D6.2 COMMUNICATION, DISSEMINATION, STANDARDISATION AND EXPLOITATION REPORT

Revision: v.1.0

Work package	WP 6
Task	Tasks 6.1, 6.2, and 6.3
Due date	31/12/2025
Submission date	18/12/2025
Deliverable lead	Digital for Planet
Version	1.0
Authors	Anita Gojanovic (Digital for Planet), Hermann Hellwagner (University of Klagenfurt), Thomas Buchholz (Deutsche Telekom)
Reviewers	Ali El Essaili (Ericsson) – Chapters 1, 3, 6; Hermann Hellwagner (University of Klagenfurt) – Chapters 2, 4, 5
Abstract	This deliverable reports on the communication, dissemination, standardisation, and exploitation strategy and activities performed in the SPIRIT project to guarantee broad visibility, promotion, and uptake of the project results. It describes the actions taken in the course of the project as well as how the targeted metrics were achieved. The use of standards in the project and the contributions to standardisation processes are described. The exploitation work identified key market opportunities, defined a business strategy for SPIRIT technologies, and outlined how partners will use the

www.spirit-project.eu

	results.
Keywords	Dissemination, Communication, Outreach, Standardisation, Exploitation

Document Revision History

Version	Date	Description of change	List of contributor(s)
v0.1	17/09/2025	Initial document to allow for planning and providing contributions	H. Hellwagner (UNI-KLU)
v0.2	27/11/2025	Content on communication and dissemination	A. Gojanovic (D4P)
v0.3	02/12/2025	Content on exploitation	T. Buchholz (DT)
v0.4	08/12/2025	Content on standardisation	H. Hellwagner (UNI-KLU)
v0.5	15/12/2025	Revised version after reviews; final numbers (KPIs)	A. Gojanovic (D4P), H. Hellwagner (UNI-KLU)
v1.0	17/12/2025	Final version ready for submission	A. Gojanovic, M. Voltolini (D4P)

DISCLAIMER

The information, documentation and figures available in this deliverable are written by the "*Scalable Platform for Innovations on Real-time Immersive Telepresence*" (SPIRIT) project's consortium under EC grant agreement 101070672 and do not necessarily reflect the views of the European Commission.

The European Commission is not liable for any use that may be made of the information contained herein.

COPYRIGHT NOTICE

Project co-funded by the European Commission in the Horizon Europe Programme		
Nature of the deliverable:	**to specify R, DEM, DEC, DATA, DMP, ETHICS, SECURITY, OTHER***	
Dissemination Level		
PU	*Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)*	✓
SEN	*Sensitive, limited under the conditions of the Grant Agreement*	
Classified R-UE/ EU-R	*EU RESTRICTED under the Commission Decision No2015/ 444*	
Classified C-UE/ EU-C	*EU CONFIDENTIAL under the Commission Decision No2015/ 444*	

Classified S-UE/ EU-S	EU SECRET under the Commission Decision No2015/ 444	

* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

DATA: Data sets, microdata, etc.

DMP: Data management plan

ETHICS: Deliverables related to ethics issues.

SECURITY: Deliverables related to security issues

OTHER: Software, technical diagram, algorithms, models, etc.

EXECUTIVE SUMMARY

This deliverable presents the final report on SPIRIT's communication, dissemination, standardisation, and exploitation activities, carried out throughout the project's lifetime (October 2022 - December 2025). Building on the initial plan defined in Deliverable D6.1, the consortium implemented a comprehensive set of outreach actions aimed at ensuring broad visibility, stakeholder engagement, and long-lasting impact, monitored and performed standardisation activities, and developed an exploitation strategy for the project results.

In the **first part** (Section 2), the report provides an overview of the communication and dissemination activities carried out during the project, including the website, news items, press releases, e-newsletters, social media, printed materials, videos, events and workshops, and contributions to scientific publications. In addition, the document highlights activities related to the promotion of SPIRIT's two Open Calls (OCs) and the synergies established with other projects and initiatives.

Key results of SPIRIT's communication and dissemination activities include:

- **Online presence:** The project website has been regularly updated with news, events, publications, use case information, and Open Call details, reaching more than 24,000 visits and more than 55,000 page views.
- **News and press coverage:** Five press releases issued throughout the project were disseminated via the project website and targeted media channels, reaching audiences within and beyond Europe, including outlets such as *Science Business*, *IEEE Communications Magazine*, and *WIRED*.
- **Newsletter and mailing list:** Six e-newsletters were published, keeping stakeholders informed about project milestones, partner activities, scientific publications, and event participation.
- **Social media outreach:** SPIRIT established an active presence on LinkedIn, X, and YouTube, surpassing the original Key Performance Indicators (KPI) on LinkedIn with more than 600 followers and consistently engaging professional and XR-focused communities.
- **Promotional materials:** Flyers, roll-ups, posters, and videos were produced to promote the project, its use cases, and the OCs, supporting dissemination at key events.
- **Events and workshops:** Consortium partners participated in 22 events, while SPIRIT itself organised two workshops to showcase its innovations and engage stakeholders, and co-organised a final joint event with CORTEX² at EuroXR 2025.
- **Scientific contribution:** The consortium produced 23 peer-reviewed publications and conference papers, fostering knowledge transfer and increasing SPIRIT's visibility within academic and technical communities.
- **Synergies and collaboration:** SPIRIT actively engaged with relevant EU projects, most notably through participation in the Beyond-XR cluster, strengthening cooperation and creating shared opportunities for outreach and impact.

The **second part** (Section 3) of this deliverable describes SPIRIT's efforts on the **use of standards** and **contributing to standardisation** (Task 6.2). The importance of the use of standards and standardised technologies, the work on monitoring the activities and processes of standards-defining organisations, and both SPIRIT's and Open Call project contributions to standards are addressed. Some conclusions on the importance of the use of standards and on the challenges of standardisation work are drawn ("lessons learnt").

The **third part** (Section 4) describes the exploitation approach which builds a pathway from project results to market opportunities, partner-specific business actions, and long-term innovation impact.

Market assessment shows a rapidly expanding European landscape for immersive communication, driven by 5G, edge computing, and the increasing adoption of XR in industry,

healthcare, education, entertainment, and customer services. Across the SPIRIT use cases, four major business opportunities emerge:

- **multi-source holographic streaming** for collaboration, training, events, and tourism;
- **distributed robot steering** for automation, logistics, and remote operations;
- **holographic human-to-human communication** for telemedicine and high-value collaboration;
- **real-time avatar animation** for cultural, creative, retail, and learning sectors.

These insights guide priority areas for commercialisation and further R&D.

Based on these opportunities, the **business strategy** focuses on:

- delivering high-quality immersive services that enhance customer engagement;
- enabling revenue growth through enterprise and sector-specific offerings; and
- positioning the consortium as a leader in next-generation communication ecosystems.

A phased plan - pilots, targeted rollout, then scaling - ensures structured market entry, supported by KPIs such as adoption, satisfaction, and operational efficiency. The results from the Open Calls directly inform partner strategies and roadmap updates.

The **individual exploitation plans** demonstrate how each partner will continue to use SPIRIT results in future products and services, industrial innovation, future R&D projects, testbeds, standardisation, and teaching: telecom companies will integrate results into future telepresence services and network evolution; research institutions will embed advances into new scientific projects; SMEs will extend their product portfolios in XR training, digital twins, telepresence, or media technologies; and Open Call partners exploit their solutions in cultural heritage, health, manufacturing, and education sectors.

Finally, the project defines a set of **Key Exploitable Results (KERs)** including: network and streaming innovations, QoE tools, security and privacy frameworks, digital-twin integration technologies, immersive communication blueprints, and application-layer protocol enhancements. These KERs provide the technical and commercial foundation for future services, products, and research activities.

The dissemination, communication, and outreach activities were continuously monitored against predefined KPIs (Section 5). The project successfully achieved wide and meaningful visibility, with results in most areas meeting or significantly overachieving their numerical targets. More detailed performance metrics are provided in Section 5.

The document concludes with lessons learnt (Section 6), underlining the importance of adapting outreach approaches to evolving digital platforms, leveraging collaboration opportunities with other projects, and ensuring sustainability through the visibility and exploitation of the OC experimenters' outcomes. The importance of building the R&D on established standards is emphasised, particularly with respect to making Open Calls attractive and Open Call projects successful. Challenges of standardisation work are pointed out, such as the long-term commitment and specific expertise needed.

TABLE OF CONTENTS

Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

3GPP	**3rd Generation Partnership Process**
5G-MAG	**5G Media Connectivity Association**
AI	**Artificial Intelligence**
APN	**Application-Aware Networking**
AR	**Augmented Reality**
B2B	**Business to Business**
B2C	**Business to Consumer**
CPU	**Central Processing Unit**
DASH	**Dynamic Adaptive Streaming over HTTP**
G-PCC	**Geometry-based Point Cloud Compression**
GHG	**Green House Gas**
GPU	**Graphic Processing Unit**
ICT	**Information and Communication Technology**
IEC	**International Electrotechnical Commission**
IEEE	**Institute of Electrical and Electronics Engineers**
IETF	**Internet Engineering Task Force**
IoT	**Internet of Things**
IPCEI CIS	**Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services**
ISO	**International Standardisation Organisation**
IT	**Information Technology**
KPIs	**Key Performance Indicators**
KER	**Key Exploitable Results**
MoQ	**Media over QUIC**
MPEG	**Motion Picture Expert Group**
MPEG-I	**MPEG Immersive Media**

MSF	Metaverse Standards Forum
NGI	Next Generation Internet
NPS	Net Promoter Score
OC1	Open Call 1
OC2	Open Call 2
QoE	Quality of Experience
QoS	Quality of Service
RAM	Random Access Memory
SA4	Multimedia Codecs, Systems and Services
SaaS	Software as a Service
SME	Small and Medium-sized Enterprise
TEEs	Trusted Execution Environments
T-MCU	Tiny Micro Controller Unit
V-PCC	Video-based Point Cloud Compression
VR	Virtual Reality
W3C	World Wide Web Consortium
WebRTC	Web Real-Time Communication
WP	Work Package
XR	Extended Reality

1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This deliverable is created as part of **Work Package 6 (WP6) "Impact Creation and Out-reach"** and serves as the final report on SPIRIT's communication, dissemination, standardi-sation and exploitation activities conducted until the end of the project. Building on the previous report (D6.1), which set out the plan for impact creation and outreach, this document provides a comprehensive account on the activities carried out over the full project duration (since the project kick-off in October 2022 until the project end in December 2025).

In particular, this document:

- assesses how the identified target audiences, including stakeholders in the extended reality and multimedia communication communities, were engaged throughout the pro-ject;
- presents the communication and dissemination methods, tools, and materials effec-tively employed to maximise project visibility;
- reviews SPIRIT's use of relevant standards for the core technical work and SPIRIT's and Open Call projects' contributions to standardisation activities;
- summarises exploitation efforts, identifies the most relevant business opportunities, partner specific exploitation plans, and key exploitable results.

1.2 STRUCTURE OF THE DOCUMENT

The deliverable is structured as follows:

- **Section 1 - Introduction** provides the context and objectives of the report.

- **Section 2 - Communication and Dissemination Activities** presents the activities and tools implemented throughout the project. This includes detailed accounts of SPIRIT's website, communication campaigns, news items, press releases, newsletters, social media channels, printed materials, and videos. This section also reports on events at-tended and workshops organised, as well as scientific publications. Moreover, it high-lights the promotion of the two SPIRIT OCs and describes the synergies and collabo-rations established with related projects and initiatives.

- **Section 3 - Standardisation** outlines SPIRIT's use of, and the alignment of the SPIRIT platform, use cases and testbeds with, pertinent standards as well as the contributions to standardisation efforts, including the Open Call projects' activities.

- **Section 4 - Exploitation** summarises the activities aimed at maximising the uptake and use of SPIRIT's results, including identified opportunities and strategies applied.

- **Section 5 - Impact Assessment** evaluates the outcomes of the communication, dis-semination, standardisation, and exploitation activities.

- **Section 6 - Conclusions and Lessons Learnt** provides a summary of key actions and lessons learnt.

2   COMMUNICATION AND DISSEMINATION ACTIVITIES

2.1   COMMUNICATION AND DISSEMINATION OBJECTIVES

As the foundation of SPIRIT's outreach activities, a comprehensive communication and dissemination strategy was designed at the outset of the project and documented in Deliverable D6.1. This strategy aimed to maximise the project's visibility among its target stakeholder groups and was coordinated by Digital for Planet (Leader T6.1). It was built around the following key objectives:

- creating a clear and coherent visual identity to support and strengthen SPIRIT's visibility and outreach efforts;

- ensuring broad visibility and awareness of the project and its results;

- engaging relevant stakeholders to disseminate the SPIRIT concepts and OCs for maximum participation and promotion, as well as to effectively showcase project outcomes;

- facilitating the exploitation of project outcomes and the development of innovative solutions building on SPIRIT's technologies and architectures;

- contributing to relevant scientific domains and engaging with standardisation bodies in alignment with the project's exploitation plans and results; and

- building and maintaining connections with related initiatives in the multimedia communication and in the research and innovation domains.

The strategy provided the overarching framework for communication and dissemination across the consortium, offering clear guidance to ensure that all partners could contribute consistently and effectively to outreach efforts. The following subsections present the specific tools and activities that were developed and implemented over the course of the project to effectively engage with the targeted stakeholders.

Moreover, in line with the sustainability principles defined in the initial communication and dissemination strategy, SPIRIT ensured that its outreach activities were carried out with careful consideration of environmental impact. Several virtual meetings took place and two workshops were organised, which reduced the need for travel while maintaining strong stakeholder engagement. The consortium also limited the production of printed promotional materials, prioritising digital formats and online downloads whenever possible. When physical meetings took place, many partners actively adopted sustainable mobility practices such as using public transport to attend SPIRIT events and General Assemblies.

2.2   ONLINE COMMUNICATION AND DISSEMINATION

2.2.1   Website

The SPIRIT website (www.spirit-project.eu) was launched at the start of the project (M1) to present its goals, activities, and achievements. Since then, it has been regularly updated with news items (60 in total), event announcements, new synergies, publications, promotional materials, and other relevant content.

In comparison with the structure initially outlined in D6.1, the website has been enriched with additional sections, including:

- Use cases: providing an overview and implementation details of each use case, complemented by short dedicated videos.

- Videos: a compilation of all videos produced during the project (10 in total).
- Open Calls: two dedicated pages presenting detailed information on each SPIRIT Open Call, including objectives, required documents, funding and duration, eligibility criteria, submission process, and related guidance. This section also includes two more pages with video interviews with OC1 and OC2 experimenters, in which they present their projects and share the impact of their work.
- EuroXR 2025: this section includes a page with key information about the event and the joint final workshop organised by SPIRIT and CORTEX², as well as a page presenting the OC1 posters and another showcasing the OC2 posters.

As of 15 December 2025, the website has attracted **24,465 visits**, generating **55,112 page views and 41,088 unique page views**. Among the individual sections, the OC1 page, followed by the OC2 page, stands out as the most visited, with 8,263 total page views (5,900 unique) for OC1, and 7,542 total page views (4,724 unique) for OC2.

Figure 1 below shows the overall traffic overview, including the number of visits, page views, average visit duration, and downloads.

FIGURE 1: SPIRIT VISITS FROM THE BEGINNING OF THE PROJECT UNTIL DECEMBER 2025

2.2.2 News Items and Press Releases

Over the course of the project, SPIRIT maintained an active flow of updates, regularly publishing news items on its website and amplifying it through social media and newsletters. In total, **60 news articles** were issued, covering a wide range of topics including partner interviews, consortium participation in events, updates on the Open Calls, and interviews with their winners.
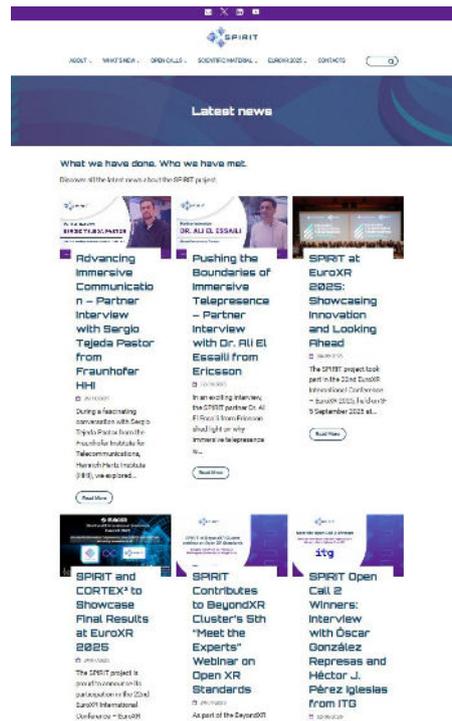
FIGURE 2: SCREENSHOT OF SPIRIT'S NEWS ITEMS

At the time of writing, SPIRIT has issued **five press releases** covering key milestones, including the project launch, the announcement of both OC winners, the four use cases, and the promotion of the final joint workshop organised with CORTEX². Each press release was published in the dedicated section of the project's website and distributed to targeted press contacts through Prowly.

Following the First Review Meeting in November 2024, the consortium carefully considered the recommendation received regarding addressing international magazines and journalists in order to maximise outreach. Press releases were therefore distributed to a wide range of outlets in and beyond Europe, including *Science Business, EU-Startups*, *IEEE Communications Magazine*, *WIRED*, *Asian Scientist Magazine*, and *Recode*, ensuring that SPIRIT's activities reached an international audience.

Moreover, the SPIRIT project will also be featured in *Horizon Magazine*, which provides information on the latest EU-funded research projects. The article, titled "Tech moves to holograms, fine dining and teleporting classes for more immersive experience," highlights the project's impact and its focus on making immersive telepresence more accessible.

2.2.3 E-newsletters

The SPIRIT newsletter, published twice a year, served as a key channel to share updates on project activities and results. Each issue featured content such as OC updates, partner interviews, scientific publications, and event highlights. The design followed the SPIRIT brand identity and was optimised for full responsiveness, ensuring readability across devices.

All newsletters were made available on the SPIRIT website and distributed through a mailing list created via online subscriptions. Visitors could subscribe directly on the website, while SPIRIT's social media channels regularly promoted the newsletter to boost subscriptions. Since the project's launch, **six editions** have been published.

Table 1 summarises the newsletter's reach, while the figure below provides an example of the SPIRIT newsletter.

TABLE 1: SPIRIT'S NEWSLETTER REACH

Criteria	Issue 1 – March 2023	Issue 2 – September 2023	Issue 3 – April 2024	Issue 4 – October 2024	Issue 5 – May 2025	Issue 6 – November 2025
No. of subscribers	10	14	22	33	40	113
Total of opens	70%	85%	59%	39%	65%	11.5%
Total of clicks	30%	28%	22%	24%	17%	2%
Click-to-open rate	43%	33%	38%	61%	27%	15%
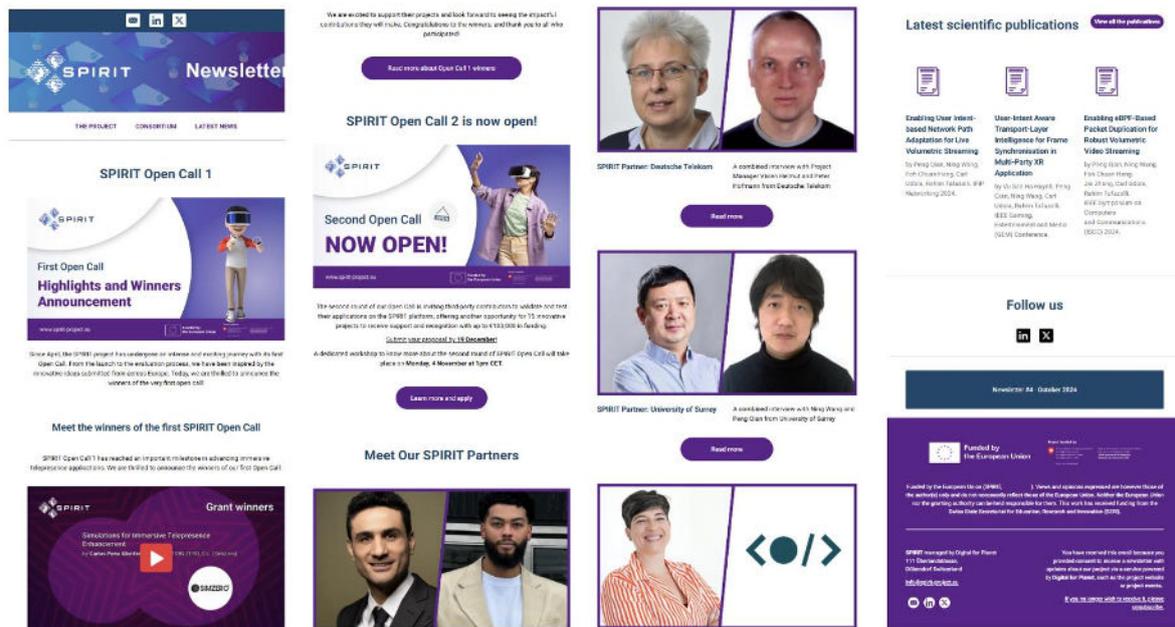
FIGURE 3: SCREENSHOT OF SPIRIT'S NEWSLETTER #4 (OCTOBER 2024)

2.2.4 Social Media

SPIRIT built a strong social media presence to showcase its activities and results to a wide audience. The project maintained active profiles on LinkedIn, X, and YouTube, steadily growing its follower base across these platforms. SPIRIT's social media channels were regularly updated with diverse content, including news items linked to the website, announcements of partner participation in events, and targeted campaigns such as the partner interviews. Posts on LinkedIn consistently tagged partner accounts to amplify reach, while the use of relevant hashtags, such as #XR, #EUXR, #ExtendedReality, #Telepresence, and #HorizonEU.

LinkedIn

At the time of writing, the SPIRIT LinkedIn page had attracted **631 followers** and published 189 posts. With an engagement rate of 11.42% and a total of 97,353 impressions, the page has become a reference point for a global community of professionals active in education, business development, research, engineering, and information technology. Most followers are based in Germany, United Kingdom, Spain, Switzerland, Greece, and the Netherlands.
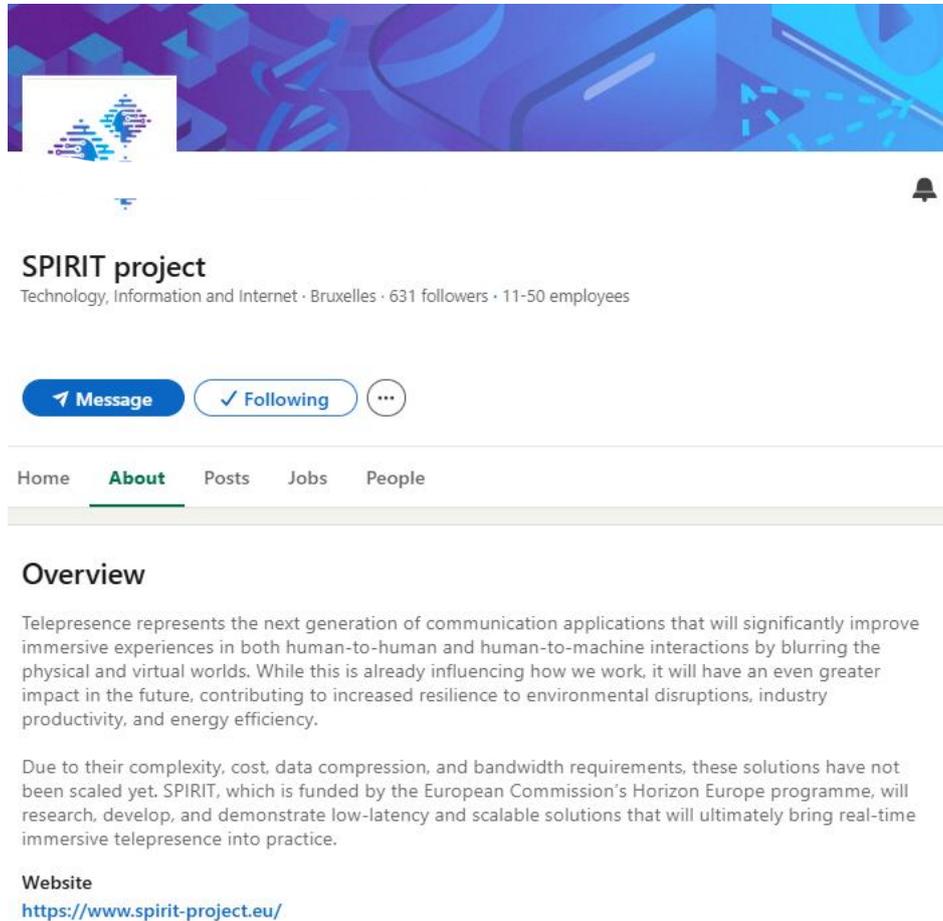
FIGURE 4: SCREENSHOT OF SPIRIT'S LINKEDIN CHANNEL
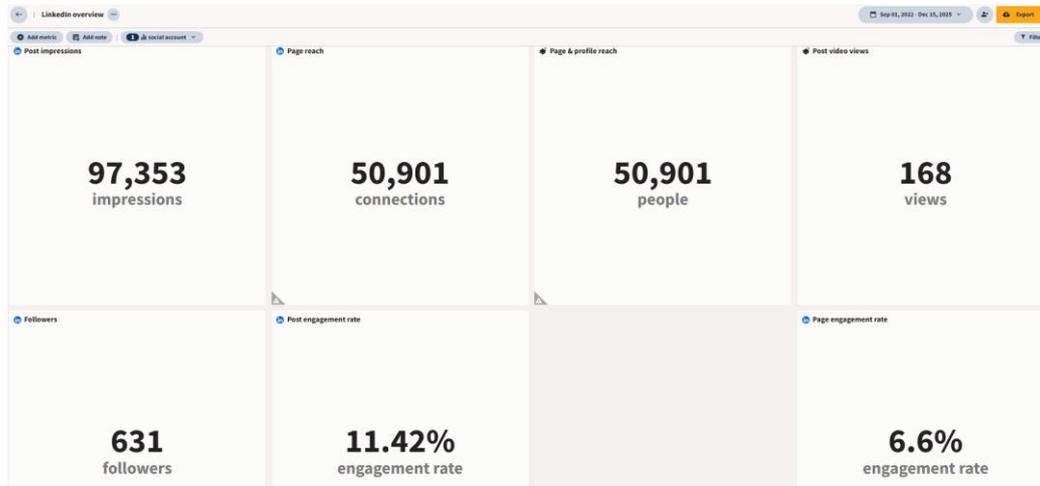
FIGURE 5: STATISTICS OF SPIRIT LINKEDIN ACCOUNT. DATA TRACKED USING HOOTSUITE

X

By the end of the project, SPIRIT's X account had grown to **265 followers**, with 125 posts published. The account achieved an engagement rate of 8.76% and generated a total of 9,494 impressions. Although the final follower count did not meet the initial 500 follower KPI, this performance must be contextualised within the rapidly changing social media landscape throughout the project period. The platform's recent change in ownership and policies led to mass user migration and a steep decline in its overall popularity, which significantly impaired visibility and follower growth across X accounts. Nevertheless, SPIRIT successfully leveraged LinkedIn, where it significantly exceeded expectations: with more than 600 followers, the page surpassed the original target of 150, demonstrating strong visibility and engagement within the XR communities.

FIGURE 6: SCREENSHOT OF SPIRIT'S X CHANNEL

FIGURE 7: STATISTICS OF SPIRIT X ACCOUNT. DATA TRACKED USING HOOTSUITE

YouTube

The SPIRIT YouTube channel functioned as a central platform for sharing project-related videos, complementing the content published on the website, LinkedIn, and X. To date, the channel hosts 39 videos (including the recordings of workshops and video interviews with OC experimenters), with individual view counts as follows:

- SPIRIT project – a sneak peek: 196 views.
- SPIRIT Open Call 1 Highlights and Winners Announcement: 364 views.
- SPIRIT Use case #1: Multi-Source Live Teleportation with 5G MEC Support: 70 views.
- SPIRIT Use case #2: Real-Time Animation and Streaming of Realistic Avatars: 60 views.
- SPIRIT Use case #3: Holographic Human-to-human Communication: 98 views.
- SPIRIT Use case #4: Distributed Steering of Autonomous Mobile Robots (AMR): 87 views.
- Exploring the Future of Immersive Telepresence with Dr.Hermann Hellwagner, Universität Klagenfurt: 32 views.
- SPIRIT Open Call 2 Highlights and Winners Announcement: 70 views.
- Pushing the Boundaries of Immersive Telepresence: Interview with Ali El Essaili from Ericsson: 92 views
- Advancing Immersive Communication - Partner Interview with Sergio Tejeda Pastor from Fraunhofer HHI: 9 views

2.3 PROMOTIONAL MATERIAL

2.3.1 Printed Material

The consortium developed a variety of promotional materials to support the dissemination of SPIRIT at events. The first project flyer provided general information about the project, including its mission, the use cases, and guidance on applying to the first OC. A second flyer focused specifically on the use cases, offering an overview of their scope and objectives. A third flyer, created in collaboration with the CORTEX² project, presented the agenda for the final workshop at EuroXR, designed in a concise and accessible format to facilitate participants' engagement with the event.

FIGURE 8: SPIRIT FLYER AT EUCNC 2024

FIGURE 9: SPIRIT FLYER AT EUROXR 2025

In addition to flyers, SPIRIT produced two rollups: one promoting OC1 at EuCNC 2024 and another for the joint final workshop with CORTEX² at EuroXR.

FIGURE 10: SPIRIT ROLLUP AT EUCNC 2024

FIGURE 11: SPIRIT ROLLUP AT EUROXR 2025

During EuroXR, the SPIRIT OC experimenters submitted a poster showcasing their innovative projects, available on this section for OC1 and on this section for OC2. Out of 27 posters from the OC experimenters, 22 were officially accepted by the conference. The SPIRIT OC1 project DIANE was awarded the Best Poster Award at EuroXR for their poster entitled "Demonstrating Immersive Teleoperation of Robots via Adaptive Point Cloud Streaming."

FIGURE 12: OPEN CALL PROJECT POSTER AT EUROXR 2025

Finally, promotional cards were developed to support the OC2 promotion at Stereopsia 2024 and later for general promotion of the project at EuroXR.

At EuroXR, the SPIRIT consortium distributed branded notebooks to the OC experimenters, with the remaining copies shared among other participants.

All the printed materials are accessible for download on the SPIRIT website.

2.3.2 Videos

SPIRIT produced 10 videos, which are available on YouTube and the project website, showcasing the project's activities, use cases, OCs, and partner insights. The YouTube channel includes also the recordings of the two online workshops and the short video interviews with the 27 OC experimenters.

- SPIRIT project – a sneak peek: Offers a brief overview of the project, including its objectives, partners, and funding opportunities, featuring the project coordinator imec. (196 views)

- **SPIRIT Open Call 1 Highlights and Winners Announcement**: Highlights the 11 winning projects, detailing awarded projects by country and industry, and announces the selected winners. (364 views)
- **SPIRIT Use case #1: Multi-Source Live Teleportation with 5G MEC Support**: Led by the University of Surrey, this video demonstrates live teleportation of individuals from different Internet locations into a shared virtual audience space. (70 views)
- **SPIRIT Use case #2: Real-Time Animation and Streaming of Realistic Avatars**: Fraunhofer HHI presents their effort to create highly immersive, realistic avatars animated in real-time. (60 views)
- **SPIRIT Use case #3: Holographic Human-to-human Communication**: Ericsson showcases 3D holographic communication as an alternative to traditional video or voice calls, demonstrating asymmetrical communication where one person appears as a hologram. (98 views)
- **SPIRIT Use case #4: Distributed Steering of Autonomous Mobile Robots (AMR)**: Highlights how this use case combines autonomous operations with manual control to enhance efficiency and safety in logistics. (87 views)
- **Exploring the Future of Immersive Telepresence with Dr.Hermann Hellwagner, Universität Klagenfurt**: Dr. Hermann Hellwagner from Universität Klagenfurt shares insights on the transformative potential of immersive telepresence and SPIRIT's role in advancing the field. (32 views)
- **SPIRIT Open Call 2 Highlights and Winners Announcement**: Announces the 16 winning projects selected for the SPIRIT ecosystem, detailing countries and industries involved. (70 views)
- **Pushing the Boundaries of Immersive Telepresence: Interview with Ali El Essaili from Ericsson**: Ali El Essaili from Ericsson discusses the growing relevance of immersive telepresence and SPIRIT's impact on its future development. (92 views)
- **Advancing Immersive Communication - Partner Interview with Sergio Tejeda Pastor from Fraunhofer HHI**: Sergio Tejeda Pastor from Fraunhofer HHI explores how SPIRIT is redefining the future of immersive communication and the project mission. (9 views)
- **SPIRIT Open Call 1 and 2 Projects**: Short video interviews where the Open Call 1 and 2 experimenters present their projects, explain how they used the SPIRIT platform, and share the impact of their work.

While the KPI set in the Grant Agreement targeted an average of 150 views per video, the project did not fully reach this benchmark across all uploads. However, the overall impact of the video dissemination activities exceeded the initial plan. The project originally committed to producing 4 videos (for a total expected reach of approximately 600 views), whereas SPIRIT delivered 10 videos that collectively accumulated more than 1,000 views. This demonstrates that, despite lower-than-expected view counts per video, the total outreach achieved through video content was significantly higher than planned. The videos remain publicly available on YouTube and the project website, continuing to attract viewers beyond the reporting period and contributing to sustained dissemination and visibility.

2.4 EVENTS

2.4.1 Events Attended

SPIRIT partners actively participated in a wide range of scientific and industry events, both to stay connected with relevant communities and to showcase the project's progress and achievements. Over the course of the project, consortium members attended a total of **22 events**, delivering presentations and promoting SPIRIT's outcomes and OCs. Table 2 below provides a summary of the events attended.

TABLE 2: EVENTS ATTENDED BY SPIRIT CONSORTIUM

EVENT	DATE & LOCATION	TYPE OF AUDIENCE	ACTIVITIES	PARTNER INVOLVED
IEEE Global Communications Conference (GLOBECOM) 2022	4-8 December 2022 Rio de Janeiro, Brazil	Research, academia, policy makers	Project promotion and networking	imec
IEEE/IFIP Network Operations and Management Symposium (NOMS) 2023	8–12 May 2023 Miami, USA	Network management community, scientific community	Project and OC promotion, networking	imec
EuCNC 2023	6-9 June 2023 Gothenburg, Sweden	Networks and communications, industry	Project promotion	D4P
SII40 Lecture	9 June 2023 Online	Students, research, academia, industry	Presentation of the project and OCs	imec
15th International Conference on Quality of Multimedia Experience (QoMEX 2023)	20-22 June 2023 Ghent, Belgium	Research, academia, industry	Three paper presentations	imec, UNI-KLU
IEEE 6th International Conference on Multimedia Information Processing and Retrieval (IEEE MIPR 2023)	30 August – 1 September 2023 Singapore	University researchers, scientists, industry professionals, software engineers	Keynote presentation, including the SPIRIT project and platform	UNI-KLU
IBC 2023	15-18 September 2023 Amsterdam, the Netherlands	Media and entertainment industry	Project promotion and networking	imec
NGI Forum 2023	15-16 November 2023 Brussels, Belgium	Policymakers, researchers, innovators, industry representatives, focus on key trends of the future technological transition of the internet	Project promotion and networking	D4P
3rd ACM Mile-High Video Conference	11-14 February 2024 Denver, USA	Practicing engineers and researchers in areas related to media compression and streaming from both industry and academia	Paper presentation	UNI-KLU
Mobile World Congress 2024	26-29 February 2024 Barcelona, Spain	Industry, focus on connectivity ecosystem	Booth with SPIRIT logo, project promotion	Fraunhofer HHI
ICIN 2024	11-14 March 2024 Paris, France	Internet and Telecom experts from industry, academia, and government, cloud networking and Internet communities	Presentation of the project and OCs	imec

Event	Date & Location	Type of Audience	Activities	Partner
IEEE VR 2024	16-21 March 2024 Orlando, USA	VR researchers and innovators	Paper presentation	Fraunhofer HHI
ACM Multimedia Systems Conference 2024	15-18 April 2024 Bari, Italy	Researchers from academia and industry, multimedia systems	Three paper presentations, promotion of OCs	imec, UNI-KLU
Lange Nacht der Forschung 2024	24 May 2024 Klagenfurt, Austria	General public, science enthusiasts, research and innovation	Demos of immersive content (point clouds)	UNI-KLU
EuCNC 2024	3-6 June 2024 Antwerp, Belgium	Networks and communications, industry	Stand, project promotion and networking	imec
Lange Nacht der Wissenschaften 2024	22 June 2024 Berlin, Germany	Researchers, students, AI-focused	Demo running including the components used for SPIRIT	Fraunhofer HHI
Open Living Lab Days 2024	25-27 September 2024 Timisoara, Romania	Researchers and academia	OCs promotion	D4P
IEEE INFOCOM 2025	19 May 2025, London, UK	Research community, students, academia	Paper presentation	University of Surrey
IEEE ICME 2025	30 June - 4 July 2025, Nantes, France	Leading researchers and practitioners	Paper presentation	University of Surrey
EuroXR 2025	3-5 September 2025 Winterthur, Switzerland	Experts from academia and industry, researchers	SPIRIT final workshop, project promotion, participation of OC experimenters with posters, presentations, and demos.	All partners and OC experimenters
16th International Conference on Network of the Future 2025	30 September - 3 October 2025 Montreal, Canada	Experts from academia and industry, researchers	Paper presentation	imec
IEEE/ACM International Conference on Utility and Cloud Computing (UCC2025)	1-4 December 2025 Nantes, France	Researchers from academia and industry	Paper presentation	imec

In addition to the consortium's participation, SPIRIT OC experimenters also played a central role in disseminating the project and showcasing their innovations at key events. Table 3 below presents an overview of the events attended by the experimenters, where they contributed through presentations, demonstrations, and networking activities.

TABLE 3: EVENTS ATTENDED BY OPEN CALL EXPERIMENTERS

EVENT	DATE & LOCATION	TYPE OF AUDIENCE	ACTIVITIES	OC PROJECT INVOLVED

IESC Students and Companies	5 March 2025 Brasov, Romania	Academia, students	GENBA SAVR's presentation, live demonstrations, networking with students and industry leaders	OC1 Project GENBA SAVR
Advanced Factories	8-10 April 2025 Barcelona, Spain	Industry professionals, global leaders	Presentation of OC Project REDIA	OC1 Project REDIA
FEINDEF (Spanish International Defence and Security Fair)	12-14 May 2025 Madrid, Spain	Exhibitors, international delegations	Stand and promotion of OC Project REDIA	OC1 Project REDIA
ACM Multimedia Systems Conference 2025	31 March - 4 April 2025 Stellenbosch, South Africa	Experts from academia and industry, researchers	Project promotion and presentation of OC Project DIANE	OC1 Project DIANE
MMVE 2025 Workshop	31 March - 4 April 2025 Stellenbosch, South Africa	Experts from academia and industry	Paper presentation	OC1 Project ETHOS
ICT.OPEN 2025	15-16 April 2025 Utrecht, Netherlands	Experts from academia and industry, researchers	Demonstration presentation	OC1 Project ETHOS
IEEE International Wireless Communications & Mobile Computing Conference (IWCMC)	12-16 May 2025 Abu Dhabi, UAE	Academic pioneering researchers, scientists, industrial engineers	Paper presentation	OC1 Project TENeMP
AFCO (Graduates in Front of Companies)	13 May 2025 Brasov, Romania	Academia, students, information about internship or employment opportunities	GENBA SAVR poster presentation and project promotion	OC1 Project GENBA SAVR
ACM IMX 2025	3-6 June 2025 Niterói, Brazil	Researchers and practitioners	Demo paper	OC1 Project ETHOS
EEITE 2025	4-6 June 2025 Crete, Greece	Experts, researchers, and practitioners	Paper presentation	OC1 Project GENBA SAVR
ACM DIS Conference	5-9 July 2025 Madeira, Portugal	Research community, industry leaders	Project promotion and presentation of OC project BAZKARIA, paper presentation	OC1 Project BAZKARIA
EuroXR	3-5 September 2025 Winterthur, Switzerland	Experts from academia and industry, researchers	Participation of OC experimenters with posters, presentations, and demos	All 27 OC experimenters
CHIGreece 2025 International Conference in HCI	24-26 September 2025 Syros Island, Greece	Experts from academia and industry, researchers	Extended abstract and demo	OC2 Project ANNETTE
17th International Conference on Quality of Multimedia Experience (QoMEX 2025)	29 September - 3 October 2025 Madrid, Spain	Experts from academia and industry, researchers	Paper presentation	OC2 Project QEST

ICL 2025 (International Conference on Interactive Collaborative Learning)	1-3 October 2025 Budapest, Hungary	Global leaders, researchers, and professionals	Paper presentation	OC1 Project GENBA SAVR
Physics-Enhancing Machine Learning (PEML 2025) Workshop	1-3 October 2025 London, UK	Researchers and academia	Invited talk	OC1 Project SITE
XOVE TIC 2025	9-10 October 2025 A Coruña, Spain	Researchers and academia	Paper presentation	OC2 Project ROTIE
Valencia Digital Summit	22-23 October 2025 Valencia, Spain	Startups, corporations, investors	Booth at global tech event for leading startups, corporations and investors. Replay of videos and XR demo	OC1 Project SITE
3rd International Workshop on Interactive eXtended Reality (IXR'25), ACM Multimedia 2025	29 October 2025 Dublin, Ireland	Experts from academia and industry, researchers	Paper presentation	OC1 Project BAZKARIA
OPENVERSE Workshop "AI, AIoT, IoT building blocks for Virtual Worlds"	10 December 2025, Online	Research community, industry leaders	SITE Project presentation	OC1 Project SITE

2.4.2 Workshops Organised by SPIRIT

Over the course of the project, SPIRIT organised three workshops designed as strategic opportunities to engage stakeholders, present innovations, and foster collaboration through the OCs. These events played a central role in raising awareness of the project's framework, stimulating participation in the OCs, and disseminating results to the wider XR and telepresence community.

The **first workshop**, held online on 16 April 2024, was dedicated to engaging potential participants of the first OC (OC1). The session provided attendees with an overview of SPIRIT's vision, technical advancements, and the telepresence framework developed within the project. It also served as a platform for interaction, enabling participants to better understand the requirements, expectations, and opportunities linked to the cascade funding scheme. In total, 45 attendees joined the event, representing a broad mix of researchers, SMEs, and innovators interested in contributing to SPIRIT's ecosystem.
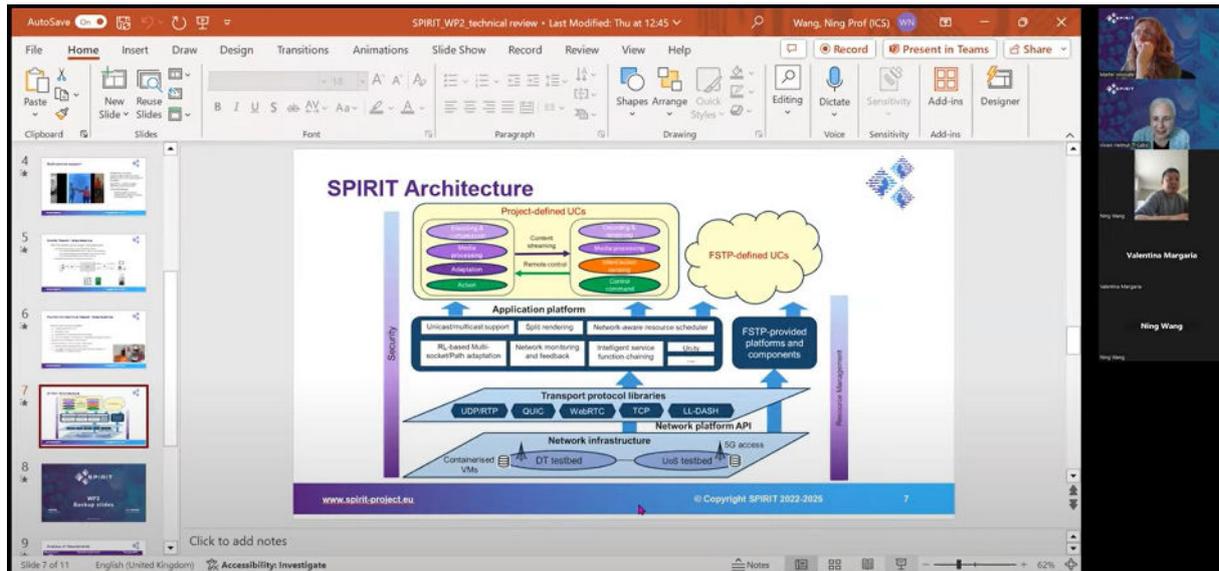
FIGURE 13: SCREENSHOT FROM THE FIRST SPIRIT ONLINE WORKSHOP

The **second workshop**, also held online on 4 November 2024, followed a similar structure and objectives but focused specifically on the second OC (OC2). This workshop aimed to attract new applicants while building on the momentum of the first round and providing updated insights into SPIRIT's technical framework and funding opportunities. The session enabled participants to engage directly with the consortium and clarify questions related to the application process. In total, 41 stakeholders attended the workshop.

To make the event more interactive and engaging, the consortium used the Slido platform to collect input from participants and stimulate discussion. Through a series of live polls, the organisers gathered valuable data on attendees' backgrounds, levels of expertise, and expectations. For example, 53% of respondents reported being somewhat familiar with EC projects, while 32% indicated strong familiarity. Regarding SPIRIT itself, 58% of participants knew about the project but needed more in-depth information. Attendees also shared how they learnt about the workshop, primarily via networking, social media, and mailing lists, and identified their organisational types, with SMEs making up the majority, followed by academia and research centres.

Participants highlighted diverse areas of application, including XR, healthcare, energy, holographic communication, life sciences, and videogames, and most identified as senior experts or leaders in their respective fields when asked how they would rate their level of experience. In terms of vertical interests, healthcare, education, and entertainment emerged as the most relevant, followed by tourism, training, Industry 5.0, energy, and cultural heritage. Finally, participants expressed what they were most eager to gain from collaborating with SPIRIT, with responses ranging from testing the SPIRIT platform and use cases, to exploring applications in VR education and testbeds.

The workshop concluded with highly positive feedback: participants rated the event 5/5, underscoring the value of both the information provided and the interactive format.
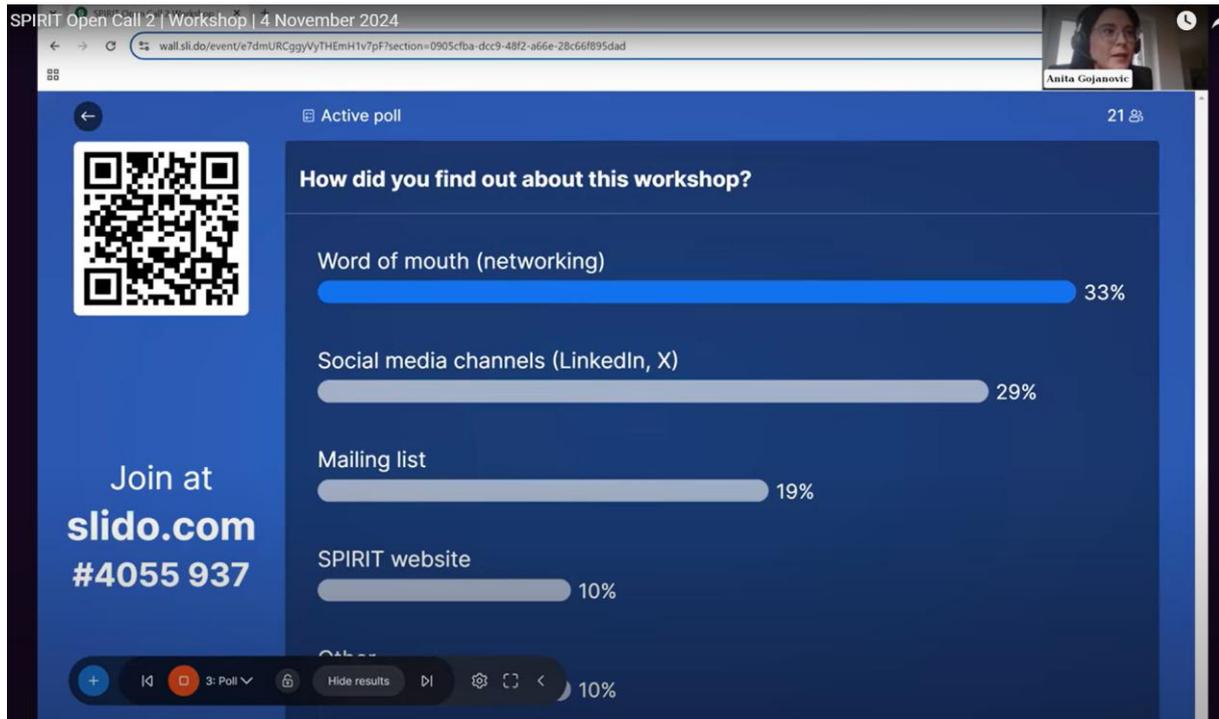
FIGURE 14: SCREENSHOT FROM THE SECOND SPIRIT ONLINE WORKSHOP

The **final workshop** took place on 3-5 September 2025 during the EuroXR Conference in Winterthur, Switzerland. Organised jointly with the CORTEX² project, the special session entitled "Extended Collaborative Telepresence – How CORTEX² and SPIRIT are Advancing Innovation in XR" brought together a large community of XR experts and innovators. The track showcased the outcomes of both projects' cascade funding programmes, featuring presentations of research results, live demonstrations, and poster sessions. More than 50 funded initiatives were represented, including all 27 SPIRIT OC projects. In parallel, SPIRIT also presented its key achievements and demonstrated its four use cases. The workshop attracted 125 participants on the first day (3 September) and 112 on the second (4 September), marking it as a highly successful closing event for the project's outreach activities.

FIGURE 15: SPIRIT AND CORTEX² WORKSHOP AT EUROXR 2025

2.5 SCIENTIFIC PUBLICATIONS

The SPIRIT consortium has been actively engaged in publishing research outcomes through conference proceedings and scientific journals. In total, **23 publications** have been produced as part of the project. A full list of these papers, arranged chronologically, is included in the table below and available on the project website. Consistent with Open Access principles, the SPIRIT publications are freely accessible via Zenodo.

TABLE 4: SPIRIT SCIENTIFIC PUBLICATIONS

PUBLICATION	AUTHORS	YEAR	JOURNAL/CONFERENCE PROCEEDING	LEADING PARTNER
A Platform for Subjective Quality Assessment in Mixed Reality Environments	Shivi Vats, Minh Nguyen, Sam Van Damme, Jeroen van der Hooft, Maria Torres Vega, Tim Wauters, Christian Timmerer, Hermann Hellwagner	2023	15th International Conference on Quality of Multimedia Experience (QoMEX 2023)	University of Klagenfurt, imec
Impact of Quality and Distance on the Perception of Point Clouds in Mixed Reality	Minh Nguyen, Shivi Vats, Sam Van Damme, Jeroen van der Hooft, Maria Torres Vega, Tim Wauters, Christian Timmerer, and Hermann Hellwagner	2023	15th International Conference on Quality of Multimedia Experience (QoMEX 2023)	University of Klagenfurt, imec
Immersive and Interactive Subjective Quality Assessment of Dynamic Volumetric Meshes	Sam Damme, Imen Mahdi, Hemanth Kumar Ravuri, Jeroen van der Hooft, Filip De Turck, and Maria Torres Vega	2023	15th International Conference on Quality of Multimedia Experience (QoMEX 2023)	imec

Characterization of the Quality of Experience and Immersion of Point Cloud Videos in Augmented Reality Through a Subjective Study	Minh Nguyen, Shivi Vats, Sam Van Damme, Jeroen Van Der Hooft, Maria Torres Vega, Tim Wauters, Filip de Turck, Christian Timmerer, and Hermann Hellwagner	2023	IEEE Access, vol. 11, 2023	University of Klagenfurt, imec
Video-Driven Animation of Neural Head Avatars	W. Paier, P. Hinzer, A. Hilsmann, P. Eisert	2023	Vision, Modeling, and Visualization, The Eurographics Association	Fraunhofer HHI
Quality of Experience Modelling and Analysis for Live Holographic Teleportation	Carl Udora, Peng Qian, Sweta Anmulwar, Anil Fernando, and Ning Wang	2024	International Conference on Computing, Networking and Communications 2024 (ICNC 2024)	University of Surrey
No-Reference Quality of Experience Model for Dynamic Point Clouds in Augmented Reality	Minh Nguyen, Shivi Vats, Hermann Hellwagner	2024	Proceedings of the IEEE Mile High Video Conference 2024 (MHV 2024)	University of Klagenfurt
Scalable MDC-Based Volumetric Video Delivery for Real-Time One-to-Many WebRTC Conferencing	Matthias De Fré, Jeroen van der Hooft, Tim Wauters, and Filip De Turck	2024	15th ACM Multimedia Systems Conference (ACM MMSys 2024)	imec
Demonstrating Adaptive Many-to-Many Immersive Teleconferencing for Volumetric Video	Matthias De Fré, Jeroen van der Hooft, Tim Wauters, and Filip De Turck	2024	15th ACM Multimedia Systems Conference (ACM MMSys 2024)	imec
ComPEQ–MR: Compressed Point Cloud Dataset with Eye Tracking and Quality Assessment in Mixed Reality	Minh Nguyen, Shivi Vats, Xuemei Zhou, Irene Viola, Pablo Cesar, Christian Timmerer, Hermann Hellwagner	2024	15th ACM Multimedia Systems Conference (ACM MMSys 2024)	University of Klagenfurt
Enabling eBPF-based packet duplication for robust volumetric video streaming	Peng Qian, Ning Wang, Foh Chuan Heng, Jia Zhang, Carl Udora, Rahim Tafazolli	2024	IEEE Symposium on Computers and Communications (ISCC) 2024	University of Surrey
User-Intent Aware Transport-Layer Intelligence for Frame Synchronisation in Multi-Party XR Application	Vu San Ha Huynh, Peng Qian, Ning Wang, Carl Udora, Rahim Tafazolli	2024	IEEE Gaming, Entertainment and Media (GEM) Conference	University of Surrey
Enabling User Intent-based Network Path Adaptation for Live Volumetric Streaming	Peng Qian, Ning Wang, Foh Chuan Heng, Carl Udora, Rahim Tafazolli	2024	IFIP Networking 2024	University of Surrey
Animatable Virtual Humans: Learning pose-dependent human representations in UV space for interactive performance synthesis	W. Morgenstern, M. Bagdasarian, A. Hilsmann, P. Eisert	2024	IEEE VR 2024	Fraunhofer HHI
Enabling Haptic-Integrated Interactive Holographic	Peng Qian, Ning Wang, Carl Udora, Carlos Velez Redondo, JingXuan Men, Rahim Tafazolli	2025	IEEE ICME 2025	University of Surrey

Video Streaming Powered by 5G Edge Computing				
Enabling Generative AI based Multi-sensory XR Applications with Mobile Edge Computing	Peng Qian, Carlos Velez Redondo, Ning Wang, Carl Udora, JingXuan Men, Rahim Tafazolli	2025	IEEE INFOCOM 2025	University of Surrey
A Multidimensional Media Adaptation Framework for Live Holographic Communication	Carl Udora, Peng Qian, Jingxuan Men and Ning Wang	2025	IEEE Transactions on Multimedia	University of Surrey
STEP-MR: A Subjective Testing and Eye-Tracking Platform for Dynamic Point Clouds in Mixed Reality	Shivi Vats, Christian Timmerer, and Hermann Hellwagner	2025	EuroXR Conference, MMM 2026	University of Klagenfurt
Towards Efficient Transport for Real-Time Immersive Applications over Hybrid Networks	Casper Haems, Matthias De Fre, Tim Wauters, Filip De Turck	2025	16th International Conference on Network of the Future	imec
Demonstration of Viewport-Aware Hybrid Broadcast-Unicast Streaming for Volumetric Video	Casper Haems, Matthias De Fre, Tim Wauters, Filip De Turck	2025	16th International Conference on Network of the Future	imec
Scalable MDC-Based WebRTC Streaming for One-to-Many Volumetric Video Conferencing	Matthias De Fré, Jeroen van der Hooft, Tim Wauters, Filip De Turck	2025	ACM Transactions on Multimedia Computing, Communications, and Applications	imec
GreenWise: Intelligent Application Migration for Containerized Machine Learning Services in the Computing Continuum	Peini Liu, José Santos, Filip De Turck, Jordi Guitart	2025	IEEE/ACM International Conference on Utility and Cloud Computing (UCC2025)	imec
Eye-Tracking, Quality Assessment, and QoE Prediction Models for Point Cloud Videos: Extended Analysis of the ComPEQ-MR Dataset	Shivi Vats, Minh Nguyen, Christian Timmerer, Hermann Hellwagner	2025	IEEE Access	University of Klagenfurt

Additionally, some OC experimenters have also produced scientific publications acknowledging SPIRIT; these are reported in the table below.

TABLE 5: SPIRIT OPEN CALL EXPERIMENTERS' SCIENTIFIC PUBLICATIONS

PUBLICATION	AUTHORS	YEAR	JOURNAL/CONFERENCE PROCEEDING	OC PROJECT INVOLVED
Real-time Point Cloud Transmission for Immersive Teleoperation of Autonomous Mobile Robots	N. Barone, W. Brescia, G. Santangelo, A. Maggio, I. Cisternino, L. De Cicco, S. Mascolo	2025	ACM Multimedia Systems (MMSys) 2025	OC1 Project DIANE

The Stereo Microscope: Stereo 3D images for complex remote soldering teaching	Gunkel, S. N., Klunder, T., Ansorge, F., & Zuraniewski, P.	2025	MMVE 2025 Workshop	OC1 Project ETHOS
Network Music Performance Beyond 4G	K. Tsioutas, Y. Thomas, F. Bistas, I. Barous, G. Xylomenos, G.C. Polyzos	2025	IEEE International Wireless Communications & Mobile Computing Conference (IWCMC)	OC1 Project TE-NeMP
Scalable Secure Platform for XR	Rebecca Acheampong, Bogdan Valentin Floricescu, Ionut Alexandru Oprea, Alexandre Rekeraho, Vladut Gabriel Anghel, Gabriel Danciu, Ioana Corina Bogdan	2025	EEITE 2025	OC1 Project GENBA SAVR
The XR Table: Envisioning the Future of Remote Dining Experiences Using Immersive Telepresence	Andres Santos Torres, Patricia de Torres Coll, Tamás Bukits, Ramon Perisé Moré, and Sergio Cabrero Barros	2025	ACM DIS Conference	OC1 Project BAZKARIA
Ready Expert One: Universal 3D Workbench for Remote Industrial Training	Gunkel, S. N., Klunder, T., and Cernigliaro, G.	2025	ACM IMX 2025	OC1 Project ETHOS
R3-D3: (Photo-) Realistic Real-time Representations of Dynamic 3D-Driven Industrial Trainings	Gunkel, S. N., Klunder, T., and Cernigliaro, G.	2025	ACM IMX 2025	OC1 Project ETHOS
Ultra-low Latency Point Cloud Streaming in 5G	Y. Thomas and G. Xylomenos	2025	EuroXR Conference	OC1 Project TE-NeMP
Seeing Through the Robot's Eyes: Adaptive Point Cloud Streaming for Immersive Teleoperation	Luca De Cicco, Saverio Mascolo	2025	EuroXR Conference	OC1 Project DIANE
HOLOVER-5G: Industrial Trainings Integrating Spatial Gaussian Splats with Real-Time 3D Holograms over 5G	Gunkel, S. N., Klunder, T., Rahim, G., and Cernigliaro, G.	2025	EuroXR Conference	OC1 Project ETHOS
ANNETTE: Immersive AR Telepresence– The Dodona Oracle Experience	Anastasios Manos, Despina Elisabeth Filippidou, George Karanasios	2025	CHIGreece 2025 International Conference in HCI	OC2 Project ANNETTE
MVAW-PCQA: A No-reference Point Cloud Quality Assessment via Multi-View Adaptive Weighting	MohammadAli Hamidi, Simone Porcu, Alessandro Floris, and Luigi Atzori	2025	17th International Conference on Quality of Multimedia Experience (QoMEX)	OC2 Project QEST
Enhancing XR Platform Performance, Security and Scalability with a Microservices Architecture	Oprea, Ionut Alexandru; Anghel, Vladut Gabriel; Floricescu, Bogdan Valentin; Bogdan, Ioana Corina; Danciu, Gabriel; Acheampong, Rebecca; Rekeraho, Alexandre;	2025	ICL2025 (International Conference on Interactive Collaborative Learning)	OC1 Project GENBA SAVR

	Velicea, Fabian Pavel; Parv, Andrei; Car-caleţeanu, Cristian Nico-lae			
Quadruped robot control using immersive inter-faces in emergency con-texts	Anabel Díaz-Labrador, Ángel Delgado, Héctor J. Pérez-Iglesias, Oscar Fontenla-Romero and Jose Luis Calvo-Rolle	2025	XOVE TIC 2025	OC2 Pro-ject ROTIE
Beyond Bounding Boxes: 2D Semantic Segmentation for Live Volumetric Video Streaming	Tamás Bukits, Ander Elo-segi, Ana Dominguez, Sergio Cabrero Barros	2025	3rd International Workshop on Inter-active eXtended Re-ality (IXR'25), ACM Multimedia 2025	OC1 Pro-ject BA-ZKARIA

2.6 OPEN CALL'S PROMOTION

Promoting SPIRIT's OCs was a central activity within WP6, led by D4P in close collaboration with all consortium partners. The calls were advertised through all of SPIRIT's communication channels, including the project website, newsletters, and social media, and highlighted at events whenever opportunities arose.

For each of the two SPIRIT OCs, a dedicated webpage was created on the project website to provide applicants with all relevant information. The pages featured:

- OC documents
- Overview of the OC
- Objectives
- Patron role
- Funding and duration
- Eligibility criteria
- Submission process
- Feasibility advisory
- Dedicated workshop
- FAQ

At the EuroXR conference, all the 11 OC1 projects and 16 OC2 projects actively participated, contributing through posters and, in some cases, with demo sessions.

- The posters presented by the OC1 projects are available here.
- The posters presented by the OC2 projects are available here.

As outlined in the section on promotional materials, the OC projects were also supported with dedicated flyers, roll-ups, and promotional cards distributed during the conference.

Further details on the promotion of each call are presented in Sections 2.6.1 and 2.6.2, re-spectively, covering OC1 and OC2.

2.6.1 Open Call 1

Open Call 1 was launched in March 2024 with an official submission deadline of 27 May 2024. As outlined above, a **dedicated webpage on the SPIRIT website** was created to provide applicants with all the relevant details about the OC.

To support the launch, a dedicated **news item** was published on the website, presenting key information and deadlines. In parallel, a targeted **social media campaign** ran throughout the

application period, highlighting essential aspects such as funding, duration, objectives, and the information webinar.
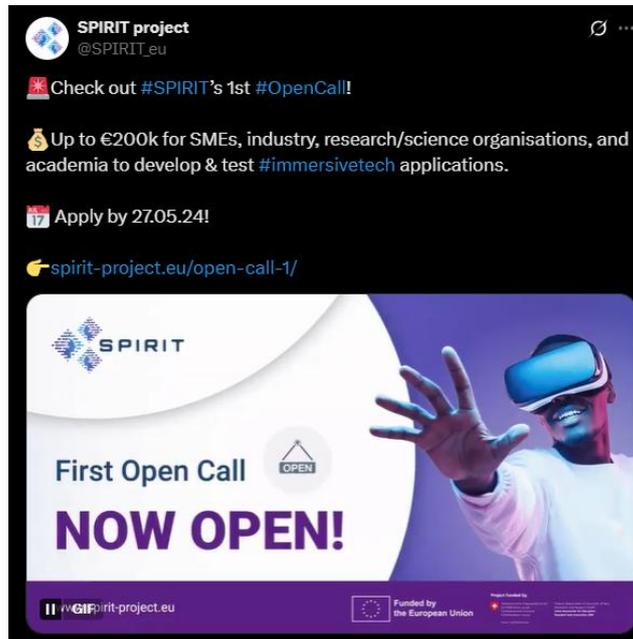
FIGURE 16: SCREENSHOT OF SPIRIT OPEN CALL 1 PROMOTION ON X

The **information webinar** took place online on 16 April 2024. During the session, the consortium presented the OC and provided both technical and administrative guidance on the application process and requirements. It also served as a Q&A opportunity for potential applicants. The slides and recording were made available on the website and promoted further through social media and a dedicated news item.

FIGURE 17: SCREENSHOT OF SPIRIT OPEN CALL 1 WORKSHOP

To facilitate networking, a **LinkedIn group** was established to connect potential applicants with like-minded organisations interested in preparing joint proposals.

The OC was also actively promoted at events and conferences attended by consortium partners. Specifically, imec presented the call at **IEEE NOMS 2023**, the **SII40 Lecture**, and **ICIN 2024**, while the University of Klagenfurt promoted it at the **ACM Multimedia Systems Conference 2024**.

FIGURE 18: PROMOTION OF SPIRIT OPEN CALL 1 AT ACM MULTIMEDIA SYSTEMS CONFERENCE 2024

Promotional materials were produced to maximise visibility, including:

- a flyer featuring key information and a dedicated section on how to apply;
- a rollup, showcased at EuCNC 2024.

FIGURE 19: FLYER FOR OPEN CALL 1 PROMOTION

FIGURE 20: ROLLUP FOR OPEN CALL 1 PROMOTION

The OC was also featured in the **SPIRIT newsletters**: in the second and third editions to attract applicants, and in the fourth to announce the winners. A **press release** further publicised the results while also promoting the upcoming second round of the call.

To celebrate the outcome, the consortium released a **dedicated video** summarising highlights from the 61 submitted proposals and announcing the 11 winners. This video became the most viewed on the SPIRIT YouTube channel, with 362 views.
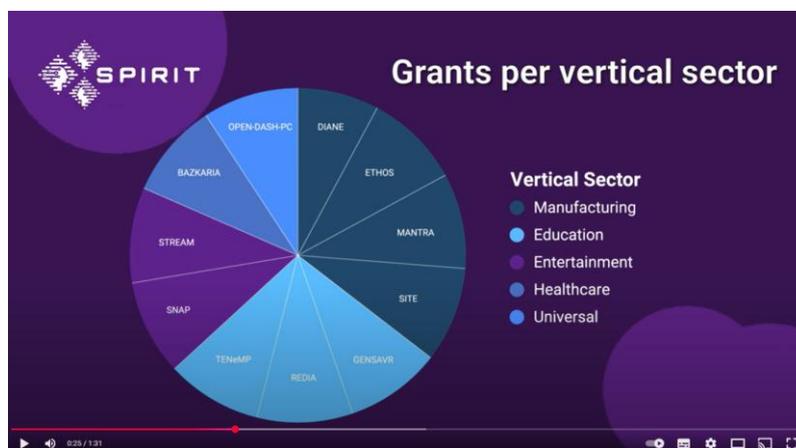
FIGURE 21: SCREENSHOT ABOUT VIDEO FOR OPEN CALL 1 HIGHLIGHTS AND WINNERS ANNOUNCEMENT

In addition, a recap news item was published on the website summarising key insights from the proposals. The consortium also conducted and shared written **interviews with each of the 11 winners**, highlighting their projects' objectives and innovations, their motivation to apply to SPIRIT, and the impact they envisioned for their work. These interviews were further promoted through a **social media campaign**, which simultaneously helped raise awareness for the launch of OC2.

FIGURE 22: SCREENSHOT ABOUT INTERVIEWS WITH OPEN CALL 1 WINNERS

To summarise, the SPIRIT consortium supported the promotion of OC1 through a wide range of actions: publishing a dedicated news item for the launch, running a sustained social media campaign, organising one online workshop, creating a LinkedIn matchmaking group, promoting the call at relevant conferences, issuing newsletters, developing one flyer and one roll-up, releasing a dedicated video on the highlights and winners announcement, publishing 15 news items (including 11 winner interviews), and issuing one press release.

2.6.2 Open Call 2

OC2 followed a strategy similar to OC1, retaining the most effective approaches while incorporating refinements based on the recommendations received during the Review Meeting in November 2024.

The call was launched in October 2024, with the submission deadline set for 19 December 2024. A **dedicated webpage on the SPIRIT website** provided applicants with all relevant information about the call, ensuring easy access to guidance.

Promotion of OC2 on social media began by highlighting the winner interviews from OC1, creating continuity and leveraging previous success. A dedicated social media campaign then ran throughout the application period, presenting essential information such as funding, objectives, eligibility, and submission details.

FIGURE 23: SCREENSHOT OF SPIRIT OPEN CALL 2 PROMOTION ON LINKEDIN

The **online workshop** was held on 4 November 2024. During the session, the consortium presented the OC, providing both technical and administrative guidance, and offered participants the opportunity to ask questions. The slides and recording were made available on the website and promoted further through social media and a dedicated news item. A separate news item was also published to provide ongoing access to these materials.
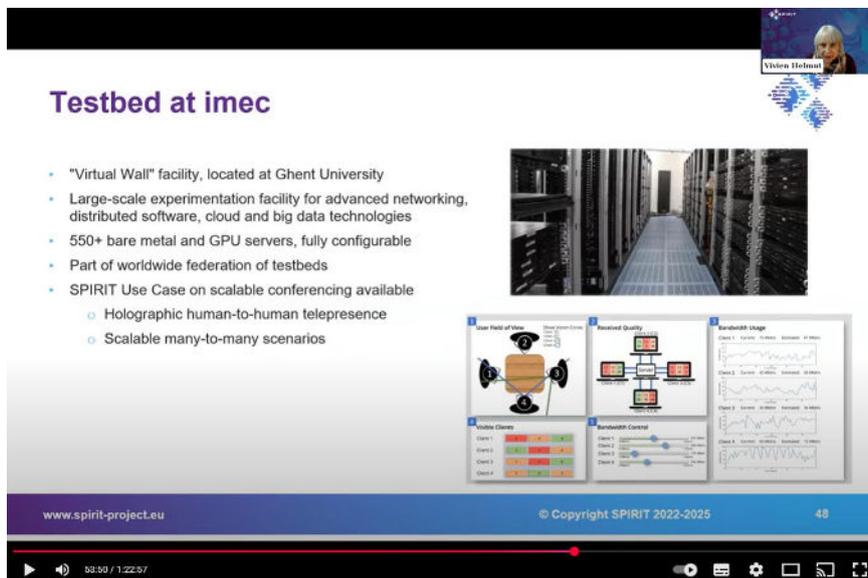
FIGURE 24: SCREENSHOT OF SPIRIT OPEN CALL 1 WORKSHOP

The existing **LinkedIn group** created for OC1 applicants was reused for OC2, facilitating connections between potential collaborators for joint proposals.

OC2 was actively promoted at events attended by consortium partners, including **Open Living Labs 2024** and **STEREOPSIA 2024**, where SPIRIT promotional cards were distributed.

FIGURE 25: SPIRIT PROMOTIONAL CARD FOR OC2 AT STEREOPSIA 2024

The call was also featured in the **SPIRIT newsletters**: in the fourth edition to attract applicants and in the fifth edition to announce the winners. A dedicated **press release** further publicised the results and highlighted the winning projects.

The consortium released a **dedicated video** summarising highlights from the 62 submitted proposals and announcing the 16 winners.

FIGURE 26: SCREENSHOT ABOUT VIDEO FOR OPEN CALL 2 HIGHLIGHTS AND WINNERS ANNOUNCEMENT

A news item on the website further presented the winning projects. Written **interviews with each winner** were also conducted and shared, showcasing project objectives, innovations, motivations for applying, and the envisioned impact. These interviews were further promoted through a social media campaign, which simultaneously helped raise awareness for SPIRIT's broader activities.
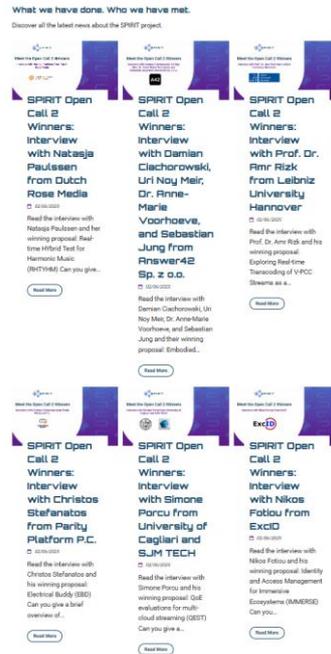
FIGURE 27: SCREENSHOT ABOUT INTERVIEWS WITH OPEN CALL 2 WINNERS

Following the first Review Meeting in November 2024, the consortium acted on recommendations to enhance outreach and improve marketing strategies. In response, promotional efforts were intensified through social media, email campaigns, and the use of **relevant EU projects' communication channels**, such as COROB, EUCloudEdgeIoT.eu, OPENVERSE, NGI Commons, one6G, and 6G-XR.

To reach interested parties in the EU, a dedicated communication about OC2 was sent to the Digital National Contact Points (NCPs) network (Idealist).

To summarise, the SPIRIT consortium promoted OC2 through a combination of coordinated actions: publishing dedicated news items, running a continuous social media campaign, organising one online workshop, using the LinkedIn matchmaking group, promoting the call at two events, featuring the call in newsletters, creating one video summarising highlights and ann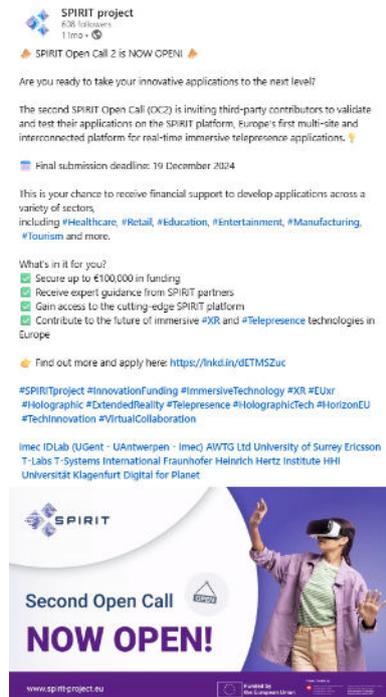ouncing winners, publishing 16 winner interviews, and issuing one press release. Outreach was further amplified through EU project channels, ensuring broader visibility and engagement.

2.7 SYNERGIES AND LIAISONS WITH RELATED PROJECTS AND INITIATIVES

Building connections with other initiatives has been a key part of SPIRIT's strategy to amplify its reach and strengthen knowledge exchange.

Strategic liaison efforts were initially established with other European projects and initiatives, including **TRANSMIXR**, **COROB**, **EUCloudEdgeIoT**, **OPENVERSE**, and **6G-XR**. The focus of these collaborations was primarily on promoting SPIRIT OCs and supporting the dissemination of SPIRIT results. Specifically, a member of the SPIRIT consortium was appointed as TRANSMIXR External Advisory Board member, while SPIRIT acted as a supportive partner of the COROB project, promoting information sharing and collaboration. For EUCloudEdgeIoT, OPENVERSE, and 6G-XR, efforts focused primarily on cross-promotion through social media channels and newsletters.

In response to the recommendation from the First Periodic Review in November 2024 of strengthening collaboration with complementary EU projects, SPIRIT joined the **Beyond-XR cluster** in February 2025 to foster collaboration and enhance visibility. This network brings together leading EU projects in the fields of Extended Reality (XR) and emerging technologies, promoting synergies and amplifying collective impact. Through this collaboration, SPIRIT worked alongside the following projects: CORTEX², XR5.0, XR4ED, HECOF, MASTER, augMENTOR, XR2Learn, SERMAS, TRANSMIXR, XR2INDUSTRY, MOTIVATE XR, OPENVERSE, VOXReality, and GenAI4ED.

In particular, SPIRIT collaborated with CORTEX² for the organisation of a joint workshop at the EuroXR 2025 Conference "Extended Collaborative Telepresence – How CORTEX² and SPIRIT are Advancing Innovation in XR" (see Section 2.4.2 for details), showcasing the outcomes of both projects' OC initiatives.

SPIRIT consistently promoted the cluster and its member projects on social media, while in the monthly cluster meetings, consortium members shared areas where support was needed and offered mutual assistance to other projects, fostering a strong collaborative environment. The primary focus of SPIRIT's engagement in the cluster was on the dissemination of SPIRIT results and tracking the progress of OC projects. As part of the BeyondXR activities, the SPIRIT project contributed to the 5th episode of the "Meet the Experts" webinar series, entitled "Breaking Barriers: How Open XR Standards Unlock Interoperability and Compliance" on 14 July 2025. Representing SPIRIT, Prof. Dr. Hermann Hellwagner (University of Klagenfurt) joined a panel of experts, presenting on topics such as cross-platform interoperability, immersive telepresence, adaptive streaming of point clouds, and the role of open XR standards in supporting innovation.

A dedicated page introduces the projects that SPIRIT liaised with, highlighting its participation in BeyondXR in particular.

TABLE 6: SPIRIT LIAISONS WITH PROJECTS AND INITIATIVES

PROJECT TITLE	DESCRIPTION	KEY ACTIVITIES / LINK WITH SPIRIT
TRANSMIXR	The future of media experiences poses a series of thrilling challenges, and the maturity of eXtended Reality (XR) and Artificial Intelligence (AI) technologies provides a unique window of opportunity for the European Creative and Cultural Sector (CCS) to reimagine digital co-creation, interaction and engagement possibilities. The TRANSMIXR project aims to create a range of human-centric tools for remote content production and consumption via social virtual reality.	SPIRIT consortium member appointed to External Advisory Board; mutual exchange of expertise and guidance; collaboration within Beyond-XR; promoting SPIRIT OCs and dissemination of results.
COROB	The COROB project (COoperative and intelligent multi-ROBotic solution for arc welding-based manufacturing processes) aims to develop a cooperative, intelligent multi-robotic system for flexible and reconfigurable manufacturing in arc welding processes, addressing the needs of HMLV industrial production. By leveraging inspection, monitoring, control, and AI techniques, COROB enhances efficiency and flexibility in line with Industry 5.0 principles.	Supportive partnership; mutual promotion and information sharing; promoting SPIRIT OCs and dissemination of results.

EUCloudEdgeIoT	The EUCloudEdgeIoT.eu initiative aims to realise a pathway for the understanding and development of the Cloud, Edge and IoT (CEI) Continuum by promoting co-operation between a wide range of research projects, developers and suppliers, business users and potential adopters of this new technological paradigm.	Cross-promotion via newsletters and social media; knowledge exchange; promoting SPIRIT OCs and dissemination of results.
OPENVERSE	OPENVERSE project aims to create inclusive, open, and ethically responsible European Virtual Worlds, enhancing the European Union's technological sovereignty in the global arena. Its strategy involves integrating diverse technological expertise, fostering collaborative innovation, and ensuring interoperability, privacy, and security in digital environments. OPENVERSE aims to lay the foundational framework for these Virtual Worlds, combining user co-creation with extended reality technologies, addressing legal and ethical challenges, and guiding future policy and industry standards for globally influential Virtual Worlds.	Cross-promotion via social media; sharing of outreach resources; collaboration within Beyond-XR; promoting SPIRIT OCs and dissemination of results, presentation of OC1 project SITE at OPENVERSE workshop.
6G-XR	6G eXperimental Research's ambition is to strengthen European leadership in 6G technologies by enabling next-generation XR services and infrastructures that will provide beyond-state-of-the-art capabilities towards the 6G era. The project will develop an experimental multi-site Research Infrastructure (RI) to provide a validation platform for various 6G use cases by developing enablers for networking and computing, radio access technologies beyond 5G, enablers for XR services with in-build federation, trial management, abstraction tools as well as energy measurement frameworks.	Cross-promotion via social media; collaboration on communication activities; promoting SPIRIT OCs and dissemination of results.
CORTEX²	CORTEX² aims to facilitate remote collaboration between workers through next-generation XR technology solutions across a wide range of industries and SMEs. To this end, it is developing an innovative XR platform to facilitate work and social activities involving physical interaction with the environment and remote objects — from industrial cooperation to technical training and business meetings.	Collaboration within Beyond-XR; joint EuroXR workshop; shared dissemination activities; dissemination of SPIRIT results and OC progress.
XR5.0	The XR5.0 project will build, demonstrate, and validate a novel Person-Centric and AI-based XR paradigm that will be tailored to the requirements and nature of I5.0 applications. The XR5.0 project aims to develop user-friendly Extended Reality (XR) applications for industrial workers using Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR).	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
XR4ED	XR4ED brings together the EdTech and XR communities to establish a European reference platform on learning and training with XR. This platform will provide a central access point to existing solutions and contribute to Europe's leading position in cutting-edge education technologies.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of

		SPIRIT results and OC progress.
HECOF	The HECOF project aims to revolutionise teaching in higher education through AI-driven, personalised, adaptive learning. Focused on Chemical Engineering, it leverages digital data to enhance student assessment and learning methods. HECOF fosters ethical AI development and supports education sector reform, aligning with the Digital Education Action Plan (2021-2027). It seeks to impact both academic and vocational training by promoting innovative digital teaching practices.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
MASTER	The MASTER project enhances robotics training in manufacturing with its innovative open XR platform. By integrating key functionalities, MASTER creates safe, flexible robotic environments with advanced interaction mechanisms.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
augMENTOR	augMENTOR aims to revolutionise education by integrating emerging technologies into a pedagogical framework focused on developing both basic and 21st-century skills. Using an AI-boosted toolkit, the project will leverage machine learning algorithms to provide personalised learning pathways tailored to individual learners' characteristics and preferences.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
XR2Learn	XR2Learn aims to establish cross-border creation of human-centric XR applications in education. The project will deliver its one-stop shop platform, organised as a Digital Innovation Hub, for all actors involved in the XR-based educational applications supply chain, aimed at enhancing training in manufacturing and distance learning scenarios.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
SERMAS	SERMAS lays the foundations of next-generation XR systems, looking at how people relate and interact with the technology. Transform your eXtended Reality (XR) experience with SERMAS. Embrace social acceptance and discover our concepts, techniques, and tools that will help you discover the full potential of XR systems through coherent design, implementation, and deployment.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
XR2INDUSTRY	XR2INDUSTRY focuses on developing fundamental blocks for a reference XR European platform, marking it as the first European data-aware XR headset. XR2INDUSTRY aims to the creation of a European reference platform aiming to develop and prototype advanced interoperable XR solutions to solve common challenges encountered by the industry (in areas such as assem-	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.

	bly, maintenance, remote operation, training, design, logistics, etc.), placing the wellbeing of workers at the centre of the production process.	
MOTIVATE XR	By making training and the most complex industrial tasks more appealing, safer, and more accessible, MOTIVATE XR aims to contribute to a novel generation of XR collaborative authoring, publishing, and experiencing tool suite for training and assistance to industrial operations such as the assembly, manufacturing, maintenance, and dismantlement of industrial goods. MOTIVATE XR uses the latest advances in No-Code authoring, interactive storytelling, generative AI, knowledge and story graphs, 3D videogrammetry scanning, XR smart headsets and telepresence to showcase a complete, end-to-end solution.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
VOXReality	VOXReality is an initiative that aims to facilitate the convergence of Natural Language Processing (NLP) and Computer Vision (CV) technologies in the Extended Reality (XR) field. They will develop innovative Artificial Intelligence (AI) models that will combine language as a core interaction medium supported by visual understanding to deliver next-generation applications that provide comprehension of users' goals, surrounding environment and context.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.
GenAI4ED	GenAI4ED is dedicated to advancing digital skills for students, teachers, and parents. The initiative goes beyond skill-building; it also explores perceptions of AI in education and identifies practical ways to integrate it effectively. The goal is to empower individuals to use AI tools responsibly, understand their functionality, and use critical thinking to evaluate their applications.	Collaboration within Beyond-XR; mutual promotion and knowledge sharing; dissemination of SPIRIT results and OC progress.

3   STANDARDISATION

In the framework of the Horizon Europe programme, the European Commission prioritises projects integrating R&D and standardisation and bridging the results into concrete innovation. The use of and contributions to standards can bring significant benefits in terms of improved:

- understanding of the state of the art,
- technical knowledge,
- efficiency of project activities,
- compatibility and ease of use for Open Call experiments,
- quality of results, and
- visibility and impact.

The SPIRIT consortium and OC experimenters have thus intensely made use of standardised technology in the course of their projects. Moreover, several SPIRIT partners and OC projects have actively contributed (or plan to contribute) to international standardisation efforts. This chapter reports on Task 6.2, the SPIRIT standardisation activities. More broadly and specifically, we report on the use of standardised technology, the monitoring of standardisation efforts, and active standardisation contributions. Finally, some conclusions are drawn ("lessons learnt").

The planned/potential contributions to standardisation are laid out in Table 7 of D6.1 ("Communication, Dissemination, Standardisation and Exploitation Plan"). The standardisation bodies to be monitored and considered for contributions include MPEG, IETF, 3GPP, W3C, and MSF (cf. Sections 3.2 and 3.3). The nature of the contributions was envisaged to be quite diverse, ranging from monitoring standardisation activities to contributing technology and software.

However, not earlier than in the course of the project the importance and benefits of *making use of standards* and standardised technology became apparent, specifically with respect to devising and preparing the SPIRIT platform and testbeds for the OC projects. This topic is thus the first one to be addressed.

3.1 USE OF STANDARDISED TECHNOLOGY

The SPIRIT platform, use cases and testbeds were devised and built making intense use of standardised technology. This not only fostered the "efficiency of project activities" (as listed in the initial paragraph of this section), but also made the platform, use cases and testbeds attractive, "compatible and easy to use for the OC experiments" (see initial paragraph).

The intense use of standards was emphasised by Prof. Dr. Hermann Hellwagner (University of Klagenfurt) in his presentation "The Use of Standards and the Challenges of Standardisation in the SPIRIT Project" for the BeyondXR webinar "Breaking Barriers: How Open XR Standards Unlock Interoperability and Compliance", mentioned earlier in Section 2.7 of this report. Figure 28, one of the slides of this presentation, exemplifies that standards and standardised technologies — including formal ones like WebRTC and content encoders/decoders and de-facto standards like Unity and QoE study recommendations — were used widely and on all levels of the SPIRIT architecture.
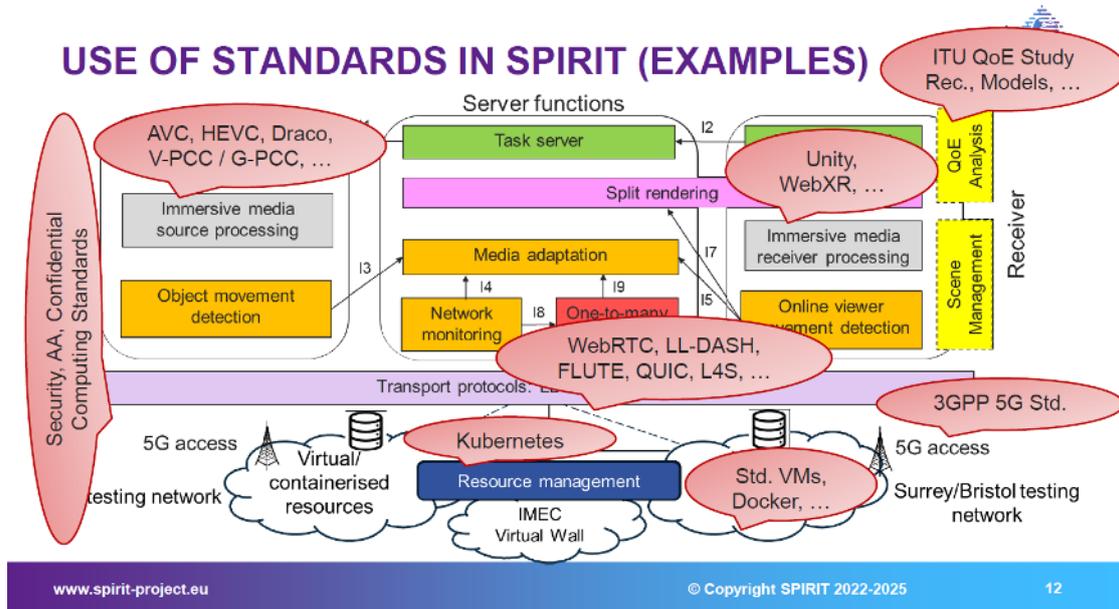
FIGURE 28: SLIDE ON THE USE OF STANDARDS IN SPIRIT

Obviously, without the use of these standardised technologies, creating the SPIRIT use cases, building the SPIRIT platform and setting up the SPIRIT testbeds would have been tedious, ineffective and slow. The most important benefit of the use of standards was, however, that OC experimenters – themselves deploying pertinent standards for their applications and technology innovations – were familiar with or ready to use the SPIRIT platform/use cases/testbed standards as well. This certainly was one of the reasons why the SPIRIT Open Calls raised great interest and many good proposals. And finally, the fact that most OC projects managed well to integrate their applications and innovations in the SPIRIT testbeds also provides evidence of the significance of standards and SPIRIT's approach.

Frankly, that importance and those consequences of the use of standards in SPIRIT's and the OC projects' R&D and innovations were not fully anticipated but unfolded conveniently during the project.

3.2 MONITORING OF STANDARDISATION ACTIVITIES

As specified in D6.1, in Task 6.2 we continuously monitored:

- SPIRIT technologies, innovations and results for eligibility for standardisation (by reviewing WP 2, 3 and 4 deliverables and discussing with partners) and
- the work and progress of standardisation bodies w.r.t. relevance for SPIRIT.

Progressing along the five standardisation bodies to monitor according to Table 7 of D6.1, the outcome of these efforts are summarised as follows.

Moving Picture Experts Group (MPEG) – MPEG-I

The Immersive Media (MPEG-I) part of ISO/IEC MPEG showed limited activity relevant for SPIRIT. In particular, there did not seem to be significant progress on the point cloud compression standards (V-PCC and G-PCC); most importantly, in the course of the SPIRIT project no tools appeared that would work for real-time point cloud-based telepresence applications.

UNI-KLU's QoE studies on dynamic point cloud presentations (cf. D4.3) were identified as potential contributions to MPEG-I; cf. Section 3.3.

Internet Engineering Task Force (IETF) – APN

UoS/UoB performed relevant research on application-aware networking (APN), for instance the "User-Intent Driven Network Adaptation" work (cf. D3.3), but had no opportunity to contribute to the IETF standardisation process.

3rd Generation Partnership Project (3GPP) – SA4

EDD submitted some early contributions to the 3GPP SA Working Group WG4 (SA4 – Multimedia Codecs, Systems and Services; cf. Section 3.3), but performed no further pertinent work in later phases of the SPIRIT project.

Vice versa, SA4 activities that would be relevant and useful for SPIRIT could not be identified.

World Wide Web Consortium (W3C) – WebRTC

In general, there was not too much activity on WebRTC in SPIRIT's lifetime. The most interesting, but not fully relevant activity and document was "WebRTC Extended Use Cases" (14 December 2023) which addressed low-latency communication in general, but not specifically immersive content and services.

Metaverse Standards Forum (MSF)

As a monitoring member, UNI-KLU continuously monitored the MSF messages, activities, groups, and meetings. The SPIRIT consortium was always informed about potentially relevant activities.

Two items appeared to be really relevant for SPIRIT, yet eventually were of limited utility:

- MSF Network Requirements and Capabilities WG: "D1: Network Requirements for Metaverse Services", 23 September 2024. Unfortunately, the document was too late for the requirements definition phase of SPIRIT (WP2), but work-in-progress versions provided some input.
- MSF Volumetric Media Interoperability WG: "Volumetric Media Interoperability Town Hall", 26 November 2024. This was an interesting online workshop with an emphasis and demonstrations on immersive content coding and applications. Again, unfortunately this workshop was too late to inform SPIRIT's content coding decisions.

We realised that MSF seems to be a big, complex endeavour, difficult to follow and understand. Thus, the understanding of MSF developed by the SPIRIT consortium was limited, and contributions to MSF were beyond reach.

3.3 CONTRIBUTIONS TO STANDARDISATION

Actively contributing to standardisation processes is challenging and requires specific expertise; cf. Section 3.4. Despite these challenges, two SPIRIT partners as well as two OC projects successfully contributed to standardisation (or plan to do so), as Table 7 documents.

TABLE 7: SPIRIT CONTRIBUTIONS TO STANDARDISATION

STANDARDISATION BODY	GROUP	CONTRIBUTIONS	CONTRIBUTING PARTNER
MPEG	MPEG-I	Input contribution (ComPEQ-MR point cloud dataset) to MPEG AG 5 (MPEG Visual Quality Assessment) and WG 7 (MPEG 3D Graphics and Haptics Coding), for the MPEG meeting #148, Kemer, Turkey, 4–8 November 2024	UNI-KLU

		Input contribution (extended analysis of the subjective QoE study based on the ComPEQ-MR dataset) to MPEG AG 5 and WG 7, for the MPEG meeting #152, Geneva, Switzerland, 7–11 October 2025	
3GPP	SA4	Three input contributions for the SA4 meeting #121, Toulouse, France, 14–18 Nov. 2022 One input contribution for the SA4 meeting #122, Athens, Greece, 20–24 February 2023	EDD
IEEE	P1955	Contribution to IEEE P1955 (Standard for 6G Empowering Robotics: Use Case Scenarios, Requirements, Architectural Impact, and Technical Assumptions): The project results have been considered as one use case suitable for 6G architecture definition.	OC1 project MANTRA
MPEG 5G-MAG (Media Connectivity Association)	MPEG Systems MAG (Media Action Group)	Plan to contribute a demonstration of the project results; potential further experimentation or contributions	OC1 project OPEN-DASH-PC

It is worth noting that some OC projects specifically reported that they contributed to international endeavours other than standards, most notably to open-source projects. Examples are:

- OC2 project AIVATAR: *"Our work focused on implementing existing standards and contributing to open-source tools that support them: The project's core technology implemented the MPEG-5 Part 2 LCEVC standard. We contributed fixes to the open-source GStreamer VMAF plugin and submitted a corresponding patch to Netflix's core VMAF library to resolve a bug. We are also preparing to contribute a new video mixer and encoder statistics utilities upstream to GStreamer."*

- OC2 project QUEST: *"We do not directly contribute to the IETF MoQ working group, but we have been in correspondence with some of the key figures of the working group (for example here: https://discord.com/channels/1124083992740761730). We have also contributed patches to these people's open-source MoQ project (https://github.com/cloudflare/moq-rs)."*

- OC2 project HOPE: *"Our work in the HOPE project aligns closely with existing industry standards and contributes to broader standardization efforts in the 3D and XR ecosystem. The system leverages WebXR2 for client rendering and WebSocket3 for real-time data transmission, ensuring interoperability with established web-based XR frameworks. Additionally, Phasmatic actively participates in the Khronos Group4 as well as the Metaverse Standard Forum, supporting the development and harmonization of open standards for 3D content and extended reality. Through this engagement, the project's results help validate and refine best practices for asset compression (via Google Draco6) and data handling pipelines that are compatible with cross-platform, standards-based XR environments."*

- OC2 project RHYTHM: *"While no formal standardization body engagement occurred during RHYTHM, the project aligned with emerging best practices in WebRTC-based streaming and XR performance evaluation. The structured use of ITC-SOPI and QoE tools for benchmarking immersive user experience contributes toward informal standard-setting for remote concert delivery in VR. These learnings are now informing internal documentation and cross-partner collaboration templates for future interoperability. Additionally, the ITC-SOPI framework is currently being promoted within the CIIIC consortium for broader application in immersive culture and co-creation projects, with the aim of harmonizing evaluation methods across institutions."*

Most other OC projects reported that they beneficially aligned with, made use of, or validated international standards or standardised technology and acquired expertise therein.

3.4 LESSONS LEARNT

Standardisation is a specific activity that requires specific interests, commitment and skills. Several partners of the SPIRIT project have actively and successfully contributed to international standardisation efforts, in part for many years, in different standardisation organisations. From these previous activities and the pertinent work in SPIRIT, we can conclude as follows:

- The use of standards and standardised technology is of utmost importance, both for the core project consortium to make R&D efforts effective and successful and – in case of cascade funding – for Open Call experimenters to make core project's results (e.g., platform, use cases, testbeds) compatible and easy to use.

- Active contributions to standardisation come with challenges including:

    o Standardisation is a long process, often extending beyond the timeframe of a typical EC project; it needs long-term commitment and specific expertise.
    o Standards-defining organisations, even monitoring of and assessing standardisation activities, are complex, take time, need effort, and legitimate interest.
    o Standardisation in the XR domain is more fragmented than in other fields (such as video compression or network protocols) where SPIRIT consortium members had acquired expertise and provided contributions. Beyond the standardisation bodies addressed above, many others are active and relevant, e.g., other ISO/IEC groups, Khronos Group (OpenXR), W3C Immersive Web (WebXR), ETSI (Augmented Reality Framework ARF), IEEE, ITU-T, etc., as impressively shown by the [XR and Metaverse Standards Register](#) of VDC Fellbach. It is demanding to find one's way in this plethora of standardisation groups and activities.
    o It is difficult to identify and do relevant, impactful, decisive work, rather than creating "yet another standard".

4 EXPLOITATION

SPIRIT has a dedicated Task (Task 6.3) under the WP6 "Impact Creation and Outreach" which focuses on the maximisation of the impacts created by the project by facilitating the use of its outputs and findings. The specific objectives of the exploitation plan are to:

- assess the market and identify the most relevant business opportunities based on the addressed application scenarios;
- develop a business strategy and a plan how to address the market after the end of the project; and
- define a set of relevant parameters to measure and monitor the success of these actions.

4.1 EXPLOITATION DEFINITION

The article 16 of the GA defines "exploitation" as follows: "*The use of results in further research and innovation activities other than those covered by the action concerned, including among other things, commercial exploitation such as developing, creating, manufacturing and marketing a product or process, creating and providing a service, or in standardisation activities*".

Based on this definition each beneficiary must take measures aiming to ensure the exploitation of their results, either by themselves (e.g., for further research or for commercial or industrial exploitation in its own activities) or by others (other beneficiaries or third parties, e.g., through licensing or by transferring the ownership of results). To do so, all the beneficiaries have to take specific measures to ensure that their results are used, enhanced or will be the base for further activities.

4.2 EXPLOITATION STRATEGY IN SPIRIT

The exploitation strategy of SPIRIT targets **three main objectives**. The first objective is to contribute significantly to European technology domains, society and economy, which is complemented by the second objective to mitigate the risks and entry barriers for real-time immersive telepresence services. The third objective is to strengthen the global position of the consortium's scientific and commercial partners.

For the creation of a well-formulated and comprehensive exploitation plan, the SPIRIT consortium identified a preliminary list of Key Exploitable Results (KERs) that were to be developed during the execution of the project, see Section 0. For the KERs, their potential use, target market, success measures, and responsible partners were determined during the project.

The aim for the exploitation activities is to lay the foundations to:

- maximise the impact of the project results;
- utilise and exploit the project results during and after the duration of the project; and
- incorporate project results into future strategic planning for telepresence applications in various sectors.

4.2.1 Contributions to European Technology Domains, Society and Economy

Future services based on the SPIRIT framework will enable a completely new level of immersive communication and collaboration and have game-changing impact on both economical and societal sustainability.

The partners will exploit the project results for providing new capabilities to large-scale

telepresence services that will create an important impact for our society but also for the European economy as the limitations of current video-based communications will be overcome. People will be able to communicate, collaborate, work, and study remotely as well as interact with machines naturally with full immersion.

Exploiting the SPIRIT project results will create significant **impact on technology, society and economy** at different time scales.

TABLE 8: IMPACT CREATED BY EXPLOITED RESULTS

TIME FRAME	IMPACT TARGETS
Near and mid-term impact	**Technology:** SPIRIT will substantially contribute to the acceleration of telepresence technologies with newly built network and application platform capabilities that are able to demonstrate a wide variety of vertical applications at large scale. **Internet users:** Successful demonstration of the use cases within the project will lead to future emergence of commercial telepresence-based services in different vertical sectors, which will improve the standard of living of European Internet users, including remote working, learning, healthcare, and entertainment. **Telecom industry operations:** It is expected that the rapid growth in the diversity of telepresence applications and the incurred content volume will soon push the increase of immersive media content traffic demand to be carried by the underlying networks. This can be one of the key driving forces for telecoms to develop technologies to tackle the challenge, e.g., network slices for immersive media or even 6G technologies.
Long term impact	**Economy:** Telepresence-enabled industry remote control and professional skill training will substantially improve the industry productivity and efficiency, making them resilient to social/environmental disruptions such as the COVID-19 pandemic. Meanwhile, consumer markets, such as entertainment, leisure, and tourism, will also benefit from immersive XR technologies with emerging telepresence-enabled services, thus creating new revenues in the respective markets. **Society:** The innovations and the developed technologies from the project will also potentially change human behaviour in the digitised society, and lead to a proliferation of remote-* activities (working, learning, medical treatment, leisure, etc.) that can be performed without being physically together. **Environment:** As the result of potential change of behaviours of people in future daily activities, substantially reduced travelling will also help to reduce CO_2 footprint.

4.2.2 Mitigation of Risks and Barriers to Market Adoption

For the market introduction of future services, it is crucial to identify potential risks and entry barriers and to take measures to reduce these risks and entry barriers. Even if we see no fundamental barriers to achieving the intended impact as described in the section above, project results are analysed for their risk and barrier minimising potential. The results identified as relevant are exploited for the mitigation of risks and entry barriers for the market introduction of future real-time immersive telepresence services.

TABLE 9: MITIGATION OF RISKS AND BARRIERS BY EXPLOITING RESULTS

BARRIER	BARRIER DESCRIPTION	MITIGATION
Technology and infrastructure deployment costs	Given the relatively high bandwidth and data processing power requirements for supporting tele-presence-based services, infrastructure providers may face the barriers of high CAPEX/OPEX in deployment.	The market assessment includes an analysis of relevant costs of technology development, including the required computing and communication resources, typically in the context of 5G networking and edge computing. This will help to identify potential bottlenecks, i.e., **potential for cost optimisation**, towards future technology deployment with cost efficiency awareness.
Uncertainties in user adoption	Although the end user tests to be performed during the project reported satisfactory user experiences, there is still uncertainty in user adoption, including the factors of high price and device usability.	The user experience studies conducted are a base for **commercial marketing surveys** to obtain information on customer views in the context of different applications.
Lack of killer application use cases	Despite various potential application scenarios that have been envisaged, there is no distinct killer application in the market that is able to provide a decisive push for commercial adoption.	The application use cases submitted from **open call participants** with a range as wide as possible, will be analysed regarding their **business potentials** together with the relevant stakeholders both inside and outside the project team.
High energy consumption required for transmitting and processing telepresence content	Although future telepresence-based services can substantially help to reduce CO_2 emissions thanks to reduced necessity of physical travelling, higher content processing demands may increase the energy consumptions of the required IT resources.	The infrastructure providers in SPIRIT will aim to measure and quantify the energy consumption levels for content processing tasks in the testing activities to **minimise the required power** for content processing and delivery operations.

Throughout the project, the identified barriers were monitored and discussed within the consortium. While not all mitigation actions were implemented exactly as planned, each barrier was addressed in a pragmatic way, and none developed into a critical issue. Below is an **overview of how each barrier was practically handled** and its final status.

Technology and Infrastructure Deployment Costs

This barrier was monitored during technical and market activities. Partners gained sufficient insight into infrastructure requirements during prototype development, testing, and Open Call experiments. Because much of the testing relied on shared or existing infrastructure, cost pressures were less critical during the project timeline. As a result, a more extensive mitigation strategy was not necessary.

Uncertainties in User Adoption

In the project, a platform for subjective quality assessment in Mixed Reality Environments was further developed. Several user studies were conducted which delivered valuable feedback on usability and acceptance. Additionally, Open Call partners provided real-world scenarios that extended the data basis beyond the user studies. While full commercial marketing surveys were not executed, the insights gathered proved adequate to assess adoption potential. The planned mitigation was therefore partly replaced by these broader evaluation activities.

Lack of Killer Application Use Cases

The wide range of Open Call projects, spanning training, health, culture, robotics, digital twins, and telepresence, effectively broadened the application landscape. Although no single "killer application" emerged, the variety of validated use cases demonstrated the versatility and market relevance of SPIRIT technologies. This reduced the need for a formal comparative analysis, as practical experimentation by external partners provided the required insights.

High Energy Consumption for Telepresence Processing

Energy measurement capabilities were integrated (e.g., Kubernetes power monitoring), and selected tests—such as immersive conferencing experiments—yielded informative results. Although a full quantitative energy assessment for all VR/AR scenarios was not completed, the activities carried out provided sufficient understanding of where energy bottlenecks occur (e.g., massive client-side decoding of high quality video streams). Several originally planned actions proved unnecessary as technical findings showed energy use to be less critical in certain components or were covered by related research efforts.

Even though some mitigation measures were implemented in a lighter or adapted form, all risks were monitored, and the project achieved a balanced and pragmatic handling of the identified barriers. Practical experimentation, Open Call involvement, and iterative system integration helped ensure that no barrier posed a significant threat to the project's technical progress or exploitation potential.

4.2.3 Market Assessment and Identification of the Most Relevant Business Opportunities

The European market for immersive communication and collaboration is rapidly evolving within the context of digitalisation and new working models, offering significant opportunities for telecom companies as enterprises increasingly rely on virtual interaction, hybrid collaboration, and immersive customer experiences.

Market Size and Growth

Immersive communication and collaboration are key segments within the European AR/VR market, estimated at approximately €10.7 billion in 2025 with annual growth rates exceeding 35% through 2033 [1].

Europe is heavily investing in digital infrastructure, especially 5G, to enable seamless, low-latency real-time communication and immersive collaboration services [2].

Key Drivers and Use Cases in Immersive Communication and Collaboration

The Ericsson ConsumerLab report *"10 Hot Consumer Trends 2030 – The Everyspace Plaza"* [3] envisions a future where digital and physical realities merge seamlessly across diverse spaces. Key use cases highlighted include:

1. **Connected and adaptive spaces**: homes, workplaces, and public areas that dynamically adjust to individual needs using AI and IoT.

2. **Immersive virtual worlds**: enhanced VR/AR experiences enabling realistic collaboration, entertainment, and shopping.

3. **Blended urban landscapes**: smart city infrastructure that integrates real-time data to manage energy, safety, and transport.

4. **Personalised health and wellness zones**: spaces equipped with sensors and AI to monitor and support well-being.

5. **AI-driven retail and commerce**: physical and virtual marketplaces working together for frictionless purchasing.

6. **Sustainable and efficient living environments**: buildings and public spaces optimised for resource efficiency.

Virtual Workplace Collaboration

Companies increasingly adopt immersive collaboration tools enabling meetings, workshops, and co-creation in virtual 3D environments. Studies show that immersive meetings can boost productivity by up to 25% and improve employee satisfaction [4].

For telecom companies and telecom providers, providing integrated high-bandwidth, low-latency network solutions is expected to become a growing business area [5].

Customer Service and Immersive Consulting

Telecom providers offer immersive self-service and advisory formats such as virtual stores or AR-assisted product consultations, enhancing customer experience and reducing support costs. More than 70% of European companies expect to transform their customer support processes with immersive media [2].

Remote Training and Learning

Immersive training programs for professionals and technical staff deliver improved learning outcomes, fewer errors, and shorter onboarding times [1].

Europe-wide platforms are emerging that offer VR/AR learning as a SaaS model, often combined with AI-driven learning paths.

Analysis of the SPIRIT platform application scenarios and enabling technologies reveals clear priorities for market entry and exploitation.

Multi-Source Holographic Streaming (UC1) emerges as the leading business opportunity, addressing strong demand for collaborative, real-time, multi-user XR environments. This use case is central to Industry 4.0, upskilling and remote training, live events, global team collaboration, and virtual tourism, all sectors projected for substantial investment and adoption in the coming years.

Distributed steering of autonomous mobile robots (UC4) follows closely, as industrial automation, logistics, and smart infrastructure shift toward remote, resilient, and real-time control fuelled by labour dynamics, rising robotics adoption, and ongoing 5G rollout. Business opportunities here are substantial, with direct value for manufacturing, utilities, and hazardous environment operations.

Holographic human-to-human communication (UC3) represents a high-potential but still emerging opportunity. This scenario enables the next generation of immersive remote collaboration for telemedicine, scientific cooperation, and high-value customer engagement. Its adoption is expected to rise as device ecosystems mature and costs decrease, offering entry points in training, specialist consultation, and creative industries.

Real-time animation and streaming of realistic avatars (UC2) addresses business opportunities in cultural, creative, education, and retail sectors, where digital humans can enrich interaction and storytelling. While currently more niche and sector-specific, its business significance is expected to grow as XR hardware becomes widespread and digital-first experiences are prioritised by both consumers and enterprises.

This is also reflected in the selection in our open calls.

Confidential Computing for Telepresence Applications

Confidential computing offers a significant opportunity for enhancing telepresence applications by providing highly secure environments for data processing and storage. This technology allows sensitive data to be processed in isolated environments, ensuring data privacy and reducing risks associated with unauthorised access.

Enhancing Data Privacy and Security:

Telepresence applications involve the transmission and processing of vast amounts of sensitive data, including video streams, audio communications, and other interactive elements. Confidential computing can secure this data by leveraging Trusted Execution Environments (TEEs). These TEEs ensure that data remains encrypted and secure even during processing, mitigating the risks of data breaches and unauthorised access. Gartner listed it as one of the top strategic technology trends for 2026.

Business Opportunities:

1. Secure Real-Time Communications:
   - Confidential computing can enhance real-time telepresence applications by ensuring that communications are encrypted end-to-end. This can be particularly valuable in sectors such as healthcare and legal services, where privacy and confidentiality are paramount.
   - Using TEEs, telepresence platforms can offer secure consultations, remote surgeries, and other sensitive interactions, opening new avenues for telehealth services.
2. Data Protection in Collaborative Environments:
   - Businesses can utilise confidential computing to protect data during remote collaboration sessions, including design, brainstorming, and strategic planning meetings.
   - Enhanced security features can attract industries with high data sensitivity, such as finance and defense, ensuring confidential information remains protected during discussions.
3. Regulatory Compliance and Trust Building:
   - Confidential computing supports compliance with stringent data protection regulations like GDPR, ensuring that telepresence solutions are legally robust and trustworthy.
   - By demonstrating commitment to data privacy and security, companies can build customer trust and differentiate themselves in the competitive telepresence market.

Integration with Existing Services:

Confidential computing can be integrated with existing telepresence services, providing an additional layer of security without compromising performance. For example, integration with cloud services like the Open Telecom Cloud allows hybrid cloud deployments, balancing flexibility and security.

Leveraging Encrypted Environments:

Organisations can deploy AI and machine learning in TEEs for tasks requiring sensitive data analysis, like patient diagnostics or fraud detection in financial services. Confidential computing ensures these processes are secure, preventing data exposure and enhancing the reliability of AI outputs.

By adopting confidential computing, telepresence applications can provide secure, reliable, and compliant solutions that address the growing demand for privacy and data protection in digital communications, fostering new business opportunities and operational efficiencies.

4.2.4 Business Strategy and a Plan How to Address the Market

Strategic Perspective

Immersive communication represents the next major evolution in digital interaction — following text, images, and video — by enabling a sense of digital presence. The project partners have developed a multi-site and interconnected framework designed to support heterogeneous collaborative telepresence applications at scale. This framework has the potential to redefine how people, businesses, and societies interact.

From a business value perspective, immersive communication enables new revenue streams for the participating partners, premium service offerings, and innovative customer experiences. Economically, it strengthens customer loyalty and opens opportunities for upselling in the future. Technologically, it positions the European project partners as front-runners in shaping next-generation communication ecosystems. By creating a stronger sense of presence and connection across distance, it fosters deeper engagement in professional and personal contexts.

The project partners built upon their pre-existing immersive communication platforms, which had been independently developed prior to the project. Within the project, these platforms were further enhanced, harmonised, and interconnected, leading to a robust and flexible ecosystem for immersive applications.

Through two Open Calls, selected external partners were granted access to these enhanced platforms. They integrated their own services and products, such as training modules, tele-operation tools, and entertainment applications, and further improved them by leveraging the project's technological environment. As a result, the Open Call partners are now able to offer new and improved services to their customers, extending the project's impact beyond its original consortium.

The insights gained from the Open Call partners' experiments have been directly incorporated into the business and technology strategies of the main partners. New requirements, goals, and visions for further platform development were identified and will be included in the partners' product roadmaps to ensure that future iterations align with both market needs and EU strategic objectives.

The business strategy of the consortium addresses three main objectives:

1. **Better customer engagement**: delivering experiences that go beyond traditional voice and video, fostering stronger emotional and professional relationships.
2. **Revenue growth**: monetising immersive services through tiered offerings, enterprise packages, and B2B/B2C solutions. Deutsche Telekom's focus will be on industrial and enterprise services.
3. **Brand positioning**: demonstrating innovation leadership and alignment with the corporate vision of enabling meaningful digital lives.

This strategy fully aligns with the mission and brand promise of the partners: connecting people and businesses in ways that are seamless, secure, and transformative.

Market and Competitive Perspective

The market outlook for immersive communication in telecommunications is accelerating, driven by 5G, edge computing, cloud gaming, and affordable XR devices. Forecasts indicate strong growth in enterprise collaboration, training and education, healthcare, and entertainment use cases.

Key competitors include global hyperscalers and specialised XR companies. The consortium's differentiation lies in the combination of trusted network performance, robust security and compliance, and deep integration capabilities within existing telecom infrastructure. Local presence and adherence to European regulatory standards provide an additional competitive advantage.

Strategic partnerships with device manufacturers, content providers, and application platforms are essential for scaling the solutions to wider markets. The Open Call mechanism has proven to be an effective instrument for ecosystem expansion, attracting SMEs and startups that contributed innovative use cases and validated the platform technologies. This collaborative model enhances market positioning and fosters cross-industry adoption of immersive communication technologies.

Technological Perspective

A scalable solution requires a robust technology stack:

- Networks: low-latency 5G and fiber backbones enabling real-time rendering.
- Platforms: cloud- and edge-based orchestration for immersive content.
- Hardware: XR headsets, AR glasses, haptic devices, and AI-driven media processing.

Integration with existing IT and telecom infrastructures ensures reliability and adoption. Key demands include network slicing for QoS, data infrastructure with edge nodes, end-to-end security, and compliance with GDPR and other regional regulations. User privacy must be safeguarded with transparent policies and privacy-by-design principles.

Operational and Organisational Perspective

To ensure measurable impact, the partners plan a phased implementation roadmap:

1. Pilot phase with selected enterprise and consumer use cases, focusing on validating platform performance and interoperability.
2. Commercial rollout, targeting specific verticals and markets, especially in industrial services, training, and teleoperation.
3. Scaling phase, leveraging the partner ecosystem and cross-industry collaborations for broader adoption.

A cross-functional governance model will combine business, technology, and customer-experience units. Required resources include XR specialists, network architects, product managers, and partner managers.

The Open Call participants acted as early adopters and co-developers, validating the platforms in more realistic environments and demonstrating feasibility.

Success will be measured through Key Performance Indicators (KPIs) such as adoption and usage rates, user satisfaction (NPS), incremental revenue, and operational efficiency gains.

User Experience and Storytelling

The ultimate success factor of immersive communication lies in user experience design. Solutions must be intuitive, accessible, and emotionally engaging. In teleoperation use cases, situational awareness and safety are essential to build user trust. Automated assistance features, such as autonomous navigation or object detection, simplify interaction and strengthen confidence in the system. In training applications, realistic, interactive simulations improve knowledge transfer and skill retention.

Storytelling is a central design principle — it provides orientation, motivation, and a coherent brand narrative. By embedding storytelling into the user experience, immersive services become not only functional but also memorable and emotionally resonant. This narrative approach reinforces the brand identity and strengthens the relationship between users and service providers.

As an example, the project partner Ericsson developed and tested future scenarios for immersive communication and collaboration in several user studies, providing valuable insights into user behaviour, expectations, and the perceived value of digital presence.

The demonstrators from the Open Call partners further served as storytelling showcases, illustrating real-world benefits and sector-specific applications, thereby amplifying the visibility and exploitation potential of the project's results.

4.2.5 Individual Exploitation

In this section each partner indicates their own individual exploitation plan. These plans were regularly updated to ensure that the widest communication and dissemination of the results generated by SPIRIT can be achieved, protected, and exploited.

The project's initial exploitation plan for individual project partners is presented in the second column of Table 10. During the project lifetime, these plans were revised as represented in the third column of Table 10.

TABLE 10: INDIVIDUAL PROJECT PARTNER EXPLOITATION PLANS

PARTNER	INITIAL EXPLOITATION PLAN	FINAL EXPLOITATION PLAN
IMEC	imec will expand its research and innovation activities in immersive multimedia delivery services, foster new national and international collaborations and pursue valorisation opportunities via licensing mechanisms, joint-ventures and spin-off creation. SPIRIT will enforce imec's position as a centre of expertise in (beyond) 5G network and service management.	imec will strengthen its position as a leading research centre in cloud-native networking and AI-based orchestration for immersive applications. Building on the results of SPIRIT, imec will enhance its portfolio of intelligent management solutions for cloud infrastructures, networking enablers, streaming protocols, encoding techniques, and QoE monitoring. These innovations will be applied across key verticals such as healthcare, media and entertainment, education and training, and industry and enterprise, and enhanced through future research collaborations.
EDD	EDD will provide the innovation platform to enable authentic 3D communications on 5G networks. EDD will exploit the adoption of integrated use-cases for enterprises and consumers and work with telecom operators. We will contribute to the development of standards for XR communications to support a wide scale of ecosystem applications.	EDD leverages the results to advance the understanding of the characteristics of holographic communication and their impact on the network. In collaboration with Open Call partners and SMEs, EDD further seeks to investigate representative real-world applications, thereby linking technical findings with practical implementation scenarios, e.g., audio rendering for AR telepresence and real-time hybrid test for harmonic music.
DT	DT uses the results of this project as a basis platform for own next generation high quality XR telepresence service offerings or as an open platform for 3rd parties based on the developed Edge cloud platform. The project outcome will also be used as valuable input for future enhancements in DT's network. Additionally, T-Systems will examine whether the results can expand the "Autonomous Logistics" products.	DT uses the results of this project as a basis platform for high quality telepresence service offerings focusing on B2B services in industry and healthcare. The project outcome is also used as valuable input for future enhancements in DT's network. The security technologies developed and proved in the project are valuable input to enhance DT's cloud security portfolio. T-Systems will use the results to expand future "Autonomous Logistics" products. Specific KERs see below.
DT	Security solutions developed in the project will be used to enhance DT's cloud security portfolio.	DT builds on the confidential computing concepts and prototypes developed for the SPIRIT project to develop a sovereign, European edge cloud continuum in the IPCEI CIS project enhanced with confidential computing capabilities. The IPCEI CIS platform extends the technologies developed in the SPIRIT project and pursues a Kubernetes-first approach with confidential container technology. The IPCEI CIS project

		will realise the European vision of sovereign cloud stack with strong security and privacy guarantees.
HHI	Fraunhofer HHI will leverage the platform to carry out future research activities as well as industrial projects and collaborations regarding interaction with virtual humans, virtual human representation, immersive telepresence applications but also application-oriented projects, e.g., AR/VR-based training and education, tele-medicine etc.	Fraunhofer HHI leverages the results to generate new research paths that extend the realistic representation of humans and the streaming capabilities of XR-based systems. The knowledge and tools gained throughout the project have provided valuable insights on the challenges associated with these technologies. The integration of the Avatar use case in multiple sectors as part of the Open Calls demonstrates the potential of the results achieved, and its modular approach guarantees the further inclusion of state-of-the-art technologies.
UNI-KLU	UNI-KLU will use the SPIRIT system and technologies as a basis for research activities and industrial collaborations on future (immersive) multimedia systems and services, e.g., in the CD laboratory ATHENA (https://athena.itec.aau.at/) run jointly with UNI-KLU's spin-off company BITMOVIN; furthermore, to teach to computer science students the fundamentals and technologies of immersive telepresence and collaboration systems.	UNI-KLU will use the SPIRIT technologies and the acquired expertise for research activities and industrial collaborations on future immersive multimedia systems and services. Ongoing collaboration with UNI-KLU's spin-off company BITMOVIN provides the opportunity to feed the SPIRIT expertise and technologies into the company's innovation system. The expertise and contacts built within SPIRIT are being used for further national and European research project proposals, particularly on using AI for multimedia processing and transmission. The QoE evaluation results and expertise will continue to inform the pertinent ISO/IEC MPEG standardisation, thus increasing visibility of the research. Finally, the SPIRIT results will be used in teaching the fundamentals and technologies of immersive telepresence and collaboration systems to students of the following study programmes: Computer Science, Games Studies and Engineering, Information and Communication Engineering, and Robotics & AI.
D4P	D4P provides ICT innovation consulting and media services at Swiss, European and international level and thanks to the participation in SPIRIT plans to strengthen its experience in the media sector. It will allow D4P to offer new services in the R&D&I context and visibility and credibility both in the scientific and industrial communities opening up new business opportunities.	D4P strengthens its expertise in immersive media and next-generation telepresence through its participation in SPIRIT. SPIRIT increases D4P's visibility and credibility across scientific and industrial communities, creating new collaboration and business opportunities. D4P exploits the project outcomes through service innovation, targeted business development in immersive communication markets, and the creation of high-quality media and outreach materials that support the uptake of SPIRIT's technologies.

UoS/UoB	UoS/UoB will leverage the platform to carry out future research activities related to immersive telepresence applications and will also customise the environment for enabling future remote learning activities for both undergraduate and postgraduate students based on telepresence technologies.	UoS/UoB leverages the SPIRIT results and innovations to expand and enhance its research and innovation activities, enriching contributions in relation to immersive media and telepresence applications. Furthermore, UoS/UoB builds on the work conducted within this project, expanding its research collaborations, while also actively participating in teaching activities for both undergraduate and postgraduate students. These include not only the new knowledge and innovations developed from the project, but also the testbed platform that can be exploited for student experiments.
AWTG	AWTG will leverage the SPIRIT innovations to expand its Immersive Health and Education applications which will be available to the market as commercial off-the-shelf offering paving for growth and expansion outside of its current markets. The project outcome will feed into AWTG innovations in immersive communications and applications such as immersive health professional training and education for patients and practitioners, as well as the pioneering VRBA application to deliver behavioural activation therapy to individuals diagnosed with mild to moderate depression.	AWTG will apply SPIRIT's results to enhance its 5G-enabled Immersive Health and Education platforms. By combining SPIRIT's telepresence innovations with AWTG's private 5G expertise, we will deliver low-latency, high-reliability immersive applications for education, training, and support. These capabilities will be commercialised as part of AWTG's off-the-shelf solutions and will support expansion into new 5G markets across Europe and beyond.

In addition, we also asked the Open Call partners about their exploitation plans for their work carried out in the project. The results are listed in Table 11.

TABLE 11: OPEN CALL PARTNER EXPLOITATION PLANS

PARTNER	EXPLOITATION PLAN OF OPEN CALL PARTNER
BAZKARIA	BAZKARIA generated two key outcomes: enhanced software assets and valuable know-how. The software components developed with SPIRIT support strengthen Vicomtech's background IP and are already being re-used in ongoing R&D activities, including technology-transfer projects with clients as well as new EU- and national-funded initiatives. The know-how gained — particularly regarding user interaction with XR in realistic environments and the role of emerging technologies in gastronomic experiences — is being applied by both Vicomtech and Mugaritz to design future experiences, applications, and technology developments.
REDIA	REDIA will build on the project results by extending the ULTIMATE training suite with a new generation of remote, multi-user simulators and integrating markerless full-body avatars as a core capability. A new R&D track will also validate remote-assistance features in INFINITY, enabling teams to "train as they operate." Network and orchestration insights are being turned into deployable reference architectures (on-prem, edge, cloud) with validated performance targets. Overall, REDIA becomes both a product line extension and a scalable integration blueprint for XR training and remote operations.

GENSVR	GENSAVR will use the adopted standards and tools to ensure secure, scalable, and high-quality XR training. Zero Trust, ISO/IEC 27001, and Kubescape will support secure access and continuous compliance. WebRTC remains the basis for low-latency communication, while ISO 8000 workflows via Mage AI ensure reliable training data pipelines. Nakama will continue to provide scalable multi-user management, and ISO/IEC 42001:2023 will guide transparent and accountable governance of AI-driven training modules.
SNAP	The technology developed within SNAP is used in two different ways: - exploring how it can be used to improve our existing product and - trying to secure more funding to mature it into a new service/product.
MANTRA	The results of the project are being used to create a commercial platform for remote teleoperation. Currently, we are analysing the commercial viability.
SITE	The results demonstrated the value of XR and telepresence for digital twins in sectors previously hesitant to adopt such technologies, enabling several follow-up initiatives. They now feed into new projects, including AR and XR digital twins for GHG assessment, extreme-weather response, real-time decision-making ecosystems, and the extension of the Eurostars project LaPaSim. Beyond these, the outcomes are being used to refine performance metrics and drive further innovations that more effectively connect virtual and real environments through simulation.
ETHOS	The ETHOS project delivered a validated real-time holographic communication pipeline and the T-MCU, integrated into both the SPIRIT platform and OVER's industrial training application. These outcomes are now being used by TNO to advance its research on real-time 3D communication and XR streaming, contributing to future 5G/6G-ready volumetric video systems and new trials in industrial training, social XR, and immersive telepresence. OVER is using the results to extend its AR/VR metaverse platform with holographic training capabilities, including Gaussian Splatting–based digital twins and lightweight real-time 3D rendering on mobile devices.
ANNETTE	In the ANNETTE project, both partners (WINGS and DotSoft) use the Avatar tool provided by the SPIRIT project to extend the capabilities of two already available services (WINGS wi.LIVE culture and Dotsoft Oracle Dodona).
QEST	QEST builds on SPIRIT's evaluation of compressed dynamic point clouds on HoloLens and extends this work to new immersive applications for Meta Quest 3, Apple Vision Pro, and Pico 4 Ultra. These applications support real-time rendering of static and dynamic point clouds in complex scenes. The project is now developing an adaptive streaming algorithm that adjusts point-cloud detail based on user context, device capabilities, and network conditions, enabling more efficient streaming and improved user experience across future XR platforms.
RABBIT@Scale	The System Implementation and Experiment setup are used as a framework for point cloud streaming experiments in future work. We plan to release these components as open-source software to facilitate reuse by the community. The results from the experiments are used to prepare a publication about scalable on-demand transcoding of point clouds, which will be submitted to a peer reviewed venue.

EMBODIED DIA-LOGUE	The Results will be integrated into new tools that advance our work on embodied and social presence in XR. The validated Embodied Dialogue questionnaire is being refined into a lightweight assessment module and incorporated—along with movement assets—into University of Klagenfurt's SPIRIT QoE platform, combining objective tracking with subjective interaction insights. These outcomes also form the basis of a new grant proposal exploring XR in the cultural sector, extending the impact beyond the project.
VISTA-XR	Participation in the SPIRIT Open Call enabled VISTA-XR to validate a full end-to-end RGB-D streaming and volumetric telepresence workflow, which is now being integrated into MERCURY RETROGRADE's internal product roadmap. These results form the basis for upcoming XR applications in cultural heritage and urban planning, supporting interactive site exploration and real-time remote collaboration. The integration with SPIRIT's GPU-enabled testbed and WebRTC stack also supports our ongoing development of scalable 3D streaming pipelines, refining latency, compression, and synchronisation for future heritage and education deployments.
QUEST	The outcome of our QUEST Open Call project is going to be the basis for a research paper basically examining the feasibility of the Media Over QUIC (MoQ) protocol in the context of point cloud video transmission.
AURA	The results are the basis of at least five scientific publications that we are currently preparing. Moreover, the room acoustic data we collected will be widely used in the development and testing of new blind room acoustic estimation and rendering algorithms. The real-time, two-way calling system will be used in demonstrations at the Aalto Acoustics Lab and will serve as the basis for a new project regarding the acoustics for holographic calling.
ELICT	ELICT's SPIRIT results are being integrated into Maggioli's EligenceXR roadmap to expand commercial XR-based cognitive training services. The pilot study with older adults—showing high satisfaction and natural interaction—supports scaling the platform to additional healthcare facilities. The outcomes guide technical refinements to holographic telepresence, inform new immersive cognitive training modules, and serve as the basis for follow-up research on long-term cognitive effects. The demonstrated feasibility of secure XR telepresence also enables Maggioli to pursue new partnerships with healthcare technology and telehealth providers.
AIVATAR	The results are directly integrated into our commercial product roadmaps: - The LCEVC GStreamer plugins (flulcevch264enc, flulcevchwvah264dec) will be added to our Fluendo Codec Pack and Remote Desktop Coding Tools (RDCT). - The AI super-resolution models will be integrated into our Fluendo AI plugins, aligning with our Raven AI and LYNX innovation projects.
HOPE	The results of the HOPE experiment are being utilised to enhance Phasmatic's existing 3D content processing services by integrating adaptive compression techniques into our asset pipeline. This allows us to offer optimised 3D assets that maintain visual fidelity while significantly reducing file sizes. These advancements form the basis for new service offerings focused on performance-driven 3D content delivery and extend our current solutions for eCommerce, AR, and XR applications, improving scalability and user experience across client platforms.

ROTIE	ROTIE's contributions to the SPIRIT platform—extending tele-operation services for autonomous mobile robots and adding immersive 3D virtualisation—are now feeding into further development of multi-robot control and XR-based remote operations. The new XR app for controlling multiple AMRs, along with the added video/audio streaming capabilities, provides the basis for future multi-user robotic supervision tools. The Gaussian-Splatting–based 3D reconstruction service, integrated into the mapping pipeline, will be used to enhance post-processing, training, and analysis workflows, enabling richer spatial understanding in both desktop and XR applications.
OPEN-DASH-PC	The project partner Motionspell is using the results—particularly the open-sourcing of Signals and the updated build system—to engage new prospects and improve workflows across its product line, including SubStance.
	The project partner CWI has integrated the outcomes into its open-source VR2Gather platform, achieving a more stable low-latency DASH implementation, fixing bugs, improving workflows, and adding features such as statistics gathering. The benchmarking results will be submitted to ACM MM 2026 and the improved components will be used in upcoming experiments.
DIANE	The results of the project will be used to advance research on platform usability by collecting human interaction data in simulated and real environments. This dataset will be used to train a model that imitates human teleoperation using only the projected point cloud as input. The model will support faster platform tuning and validation across different parameter settings, with the most promising configurations later confirmed through additional human teleoperation experiments.
RHYTHM	The project results are actively being applied in the further development of the HYMNE project. By comparing SPIRIT's one-to-many use case with HOLOSYS in a concert setting, we gained insights that guide future immersive productions. The one-to-many setup offered higher perceived visual quality, while HOLOSYS felt more interactive despite its higher latency—showing that audience experience depends on narrative and perception, not just technical metrics. These findings now help us advise artists: HOLOSYS supports expressive performances, while SPIRIT is better suited for scenarios prioritising comfort and fluidity.
TENeMP	TENeMP developed an NMP system for audio, 2D video, and volumetric video, tested extensively in the SPIRIT Berlin testbed and on public 4G/5G networks. A key finding was that single-camera volumetric video using current codecs (e.g., Draco) can saturate 5G uplink capacity, requiring new codecs or quality reductions. The system was extended in the AViD-NMP project to support multiparty conferencing with edge-based relaying and transcoding, significantly reducing downlink bandwidth. Ongoing work focuses on smart quality reduction at the sender and improved transcoding to lower overall bandwidth, as well as adapting our low-latency transmission techniques to domains such as autonomous vehicle monitoring.

4.3 KEY EXPLOITABLE RESULTS

For the creation of a well-formulated and comprehensive exploitation plan, the SPIRIT consortium identified a preliminary list of Key Exploitable Results (KERs) that were developed during the execution of the project. For the KERs, their potential use, target market, success measures, and responsible partners were determined during the project.

The starting point to guide the consortium members to identify the KERs was based on the following set of generic questions:

- What exploitable results are the project participants hoping to generate?
- What forms, if relevant, can the exploitation of these results take (industrial use, patenting, technology transfer, publication, etc.)?
- What conditions will need to be fulfilled to enable exploitation of the results (cost of implementation and ease of obtaining)?
- What each beneficiary is hoping to gain from the project? Are the expectations of all participants compatible and coherent?

Some examples of key exploitable result types include:

- new technologies;
- new technical/scientific/societal knowledge and data (in the form of software, new process, scientific result, evidence of successful pilot, new design, educational resource, evidence-based recommendation for action towards policy makers);
- new training assets;
- new collaboration platform/mechanism.

During the project lifetime, the KERs were revised to ensure effective implementation of measures to leverage the results. The following utilisations are conceivable:

- using them in further research activities (outside the action);
- using them in teaching activities;
- developing, creating, and enhancing a product or service;
- providing and marketing a product or service.

The table below provides key exploitable results and their potential usage.

TABLE 12: PRELIMINARY KERS WITH THEIR OBJECTIVES

KEY EXPLOITABLE RESULT	EXPLOITATION OBJECTIVE	EXPLOITATION ROUTES
Business Opportunities	**D4P**: to strengthen the experience in the media sector to enrich the D4P projects portfolio focusing on the development and adoption of green digital technologies and solutions for sustainable development of our economy and society. **AWTG**: to commercialise SPIRIT's 5G-ready capabilities by integrating them into practical solutions for remote training, collaboration, and digital health.	**D4P** will use the developed business roadmap within its network to consolidate the European hub for Digital Sustainability and to assist the planning and development of green digital projects in the media sector. **AWTG** will deliver enhanced immersive applications over private and public 5G networks and offer these capabilities as part of commercial solutions for healthcare, education, and enterprise customers.
Lessons Learnt	**D4P**: to establish a portfolio of successful sustainable actions in the different ICT domains to accelerate the green digital transition.	**D4P** will use the key learnings to be exchanged in the D4P working groups (Green Cloud-Edge-IoT Computing, Climate Neutral and Sustainable Smart Cities, Towards a Sustainable

		Internet and Zero Pollution Communication Networks) to be used as base line for further R&I activities.
Application-layer Protocols for Communication in Immersive Telepresence Applications (WebRTC and low-latency DASH, and their potential interoperation)	**UNI-KLU**: These protocols and their potential interoperation are the main candidates to be used in future immersive applications. Having expertise and tools in this area will be an important asset for further research and teaching efforts.	**UNI-KLU**: The results complement the technologies in the CD laboratory ATHENA (https://athena.itec.aau.at/), run jointly with UNI-KLU's spin-off company BITMOVIN, and will be used in future research projects and industrial collaborations, and in future teaching efforts/courses.
Users' Quality of Experience (QoE) Evaluation Metrics, Tools, and Test Results	**UNI-KLU**: QoE evaluation for immersive telepresence applications is a young field; contributing to it is important and will advance the state of the art. Having expertise and QoE metrics, tools, and results in this field will be an important asset for further research and teaching efforts.	**UNI-KLU**: The results complement the technologies in the CD laboratory ATHENA and will be used in future research projects and industrial collaborations, and in future teaching efforts/courses. UNI-KLU contributed the results of a QoE study to pertinent ISO/IEC MPEG standardisation groups and plans to be further active in those standardisation efforts.
Immersive Communication Service Blueprints	**DT**: to provide product development with reference service architectures for immersive communication solutions (B2C, B2B, verticals such as training in industry).	**DT** uses the blueprints as input for product development and go-to-market strategies; leverages them for internal business case development.
Security and Privacy Framework for Immersive Communication	**DT**: to ensure telco-grade compliance with GDPR and data protection in immersive services (identity management, encryption, privacy-preserving analytics).	**DT** integrates the framework into the product portfolio as a competitive differentiator; licenses the framework to partners; contributes to industry standards; uses it for certification and trust-building with customers.
Digital Twin Integration Framework	**DT**: to connect real-time industrial data streams (e.g., sensors) with immersive visualisation for monitoring and predictive maintenance.	**DT** uses the framework as part of future industrial solution bundles; joint development with vendors.
Steering of Robots (in combined virtual and real environments)	**DT**: steering of real-world robots in a digital twin for simulation purposes.	**DT** uses the framework as part of future industrial solution bundles; joint development with vendors.
Virtual Representation of Humans	**Fraunhofer HHI**: to research and develop various methods to generate realistic and dynamic 3D objects representing humans that can be used in XR-based applications.	**Fraunhofer HHI** will use the results as a basis for further research and will make them available for future projects and applications.

Scalable Delivery Architectures	**IMEC**: Research on multi-user immersive streaming scenarios has identified key challenges for scaling of network and cloud resources.	**IMEC**: The outcomes will be used in future research project objectives, integrated in existing and future testbed offerings, and incorporated in teaching efforts and labs.
User-oriented Application-layer and Network-centric Innovations for Live Immersive Media Applications	**UoS/UoB**: The user centric application and network focused innovations extend the current scope of existing literature, contributing to foundational approaches in immersive media and telepresence applications aimed at satisfactory user focused immersive telepresence applications and experiences.	**UoS/UoB**: The outcomes from the project will serve as the basis for future research and specifically innovations within the field, further expanding the envelope of possibilities in relation to the adoption of immersive media technologies.
Testbed Support and Enhancements	**UoS/UoB**: to enhance the capabilities of the existing testbed, and subsequently, strenghten UoS/UoB in its ability to support and enrich research, innovation and development within the field of immersive media and telepresence applications.	**UoS/UoB**: The lessons learnt and the strategic approaches employed in collaboration with the deployment of further resources will be utilised in future research undertakings, supporting cutting edge and state-of-the-art research and teaching activities.
XR Application Traffic Characteristics	**EDD**: to assess how XR traffic characteristics affect network performance across application types (e.g., holograms, avatars, and multi-user scenarios).	**EDD**: The results highlight how different XR traffic profiles, such as those generated by holograms, avatars, or multi-user experiences, impact network requirements and overall performance. By understanding these effects, network designers and operators can develop specific guidelines to optimise and adapt network capabilities. This ensures smoother user experiences and more efficient use of network resources.

4.4 MANAGEMENT OF INTELLECTUAL PROPERTY RIGHTS

Effective exploitation of the KERs depends upon, amongst other issues, the proper management of intellectual property, which should be part of the overall management of knowledge in the project.

The SPIRIT consortium has undertaken actions in this regard for addressing the issues related to the Intellectual Property Rights (IPR). These include the pre-existing knowledge (Background) of the project partners, an assessment of the results generated during the project, proposals for the optimal protection of IPR, and ownership and proper implementation of IPR protection measures.

The framework of the IPR management is set out within the Consortium Agreement, which stipulates the rules related to the following IP issues:

- identification of the Background and the specific limitations and conditions for its implementation;
- ownership of the results;
- transfer of the results;
- access rights to the Background and the results; and
- non-disclosure of the information.

The SPIRIT partners assess the possibility of protecting their results. Beneficiaries are free to choose any available form of protection of intellectual property. The choice of the most suitable form of IP protection (e.g., patent, trademark, industrial design, copyright, trade-secret, confidentiality agreement) and the related business plan for the exploitation is being considered based on the achieved results.

5 IMPACT ASSESSMENT

The communication and dissemination activities have been systematically tracked throughout the project's lifecycle. To enable a precise evaluation of their effectiveness, a set of KPIs was defined prior to the project launch. These KPIs served to quantify the reach, engagement, and overall impact of SPIRIT's communication efforts (see Table 13). The table below provides a detailed overview of both the KPIs achieved and the targets originally planned.

TABLE 13: SPIRIT DISSEMINATION AND COMMUNICATION KPIS

MEASURE	INDICATOR	TARGET	STATUS AT M39
Project website	# unique visitors to the website (average per year)	> 1500	24,465
Social networks	# followers on X # followers on LinkedIn	> 500 >150	265 631
Press releases/publications in press	# press releases issued to specialised and general media channels	> 3 by the end of the project	5
Publications	# peer-reviewed publications in journals, conferences, workshops	≥ 5 per year on average	23 (+15 from OC projects)
Newsletters	# newsletters (published every 6 months)	6	6
Videos	# videos published on the YouTube channel and average number of views	4 videos 150 views per video	10 videos Views: 196 + 364 + 70 + 60 + 98 + 87 + 32 + 70 + 92 + 9
Workshop organisations	# workshops average # participants per workshop	2 20-40 per event	3 1st workshop: 45 2nd workshop: 41 3rd workshop EuroXR Day 1: 125 3rd workshop EuroXR Day 2: 112
Participation to events and presentations	# external events partners attended to promote the project, including scientific conferences, demos and or presentations	At least 12 events	22 (+20 from OC projects)

6 CONCLUSIONS AND LESSONS LEARNT

This deliverable has provided a comprehensive overview of the communication, dissemination, standardisation, and exploitation activities carried out by SPIRIT throughout its duration. From the outset, the consortium pursued a clear and structured strategy, supported by defined KPIs, which enabled consistent monitoring and adaptation of activities to maximise impact.

Overall, the **communication and dissemination** strategy proved successful in generating strong visibility for the project. The SPIRIT website, newsletters, press releases, and social media channels were continuously leveraged to ensure broad outreach, while targeted campaigns around the OCs demonstrated the project's innovation potential and attracted high-quality participants.

SPIRIT's involvement in clusters, such as Beyond-XR, and its contributions to events like EuroXR 2025, further enhanced its positioning within the XR and telepresence domains. The collaboration with CORTEX² for the joint final workshop exemplified how synergies with other EU projects can amplify impact and foster knowledge exchange. Furthermore, the consortium's commitment to sustainable practices in communication activities, including virtual events, minimised printing, and encouraging green mobility, added an important dimension to SPIRIT's outreach efforts.

Key lessons learnt include:

- **Flexibility in outreach strategies** is essential. The shift of focus from X to LinkedIn highlighted the importance of adapting communication priorities to external circumstances and audience engagement trends.

- **Clusters and cross-project collaboration** proved highly effective in amplifying visibility and consolidating impact. Initiatives such as Beyond-XR will likely continue to play a role beyond SPIRIT.

- **OCs promotion requires clear, targeted guidance and accessible materials** to ensure maximum innovation potential from third-party participants.

In conclusion, the SPIRIT consortium has succeeded in laying strong foundations for the visibility, uptake, and exploitation of its results. By actively engaging with stakeholders, producing high-quality communication materials, and contributing to international collaboration and standardisation efforts, SPIRIT has positioned itself as a key contributor to the future of XR and telepresence technologies. The lessons learnt in terms of flexibility, sustainability, and stakeholder engagement provide valuable guidance for similar projects.

In terms of **standardisation**, the key lessons learnt are:

- The use of standardised technology is of utmost importance, both for the core project consortium to make their technical work effective and their results successful and for Open Call experimenters to make the core project's output (e.g., platform, use cases, testbeds) compatible and easy to use.

- Active contributions to standardisation comes with particular challenges, for instance: the specific expertise and long-term commitment needed, often extending beyond the timeframe of a typical EC project; the complexity of standards-defining organisations and processes, and the fragmentation of XR standardisation efforts, making it time consuming and tedious to even monitor and assess standardisation activities; and the difficulty to identify and do relevant and impactful work, rather than creating "yet another standard".

Throughout the SPIRIT project, several lessons emerged that shape both the **exploitation** strategy and future development of immersive telepresence technologies.

1. Market adoption will strongly depend on demonstrating clear, sector-specific value; heterogeneous use cases from the Open Calls proved essential for identifying realistic business opportunities and validating technical assumptions.

2. Interoperability and modularity across platforms will be crucial; partners with pre-existing XR and telepresence systems were able to integrate and extend their solutions far more effectively once common interfaces and shared infrastructures were established.

3. User experience will remain a decisive factor for commercial success; early user studies confirmed high interest but also highlighted usability, comfort, and device cost as persistent barriers. Similarly, cost-efficient deployment and energy-awareness must be addressed from the start, as immersive applications place significant demands on network and computing resources.

Finally, the Open Call mechanism provided strong added value by expanding the innovation ecosystem, contributing new perspectives, and accelerating the identification of exploitable results. Collaboration with SMEs and research groups demonstrated that SPIRIT's technological outcomes can be meaningfully transferred into diverse domains—from healthcare and training to cultural heritage and industrial automation, thereby reinforcing the overall exploitation potential of the project.

BIBLIOGRAPHY

[1]   https://www.marketdataforecast.com/market-reports/europe-augmented-and-virtual-reality-market

[2]   https://www.zendesk.de/blog/die-zukunft-des-kundenerlebnisses-verandern-vr-ar-und-5g-den-kundenservice/

[3]   https://www.ericsson.com/en/reports-and-papers/consumerlab/reports/10-hot-consumer-trends-2030-the-everyspace-plaza

[4]   https://www.linkedin.com/pulse/europe-augmented-reality-virtual-apps-market-trends-in-depth-6yfdf

[5]   https://www.cbi.eu/market-information/outsourcing-itobpo/virtual-and-augmented-reality-services/market-potential