



SPIRIT

1st Open Call WEBINAR

Valentina Margaria

DIGITAL FOR PLANET D4P

WEBINAR

April 16, 2024

www.spirit-project.eu





BEFORE STARTING

- Webinar is recorded and will be published on [SPIRIT website](#)
- Write your question in the Q&A
- opencalls@spirit-project.eu



AGENDA

- Introduction to SPIRIT project
- Open Calls overview
- Technology Framework
- Questions and Answers



SPIRIT Project

- Mission and Vision
- Objectives
- Innovation and Collaboration

AMBITION

Realise Europe's first **multi-site & interconnected framework** dedicated to supporting the operation of **heterogeneous collaborative telepresence applications at scale** through relevant technology innovation

SPIRIT IN A NUTSHELL



Addressed call: eXtended Collaborative
Telepresence
HORIZON-CL4-2021-HUMAN-01-25



Outcome: SPIRIT system, a distributed network
and application platform with interconnected sites



Third party experimentation
through 2 dedicated Open Calls



Targeted TRL: from TRL 4 to TRL 7



Duration: 3 years



Consortium:





***Empowering
Innovation
Through
Collaboration***

Cascade Funding _ Open call

Cascade funding aims to **accelerate, foster and boost the development of innovative projects** through financial vouchers and mentoring by SPIRIT partners.

SPIRIT OPEN CALLS



SPIRIT will provide **3.5M EUR** in two waves of Open Calls to financially support the involvement of third parties to **develop and further test their individual applications using the capabilities of the SPIRIT platform.**



*2 waves of
Open Calls*



*3.5M EUR of
total funding*



*Up to 9 months of
testing projects*



*25 funded
project testing*



*SMEs, industries,
research & scientific
organisations*

1° Open call

Funding opportunities, Timeline, Rules and Guidelines

FUNDING and SUPPORT of 1st OPEN CALL



Opens Call number	Max funding per project [€]	Projects Duration [months]	Number of projects funded	Total funding [€]
SPIRIT-OC1	200,000	9	10 (at least)	2,000,000

- **Total Budget:**

- OC1 has a total budget of €2,000,000.

- **Number of Projects Funded:**

- Targeted number of Third-Party Projects (TPP) to be selected: 10 (at least).

- **Funding Allocation:**

- Maximum funding per project: €200,000.

- **Project Duration:**

- Each TPP funded within OC1 is expected to have a total duration of 9 months.



ELIGIBLE COSTS and PAYMENTS

- Personnel expenses
- Travel expenses
- Overhead (equivalent to 25% of direct costs: personnel and travel)
- The payment structure consists of two instalments.
 - The first instalment, equivalent to 75% of the Maximum Grant Amount at M5 following the submission of the mid-term report (1st report).
 - The second instalment will be processed after the final review and submission of Final Report.

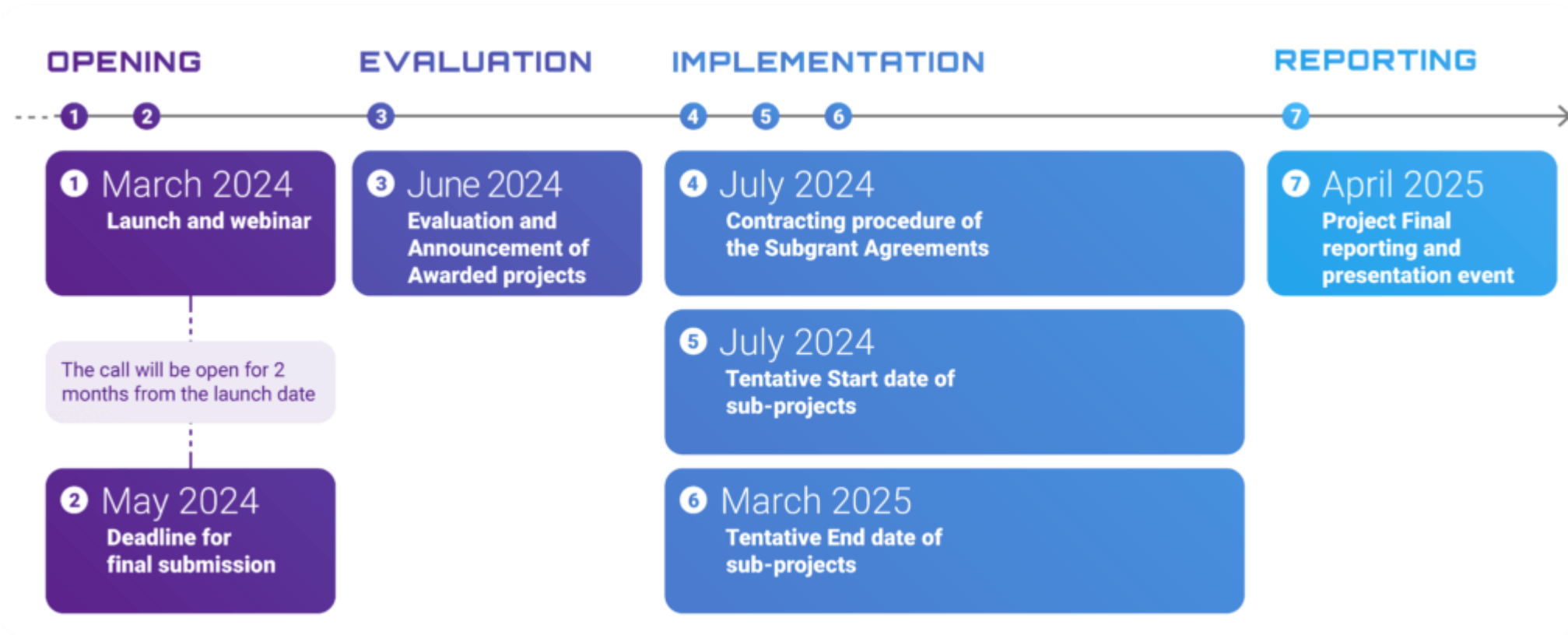


ROLE OF PATRON

Each selected project will be supervised by a PATRON, a project partner who is responsible for supporting the experimenters during execution and following up on the experiment results.

You can find the list of PATRON on [SPIRIT OPEN CALL dedicated page](#)

TIMELINE



Final Submission Deadline: 27 May 2024, 17:00 CET

IMPORTANT TOOLS



- <https://www.spirit-project.eu/open-call-1/> is your reference page

All documents needed for submission

SPIRIT Open Call 1 Toolkit ↓

Document containing all the information regarding Open Call 1, to be consulted prior to submission.

Proposal Template ↓

Declaration of Honour ↓

SME Self-Declaration ↓

SPIRIT reports explaining technological framework

D2.1 Use Case Requirements, System Architecture and Interface Definition (Draft Version not yet accepted by EC) ↓

D3.1 Innovation Platform Enablers ↓

D4.1 SPIRIT Platform (Draft Version not yet accepted by EC) ↓



ELIGIBILITY CRITERIA: WHO

- Targeted organization:
 - (i) SMEs; (ii) Industry; (iii) Research/scientific organisation; (iv) Academia.
- Both individual organisations and consortia may participate.
- Consortia must consist of a maximum of three organisations.
- The applicant (single organisation or consortium) is eligible for participation in the Horizon Europe programme.
- **IMPORTANT:** As the SPIRIT project was funded within the HORIZON-CL4-2021-HUMAN-01 call, the list of [eligible countries](#) is the one applied to this specific call.
- The applicant **is not affiliated to any of the consortium partners of the SPIRIT project** *

*According to the definition outlined in the Horizon Europe program, an affiliated entity is characterized by having a legal or capital connection with one of the project partners. Specifically, an affiliated entity encompasses any legal entity that is under direct or indirect control of a project partner, shares the same direct or indirect control as the project partners, or directly or indirectly controls the project partners.

ELIGIBILITY CRITERIA: WHAT



Type of Activities Qualified for Financial Support:

Activities that, in line with SPIRIT project goals, aim to support the advancement and validation of collaborative telepresence applications on the SPIRIT platform, as well as the development and enhancement of the platform itself.

- Validating and testing third-party applications on the SPIRIT platform.
- Providing new requirements for the SPIRIT platform.
- Advancing the SPIRIT platform.

FEASIBILITY ADVISORY



SPIRIT consortium offers an **optional advisory service to evaluate project feasibility**.

This step is highly recommended and involves submitting a condensed version of the proposal template for feasibility verification.

Submission deadline to take advantage of Feasibility Advisory:

13 May 2024, 17:00 CET.

IMPORTANT: undergoing a feasibility advisory does not guarantee the selection of the proposal and does not imply any commitment to move forward with the proposal. It is also important to note that submitting a partial proposal for the ‘Feasibility Advisory’ is an optional preliminary step which is not considered as a final submission.

PROPOSAL SUBMISSION



- Proposals must be submitted in English through the official Open Call Submission Tool on the [SPIRIT website](#).

The banner features a dark blue background with abstract geometric shapes in shades of blue and teal. The text 'OPEN CALL 1 IS NOW OPEN!' is prominently displayed in white, bold, uppercase letters. Below this, the main content area has a white background with dark blue text and a dark blue button.

OPEN CALL 1 IS NOW OPEN!

The first SPIRIT Open Call (OC1) is now open to a wide range of third-party contributors to validate and test their applications on the SPIRIT platform, Europe's first multi-site and interconnected platform for real-time immersive telepresence applications.

[Submission portal →](#)

OPEN

OPEN CALL 1 IS NOW OPEN!

PROPOSAL SUBMISSION: FEASIBILITY ADVISORY or FINAL SUBMISSION



SPIRIT OPEN CALL 1 – Submission

Stage *

Feasibility advisory Final submission

Submitting a partial proposal for the 'Feasibility Advisory' is an optional preliminary step which is not considered as a final submission. Applicants should be aware that undergoing a feasibility advisory does not guarantee the selection of the proposal and does not imply any commitment to move forward with the proposal.

Date

Full Title of the Proposal *

Acronym of the Proposal *

PROPOSAL SUBMISSION: FEASIBILITY ADVISORY



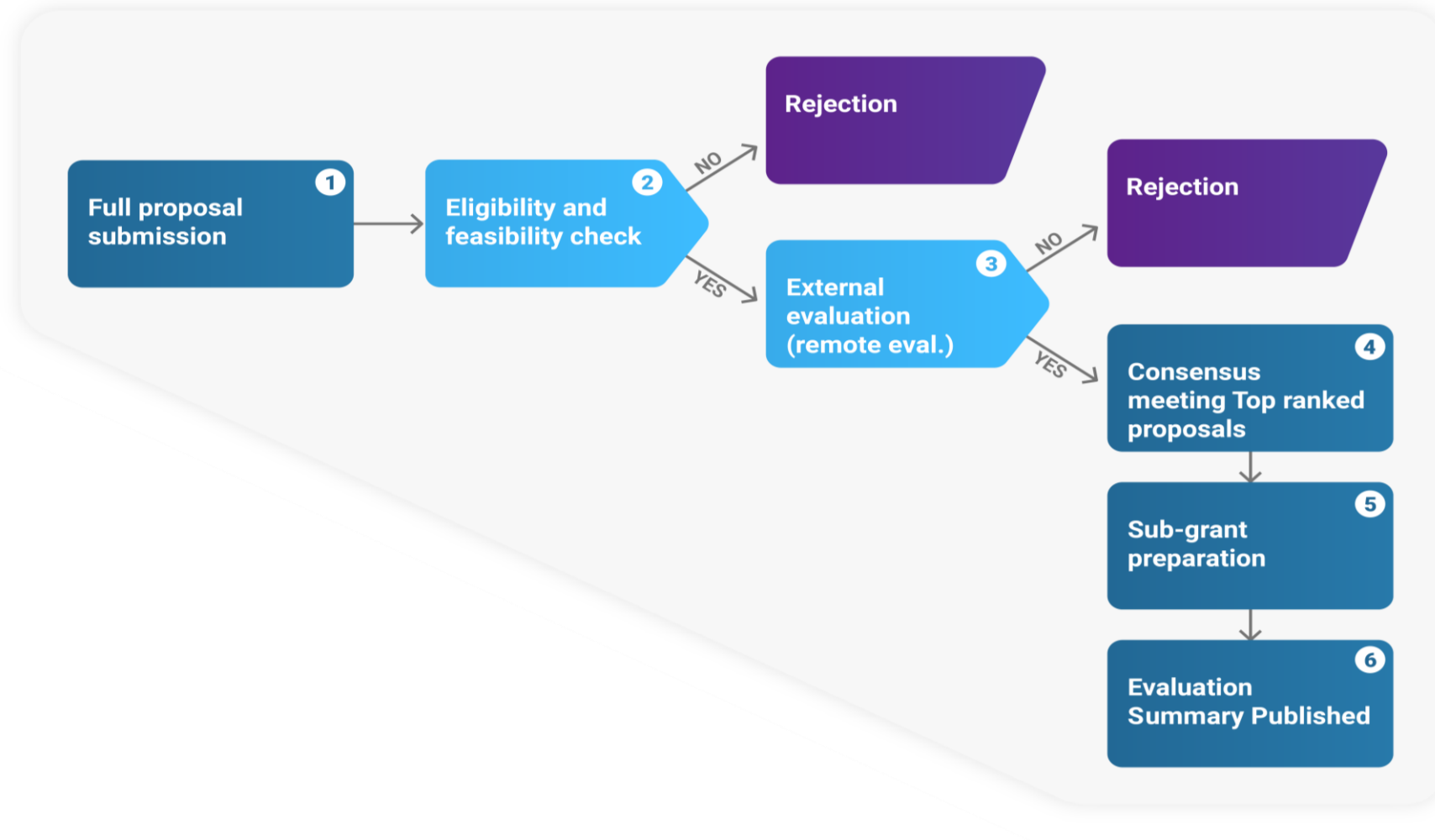
- **Submission Procedure:**
 - Select feasibility advisory
 - Complete the submission form on the SPIRIT website, ensuring all mandatory fields are filled.
- **Documents Required:**
 - Attach the Proposal Template in pdf
 - For the Feasibility advisory, at least sections A, B, C and H of the proposal template should be fully completed
- Submission deadline for Feasibility Advisory: **13 May 2024, 17:00 CET**

PROPOSAL SUBMISSION: FINAL SUBMISSION



- **Submission Procedure:**
 - Select Final Submission stage
 - Complete the submission form on the SPIRIT website, ensuring all mandatory fields are filled.
- **Documents Required:**
 - Proposal Template fully completed
 - Declaration of Honour
 - SME Self-Declaration (if applicable)
 - Submission deadline for Final Submission: **27 May 2024, 17:00 CET.**
 - Late proposals will not be admitted.

EVALUATION PROCESS



EVALUATION PROCESS: EXTERNAL EVALUATORS



- The proposals deemed eligible will be reviewed by at least **2 external experts** (NDA is signed)
- **External experts** cannot be part of the consortium.
- **External experts** cannot evaluate proposals where a conflict of interest can be identified.
- The ranking will be based on 10 Criteria (next slide)
- Consensus meetings involving all reviewing experts and partner's representative will be held to agree on a common opinion and rating for each proposal.
- **Final results will be communicated by end of June**

EVALUATION CRITERIA and SCORE



Criterion	Short description	Weight	Maximum score	Minimum threshold
1	Clarity & methodology	2	10	5
2	Ambition	2	10	5
3	Impact	2	10	5
4	Replicability	2	10	5
5	Team capacity	2	10	5
6	Contribution to standardisation	1	5	2
7	Value for money	1	5	2
8	SME participation	1	5	n/a
9	Gender dimension awareness	1	5	2
10	Maturity of the proposing organisation	1	5	2
Total score			75	33



SPIRIT

THANKS



spirit-project.eu



[@SPIRIT_eu](https://twitter.com/@SPIRIT_eu)



[@spirit-eu-project](https://www.linkedin.com/company/@spirit-eu-project)



SPIRIT project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070672



WP2

Requirements and Platform Architecture Definition

Ning Wang

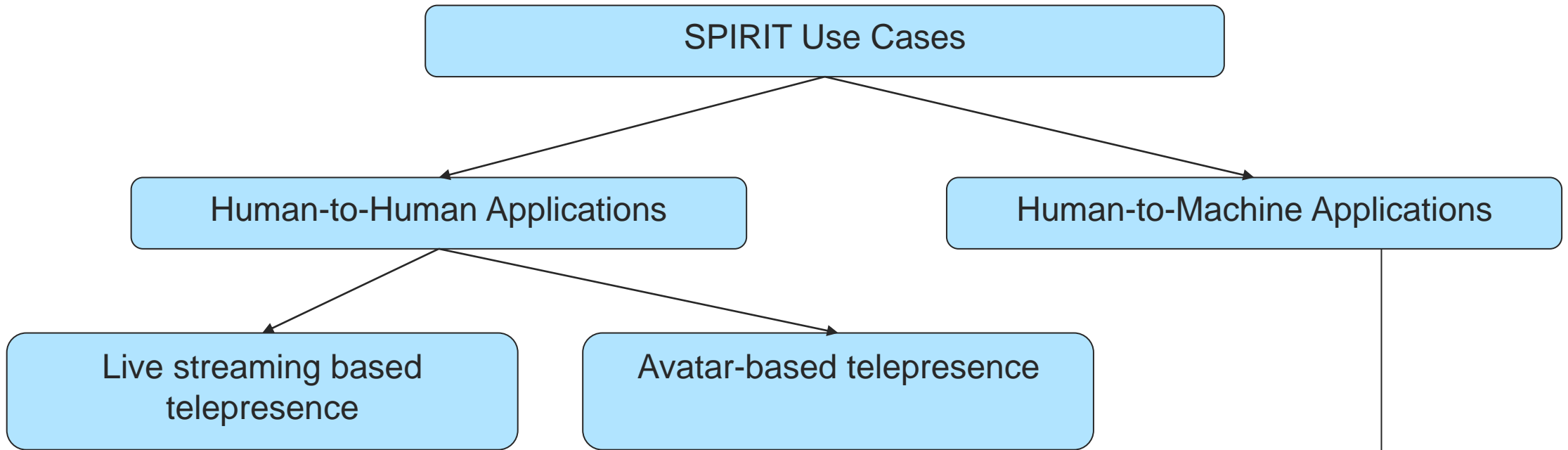
University of Surrey

FSTP Call Webinar

Online, April 16th 2024

www.spirit-project.eu

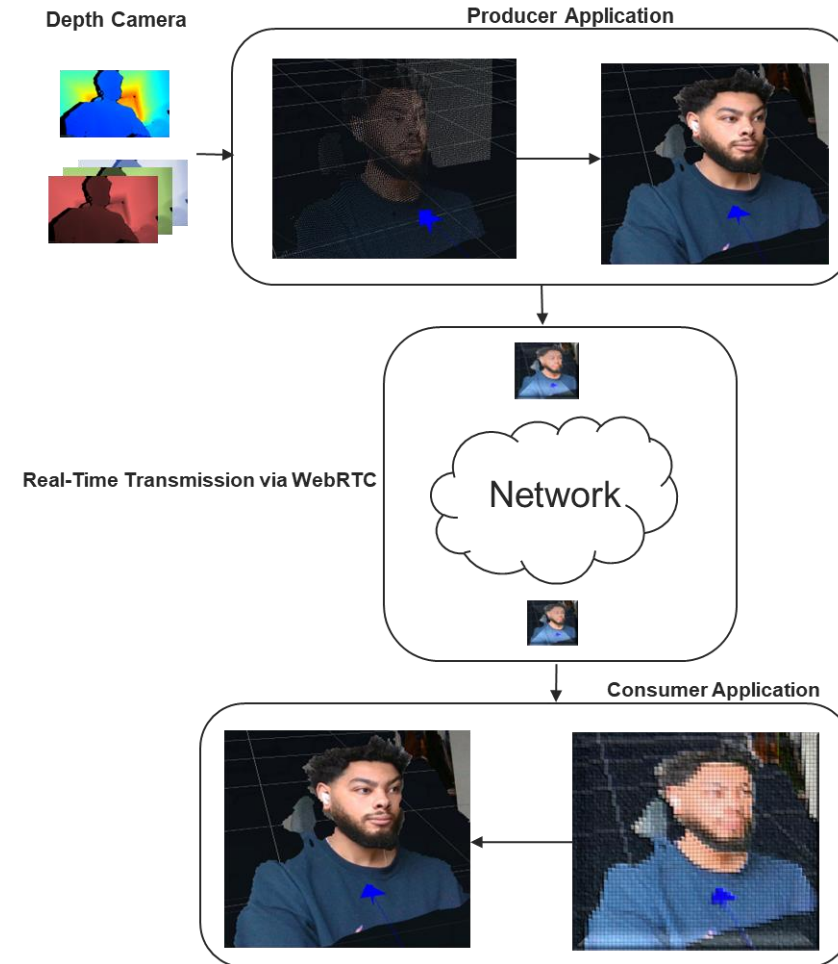
WP2 Use Cases





Live Streaming based telepresence

- Live capture, modeling, and streaming of 3D human representations using Web Real-Time Communication (WebRTC) as underlying streaming mechanism.
- A participant takes the role of the producer streaming processed data that includes a 3D human model obtained through a depth camera connected to a PC/cloud.
- A participant takes the role of the consumer receiving the data stream from the producer through a mobile phone. The decoded and rendered human 3D representation of the producer participant is displayed on AR glasses in real-time.



Multi-source support

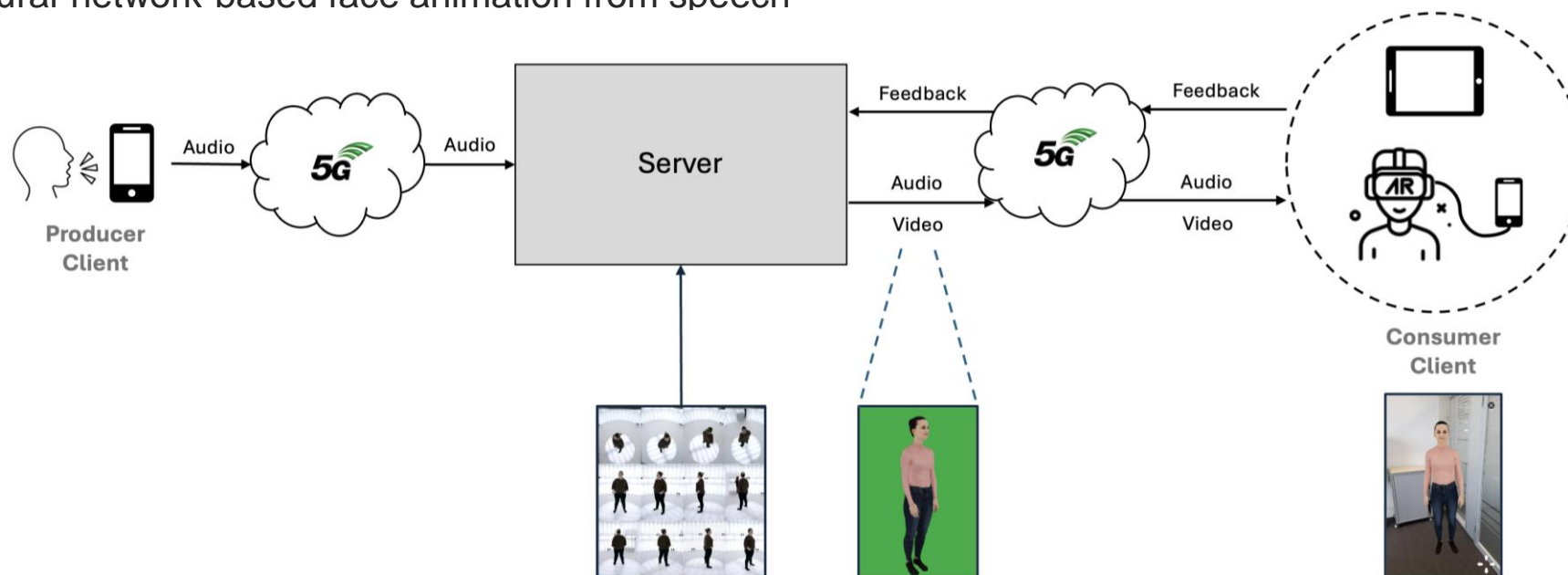


- Simultaneous streaming objects/people at different remote locations to the same virtual space for interaction
- Applications: virtual interaction, distributed performances etc.
- Technical challenges
 - Synchronisation of frames originated from different sources for assured user QoE



Avatar Based Telepresence

- Real-Time animation and streaming of a photorealistic avatar
 - Split Rendering approach -> Lower bandwidth required
 - The 3D object is rendered in the server -> Only 2D video is streamed
 - The consumer client performs the integration of the video in the scene
 - User viewpoint synchronized between client and server
 - Neural-network-based face animation from speech



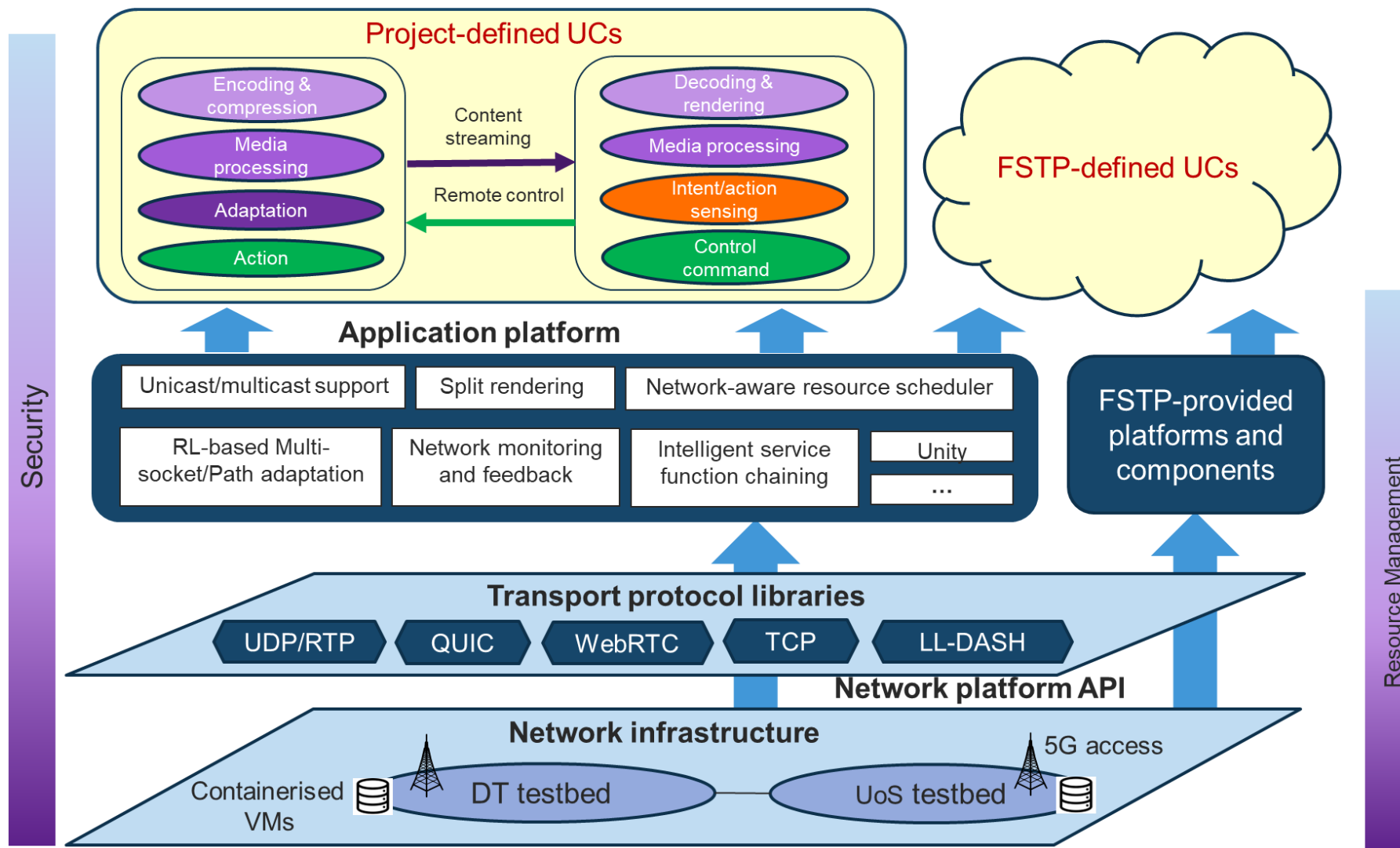


Human-to-machine Based Telepresence

- Manual & autonomous driving capabilities
 - Transport goods from A to B
 - Observation tasks
 - Switch between manual and autonomous driving
 - Intervene manually to solve problems (Notifications in certain scenarios)
- Teleoperation made possible via Video streams
- Centralized steering of devices (using an edge server)
 - Quickly "teleport" between multiple devices
 - Use multiple different devices to steer from the same network (e.g. workstations or handheld devices)



SPIRIT Architecture





THANKS



spirit-project.eu



[@SPIRIT_eu](https://twitter.com/SPIRIT_eu)



[@spirit-eu-project](https://www.linkedin.com/company/spirit-eu-project)

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI



Funded by
the European Union

SPIRIT project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070672. This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).



WP3 PLATFORM INNOVATIONS

Nick Turay, Ali El Essaili
Ericsson (EDD)

Open Call Webinar
Online, April 16th, 2024

www.spirit-project.eu

Live Holographic Communication Platform (Ericsson)



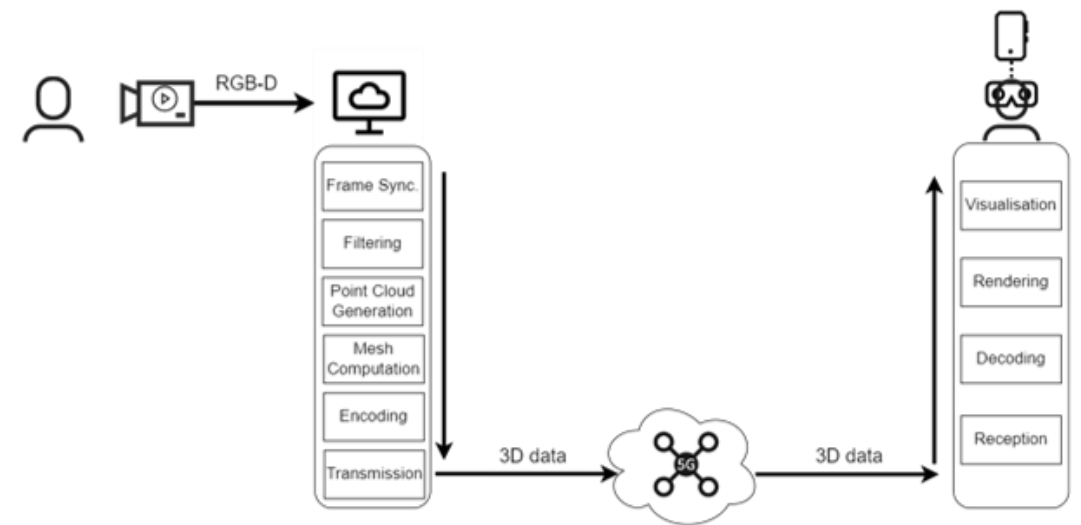
3D human representation generated from a live capture

Client producer application

- Acquisition of RGB and depth frames
- Filtering
- Computation of point clouds and meshes
- Compression
- Real-time transmission of encoded data via WebRTC

Client consumer application

- Real-time reception of encoded data via WebRTC
- Decoding and rendering
- Visualization of the producer user hologram through AR glasses



Real-Time Animation and Streaming of Realistic Avatars Platform (Fraunhofer HHI)



Photorealistic avatar generated from 16 multi-view videos

- Extraction of a parametric representation of the body movements and facial expressions
- Audio-based face animation

Client capture application

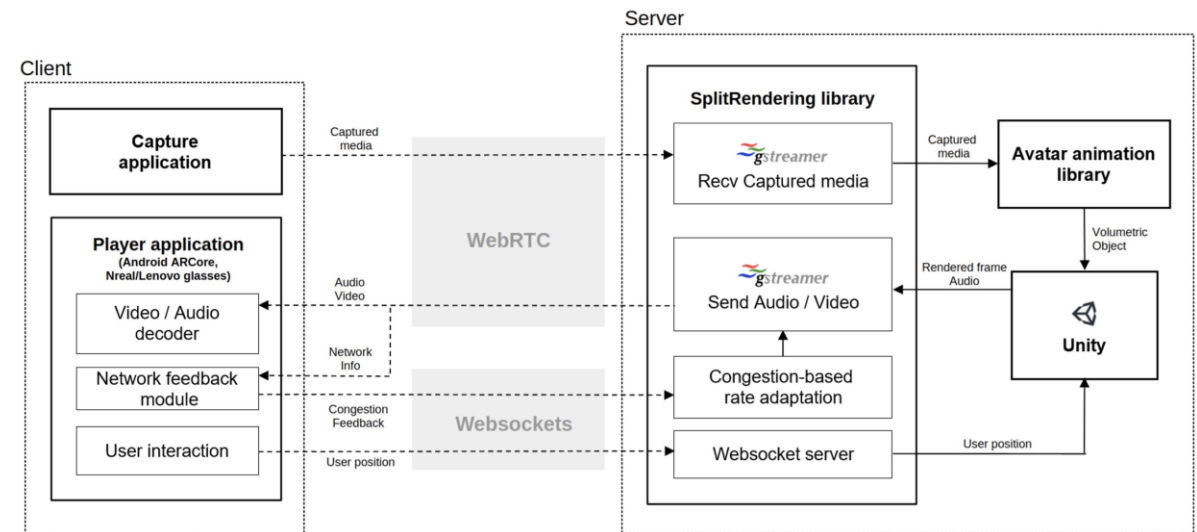
- Capture and streaming of media with WebRTC

Server animation, rendering, and streaming application

- Connection management
- Decoding and processing of incoming media streams
- Real-time NN-based animation of the avatar
- Synchronisation of user viewpoint – virtual cameras
- Rendering of 2D views of the avatar
- Streaming of 2D video and audio

Client player application

- Android tablet/phone or Mixed Reality glasses
- Integration of the avatar in the scene
- User interaction

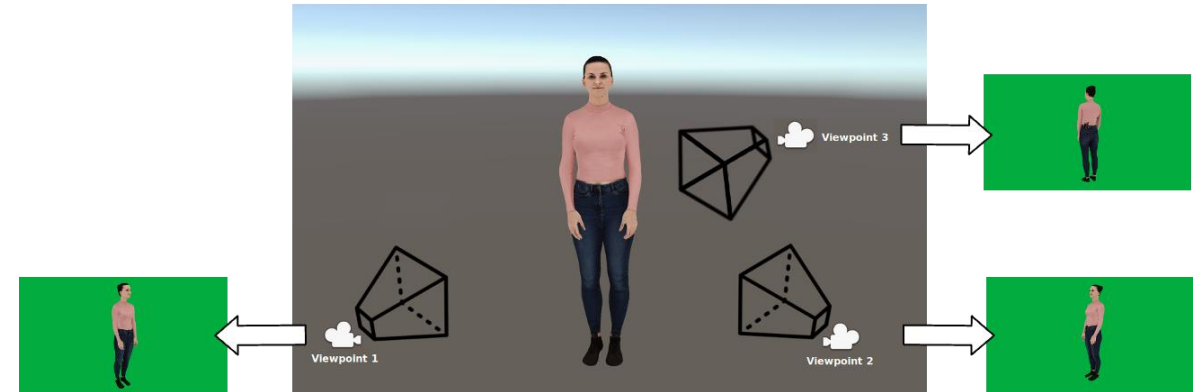


Real-Time Animation and Streaming of Realistic Avatars Platform (Fraunhofer HHI)



HHI: Split Rendering

- Object pool
- Continuous feedback
- Virtual camera (Unity)
- Gstreamer pipeline with WebRTC
- Background removal and integration



HHI: User interaction

- Drag & drop, rotation, and scaling

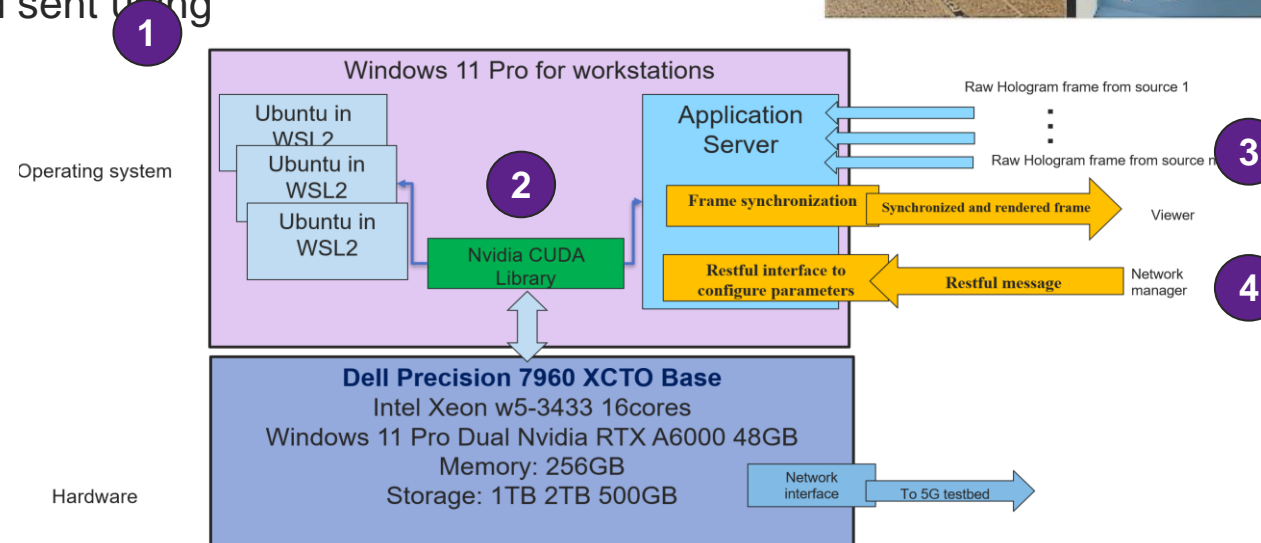


Multi-Source Live Teleportation (University of Surrey)



Teleportation of Real-time Captured Humans

1. Installed on the UoS testbed's Edge, distributed over multiple virtual machines running Ubuntu
2. The hologram server uses Nvidia CUDA to accelerate processing of the 3D video streams
3. The streams are received and sent using simple TCP sockets over 5G
4. A RESTful API is available for the management of the hologram server





Thank You For Your Attention!



spirit-project.eu



[@SPIRIT_eu](https://twitter.com/SPIRIT_eu)



[@spirit-eu-project](https://www.linkedin.com/company/spirit-eu-project)



SPIRIT project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070672



Testbeds and Integration

Vivien Helmut
Deutsche Telekom

Webinar Open Call 1
Online, April 16th 2024

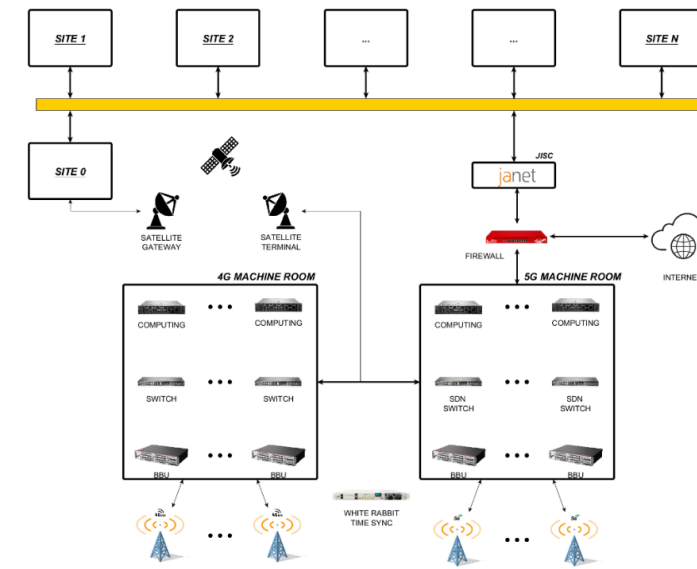
www.spirit-project.eu

© Copyright SPIRIT 2022-2025

Testbed at University of Surrey



- Multi-Radio Access Technology (RAT) network
- Covering the UoS campus, over four square kilometres
- 4G, 5G Stand Alone and 5G Non-Stand Alone
- Virtualized Core network, and fibre external connectivity
- Edge server machine
- Unmanned Aerial Vehicle (UAV) and satellite systems





Testbed at T-Systems

- Located at Berlin Siemensstadt
- Old manufacturing plant for turbines, now future factory
- 5G Stand Alone
- Indoor and Outdoor 5G Coverage
- 500 m² outdoor space and 1000 m² indoor space
- Indoor Wifi
- Edge Server
 - Containerized Applications
 - Kubernetes
 - Virtual Machines
- Multiple SPIRIT Use Cases available

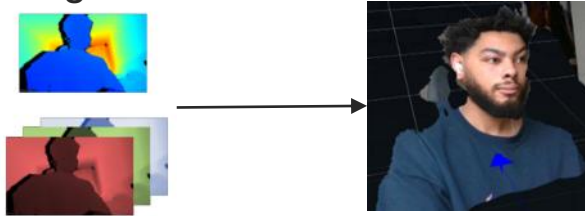




Integration of Application Frameworks

Holographic Human-to-Human Interactions

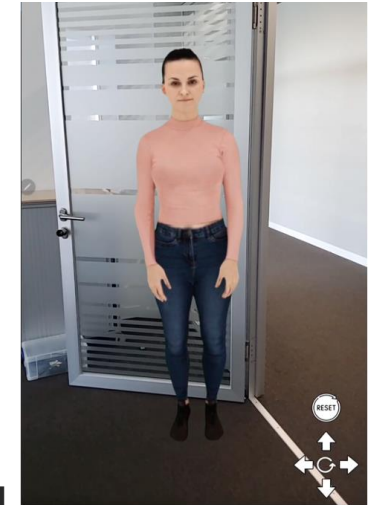
- 3D video conferencing; uses a depth camera on the producer side and an Android phone with connected AR glasses on the consumer side.



- Integration in the **Berlin testbed** is ongoing
- The components are **containerised**
- The camera's USB interface is **extended by a device server** forwarding the RGB-D stream to the Edge
- **Mobile Phone working within the 5G SA** with connected AR glasses
- **Publicly accessible WebRTC signalling server** needed for session initiation

Real-Time Animation and Streaming of Realistic Avatars

- From captured audio stream created visemes are used to animate the avatar.

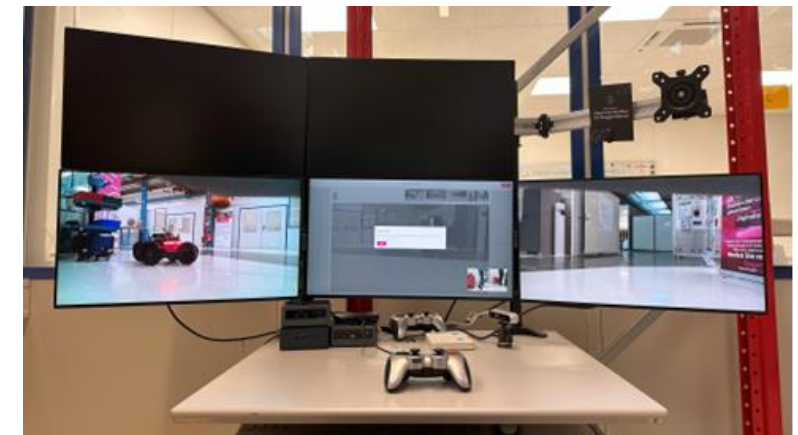


- In the **Berlin testbed** integrated
- The components are **containerised**
- **Mobile Phone working within the 5G SA** with connected AR glasses

Real-Time Human-Machine Interactions



- Driving Platform "Husky" from Clearpath Robotics
- Equipped sensors:
 - 3D Lidar from Ouster
 - 4 x Intel Realsense 435i depth cameras
 - IMU
- Robot Control System running on edge server containerised
 - Robot transmits sensor data to and receives drive commands from the edge server
- Robot is connected via 5G modem
- Multiple Video streams for teleoperation in near real time
- Robots "Control Center" with 3 monitors
 - 4 Views (Front, Left, Right and Backwards), 4th View is displayed as picture in picture
 - Connected to Robot Control System running on the edge via ethernet
- Interaction with the robot via API's:
 - Send manual drive commands
 - Send autonomous drive orders
 - Creation of "Points of interests" to navigate to
 - Creation of "No Go" zones
 - Access to sensor data

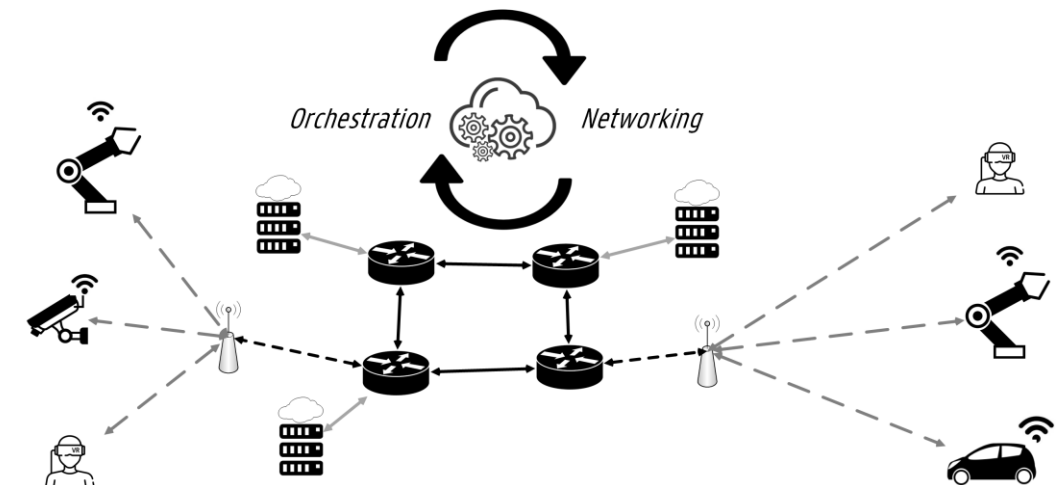


Network-aware Resource Scheduler (Diktyo)



IMEC: Network-Aware Resource Scheduler

- Diktyo from IMEC supports **network-awareness in the scheduling of containers in Kubernetes** (besides RAM and CPU)
- This ensures that end-to-end throughput and latency requirements can be met, which is important in microservice chain deployments for immersive applications
- It keeps track of application dependencies while mapping containers to the topology according to various objectives
- Diktyo has been integrated in CloudNativeLab (imec, open access Kubernetes cluster) and in the **Berlin testbed**

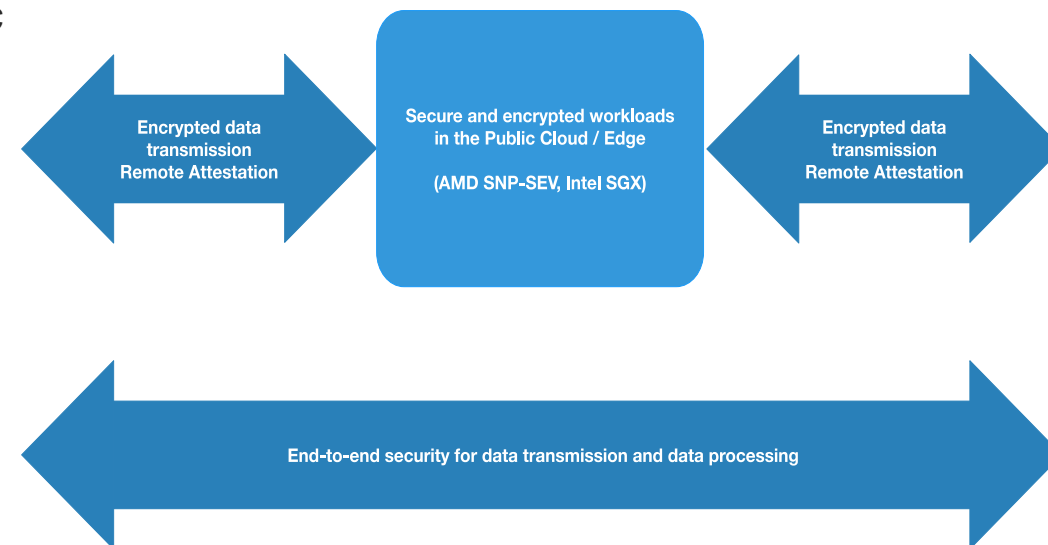




Security (End-to-End)

DT: Confidential Computing to Secure AR/VR Workloads

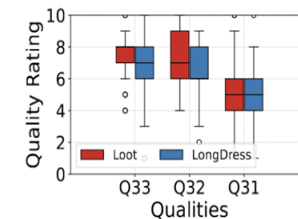
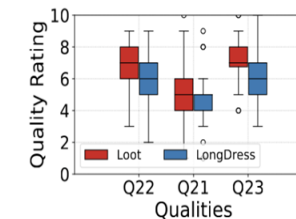
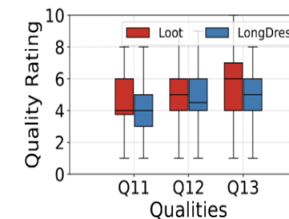
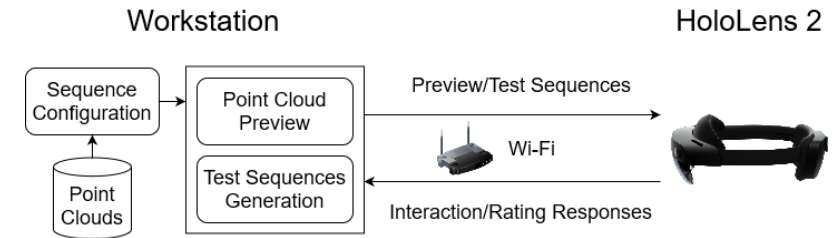
- End-to-end encryption prohibits intermediate cloud processing
 - Mathematical approaches are not feasible, e.g., homomorphic encryption
 - **End-to-end security:** Use of Confidential Computing technologies
 - Allowing processing of data within a cloud
 - Retention of full control by the data owner
1. For the preparation phase T-Sec **developed tools** to locally encrypt an operating system image for a virtual machine, modify it and upload it to the **secure data center operated by T-Sec**
 2. **For operation, scripts are available** that allow to easily launch, connect to and shut down these secured virtual machines



Quality of Experience (QoE) Evaluation



- UNI-KLU and IMEC developed tools for the MS HoloLens 2 to preview point clouds and run subjective QoE tests
- Subjective tests were performed to study the impact of different parameters on the perceived QoE:
 - Compression quality levels and quality switches
 - Viewing distance
 - Content characteristics
- With the results, **a machine-learning based QoE model was developed**
- Also, the ITU P.1203 model for QoE prediction was tuned to also support prediction for 3D point cloud content
- **The software, dataset and QoE model have been made available on github for the open call participants**





THANKS



spirit-project.eu



[@SPIRIT_eu](https://twitter.com/SPIRIT_eu)



[@spirit-eu-project](https://www.linkedin.com/company/spirit-eu-project)

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI



Funded by
the European Union

SPIRIT project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070672. This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).



Open Call Objectives

Vivien Helmut
Deutsche Telekom

Webinar Open Call 1
Online, April 16th 2024

www.spirit-project.eu

© Copyright SPIRIT 2022-2025



Activities and Contributions

The OC1 of the SPIRIT project invites FSTP proposals that concentrate on one or more of the subsequent activities, each contributing to the growing impact on SPIRIT:

- 1. Validating and testing third-party applications on the SPIRIT platform:** Conducting experiments utilising the current state of the SPIRIT platform and tools to test established FSTP solutions in specific use cases and scenarios. The evaluation focuses on factors such as scale, responsiveness, reliability, and realism, ultimately resulting in improved FSTP algorithms, components, or products. Additionally, this process provides a deeper understanding of the performance and limitations of the existing SPIRIT platform.
- 2. Providing new requirements for the SPIRIT platform:** Conducting experiments that incorporate, to some extent, established FSTP solutions previously validated in laboratory settings, either within the existing SPIRIT platform or utilising SPIRIT tools. This aims to facilitate experimentation in a more authentic environment, leading to new requirements and features for prioritizing the future development of the SPIRIT platform.
- 3. Advancing the SPIRIT platform:** Initiating developments and experiments aimed at enriching the existing SPIRIT platform. This involves integrating and testing additional functionalities offered by the FSTP, resulting in an enhanced feature set for the SPIRIT platform or expanded support for immersive application domains.

Activities and Contributions



Use of or improve for example following functionality:

- Computational and networking resource monitoring and feedback
- Efficient management and orchestration of computational resources
- Management of stand-alone or container-based applications
- Network resource adaptation
- Transport protocol optimisation
- 5G network connectivity
- Immersive media content capturing, formatting, representation, and adaptation
- Optimisation of application-level algorithms (media encoding, processing, rendering, contextualisation and control)
- Quality of experience testing and model development
- System and network security
- Confidential Computing

Extensions to the SPIRIT platform functionality could, for instance, aim at:

- Experiments that provide Research on volumetric data capturing, filtering, and compression techniques including AI algorithms.
- Experiment with XR devices such as mobile phones and AR glasses and their provided SDKs.
- Manipulate streamed audio and video data to customise the user experience within XR environments.
- Test new ways to off-load CPU/GPU heavy computations using an edge cloud solution.
- Increase scalability by extending one-to-one communication applications with one-to-many or many-to-many communication capabilities.
- Investigate novel (low-latency) transport solutions and protocols not (yet) included in the SPIRIT delivery suite.



Objectives and Expected Outcomes

The FSTP use cases are expected to start from TRL4¹ and enhance their maturity at least at TRL6².

Objectives

1. Validating and testing third-party applications on the SPIRIT platform
2. Providing new requirements for the SPIRIT platform
3. Advancing the SPIRIT platform

Expected Outcomes

- a) Practical demos in one of the testbeds and validations ...
- b) Reporting of findings, e.g. additional requirements
- c) Contributions to the platform

1) TRL 4 = technology validated in lab

2) TRL 6 = technology demonstrated in relevant environment

Use case applications, encompassing **several vertical sectors**, such as:

- Healthcare
- Retail
- Education
- Training
- Entertainment
- Manufacturing
- Tourism



THANKS



spirit-project.eu



[@SPIRIT_eu](https://twitter.com/SPIRIT_eu)



[@spirit-eu-project](https://www.linkedin.com/company/spirit-eu-project)

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI



Funded by
the European Union

SPIRIT project is funded by the EU's Horizon Europe programme under Grant Agreement number 101070672. This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).