

# AR-assisted emergency surgical care Network Application

## SUMMARY

Efficient Mobile AR vertical applications are among the technologies expected to benefit the most from the wide de-ployment of 5G networks. This vertical involves real-time, remote AR 3D rendering and streaming in the con-text of PPDR. More specifically, the vertical system to be experimented with entails the use of light, portable, and battery-efficient AR Head-Mounted Displays (HMDs), allowing first responders to view deformable 3D objects (bones, vessels, organs, etc.) overlaid on top of a victim at a disaster site.

## CONTACT

For more information, do not hesitate to visit the website <https://www.5gepicentre.eu/> and/or contact the 5G-EPICENTRE team.

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## MICROSERVICES



A single VM will be deployed within a kubevirt sandbox. Below is some relevant information.

- Ensure that Kubernetes cluster with kubevirt is installed.
- For each cluster, depending on hardware capabilities, the corresponding number of VMs can be spawned. In our case, this is usually 1 per machine (with an NVIDIA GPU, performance-wise greater than GTX 1060).
- Ensure that storage (persistent volumes) is available through PVCs.
- Wait for an instantiation message from an external vertical application connected with the message handler of the framework.
- Upon receiving the aforementioned message, instantiate exactly one instance of the VM.
- For the VM, ports 9090 and [20000-24999] (subject to change) as well as 3478 need to be forwarded to ensure that WebRTC will find a connection or use the proper STUN or TURN servers:
  - Expose the IP address of the VM externally.
  - Send the IP address as an answer back to the externally connected application that initially made it.
- Another vertical application component (ORAMA\_HMD application) will be deployed on a Magic Leap 1 AR-HMD. Both the HMD and the vertical application are provided by ORAMA.

. A short summary of the UC8 Network Application microservices is provided below:

- AR AS: This component is responsible for performing the physics calculations and final scene render-ing based on the user inputs it receives over the 5G network. It is also responsible for compressing the video stream and transmitting it via ALXR (or an equivalent protocol) to the HMD. A message bro-ker is incorporated within this component too.
- Photon Server (optional): This component is responsible for exchanging the required information among users, in multi-user scenarios, keeping them in sync. This component will be deployed only if a multi-user AR scenario is designed.
- Azure Cloud Service (optional): This component is responsible for storing necessary data. The data may be digested (analytics) after being anonymised. This component will be deployed only if user's actions analytics are incorporated in an AR-scenario.

The vertical application used to demonstrate the Network Application composed of the above services is an AR HMD Application, which is responsible for the broadcast of the initiate sequence to the 5G-platform and receiving the IP of the VM as a response from the respective edge node. It is also responsible for the broad-cast of user input (displacement & triggers) via the 5G network to the AS, as well as for decoding and project-ing the video stream, received from the AS.



# ARCHITECTURE

The following figure presents the vertical system's specific architecture.

