Ioan CONSTANTIN, Orange Romania

UC-EDU-1: XR Rural School

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6G-Path

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Orange Romania / Use-Case (1)

- **C-EDU-1 – XR rural school -** This use case aims at further developing the Digitalia program by implementing an XR-enabled learning platform to support 2 rural schools in Romania and in one mobile deployment "XR Caravan" supported by 5G mobile communications. The implementation of the project in 2 rural schools in Romania aims to create a captivating and interactive learning experiences that will help students improve their academic performance and reduce the discrepancies between them and urban students.

Creating interactive learning experiences, by using immersive education, teachers will create interactive experiences that allow students to explore learning topics in a captivating and interactive way.

Creating simulations, teachers will use immersive education to create simulations that allow students to experience different scenarios and develop practical skills.

Access to educational resources trough an immersive education platform, by using immersive education, teachers can provide access to educational resources that may be costly or difficult to access in rural areas

Personalizing the learning experience, teachers can personalize the learning experience for students based on their level of knowledge and skills.

Orange Romania / Use-Case (2)

The support for this use case will essentially rely on ORO's network and infrastructure. ORO will provide data connectivity through the commercially deployed network (5GSA) and access to a fully-fledged 5G/6G Experimentation Platform equipped with latest generation of software and hardware solution. The VR Caravan, operated from Iasi, Romania, and both rural schools will have the necessary coverage to ensure a good quality experience for both students and teachers.
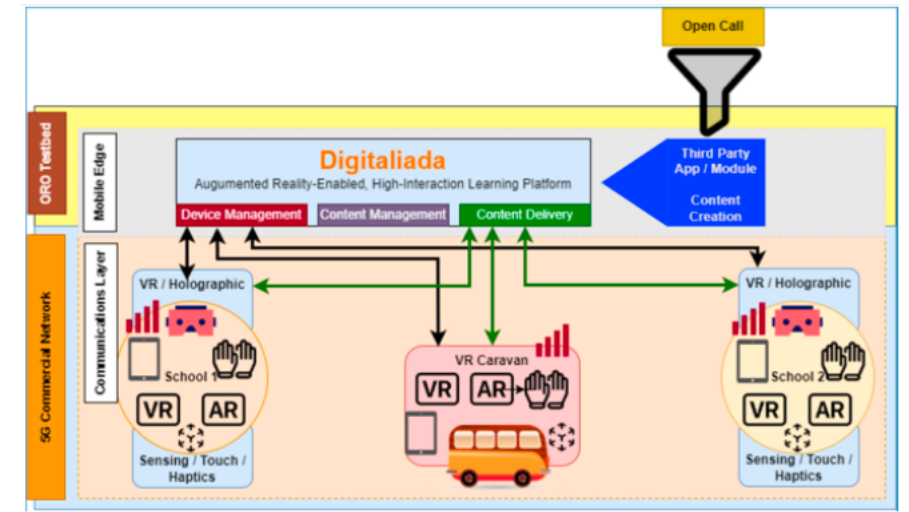
Functional Requirements

- Beyond-5G Network Connectivity and Network Infrastructure Availability

- "Digitaliada" Platform available as an EDGE-enabled application

- Availability of Third-Party Apps to develop XR-enabled content, from existing curriculum

- Integration of Device Management functionality for the XR devices, into the Digitaliada Platform or as a third-party Application running in the EDGE

UC-EDU-1 – Scenarios Description

Scenario 1 - "XR in rural schools"

This scenario targets the deployment of an XR-enabled platform to two primary schools in rural areas of Romania. The two schools will be selected through an internal evaluation process of OROF's, building on top their demonstrable experience in working with primary education institutions, on several other projects and opportunities.

Scenario 2 - "**XR Caravan"**

This second scenario targets the deployment of an XR-enabled platform to a purpose-equipped vehicle (for this purpose, a Caravan-class automobile) which will transit between rural areas near Iași, Romania, and support the dissemination of XR-enabled learning to the teachers and students, pupils in these rural areas. The principal purpose of this scenario is to demonstrate the mobility capabilities and features of the 6G-PATH platform.
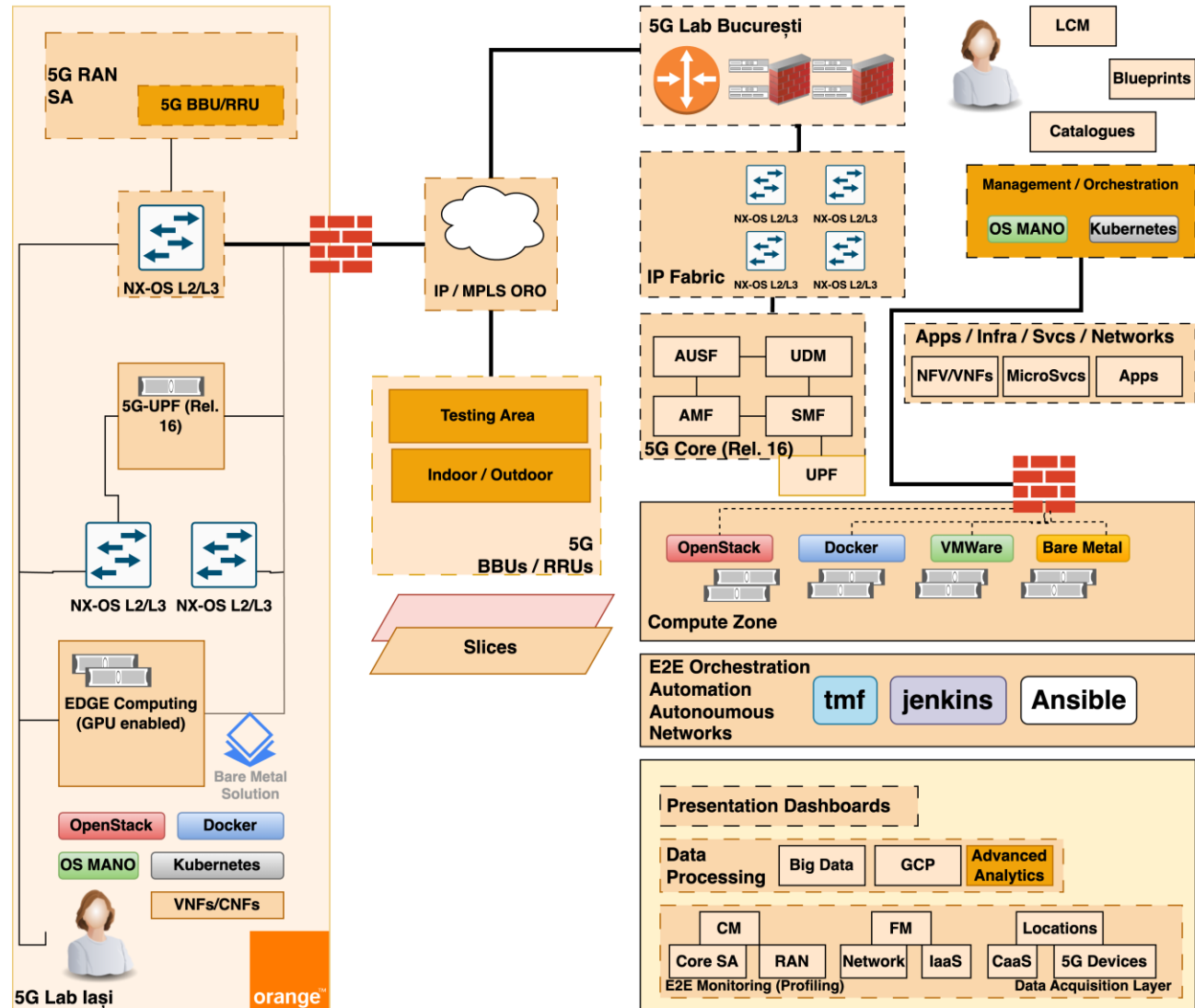
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5G Lab testing area (București – CAMPUS Building, Iași – TUI Building)

- ❑ 5G service access (NSA/SA)
- ❑ Wi-Fi6e/Wi-Fi7, IoT LoRaWAN, LTE-M
- ❑ Secured resources access, Internet

5G Lab Data Centres (București, Iași)

- ❑ Compute servers and Storage: HPE Gen10
- ❑ IP Network: Cisco routers and switches (ASR/NX-OS)
- ❑ IPFABRIC design
- ❑ Security Fortinet Firewalls
- ❑ 4G5G RAN Huawei & Nokia RRUs/BBUs
- ❑ 5G Combo Core PMR Nokia (Rel16)
- ❑ Open 5G RAN/Core network (Experimentation)
- ❑ 4G5G Antennas
- ❑ Orchestration Tools*, Virtualized infra
- ❑ 25Gbps Links, Network Racks
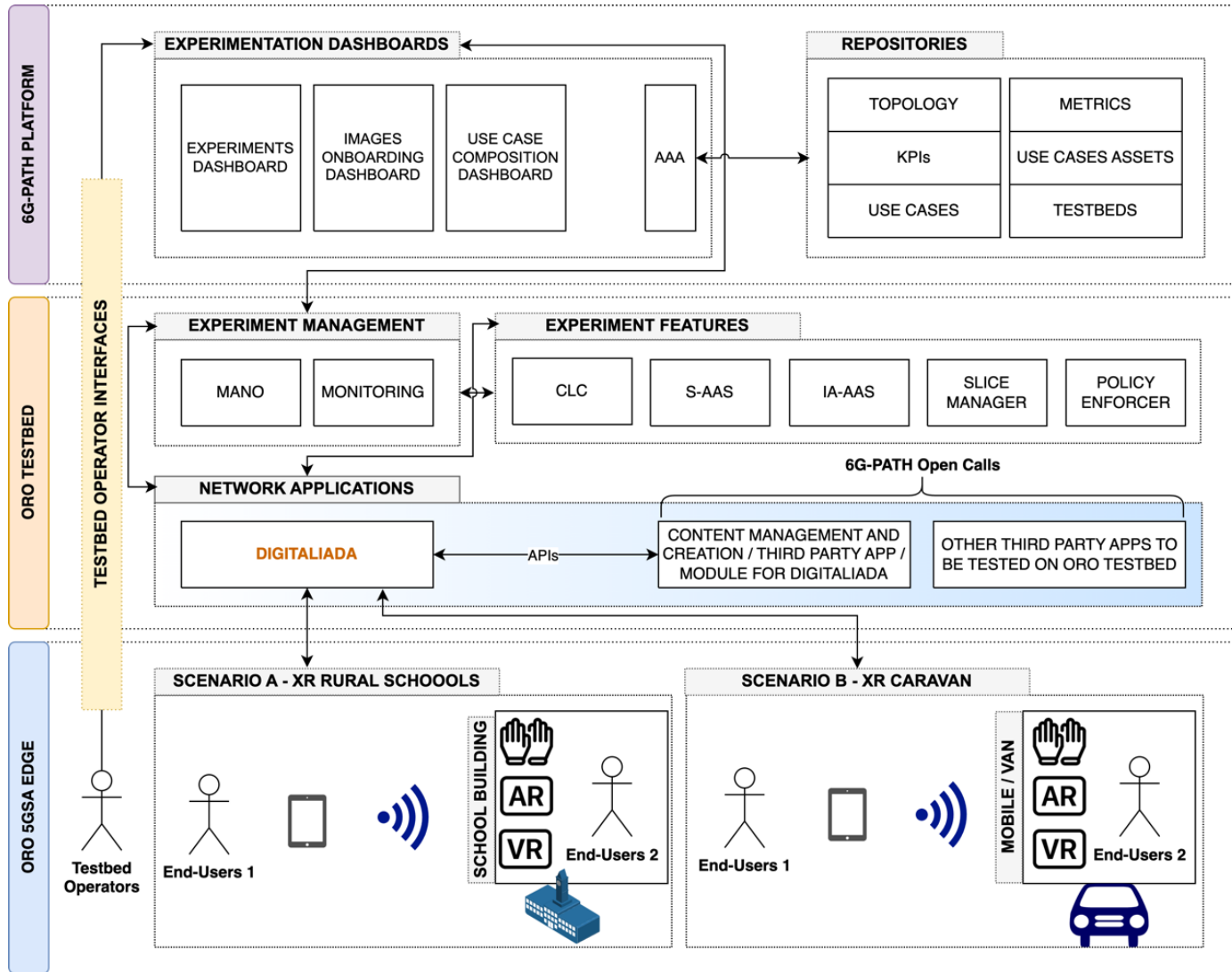
- Documentation of DIGITALIADA APIs for 3rd parties developers
- Migration of DIGITALIADA platform to ORO's IaaS
- Selection of XR UEs (Headsets, controllers etc.) based on requirements of UC-EDU-1

UC-EDU-1 – Technical KPIs

Scenario	KPI	Description	Objective	Measurement
Scenario A – "XR in rural schools"	Ultra-high bandwidth	XR Enabled Content required very high bandwidth capabilities in the 6G network transport	More than 50 Gbps available bandwidth to the XR platform and the XR UE	E2E tests – UE to Digitaliada CRM IaaS
	Ultra-low latency	XR Enabled interactions require ultra low latency	Less than 3ms available to UE XR devices	E2E tests – UE to Digitaliada EDGE processing nodes
	Near-zero packet loss	XR Ecosystems require data consistency	Near-Zero P.L.	E2E tests – UE to Digitaliada EDGE processing nodes
Scenario B – "XR Caravan"	Ultra-high bandwidth	XR Enabled Content required very high bandwidth capabilities in the 6G network transport	More than 50 Gbps available bandwidth to the XR platform and the XR UE	E2E tests – UE to Digitaliada CRM IaaS
	Ultra-low latency	XR Enabled interactions require ultra low latency	Less than 3ms available to UE XR devices	E2E tests – UE to Digitaliada EDGE processing nodes
	Near-zero packet loss	XR Ecosystems require data consistency	Near-Zero P.L.	E2E tests – UE to Digitaliada EDGE processing nodes

UC-EDU-1 – Economic KVIs

KV	KVI	Description	How to measure/Target (to discuss)	Methodology
Cost Savings	Reduced operational cost	Fraction of respondents believe that XR technology and 6G connectivity facilitate decreasing the overall operational cost that results from the digital and interactive learning environment in the long term.	Opinionated Questions using 5-point Likert Scale/ per student cost saving as a % decrease	SAFT
Resource Utilization	Increased Resource Utilization	Fraction of respondents believe that XR technology and 6G connectivity facilitate increasing resource utilization through the scalability of digital content (Ex: Digital and XR content can be reused and scaled across multiple classrooms and schools (i.e via caravan) without significant additional costs)	Opinionated Questions using 5-point Likert Scale	SAFT
Increased Productivity	Increased Productivity	Fraction of respondents believe that XR technology and 6G connectivity increase productivity in teaching and learning through enhanced teaching efficiency, improved student performance and teacher training efficiency.	Opinionated Questions using 5-point Likert Scale	SAFT
Economic Resilience	Increased economic resilience	Fraction of respondents believe that XR technology and 6G connectivity prepare students for future job markets, thereby making the workforce more resilient to changes brought by automation and other technological advancements.	Opinionated Questions using 5-point Likert Scale	SAFT

UC-EDU-1 – Social KVIs

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KV	KVI	Description	How to measure/Target (to discuss)	Methodology
Educational Outcomes and Performance	Increased academic performance	Improvement of student's educational performance (ex: in test scores, grades, and overall academic performance of students) after participating in the XR-enabled learning environment compared to traditional teaching	% increase compared to baseline (traditional teaching)	SAFT
Social Inclusion and Equity	Increased social inclusion and equity in education	Fraction of respondents believe that XR learning experiences facilitate to reduction of disparities between rural and urban students, focusing on access to quality educational content and resources.	Opinionated Questions using 5-point Likert Scale/ % increase of students with access to XR technology	SAFT
Long-Term Social Mobility	Long-Term Social Mobility	Fraction of respondents believe that XR learning experiences facilitate to long-term career progress, increase earning potential and improve the socioeconomic status of students who have benefited from digital education.	Opinionated Questions using 5-point Likert Scale/	SAFT
Technology Adoption and Utilization	Increased technology adoption and utilization	The number of workshops or training sessions conducted by the 6G-PATH project to make the parents, teachers and other rural schools aware of the XR-enabled learning environment.	Opinionated Questions using 5-point Likert Scale + No of workshops+ feedback for workshops	SAFT
Digital Literacy and Skills Development	Improved Digital Literacy and Skills Development	Improvements in students' and teachers' digital literacy and technology skills.	Opinionated Questions using 5-point Likert Scale/% increase compared to current	SAFT
Student retention	Increased student retention	Improve student retention compared to baseline (traditional teaching)	% increase compared to baseline	SAFT

UC-EDU-1 – Service Quality KVIs

KV	KVI	Description	How to measure/Target (to discuss)	Methodology
User satisfaction	Increased user satisfaction	The students' and teachers' level of satisfaction with the XR technologies enabled by 6G to make a positive impact on teaching and learning.	Opinionated Questions using 5-point Likert Scale	SAFT
Engagement and Motivation	Increased student engagement and motivation	Improvement of students' engagement and interest in learning activities after being in an XR-enabled learning environment compared to traditional teaching.	Opinionated Questions using 5-point Likert Scale/ % increase compared to current	SAFT
	Increased teacher engagement and motivation	Improvement of changes in teacher engagement, job satisfaction and motivation to teach after the XR-enabled learning environment compared to traditional teaching	Opinionated Questions using 5-point Likert Scale/% increase compared to current	SAFT
Quality of Experience (QoE)	Increase in Quality of Experience (QoE)	Increase of the perceived QoE and impact of XR-enabled teaching compared to traditional teaching.	Opinionated Questions using 5-point Likert Scale	SAFT
Interactive learning experiences	Interactive learning experiences	The user's level of satisfaction with the XR technologies enabled by 6G in providing an interactive teaching and learning experience	Opinionated Questions using 5-point Likert Scale	SAFT
Ease of Use	Increased Ease of Use	The user's level of satisfaction with the perceived ease of using XR technologies enabled by 6G in teaching and learning.	Opinionated Questions using 5-point Likert Scale	SAFT
Reliability	Increased network reliability	The users' rating on the reliability of using 6G with XR technology in the teaching and learning process to make sure they are not interrupted due to network failures, providing a consistent experience.	Opinionated Questions using 5-point Likert Scale	SAFT
Content Quality	Increased Content Quality	Student and teacher perceptions of the relevance, engaging nature, quality, and usefulness of the digital educational content provided.	Opinionated Questions using 5-point Likert Scale	SAFT
Teaching and learning efficiency	Time Savings for Teachers	The teachers' rating on to what extent digital tools and XR technologies help them to save time in preparing and delivering lessons.	Opinionated Questions using 5-point Likert Scale	SAFT
	Learning Efficiency for Students	The students' rating on to what extent students feel that digital tools and XR technologies help them learn more efficiently and effectively.	Opinionated Questions using 5-point Likert Scale	SAFT

Thanks!

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