronization of end devices, which is fundamental in industrial settings where coordination, automation, and data integrity are required.

Security Emulation Framework

Strengthens E2E time synchronization process by enabling real-time traffic analysis, precise monitoring, and prompt detection of time-delay attacks.

Exoskeleton Emulation Framework

Offloading of control strategies for occupational exoskeletons using a 6G network, physical demonstration of occupational exoskeleton and video showcase of test bench activities and network emulation.

2.2.5 Standard contributions

Table 13 presents the contributions towards standardization activities. Contributions focused towards 3GPP, IEEE, and IETF standardization bodies.

Table 13: DETERMINISTIC6G contribution towards standardization

Date	ID	Body	Title	Status
05 Jan. 2023	S2-2300205	3GPP	Support of integration with IETF Deterministic Networking (TS 23.501)	Public
05 Jan. 2023	S2-2300207	3GPP	Support of integration with IETF Deterministic Networking (TS 23.502)	Public
05 Jan. 2023	S2-2300208	3GPP	Support of integration with IETF Deterministic Networking (TS 23.503)	Public
04 Jan. 2023	S2-2300316	3GPP	Reporting timing synchronization status	Public
10 Feb. 2023	S2-2302394	3GPP	Support of integration with IETF Deterministic Networking (TS 23.501)	Public
10 Feb. 2023	S2-2302395	3GPP	Support of integration with IETF Deterministic Networking (TS 23.502)	Public
10 Feb. 2023	S2-2302396	3GPP	Support of integration with IETF Deterministic Networking (TS 23.503)	Public
10 Feb. 2023	S2-2302397	3GPP	Support of integration with IETF Deterministic Networking (TS 23.503 on YANG models)	Public
06 Apr. 2023	S2-2304125	3GPP	Time synchronization status reporting	Public
07 Apr. 2023	S2-2304126	3GPP	Resolve editor's note on indication of TEID and QFI to the TN CNC	Public
05 Apr. 2023	S2-2304127	3GPP	Updates to 5GS DetNet integration	Public
13-17 Sep. 2023	S2-2312467	3GPP	On Event ID in the SIB9	Public
22-26 May 2023	S2-2306440	3GPP	Study on DetNet Phase 2	Public

11-15 Dec. 2023	SP-231630	3GPP	Downscoping of "Study on enhancement of Timing Resiliency, TSC&URLLC, and LAN"	Public
11-15 Dec. 2023	SP-231507	3GPP	Study on user plane redundancy (revision/downscope TSC&URLLC and LAN SI)	Public
18 May 2023	-	IEEE	FRER extensions to support cloudification	Public
29 Feb. 2024	-	IETF	Latency analysis of mobile transmission	Public
16 Mar. 2024	-	IETF	RAW Architecture	Public
19 Jun. 2024	-	IETF	Deterministic Networking specific SID	Public
08 Jul. 2024	-	IETF	RAW Architecture v18 Presentation	Public
19 Jul. 2024	-	IETF	Deterministic Networking SRv6 Data Plane Presentation	Public
19 Sep. 2024	-	IEEE	Time-Sensitive Communications; FRER-aware Ethernet OAM	Public
20 Sep. 2024	-	IEEE	Control Plane Extensions for Wireless-Aware Traffic Engineering with Corresponding YANG Data Models	Public
18 – 22 Nov. 2024	S2-2412159	3GPP	New SID on Support for a de-jittering functionality in the Hold and Forward buffering mechanism (SA2#166)	Public
18 – 22 Nov. 2024	S2-2412161	3GPP	Rel-20 5G-Advanced:Justification for "Support for a de-jittering functionality in the Hold and Forward buffering mechanism" (SA2#166)	Public
10 Feb. 2025	-	IEEE	Control Plane Extensions for Wireless Aware Traffic Engineering	Public
10 Mar. 2025	-	IEEE	Control Plane Extensions for WirelessAware Traffic Engineering	Public
10 Mar. 2025	-	IEEE	Some Considerations on Multiple Configuration Domains	Public
19 May. 2025	P802.1Qee	IEEE	Project Authorization Request (PAR) Development on Traffic Engineering Extensions for Delay Uncertainties	Public
19 May. 2025	P802.1Qee	IEEE	IEEE Standard for Local and Metropolitan Area Networks--Bridges and Bridged Networks Amendment: Traffic Engineering Extensions	Public
19 May. 2025	P802.1Qee	IEEE	IEEE 802 LAN/MAN STANDARDS COMMITTEE (LMSC) CRITERIA FOR STANDARDS DEVELOPMENT (CSD)	Public

2.2.6 Open-source framework and datasets

The open-source contributions for the software packages and datasets around the evaluation framework are publicly available and promoted through the project webpage. A GitHub repository has been created where these evaluation frameworks are available. The DETERMINISTIC6G GitHub can be accessed via https://github.com/DETERMINISTIC6G.

Moreover, open-source software packages are also available on the Zenodo platform. Table 14 presents the software packages developed as part of the DETRMINISTIC6G project and corresponding open-access links at the GitHub and Zenodo platforms.

Table 14: DETERMINISTIC6G software packages available at Github and Zenodo platform

Software package	GitHub	Zenodo
6GDetCom Simulator Framework: Simulation framework for validating the concepts for a wireless-friendly design for end-to-end deterministic communication	https://github.com/DETERMINISTIC6G/6GDetCom_Simulator	https://zenodo.org/records/10401977
Implementation of a high-precision monitoring system using InBand network telemetry and P4	https://github.com/DETERMINISTIC6G/deterministic6g_security-solutions/	https://zenodo.org/records/10401698
Network Latency measurement tool	https://github.com/DETERMINISTIC6G/nlmt.git	https://zenodo.org/records/10829153
Latency Measurement Framework	https://github.com/DETERMINISTIC6G/edaf.git	https://zenodo.org/records/10829210
Sample COTS 5G measurements		https://zenodo.org/records/10390211
Security Solution for Deterministic Applications on 6G Networks	https://github.com/DETERMINISTIC6G/deterministic6g_security-solutions/	https://zenodo.org/communities/deterministic6g (https://zenodo.org/records/10401698)
DETERMINISTIC6G YANG models: YANG models developed by the DETERMINISTIC6G project	https://github.com/DETERMINISTIC6G/deterministic6g_yang_models	
Network Delay Emulator: Implements a Linux Queuing Discipline (QDisc) for network delay emulation	https://github.com/DETERMINISTIC6G/NetworkDelayEmulator	

2.2.7 Dissemination through university courses

Topics and available results from the DETERMINISTIC6G project were also integrated into different academic courses and final theses. Table 15 presents a list of Bachelor's and Master's courses along with the corresponding topics that were conducted with inputs from the DETERMINISTIC6G project.

Table 15: List of academic courses with inputs from DETERMINISTIC6G project

Date / Semester	Course Title	Topics from project	Partner
Winter term 2022/2023	Lecture (Master): Real-Time Concepts for Embedded Systems + Exercises	Concepts and technologies for deterministic real-time communication including Time-Sensitive Networking (overview of TSN standards, time-triggered scheduling with Time-aware shaper (TAS), end-to-end packet scheduling with TAS), analysis of deterministic bounds of IntServ Guaranteed Services, field buses (CAN). Scheduling algorithms for deterministic real-time tasks.	USTUTT
Winter term 2022/2023	Lab-course (Master): Software-Defined and Time-Sensitive Networking	Practical introduction to technologies for deterministic real-time communication including TSN and Software-Defined Networking (SDN), e.g., TSN scheduling with TAPRIO on Linux, SDN controllers and protocols (OpenFlow), Network emulation with Mininet	USTUTT
Summer term 2023	Lab-course (Master): Software-Defined and Time-Sensitive Networking	Topics see lab-course SDN/TSN in winter term 2022/2023 above.	USTUTT
Winter term 2023/2024	Lecture (Master): Real-Time Concepts for Embedded Systems + Exercises	Topics see lecture Real-time Concepts for Embedded Systems in winter term 2022/2023 above.	USTUTT
Summer term 2024	Lab-course (Master): Software-Defined and Time-Sensitive Networking	Additional topics compared to lab-courses SDN/TSN above: network simulation of deterministic networks with OMNeT++/INET including DETERMINISTIC6G simulator extensions	USTUTT
Winter term 2024/2025	Lecture (Master): Real-Time Concepts for Embedded Systems + Exercises	Topics see lecture Real-time Concepts for Embedded Systems in winter term 2022/2023 above.	USTUTT
Summer term 2025	Lab-course (Master):	Additional topics compared to lab-courses SDN/TSN above:	USTUTT

	Software-Defined and Time-Sensitive Networking	network simulation of deterministic networks with OMNeT++/INET including DETERMINISTIC6G simulator extensions	

Table 16 presents a list of Bachelor's and Master's theses that have been written in the scope of the DETERMINISTIC6G project.

Table 16: List of Bachelor and Master theses in scope of DETERMINISTIC6G project

Thesis title	**Bachelor / Master**	**Partner**
Adaptive Robust Scheduling in Wireless TSN	Master	USTUTT
Design and Implementation of a an Extensible Centralized Network Controller (CNC) for TSN	Bachelor	USTUTT
Scheduling with Uncertainty for TSN Using Robust Optimization Techniques and Integer Linear Programming	Master	USTUTT
Design and Implementation of a Network Emulator with Stochastic Network Delay Support	Bachelor	USTUTT
Simulation and Evaluation of the Performance of Clock Synchronization with PTP under Variable Network Delay	Bachelor	USTUTT
Algorithms for Calculating Robust Schedules for TSN	Master	USTUTT
Design and Implementation of a Web-Based CNC for TSN	Bachelor	USTUTT
Implementation and Evaluation of Robust Schedules for IEEE TSN	Bachelor	USTUTT
Roaming with Deterministic Real-Time Guarantees in Wireless TSN	Master	USTUTT
Analysis of the IEEE 802.1Qcr Asynchronous Traffic Shaper in Wireless Time-Sensitive Networks	Master	USTUTT
IEEE 802.1Qbv Scheduling Techniques in Multi-Domain Settings	Master	USTUTT
Design and Implementation of a Data Plane Interface for a Software Bridge for Time-Sensitive Networking (TSN)	Master	USTUTT
Earliest Deadline First Scheduling in Time-Sensitive Networks for Enhanced Schedule Robustness	Master	USTUTT

2.2.8 DETERMINISTIC6G Summer schools

As part of its outreach and capacity-building objectives, DETERMINISTIC6G successfully organized two specialized summer school and training events designed to bring together students, early-career

researchers, and industry professionals, creating a collaborative environment to discuss the latest advances, challenges, and opportunities in deterministic 6G communications.

The primary goal of these events was to strengthen the community's understanding of deterministic 6G technologies, promote collaboration across academia and industry, and provide participants with both theoretical foundations and practical experience. By combining lectures, tutorials, and hands-on training sessions, the program helped to build essential expertise in next-generation communication systems, directly contributing to the project's mission of driving innovation in 6G research and development.

The training day was held on September 16, 2024, in Linz, Austria, under the theme: "Wired and Wireless Time-Sensitive Networking for Deterministic Real-Time Systems: Concepts, Technologies, and Simulation Tools."

This event was specifically designed to address the growing importance of Time-Sensitive Networking (TSN) as a key enabler of deterministic communication in both wired and wireless networks. The training combined introductory lectures with practical tutorials, ensuring that participants gained a holistic understanding of the topic.

The main objectives of the training were:

- To introduce fundamental concepts and enabling technologies for the design and implementation of deterministic real-time systems based on TSN and 5G/6G networks.
- To provide hands-on tutorials with state-of-the-art simulation and emulation tools, allowing participants to experiment with wired and wireless TSN networks and explore Linux-based real-time scheduling and communication mechanisms.

The event attracted over 40 participants from diverse backgrounds, including academia, research institutes, and industry. Feedback from the attendees was highly positive, emphasizing the practical relevance of the tutorials and the value of connecting theoretical knowledge with real-world applications. All lectures on the training day were recorded and are available on the DETERMINISTIC6G YouTube channel.

Building on the success of its first event, Deterministic6G organized a summer school, which was larger in scope. The summer school was hosted by KTH in Stockholm, Sweden. The summer school was held on Sep 8 -10, 2025 under the "Dependable 6G" theme. The details of the summer school are available on the project webpage "Dependable 6G Summer School". The main objectives of the summer school were

- To present and communicate the key findings of the DETERMINISTIC6G project
- To provide a forum to discuss what "dependability" means in 6G, including technical, architectural, and performance dimensions
- To enable networking among doctoral researchers, academics, and industrial professionals

The summer school attracted around 45 participants. The summer school was also designed with lectures, practical exercises, and demonstrations based on the findings of the DETERMINISTIC6G project. The discussions, however, went beyond current project outcomes, exploring exciting future directions for 6G and deterministic networking. Participants also got hands-on experience with the emulation and simulation tools developed within the project, making the sessions both practical and insightful.

The training day and summer school events stand as a testament to the project's commitment to excellence, collaboration, and the creation of a sustainable, inclusive 6G research community.

2.2.9 6GIA events

Regular participation and contribution to 6GIA organized events and meetings are ensured by the members of the DETERMINISTIC6G projects. These meetings correspond to joint efforts on different working group activities, exchange of ideas and activities from technical managers of different SNS projects, and information exchange on communication and dissemination activities. As a result, a joint workshop (Table 17), was organized at EuCNC for several SNS projects where DETERMINISTIC6G participated and contributed to the event. Additionally, DETERMINISTIC6G project is involved in the 6GIA Architecture, pre-standardization, and communications working groups.

Table 17: Event organized under 6GIA

Date	Event	Title	Status
03 Jun. 2024	EuCNC Workshop on IMT 2030	Hyper Reliable and Low-Latency Communications for Robotics	Accepted

2.2.10 DETERMINISTIC6G deliverables

Table 18 presents a list of deliverables in chronological order that have been published under the project. As mentioned, all project deliverables are openly available and accessible on the project webpage.

Table 18: List of DETERMINISTIC6G deliverables

Number	Title
D6.1	Management Handbook and Project Website
D5.1	Impact, exploitation and dissemination plan for academic research, awareness of potential benefits to industry, standardization synergies
D6.2	Data management plan
D1.1	DETERMINISTIC6G use cases and architecture principles
D2.1	First report on 6G centric enabler
D2.2	First Report on the time synchronization for E2E time awareness
D3.1	Report on 6G convergence enablers towards deterministic communication standards
D3.2	Report on the Security solutions
D4.1	DETERMINISTIC6G DetCom simulator framework release 1
D6.3	First Intermediate Project Report
D4.2	Latency measurement framework
D1.2	First report on DETERMINISTIC6G architecture
D3.3	Report on Deterministic edge computing and situational awareness via digital twining security solution
D3.4	Optimized deterministic end-to-end schedules for dynamic systems
D5.2	Intermediate Report on Dissemination and Exploitation activities
D1.3	Report on dependable service design

D4.3	Latency measurement data and characterization of RAN latency from experimental trials
D2.3	Second report on 6G centric enabler
D2.4	Second report on the time synchronization for E2E time awareness
D3.5	Multi-domain end-to-end schedules
D3.6	Report on Deterministic Edge computing and situational awareness via digital twining
D4.4	DETERMINISTIC6G DetCom simulator framework 2
D4.5	Validation for DETERMINISTIC6G concept
D5.3	Final report on the impact and dissemination to scientific venues, industry stakeholders, and standardization synergies
D1.4	Final report on DETERMINISTIC6G architecture
D6.4	Final Project Report

2.2.11 Other events, press articles, and publications

DETERMINISTIC6G has also contributed through other miscellaneous activities to disseminate the outcomes of the project. Table 19 presents a list of such activities.

Table 19: Dissemination through miscellaneous activities

Date	Event	Title	Status
06 Feb. 2023	Press release	New EU project DETERMINISTIC6G to develop critical parts of next generation 6G networks https://www.ericsson.com/en/press-releases/3/2023/new-eu-project-deterministic6g-to-develop-critical-parts-of-next-generation-6g-networks	Published
Jun. 2023	SNS Journal 2023	Deterministic6G contributions in 6G IA Journal https://smart-networks.europa.eu/wp-content/uploads/2023/05/sns-journal-2023-web-1.pdf	Published
06-09 Jun. 2023	Recorded during EuCNC 2023	Video 6G SNS JU Phase 1 project overview https://www.youtube.com/watch?v=jSxGtAb59JI	Available on YouTube and Deterministic6G LinkedIn page
02 Nov. 2023	Interview for Italian online science newspaper (INNLIFES)	Il 6G scalda i motori per rivoluzionare la teleoperazione ("6G is gearing up to revolutionize teleoperation"): https://www.innlifes.com/med-tech/6g-teleoperazione-trigili/	Available online

31 May 2024	SNS Journal 2024	Deterministic6G contributions in 6G IA Journal 2024 https://smart-networks.europa.eu/wp-content/uploads/2024/05/sns-journal-2024-web_.pdf	Published
05 Jun. 2024	Newsletter	DETERMINISTIC6G first newsletter https://deterministic6g.eu/images/pdfs/First_Newsletter.pdf	Published
20 Jun. 2024	Joint webinar Series # 1	6G-Programmable deterministic webinar on "Architectural enhancements for 6G programmable and deterministic networks" organized by PREDICT-6G, DETERMINISTIC6G, and DESIRE6G https://www.youtube.com/watch?v=OVLAiLBuZ0Y	Available on DETERMINISTIC6G YouTube channel
22 Oct. 2024	Joint webinar Series # 2	6G-Programmable deterministic webinar on "Enhancements towards management of time-sensitive networks" organized by PREDICT-6G, DETERMINISTIC6G, and DESIRE6G https://www.youtube.com/watch?v=zqq8ZWyMXLg	Available on DETERMINISTIC6G YouTube channel
19 Dec. 2024	Blog	Network Delay Emulator: Emulating the Characteristic 5G/6G Network Delay with Linux	Available on DETERMINISTIC6G webpage
13 Jan. 2025	Blog	TSN on the Edge: Software TSN Bridge for the Edge Cloud	Available on DETERMINISTIC6G webpage
14 Feb. 2025	Newsletter	DETERMINISTIC6G Second Newsletter https://deterministic6g.eu/images/pdfs/Second_Newsletter.pdf	Available on DETERMINISTIC6G webpage
07 May 2025	Blog	Building a Programmable Software TSN Switch with P4	Available on DETERMINISTIC6G webpage
20 May 2025	Joint webinar Series # 3	6G-Programmable deterministic webinar on "Next challenges for 6G in deterministic and programmable mobile networks" organized by PREDICT-6G, DETERMINISTIC6G, and DESIRE6G https://www.youtube.com/watch?v=HuJWjVPIfEY&t=12s	Available on DETERMINISTIC6G webpage
22 May 2025	Ericsson publication	Article on Dependable networks: from best-effort to guaranteed performance	Published

02 Jun. 2025	SNS Journal 2024	Deterministic6G contributions in 6G IA Journal 2025 https://smart-networks.europa.eu/wp-content/uploads/2025/05/sns-journal-2025-web-1.pdf	Published

2.2.12 DETERMINISTIC6G final project summit

DETERMINISTIC6G organized a final project summit on September 11th, 2025, at Ericsson HQ, Kista Stockholm. A comprehensive overview of the key achievement of the project was showcased through various talks covering dependable service design, 6G enablers for ensuring dependable communication, wireless-aware E2E traffic engineering solutions, security and 6G architecture.

Following demos were also organized to showcase the concepts developed in the project.

- Latency measurement and prediction framework for detailed characterization of 6G systems
- DETERMINISTIC6G simulation framework to enable realistic simulation of stochastic packet delay of 6G systems
- Security framework for demonstrating attack detection for E2E time synchronization
- Stochastic network emulation framework through real Exoskeleton

The summit was also well received by the participants resulting in a healthy discussion on different topics. The summit was held in a hybrid format, with participants attending both in person and online.

2.3 Summary of KPIs to achieve impact

DEETERMINISTIC6G contributed considerably towards communication and dissemination of the project results. To have a clear goal, these dissemination activities have been evaluated by means of KPIs, their target values, and their status as presented in Table 20.

Table 20: Summary of proposed targets and status

Category	KPI	Targets	Status
Standard contributions	Standards and impact to standards groups	3GPP (SA1, SA2, RAN1, RAN2) Future revision of IEC/IEEE 60802 Intended new amendment to IEEE 802.1Q OPC UA FX framework	17 (3GPP) 9 (IEEE) 5 (IETF)
	Number of contributions	30	31

Industry and scientific community	Keynotes and panels in major conferences	at least 6 keynotes and at least 2 panels	29 keynotes and talks 6 panel discussion (EuCNC, O-RAN, 6G summit Dresden, Berlin 6G Conference, MeditCom)
	Number of publications (journals, conferences)	30	24 (published) 5 (under review)
	Workshops in major conferences	at least 2	7 (organized)
	5GPPP/6GIA activities	Contribution to steering board, technology board, pre-standardization, architecture, vision, and societal challenges	6GIA webinar, SNS journals, SNS video, Contribution to SNS 6GIA workshop at EuCNC, involvement in the 6GIA WGs and white papers
	Tutorials		Half-day tutorial at European Wireless'23 IEEE 802 Plenary, Berlin, Germany
	Special session		Special session at EuCNC 2023
	Webinar series		3 (conducted) Joint webinar with sister SNS projects
Influence towards academia	Training activities (summer schools)	2	2 conducted
	Graduate, PhD courses	3	7 Master courses
Communication towards the general public	Website visits outside consortium	1000+	3275 (unique hits)
	Press release, research blog	10+	11
	Social media channel used	X, LinkedIn, YouTube	Active

Compared to the dissemination goals presented in Table 2, the status in Table 20 reflects categories where the dissemination activities exceed the planned targets. Specifically, the dissemination goals towards industry and scientific community, and influence towards academia was more focused. The dissemination activities conducted in these categories resulted in gaining an increased project impact and created an understanding towards the relevant stakeholders regarding the requirements and importance of the project's targeted technologies. The number of attendees at these events, i.e., workshops, special session, tutorial, webinars, and talks varied between 40 and 70. These activities

successfully provided platforms for knowledge exchange and contributed towards disseminating DETERMINISTIC6G technical developments to a broader community.

3 Achieved impact and exploitation goals

The DETERMINISTIC6G exploitation strategy referred to the exploitation plan of the project as well as of the individual partners. The project results allowed partners to explore new market areas and enabled the definition of a roadmap for future products and solutions. Industrial partners led to future standardization work in the direction of dependable communication. Academic partners contributed towards research outcomes in the form of publications and demonstration through simulation framework in the direction of future wireless networks. SMEs can offer new techniques and functions allowing them to maintain their innovative and competitive value. In the following section, contributions by individual partners on exploitation activities are furnished.

3.1 Strategy on exploitation

The DETERMINISTIC6G project has mainly focused on establishing technical cornerstones and directions resulting in high-quality research output towards project deliverables and development of the simulation and emulation frameworks. The overall project exploitation strategy remained at contributing towards standardization activities targeting 3FPP, IETF (DetNet) and IEEE (TSN) SDOs. Moreover, publication on the results and outcomes of research activities carried out during the project were focused. As presented in Section 2, disseminated through various channels including talks at industrial and academic conferences, organization of workshops, and dissemination through customer meetings, joint webinar series has also been targeted.

To conclude, on the dissemination activities a three-day summer school was organized with both lectures and practical exercises based on the findings of the project. A final project summit wrapped up the activities highlighting the main achievements and outcomes of the project.

3.2 Individual partner exploitation contributions

In addition to the overall exploitation strategy, individual partners have been contributing towards exploitation of the project. A summary of individual contributions are summarized below.

3.2.1 Ericsson

EAB

EAB has contributed to the following dissemination activities: seven publications and one conference paper that is currently under review (see list in 2.2.1), three talks between May and June 2023 (see 2.2.3), and a tutorial (see 2.2.4).

EAB gave three presentations on the TSN/A 2024 and TSN/A 2025 conferences on the topics of TSN scheduling, time synchronization, and wireless-aware TSN engineering.

EAB has contributed to 5G-ACIA activities related to DETERMINISTIC6G project, specifically as rapporteur of a white paper which was published in 2024 (see 0). EAB contributed with eight 3GPP papers related to TSC/URLLC and time synchronization (as shown in 2.2.5).

EAB is committed to carrying on the standardization work beyond the end of the project duration.

EDD

EDD has contributed to the following dissemination activities: eight publications and one conference paper that is currently under review.

EDD has given or contributed to 12 invited talks, made 2 keynote presentations and made one lecture. EDD gave 4 TSN/A talks between years 2023 and 2025. EDD has also co-organized 7 scientific workshops, 1 special session at a conference. EDD contributed also to one project webinar. EDD also participated in 6 panels at conferences. EDD contributed to 2 white papers for SNS JU. EDD made one standardization contribution. EDD also provided two data sets for latency measurements obtained from trial network performance analysis.

EDD is committed to disseminating project results also in future and also beyond the lifetime of the project. This includes contributions to future related standardization activities.

ETH

ETH has contributed to an IEEE Access Journal paper titled '*Towards Deterministic Communications in 6G Networks: State of the Art, Open Challenges and the Way Forward*', to an MDPI Electronics paper titled '*A Framework for Communication-Compute-Control Co-Design in Cyber-Physical Systems*', to an IEEE Communications Standards Magazine paper titled '*Resilient Time Synchronization in 6G Networks: A Hot Standby Solution*', to an IEEE Network paper titled '*Wireless-aware TSN Engineering: Implications for 5G and Upcoming 6G Networks*', and to a Netdev 0x19 2025 paper titled '*Enable Time-Sensitive Applications in Kubernetes with Container Network Interface Plugin Agnostic Metadata Proxy*'. Two further papers with ETH's contribution are currently under review.

ETH has prepared nine 3GPP contributions related to DetNet and prepared or driven the preparation of nine IEEE contributions (on wireless-aware traffic engineering and multiple configuration domains) and five IETF contributions (on deterministic networking and RAW architecture). Moreover, ETH has initiated and coordinated the preparation of a new IEEE Project authorization Request (PAR) on a wireless-aware extension of IEEE 802.1Q standard.

ETH was also involved in delivering a tutorial on time-bounded and deterministic communication at European Wireless, and participated in a tutorial on 'IETF Reliable Available Wireless' at the July 2023 IEEE 802 Plenary.

ETH gave several presentations on the TSN/A 2024 and TSN/A 2025 conferences on the topics of Ethernet OAM, edge cloud-TSN integration, multi-domain TSN systems and wireless-aware traffic engineering.

ETH has contributed to the organization of the MobiCom 2024 workshop on '6G programmable deterministic networking with AI (6GPDN)' jointly organized with the DESIRE6G, and PREDICT-6G sister SNS projects.

ETH has actively engaged to various 6G-IA activities, including the preparation of white papers. ETH has also contributed to the Hexa-X-II project-initiated '6G book' with content on dependable compute aspects.

3.2.2 MONTIMAGE (MI)

Montimage has contributed to the ARES conference STAM workshop with one paper describing the techniques developed for high precision monitoring, and the project's IEEE Access paper. It also recently published a paper in the ICCCN conference on the detection of PTP Time-Delay attacks and

showcased our solution in the EUCnC and DETERMINISTIC 6G Summit. It has also added the developed software to Github and Zenodo.

Montimage developed a monitoring solution and anomaly detection techniques to assess the performance and security of networks requiring deterministic behavior. It plans to industrialize the results, which include in-band network telemetry and AI-based behavioral analysis. It will continue to present the results at forums and other events to generate interest among industrial stakeholders (i.e., operators, equipment manufacturers, Industry 4.0). It is exploiting the results as open source with advanced commercial services (e.g., integration, deployments, training, maintenance, customizations) and industrial-grade releases. It is also participating in Industry 4.0-related projects and tenders, proposing strategies for end-to-end high-precision telemetry and automated response to detect anomalies to achieve reliable, robust networks.

Strategic partnerships with different stakeholders (such as Thales, Ericsson, Cumucore, Orange) and PoC demonstrations are planned to accelerate industrial adoption by showing real-world applicability, attracting early adopters and investors. Montimage has already signed an agreement (MoU) with Cumucore and integrated the security monitoring solution in their 5G private network platform and is establishing a collaboration with Nokia Cybersecurity Product Line manager that is interested in our 5G/6G attack generation and detection techniques.

3.2.3 SILICON AUSTRIA LABS (SAL)

SAL led the impact and dissemination work package and is maintaining the project webpage and social media platforms. SAL organized joint workshops at EuCNC, PIMRC, VTC, MobiCom, and NOMS. SAL contributed towards project deliverables, publications, and dissemination of the project at events such as 6G Summit in Dresden, Fuseco forum, SAL symposium on 6G, ESBS-Austria Conference, etc.

SAL was involved in research activities on HotStandby 6G integration architectures, RAN scheduling and optimization, and situational awareness through digital twining. The research outcome on these topics were presented at various conferences and venues including EuCNC, TSN/A, Fuseco forum, one6G summit, etc.

SAL also contributed through publication of peer-reviewed journals and conference papers. SAL supported 5G-ACIA activities related to the DETERMINISTIC6G project. Lastly, SAL was actively involved in organizing DETERMINISTIC6G booth at EuCNC 2025, a training day and a summer school.

3.2.4 CUMUCORE (CMC)

CMC has contributed to EUCNC 2024 with a conference paper including the results of the MEC platform. CMC is working to extend the results and publish a new paper with additional results including network slicing to deliver optimized data flows with lower delay jitter.
CMC in cooperation with Qualcomm demonstrated a first end to end system of TSN over 5G at 5G-ACIA in Helsinki in June 2025 (https://www.askey.com/press-center-detail/192/) where accurate time synchronization was achieved. CMC continues working with Qualcomm in the design of a new 5G chipset with TSN capabilities. CMC is also cooperating with a Japanese manufacturing company to realize a PoC of TSN over 5G.

3.2.5 KUNGLIGA TEKNISKA HOEGSKOLAN (KTH)

KTH contributed to a number of dissemination activities including both talks and scientific publications. The work carried out with respect to data-driven latency predictions led to two

conference publications in IEEE Globecom 2023. Further, KTH led the preparation of the manuscript titled “Toward Deterministic Communications in 6G Networks: State of the Art, Open Challenges and the Way Forward”, which has been published in IEEE Access. Furthermore, KTH worked on developing an opensource framework for latency measurement in 5G. The results of this work have been presented in the CNERT workshop at IEEE INFOCOM. The sample measurements collected using this framework have been published at the Zenodo platform.

A conference paper is under preparation on the analysis of overhead in different learning architectures in 5G. Furthermore, a mathematical framework is being developed to quantify predictability of a given system. This work is expected to be submitted as a manuscript for journal publication.

3.2.6 UNIVERSITY OF STUTTGART (USTUTT)

USTUTT has participated in various dissemination activities: two joint journal publications published in the IEEE Access and IEEE Network journal on the state of the art and open challenges for deterministic communication in 6G networks and the implications of wireless-aware TSN engineering for 5G/6G networks, respectively. Concepts for wireless-friendly traffic engineering for 5G/6G TSN networks have also been presented to the scientific community at the IEEE/ACM International Symposium on Quality of Service 2025. Results have also been disseminated to the German-speaking scientific community through publications and presentations at the International Conference on Networked Systems (NetSys 2025), Future of Networking 2025, and the workshop on Network Softwarization by the German Informatics Society. A total of five talks have been given at the TSN/A conference in the years 2023, 2024, and 2025 on wireless-friendly traffic engineering for 5G/6G TSN networks and promoting the Deterministic6G (6GDetCom) simulation framework, in particular increasing the visibility of project results towards industry. USTUTT has also contributed to the dissemination of results to a broader audience through three posts to the Deterministic6G blog.

The 6GDetCom simulation framework and wireless-friendly extensions for the TSN control plane have been presented by USTUTT at an IEEE 802.1 WG Interim Meeting 2024 in Hamburg, Germany, contributing to activities towards the new IEEE 802.1Qee standard.

USTUTT has led the development of the open-source 6GDetCom simulation and emulation frameworks and is the main contributor to the code base. USTUTT has set up and maintained the code at the public project GitHub and via the Zenodo platform for making the source code and software artifacts openly available to the community. In this context, USTUTT has also contributed to further joint publications and demonstrations by contributing to the simulator-/emulator-based validation of results. For instance, the simulation framework has been used in a joint publication on time synchronization at the International IEEE Conference on Factory Communication Systems (WFCS 2025). Moreover, the 6GDetCom emulation framework has been used to evaluate the exoskeleton prototype demonstrated, for instance, at the European Conference on Networks and Communications (EuCNC) 2025, together with another demonstrator of the 6GDetCom simulation framework.

USTUTT has also disseminated results to early-stage researchers and students through courses at the University of Stuttgart and summer schools. For instance, TSN-related topics (including wireless TSN) are taught in a lecture on real-time concepts for embedded systems and a lab-course on software-defined and time-sensitive networking, where the students also gain hands-on experience with the 6GDetCom simulation and emulation frameworks. Moreover, USTUTT has given lectures on TSN, wireless-friendly traffic engineering, and the 6GDetCom simulator at the INTERACT Training Day 2024 in Linz, Austria, and the Dependable6G Summer School 2025 in Stockholm, Sweden. Moreover, students have been involved in the research activities of the project through various Bachelor’s and Master’s theses.

With these activities, USTUTT has made substantial contributions and progress towards increasing the visibility of project results, to strengthen its scientific reputation in the areas of networking and distributed systems, and to establish the 6GDetCom simulator as a powerful and prominent tool for the community to evaluate future concepts in TSN and 6G systems. USTUTT will continue these efforts through further publications and presentations at international conferences, workshops, and in renowned journals. Also, the efforts in developing an open-source simulation platform will continue by further enhancing and maintaining the software repositories beyond the end of the project.

3.2.7 B&R Industrial Automation (B&R)

B&R Industrial Automation GmbH took part in the European Wireless Conference, presenting the challenges of industrial communication in the future and providing an outlook on use-cases that outline the benefits of deterministic wireless communication in combination with TSN-enabled wired networks in the context of adaptive manufacturing and mobile automation.

During this project, B&R Industrial Automation GmbH aimed to disseminate results of the project into various OPC Foundation working groups, in particular, the OPC UA FX Networking and Base Facet Working Group. Moreover, the findings of the project will be considered in ongoing and upcoming standardization activities. Learnings from the simulation framework and the developed E2E scheduling concepts may have a direct impact on the development of OPC UA FX related technologies.

3.2.8 ORANGE (OR)

As a 5G-ACIA member, Orange is involved in the activities of 5G-ACIA related to DETERMINISTIC6G. Orange has taken some opportunities to promote its contribution to the project and the overall project results, which includes the participation to the production of the white paper "DetNet-based deterministic IP communication over 5G network for industrial applications". Orange has also presented the results of this white paper and ongoing deterministic communications research activities (including DETERMINISTIC6G), in conjunction with the representative of Orange in 5G-ACIA. This presentation has initiated internal discussions on the challenges and opportunities of deterministic communication, and possible involvements in standard activities and related research projects in the near future.

Orange remains interested in promoting the development of 6G and industrial network standards with deterministic communications, using the results of DETERMINISTIC6G. Orange may also use DETERMINISTIC6G results and findings to generate ownership and profitability in the operation of 6G networks and the provision of 6G connectivity to IT services. Orange expects the results of DETERMINISTIC6G to play an important role in industrial automation and the digital transformation of industries, in enabling new classes of IT and network services and in developing new markets within the industrial services domain by extension of the existing business-to-business market sector.

3.2.9 IUVO

IUVO contributed to the following dissemination activities: i) material preparation for a presentation about DETERMINISTIC6G project, held at the SNS Stream B/D Projects Workshop on KPIs and KVIs (16 May 2024, https://smart-networks.europa.eu/event/sns-stream-b-d-projects-webinar); ii) contribution to a journal paper submitted to IEEE Communications Standards Magazine. iii) A demonstration about the exoskeleton use case validation has been prepared and held during EUCNC 2025. A video about the validation framework and its results is under publication. iv) Participation at WFCS Industry forum presenting the impulse talk "Deploying Industrial Exoskeletons: Challenges,

Opportunities, and Envisioned 6G-Enabled Solutions". v) Participation to the final project summit with video demonstration of the emulation framework for the exoskeleton use case.

3.2.10 SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA (SSSA)

SSSA contributed to the following dissemination activities: online interview for an Italian science newspaper; material preparation in collaboration with IUVO for the presentation about KPIs and KVIs of DETERMINISTIC6G project held at the SNS Stream B/D Projects Workshop; contribution to a journal paper submitted to IEEE Communications Standards Magazine; presentation at workshop on objective and subjective approaches to KVI organized by 6G4Society and TrialsNet; contribution to safety thematic group for KVI development within 6G4Society; participation to DETERMINISTIC6G booth at EuCNC 2025; oral presentation and exercise session during the Summer School held at KTH premises; participation to the final summit with video demonstration of the emulation framework for the exoskeleton use case. SSSA plans to raise awareness about the outcomes of DETERMINISTIC6G in the scientific community and industrial partners on national and international level via established networks.

3.2.11 ABB

As a 5G-ACIA member, ABB participated in 5G-ACIA activities related to the DETERMINISTIC6G project.

4 Conclusions and Outlook

The overall aim of this document has been to provide information on the DETERMINISTIC6G project's dissemination and exploitation activities implemented during the project lifetime. A detailed description of the available communication channels and material prepared for dissemination of the project are provided. The document has been created with inputs from consortium partners and includes initiatives taken for the project's dissemination and exploitation strategy.

As per the dissemination activities, the project has contributed by publishing scientific papers, contributions to standards, keynotes and talks, panel discussions, university courses, organization of workshops, a training day, a summer school, a final project summit and several other miscellaneous activities. The aim was to create synergies with the operational technology players, and to communicate with the scientific community as well as with the regulators and standardization bodies to raise awareness of the project results.

List of abbreviations

Table 21: List of abbreviations

3GPP	3rd Generation Partnership Project
5G	Fifth Generation Cellular Network Technology
5G-ACIA	5G Alliance for Connected Industries and Automation
6G	Sixth Generation Cellular Network Technology
6G-IA	6G Smart Networks and Services Industry Association
AI	Artificial Intelligence
CNC	Centralized Network Controller
DETERMINISTIC6G	Deterministic End-to-end Communication with 6G
DetNet	Deterministic Networking
E2E	End-to-end
ETSI	European Telecommunications Standards Institute
EU	European Union
GM	Grand Master
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IoT	Internet of Things
OAM	Operations, Administration, and Maintenance
OPC UA FX	Open Platform Communications Unified Architecture Field eXchange
PLC	Programmable Logic Controller
PTP	Precision Time Protocol
RAW	Reliable Available Wireless
SDN	Software-Defined Networking
SDO	Standards Development Organization
SME	Small and Medium-sized Enterprise
SNS	Smart Networks and Services
TAS	Time-Aware Shaper
TSN	Time Sensitive Networking
URLLC	Ultra-Reliable Low-Latency Communication
WI	Work Item