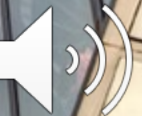


Fraunhofer FOKUS Institute for Open Communication Systems

Metaverse Cloud Rendering on the Web

Web & Networks IG Breakout Session Demo

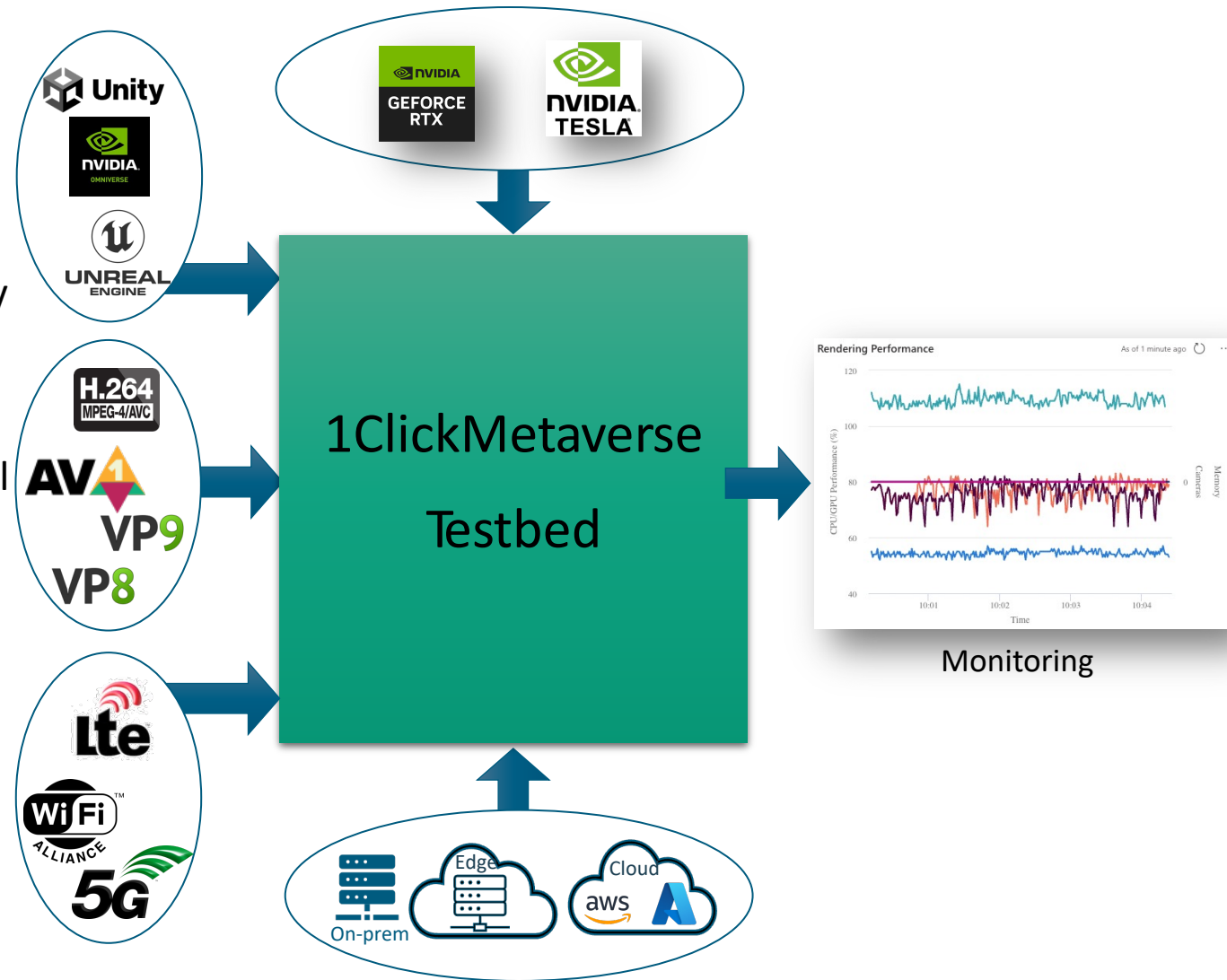
Dr. Louay Bassbous | TPAC 2023 | 11-15 September 2023

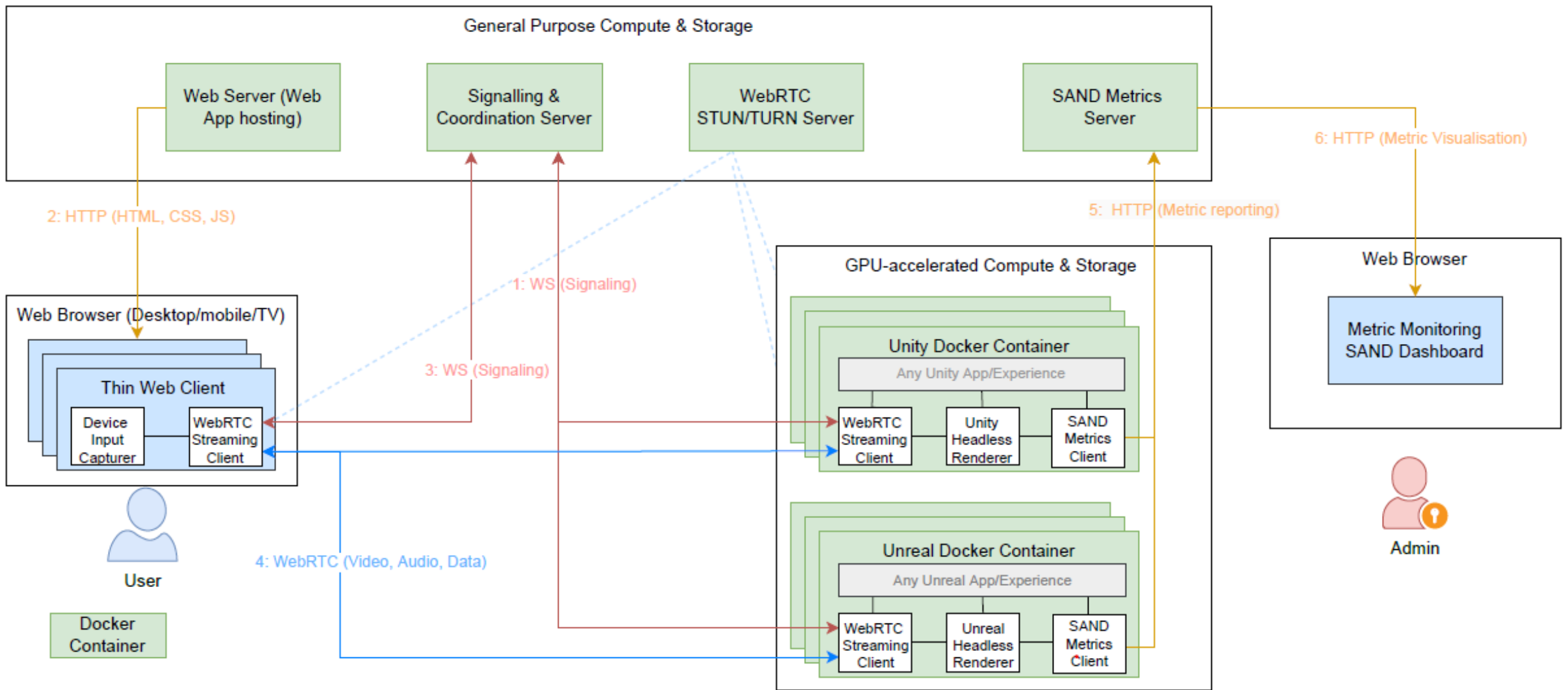


Metaverse Cloud Rendering on the Web

1ClickMetaverse (1CM) Testbed

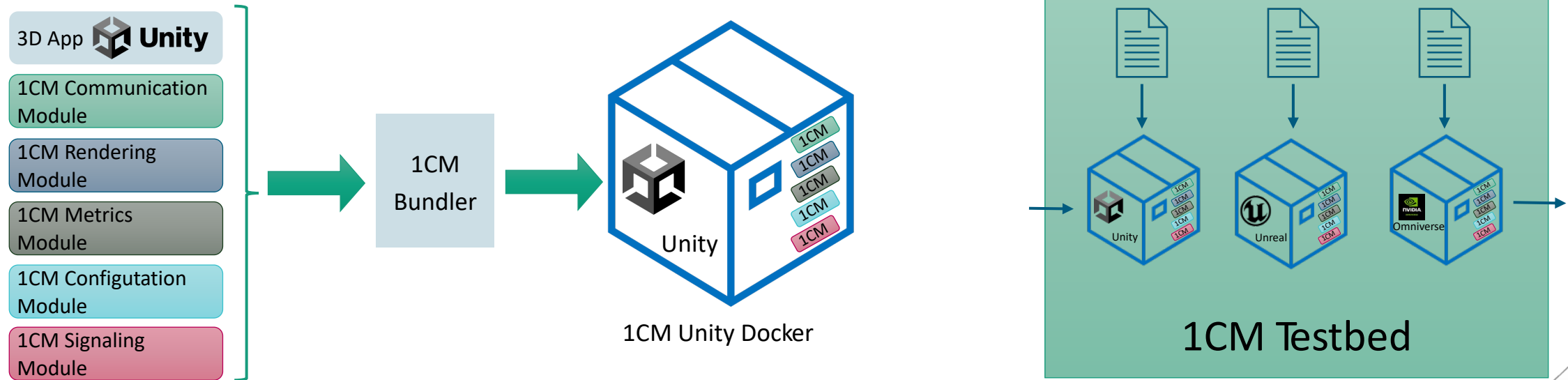
- Cloud Rendering empowers compute-intensive 3D applications and metaverse experiences on virtually any device, accessible through a web browser.
- While Cloud Gaming is the most well-known application, numerous domains, including industrial metaverse, can harness this technology.
- The 1ClickMetaverse Testbed is designed to assess Metaverse Cloud Rendering under various QoS network configurations, computational capabilities (CPU/GPU/Memory), codecs and 3D engines.
- Key Web technologies, such as WebRTC (alongside WebCodecs and WebTransport), serve as enablers for seamless Cloud Rendering experiences on the Web.

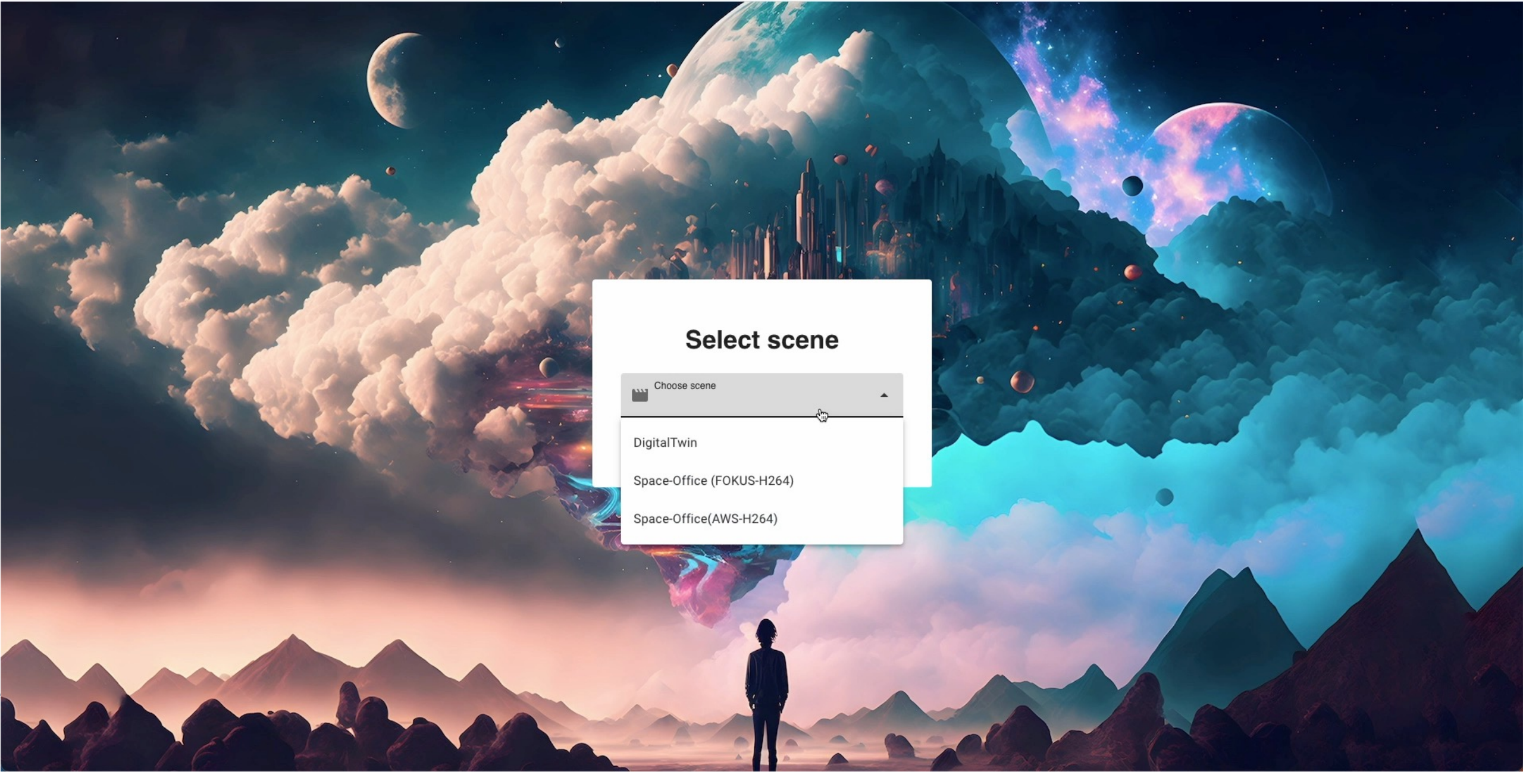




Bundling Metaverse Experiences as Docker containers

- **Leveraging Gaming Engines:** Metaverse experiences are predominantly implemented using popular gaming engines, such as Unity and Unreal Engine.
- **Modular Approach with Docker:** Bundling Metaverse Experiences as Docker containers introduces a modular framework, simplifying the deployment of 3D applications within the Testbed.
- **Decoupling for Future Flexibility:** Decoupling the testbed from rendering engines is crucial, ensuring it can seamlessly accommodate any rendering engine in the future.





Select scene

- Choose scene
- DigitalTwin
 - Space-Office (FOKUS-H264)
 - Space-Office(AWS-H264)

1 Clients



```
CPU: 313% System Memory used: 37MB
GPU: Tesla V100-PCIE-32GB - 15% GPU Memory used: 2127KB
Framerate: 123 FPS
Video Codecs: VPS, rtx, VP9, H264, AV1, red, ulpfec
Audio Codecs: opus, red, multiopus, ILBC, ISAC, G722, PCMU, PCMA, L16, CN, telephone-event
| name | rtt | rxb | rab | rvc | rac | vfr | cct | rvp |
-----|----|----|----|----|----|----|----|----|
| Louay | 31 | 11787 | 14 | H264 | opus | 54 | unknown | 1920x978
```

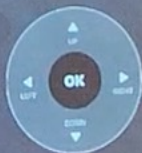
Louay



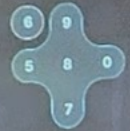
1 Client's

Multiverse

Control movement



Control camera

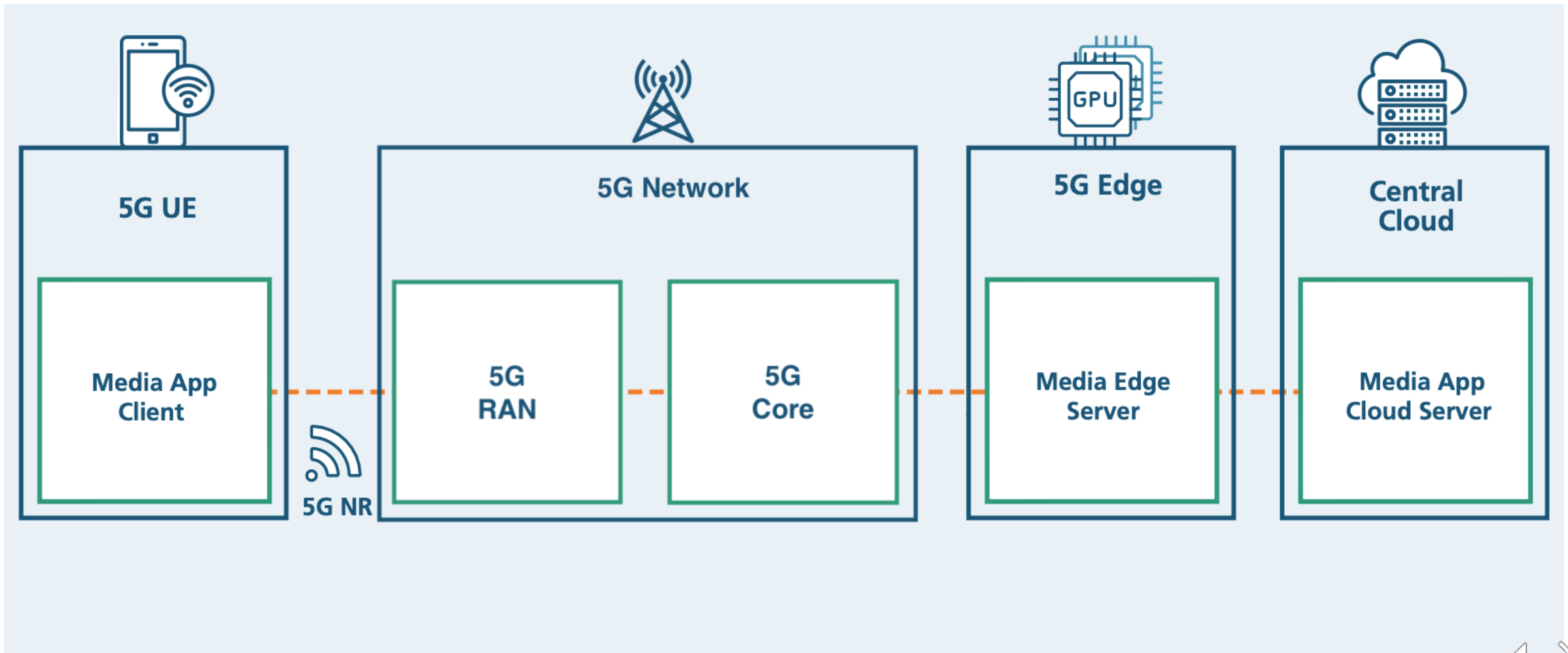


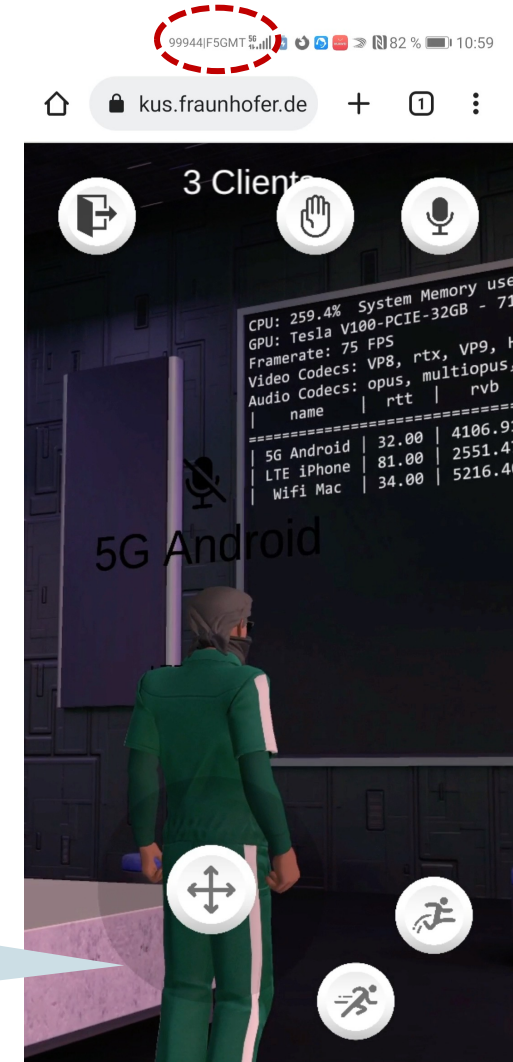
8 Jump
6 raise hand

G3ZER

Metaverse Cloud Rendering on the Web

5G Edge Rendering





- Safari
- iOS
- LTE
- Cloud Rendering

- Chrome
- Mac
- Wifi
- Cloud Rendering

- Chrome
- Android
- 5G (SA)
- Edge Rendering

fameverse.fokus.fraunhofer.de

Contact



Dr.-Ing. Louay Bassbouss

- E-Mail: louay.bassbouss@fokus.fraunhofer.de
- LinkedIn: www.linkedin.com/in/lbassbouss/
- 1ClickMetaverse: www.fokus.fraunhofer.de/go/metaverse
- Web & Networks IG: www.w3.org/web-networks/

Fraunhofer FOKUS

Institute for Open Communication Systems

Kaiserin-Augusta-Allee 31

10589 Berlin, Germany

info@fokus.fraunhofer.de

www.fokus.fraunhofer.de

