



Newsletter #8: XR in the era of 6G- Emerging technologies enabling New Dimensions

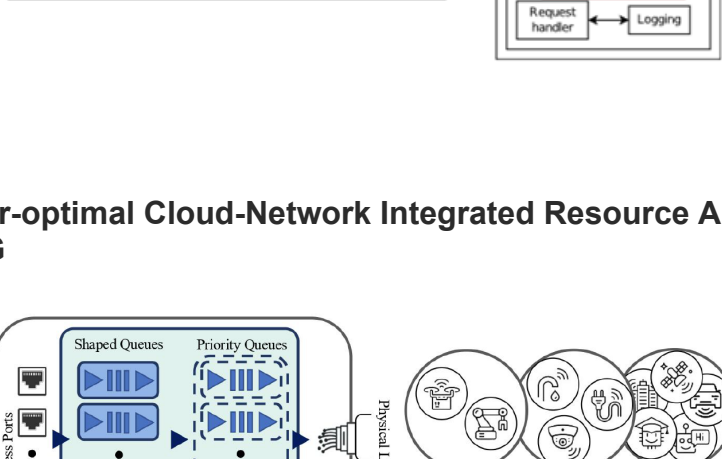
Horizon 2020 project CHARITY explores how an intelligent and autonomous framework spanning across the edge/cloud continuum of the network can facilitate the deployment and orchestration needs of Real-time Holographic Applications, Immersive Virtual Training and Mixed Reality Interactive Applications services with high-quality of experience (QoE) to users.

We begin the year with a bang as we introduce a new Blog section on the website. Do not miss to check [this](#). Here you get a glimpse of the latest, easy to understand blogs on the latest topics the project is working on. In addition, we also bring our submitted public deliverables that give a better know-how to the project learnings and discoveries. Enjoy Reading and let us know your [thoughts!](#)

New Publications Released

CHARITY project partners are motivated to bring the change and improving needs of enabling new dimensions hence are consistent in publishing research papers. The CHARITY website has a section where papers produced by project partners are available for download. Below we highlight some of the most recent ones: [Papers & Conferences section of the CHARITY project website.](#)

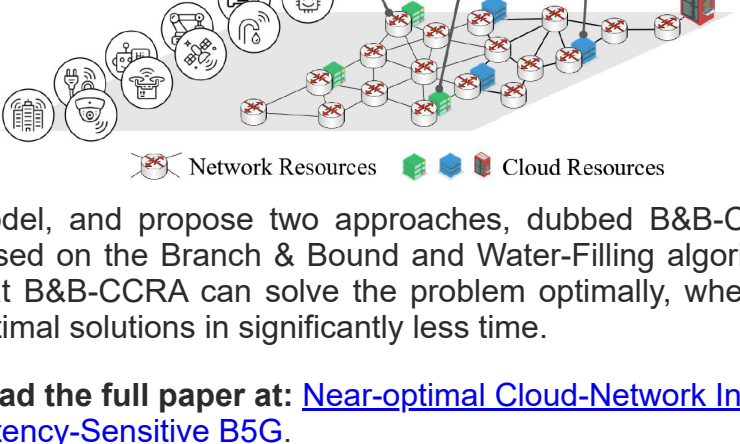
Serverless computing: a security perspective



In this article authors review the current serverless architectures, abstract and categorize their founding principles, and provide an in-depth security analysis. In particular, we show the security shortcomings of the analyzed serverless architectural paradigms; point to possible countermeasures; and, highlight several research directions for practitioners, Industry, and Academia.

For more details follow the link: [Serverless computing: a security perspective.](#)

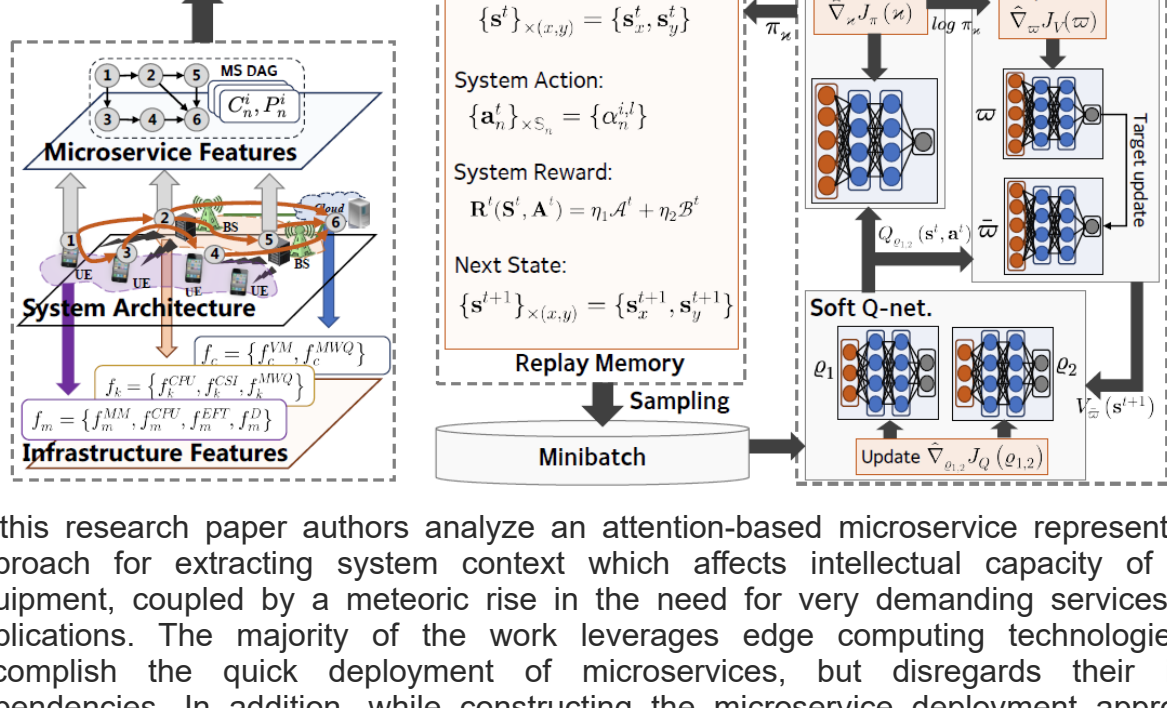
Near-optimal Cloud-Network Integrated Resource Allocation for Latency-Sensitive B5G



Recent paper publication by CHARITY partners fills in the gap by studying the joint problem of communication and computing resource allocation, dubbed CCRA, including VNF placement and assignment, traffic prioritization, and path selection considering capacity constraints as well as link and queuing delays, with the goal of minimizing overall cost. They formulate the problem as a non-linear programming model, and propose two approaches, dubbed B&B-CCRA and WF-CCRA respectively, based on the Branch & Bound and Water-Filling algorithms. Numerical simulations show that B&B-CCRA can solve the problem optimally, whereas WF-CCRA can provide near-optimal solutions in significantly less time.

Read the full paper at: [Near-optimal Cloud-Network Integrated Resource Allocation for Latency-Sensitive B5G.](#)

Deep Reinforcement Learning for Dependency-aware Microservice Deployment in Edge Computing



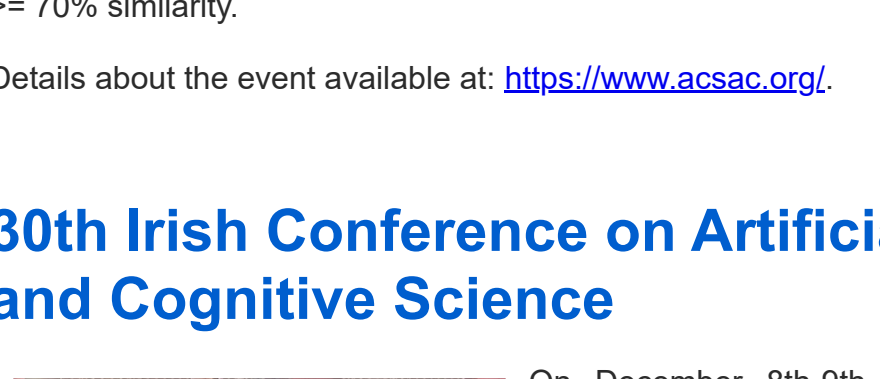
In this research paper authors analyze an attention-based microservice representation approach for extracting system context which affects intellectual capacity of user equipment, coupled by a meteoric rise in the need for very demanding services and applications. The majority of the work leverages edge computing technologies to accomplish the quick deployment of microservices, but disregards their inter-dependencies. In addition, while constructing the microservice deployment approach, several research issues (MSD) is stated as a max-min problem by concurrently evaluating the system cost and service quality. The simulation results reveal the ASAC algorithm's priorities in terms of average system cost and system reward.

Read the full paper at: [Deep Reinforcement Learning for Dependency-aware Microservice Deployment in Edge Computing.](#)

Participation at ACSAC '22 - Proposed Heimdallr: Fingerprinting SD-WAN Control-Plane Architecture via Encrypted Control Traffic

Software-Defined WAN (SD-WAN)

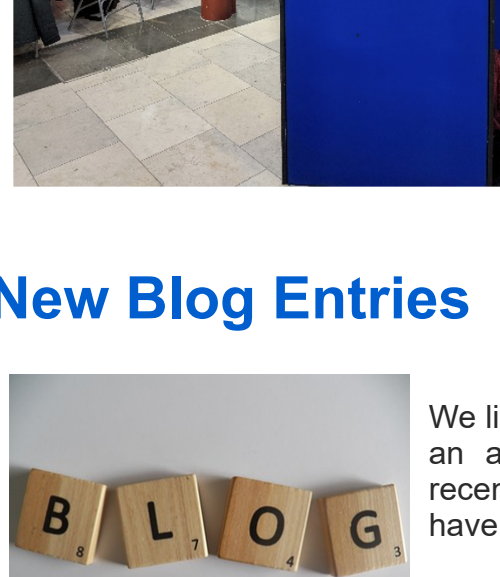
- A new use case for efficiently operating a private WAN
 - To manage geographically distributed sites with a unified platform, i.e., controller
 - Can achieve network-wide optimization → Used by many WAN operators, e.g., Google¹, Microsoft²



On 5th Dec 22 CHARITY project partner, Telefonica, presented a new SD-WAN fingerprinting system, called Heimdallr at ACSAC. This is a new SD-WAN fingerprinting system. It analyzes periodical and operational patterns of SD-WAN cluster management protocols and the context of flow directions from the collected control traffic utilizing a deep learning-based approach, so that it can classify the cluster management protocols automatically from miscellaneous control traffic datasets. The evaluation, which is performed in a realistic SD-WAN environment consisting of geographically distant three campus networks and one enterprise network shows that Heimdallr can classify SD-WAN control traffic with >= 93%, identify individual protocols with >= 80% macro F-1 scores, and finally can infer control-plane topology with >= 70% similarity.

Details about the event available at: <https://www.acsac.org/>.

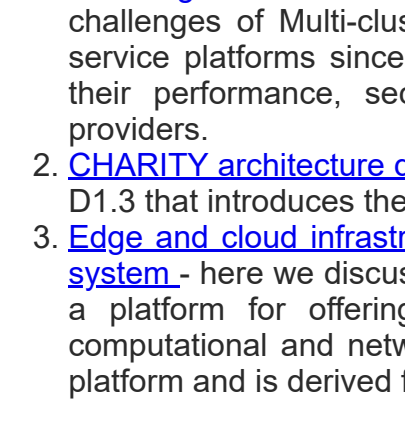
30th Irish Conference on Artificial Intelligence and Cognitive Science



On December 8th-9th, 2022 CHARITY Partner, Collins Aerospace, participated at 30th Irish Conference on Artificial Intelligence and Cognitive Science, Ireland an event that was organized by Munster Technological University. In this event CHARITY project was a key demonstrator towards advancing the state of the art with leveraging AI and cloud technologies to reimagine how on-premise products with very challenging bandwidth and latency demands can migrate to the cloud.

More details about the event are available at: <https://aics2022.mtu.ie/>

New Blog Entries

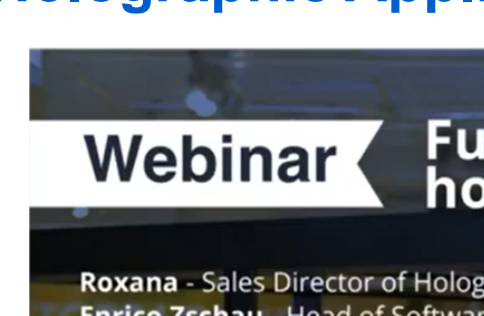


We like to do more and be inspired in positive ways. This is an attempt by CHARITY project partners to bring the recent learnings and findings that could set trends and have an impact.

Here are the most recent contributions:

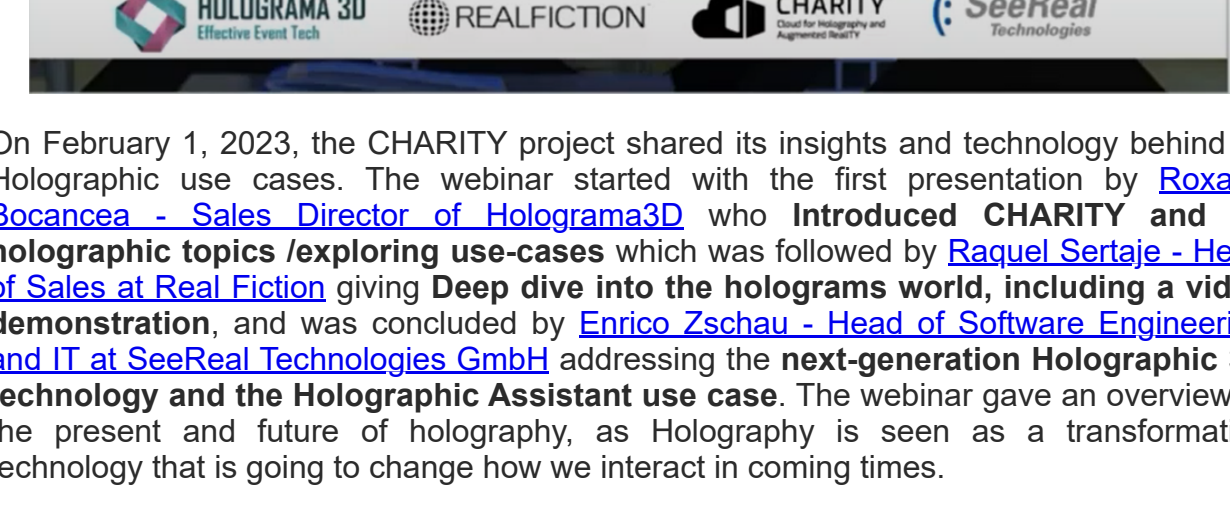
1. [Challenges of Multi-cluster Monitoring](#) - Project CHARITY is addressing some of the challenges of Multi-cluster monitoring. This is achieved when we abandon single service platforms since applications are divided into more parts and to guarantee their performance, security and stability, they must be independent of cloud providers.
2. [CHARITY architecture design and specification](#) - this blog is derived from deliverable D1.3 that introduces the CHARITY architecture to support future XR applications.
3. [Edge and cloud infrastructure resource and computational continuum orchestration system](#) - here we discuss some of the findings that will enable the implementation of a platform for offering a smooth and efficient life-cycle of the computational and networking resources as well as the XR services hosted in the platform and is derived from deliverable D2.1.

NEW VIDEO RELEASE



In our video on Multi-Cluster Connectivity, we briefly demonstrate Service Discovery and Cross-Cluster Communication. Link: <https://www.youtube.com/watch?v=JlWpicwLoLs>

Online Webinar on Future Forward Holographic Applications



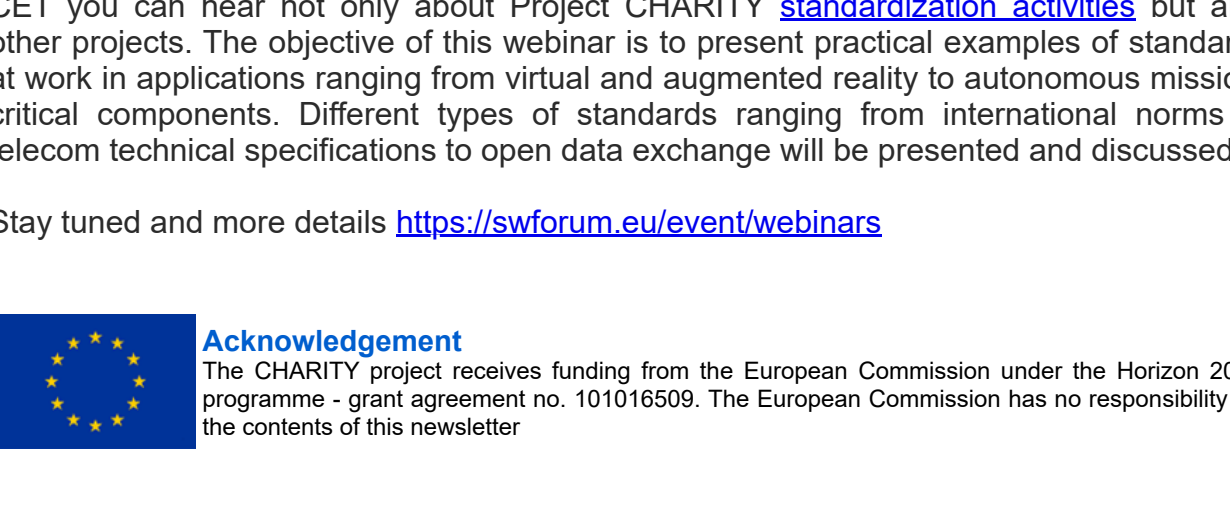
On February 1, 2023, the CHARITY project shared its insights and technology behind its Holographic use cases. The webinar started with the first presentation by [Roxana Bocancea - Sales Director of Holograma3D](#) who introduced CHARITY and its [holographic topics /exploring use-cases](#) which was followed by [Raquel Sertaje - Head of Sales at Real Fiction](#) giving [Deep dive into the holograms world, including a video demonstration](#), and was concluded by [Enrico Zschau - Head of Software Engineering and IT at SeeReal Technologies GmbH](#) addressing the [next-generation Holographic 3D technology and the Holographic Assistant use case](#). The webinar gave an overview of the present and future of holography, as Holography is seen as a transformative technology that is going to change how we interact in coming times.

The event was attended by experts, researchers in ICT, CHARITY followers, team CHARITY etc. Webinar provided great platform to engage and exchange. Thanks to the speakers, moderators, organizing team and participants to make it a success and we continue to plan such events in future too.

Further details: [CHARITY project - Webinar #4: Future Forward Holographic Applications](#)

UPCOMING EVENT PARTICIPATION

"CHARITY speaks on- Supporting advanced media applications with standards" at Online Webinar on Software Technologies and Standards: Enabling interoperability and Innovation



CHARITY project has been invited to contribute to explain its standardization activities, in the project, by SWForum. In this webinar on Tuesday, 21 February, from 15.00 to 16.30 CET you can hear not only about Project CHARITY [standardization activities](#) but also other projects. The objective of this webinar is to present practical examples of standards at work in applications ranging from virtual and augmented reality to autonomous mission-critical components. Different types of standards ranging from international norms to telecom technical specifications to open data exchange will be presented and discussed.

Stay tuned and more details <https://swforum.eu/event/webinars>



Acknowledgement
The CHARITY project receives funding from the European Commission under the Horizon 2020 programme - grant agreement no. 101016509. The European Commission has no responsibility for the contents of this newsletter