# Orchestration mechanisms to provide context-aware adaptive XR experiences on the Web

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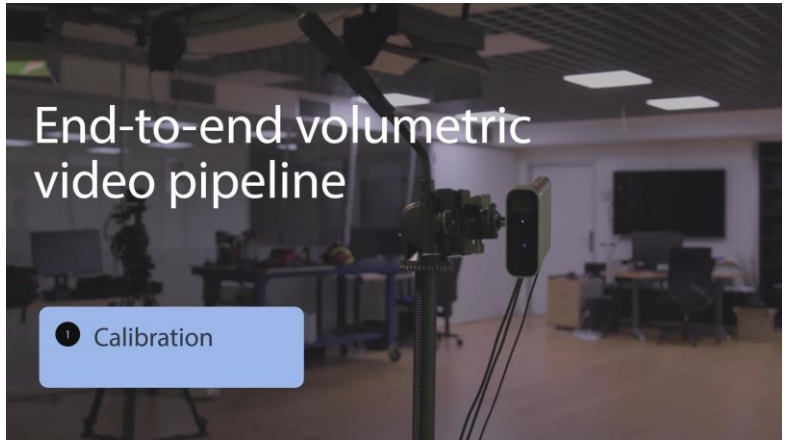
# Introduction




## Atomic XR elements

Volumetric video, spatial audio, multi-sensory. They bring new opportunities and new challenges

## Orchestration mechanisms

Next-generation XR experiences will require orchestration for context-aware adaptiveness

## Web as an open platform

Long-term, interoperable and open platform to provide native atomic XR rendering and orchestration

# Outline


01 Introduction

02 Meaning of Orchestration

03 Context-aware adaptive XR experiences

04 Conclusions

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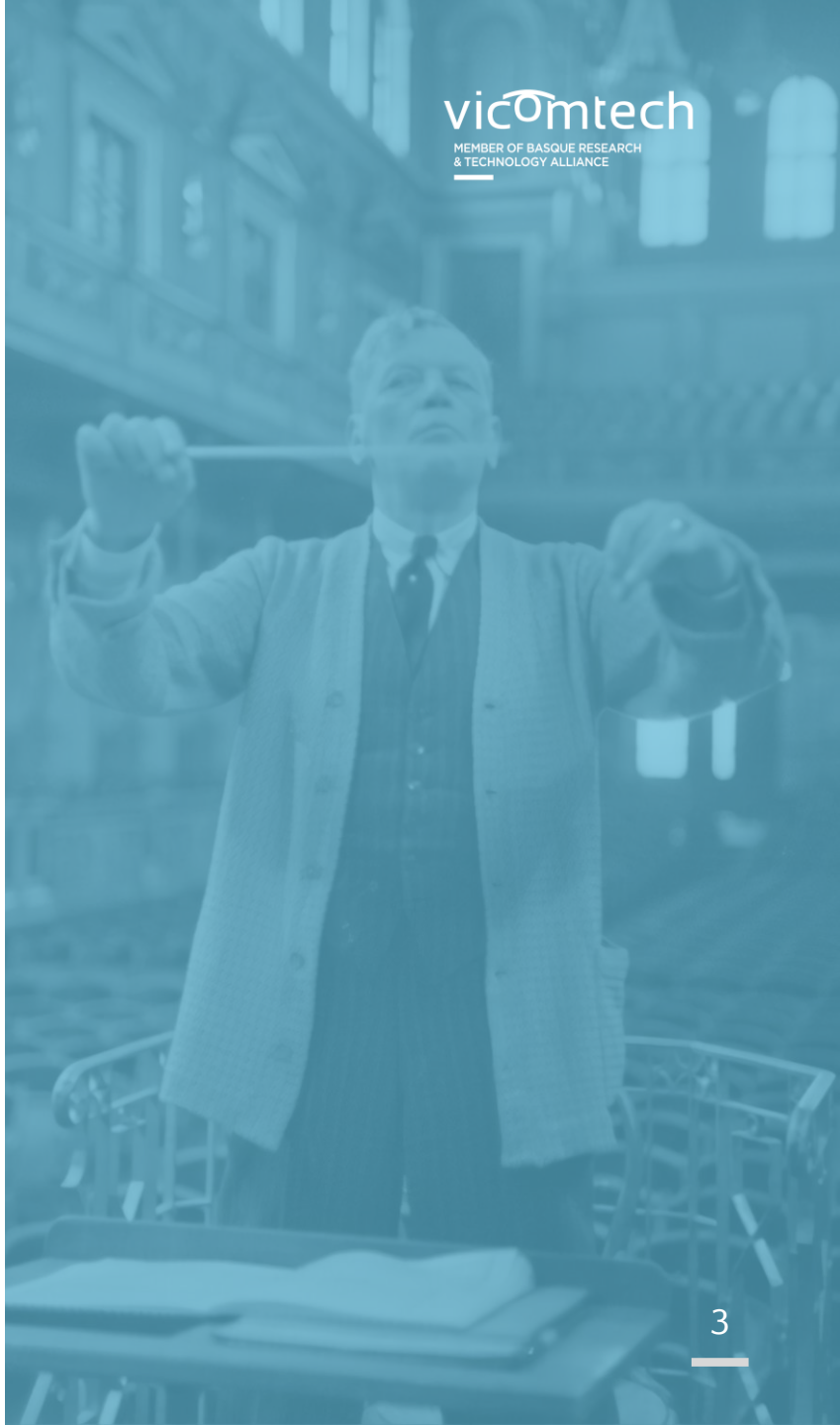

single application | multiple screens
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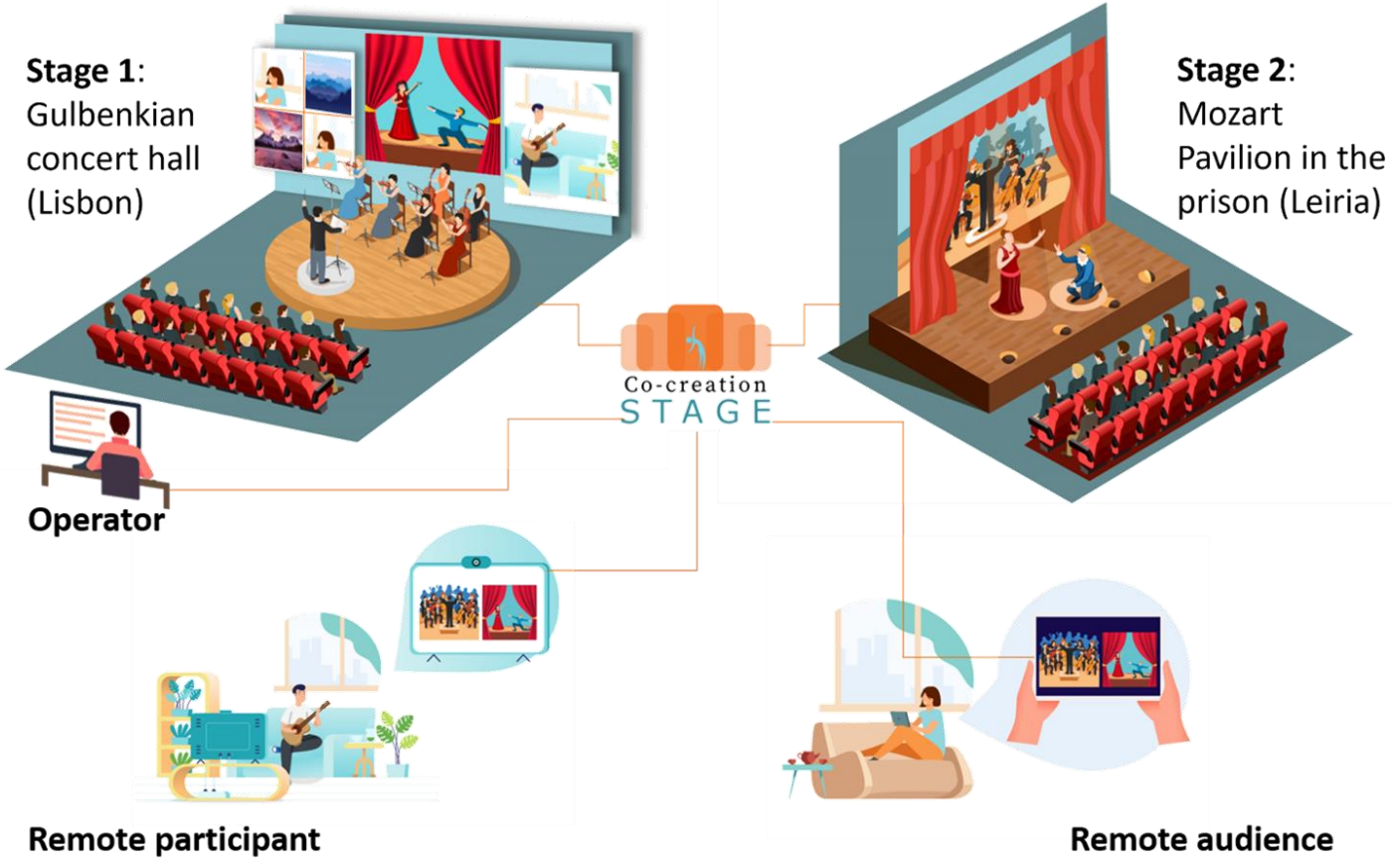
IK4 Research Alliance

Traction
Opera co-creation for a social transformation

Co-creation STAGE

A tool that **connects participants** in **real-time**, allowing multiple co-located stages and participants to **perform together**.



**40 stories, 40 years**

2024 marks 40 years since the launch of the EU's first funding programme dedicated to science, research and innovation. This booklet presents a symbolic 40 stories to illustrate the breadth of R&I made possible through EU R&I funding and some of the results achieved over the last 40 years.

# “Traditional” Media Orchestration

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**Web Authoring tool to create distributed performances**

**Authoring Tool**

Traction
Opera co-creation for a social transformation

Co-creation STAGE

**Multimedia elements (audio, video, images…)**

Live video | On-demand video | Others

Capabilities

Configuration

Reads

**Orchestration**

Creates

Capabilities

Configuration

Cloud / CDN | 4G / WiFi / Ethernet

**Media Communications**

**Experience**

# Next-generation XR Media Experiences

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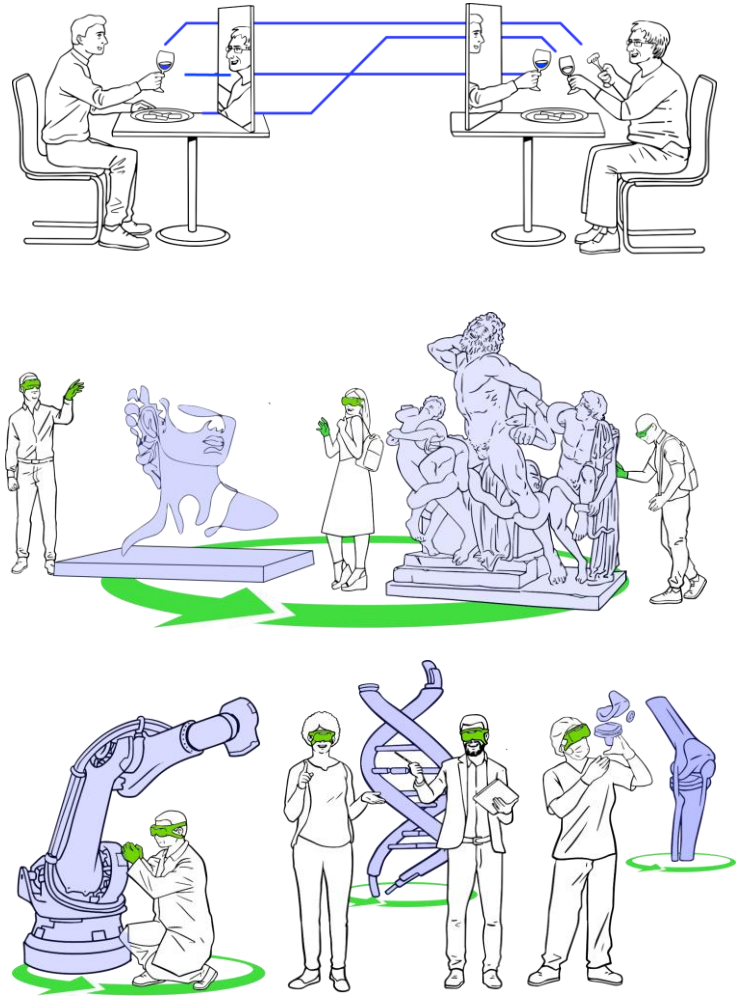
Source: sportspromedia (BT and Condense Reality)



# Orchestration in next-generation XR Media Experiences

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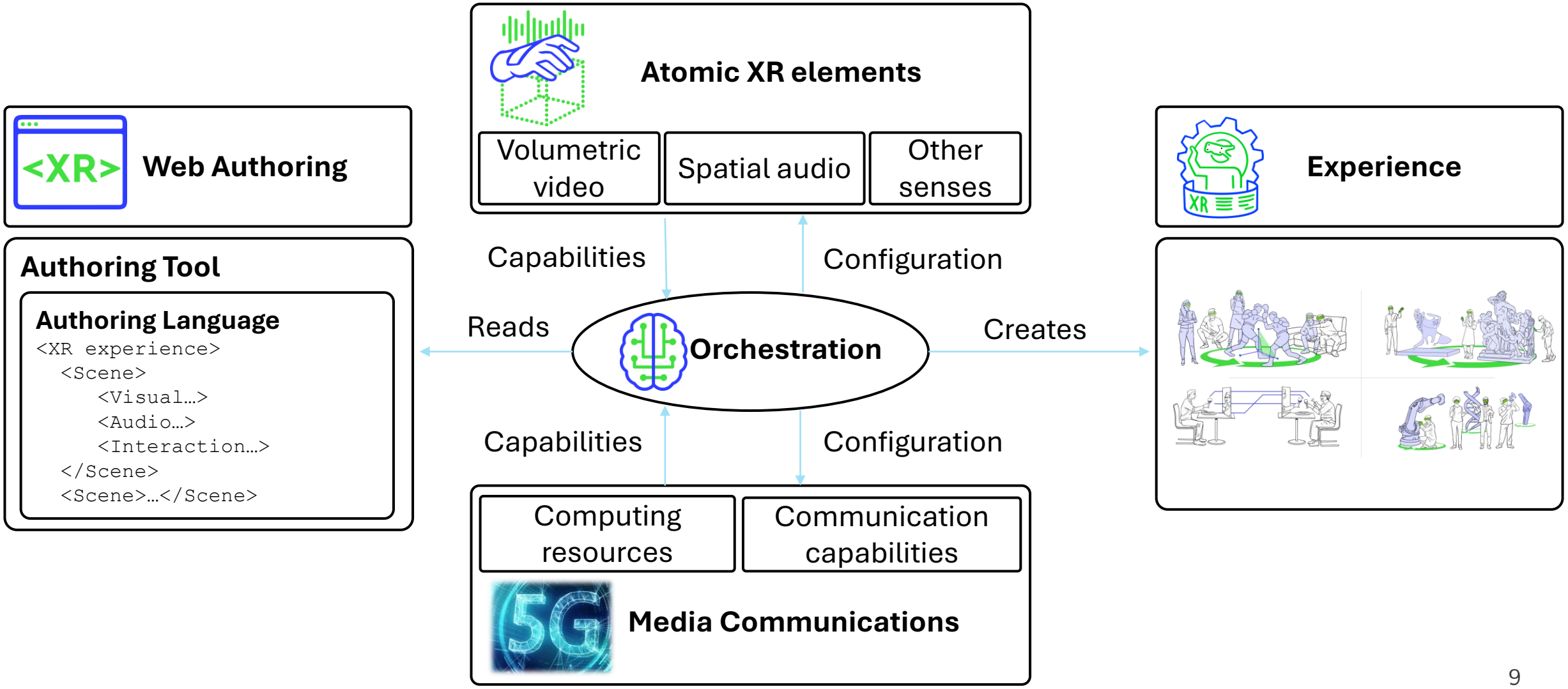

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# Context-aware adaptiveness

What is the meaning of **RESPONSIVENESS** or **ADAPTATION** in a next-generation XR experience?

Fidelity adaptation of each atomic XR element

Higher quality

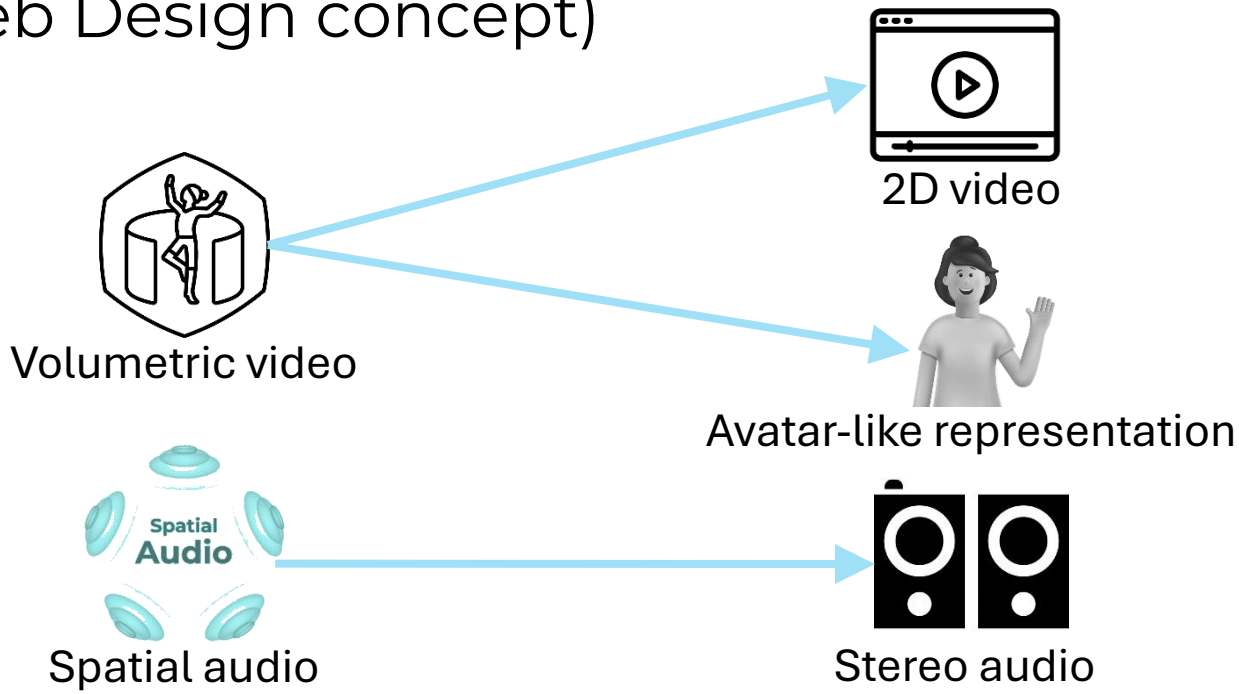
Lower quality

Source: Condense Reality

# Context-aware adaptiveness

What is the meaning of **RESPONSIVENESS** or **ADAPTATION** in a next-generation XR experience?

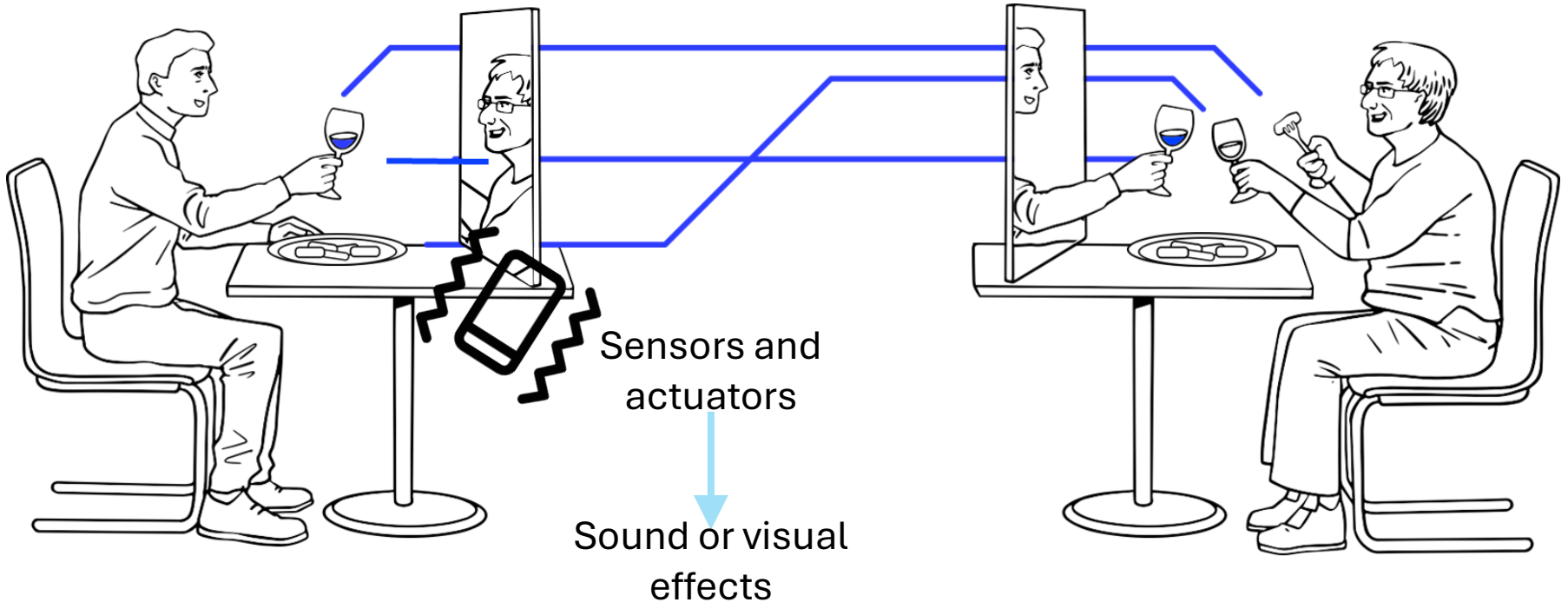
Jump from one to other representation type (like the RWD - Responsive Web Design concept)



# Context-aware adaptiveness

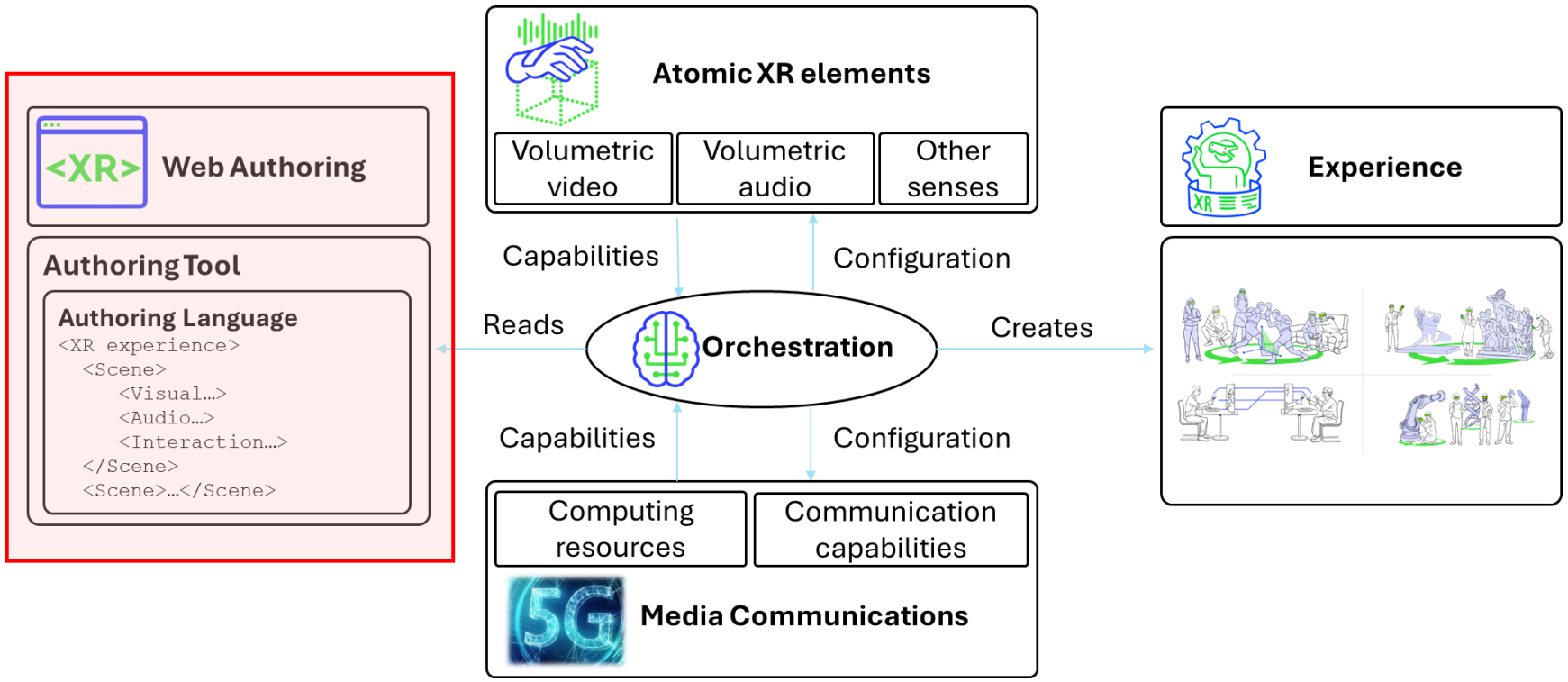
What is the meaning of **RESPONSIVENESS** or **ADAPTATION** in a next-generation XR experience?

Cross-modality transformation



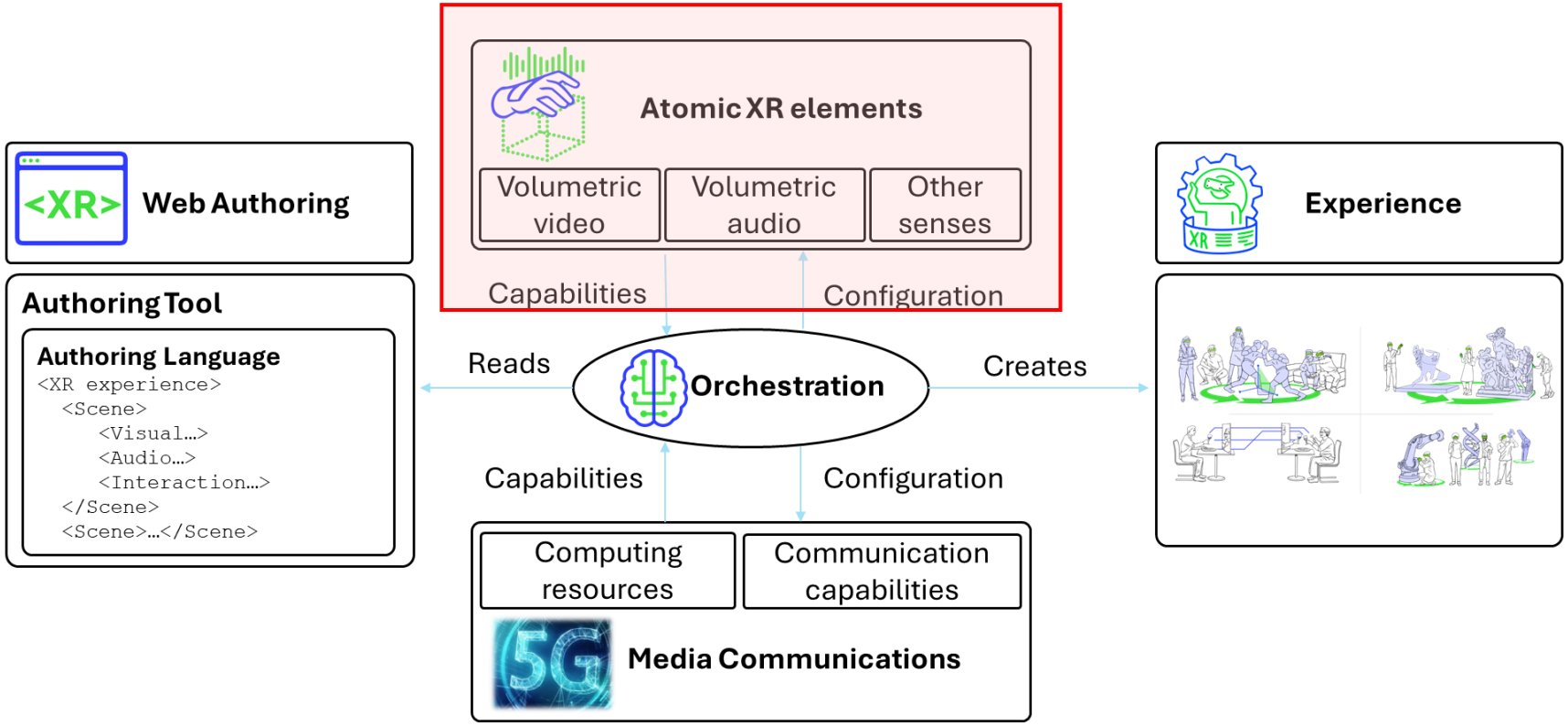
# Context-aware adaptiveness

- **Authoring capabilities** are needed:
  - Orchestration needs to read the behaviour of the application from a high-level description
  - It is not possible to define how to adapt it for each scenario



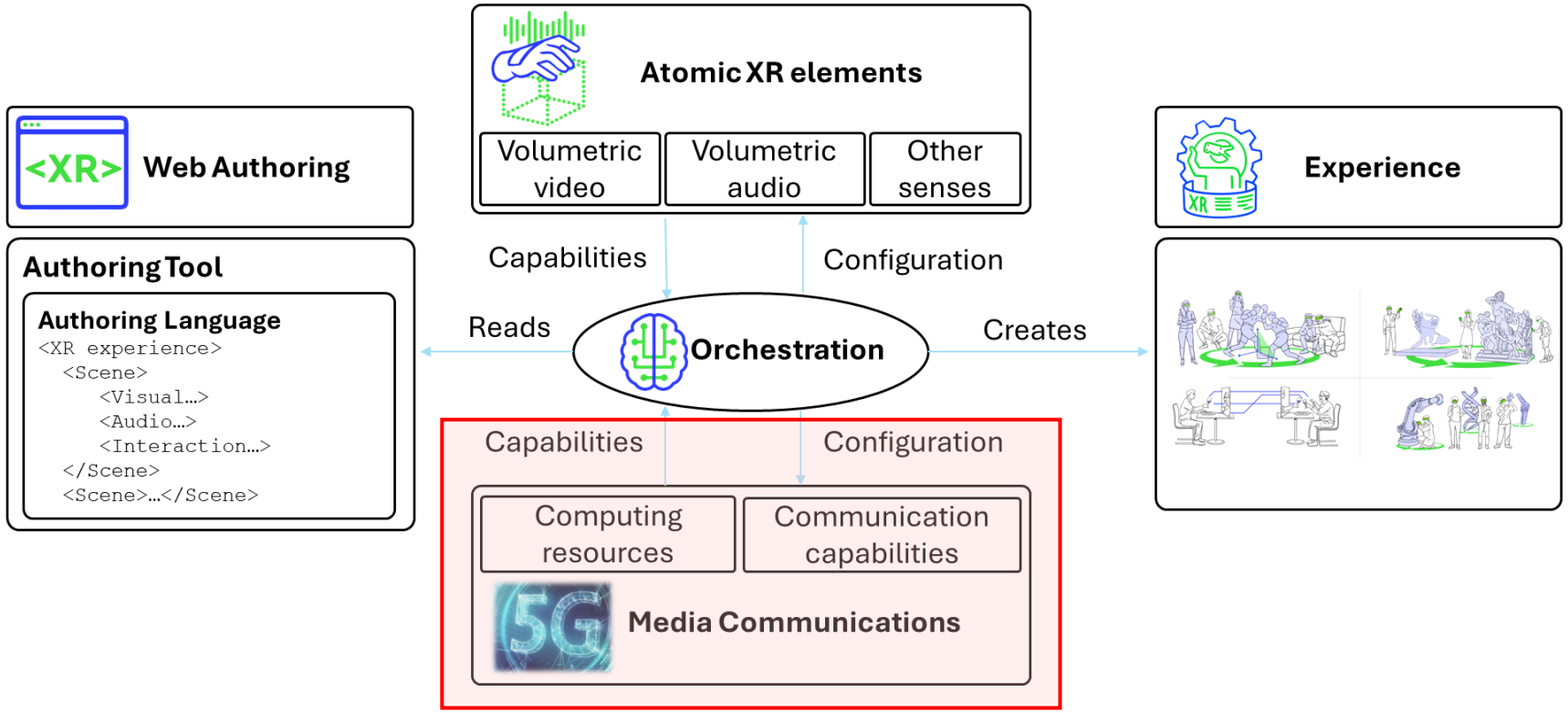
# Context-aware adaptiveness

- **Fidelity-adaptive Atomic XR elements** are needed:
  - From higher to lower fidelity levels
  - From volumetric to 2D or avatar-like
  - Cross-modality transformations



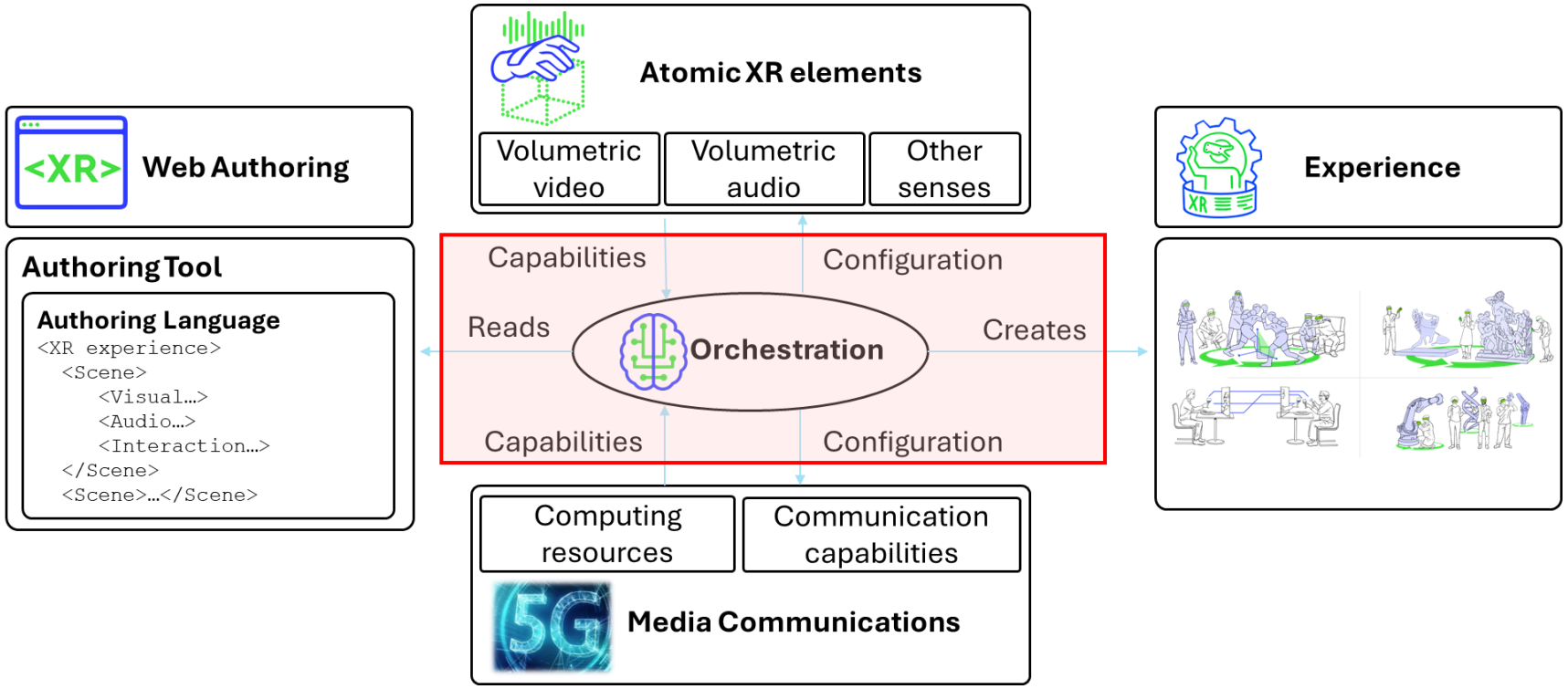
# Context-aware adaptiveness

- **Media Communications** need to expose dynamic configuration capabilities:
  - Networks are also their KPIs and performance, and *virtusalisation* and *softwarisation* enables to configure them dynamically
  - Edge/Cloud Continuum: Offload computing resources across all the network (end-device, MEC, Cloud)
  - Configure the communication capabilities (intelligent network management, self-organising network, network slicing)



# Context-aware adaptiveness

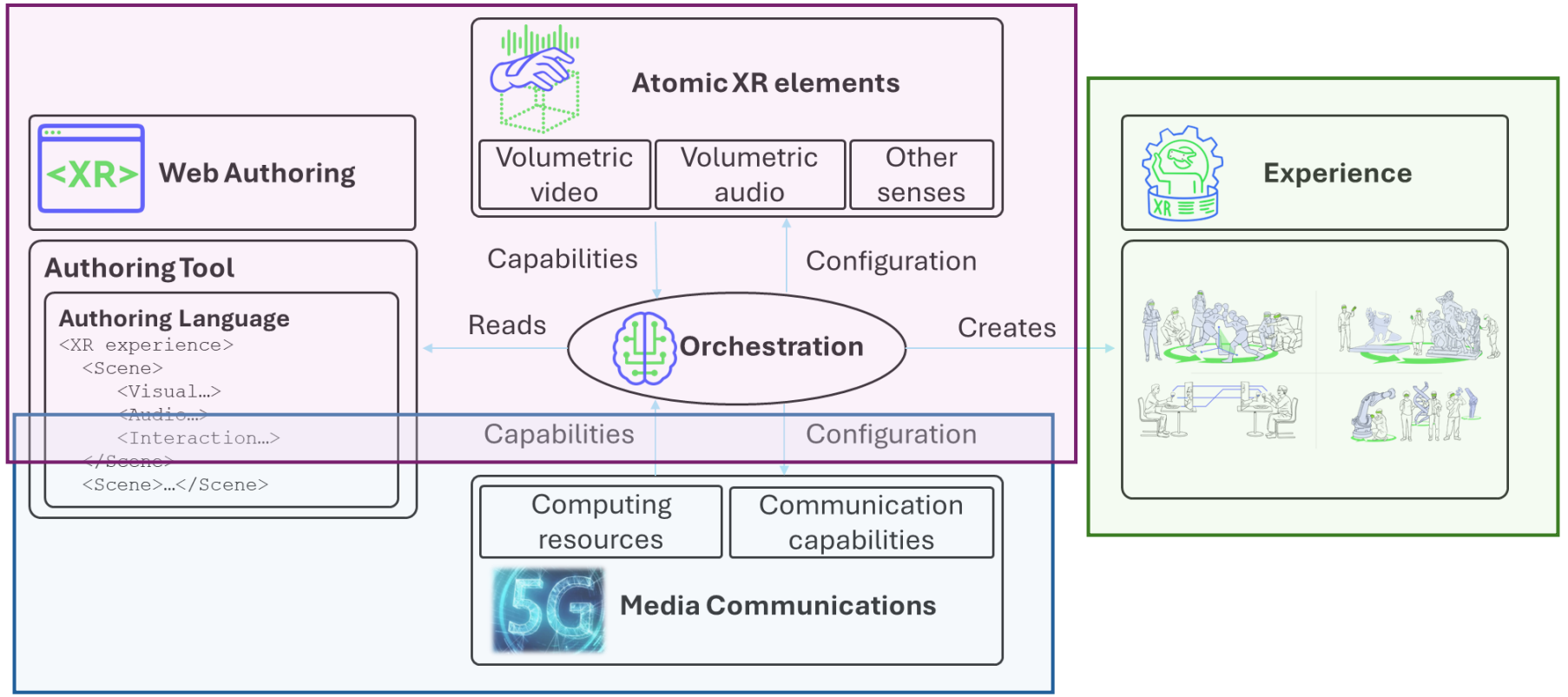
- Orchestration mechanisms are needed on the Web:
  - The models and algorithms of media orchestration need to be extended towards **new policies, models and algorithms**



# Context-aware adaptiveness

- New mechanisms to **evaluate the QoE** of next-generation XR experiences on the Web:
  - Current QoE/QoS paradigms from traditional media are useful but insufficient
  - Measuring the experience enables to: a) Understand users' satisfaction, b) activate orchestration mechanisms
  - Measuring the experience involves three different dimensions:

HUMAN / INTERACTION
SERVICE
NETWORK



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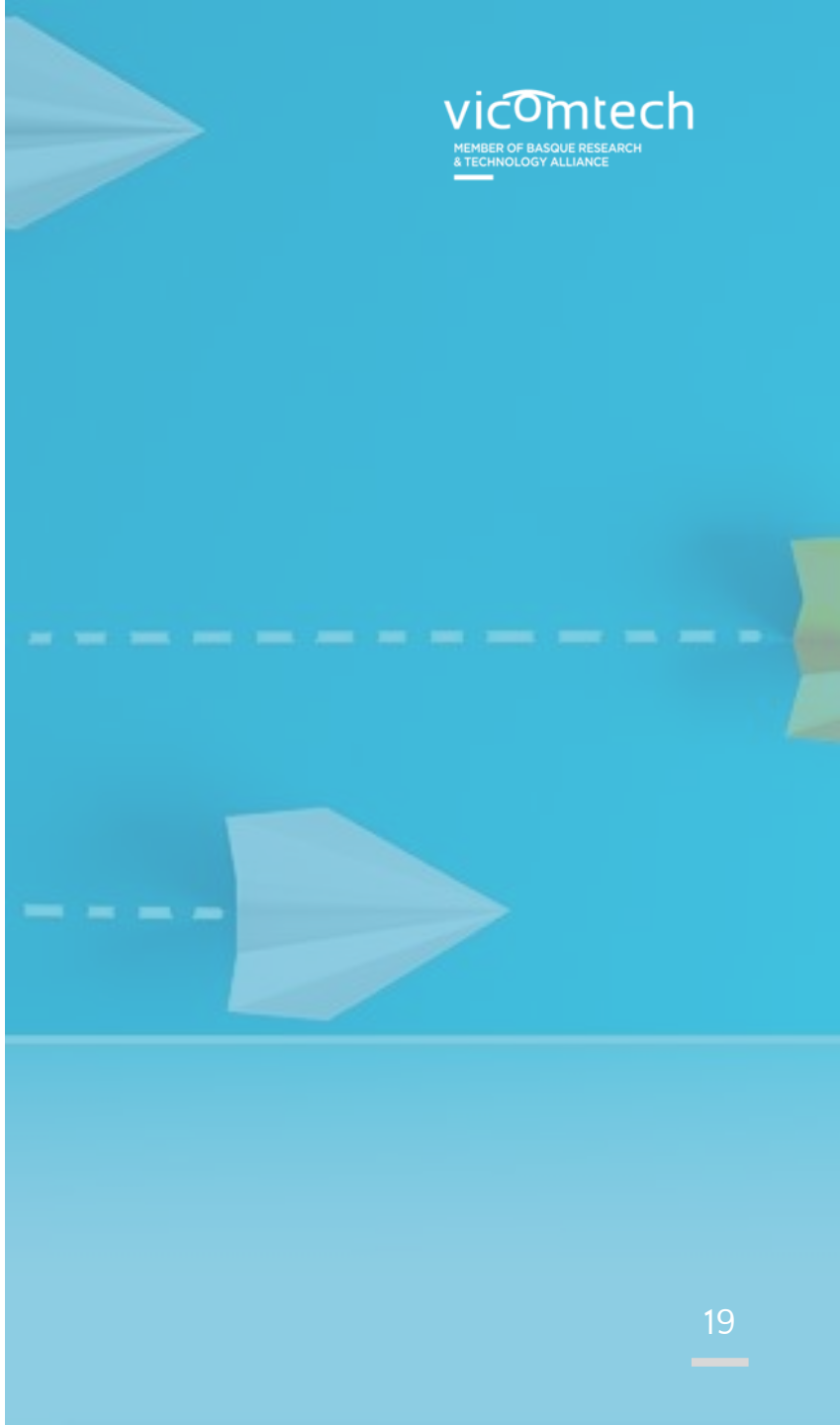
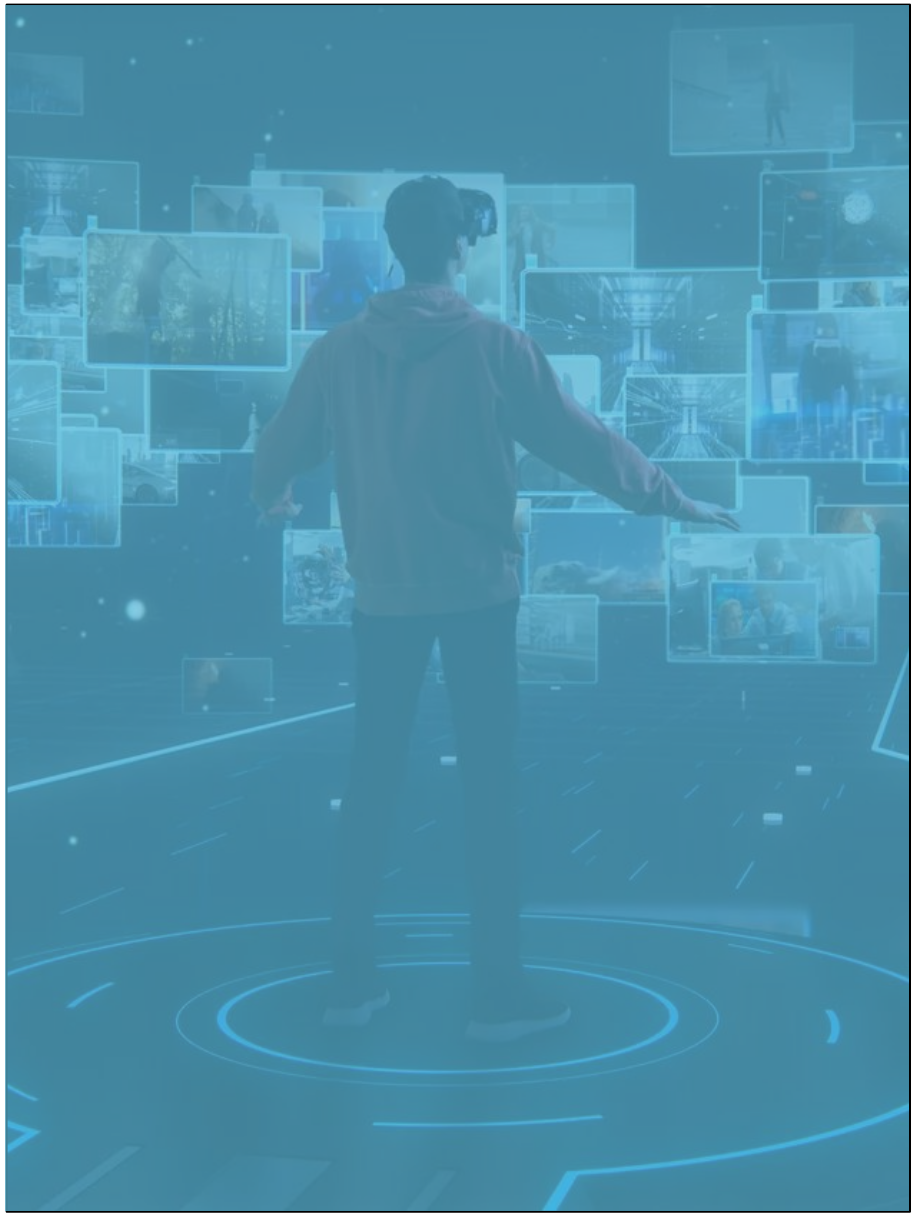


# Conclusions



- **Media experiences are evolving** towards more immersive, higher fidelity and multi-sensory
- **Networks** are also improving their KPIs and performance, and *virtusalisation* and *softwarisation* enables to configure them dynamically
- **Orchestration** is a key aspect for Next-generation XR Media Experiences
- Need for new mechanisms to **evaluate the QoE** of next-generation XR experiences on the Web
- **The Web** is the long-term, interoperable and open platform to provide native atomic XR rendering and orchestration mechanisms

Addressing this research is crucial to ensure **Next-Generation HI³ Media Experiences** *(Next-generation Human-centred Immersive, Interactive and Intelligent Media Experiences)*, aligned with the strategy for a **Web 4.0 and virtual worlds** reflecting EU values and principles

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# Orchestration mechanisms to provide context-aware adaptive XR experiences on the Web

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New European Media

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# Many thanks!


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