

## Testing and Monitoring Offerings

This is a brochure of the test and measurement offerings made available by WP4 in 5G-VINNI to support validation of use cases deployed on 5G-VINNI facilities. WP4 have made a number of tools available that can evaluate network performance of the infrastructure at different layers via active measurements, i.e. by generating synthetic traffic on the infrastructure.

As an experimenter you have created an experiment utilizing the 5G network and its capabilities. You deploy it and verify that it is functionally sound and behaves as expected - which is expected when running it in a vacuum. To really put it under test you must run the experiment in a scenario where you are not alone on the network. This can be done by creating synthetic traffic on the network and evaluate the performance of your experiment. This is where WP4 can help you.

**Synthetic traffic:** We can offer to create synthetic traffic on different paths intersecting with the traffic created by the experiment, which will emulate traffic from other users on the network. Based on this it is possible to evaluate how the experiment performs when having to compete for resources, or it can be evaluated from if the network is able to ensure the QoS according to agreed SLA. The amount of synthetic traffic can be dialed up until the tipping point is found of where the experiment is not performing satisfactorily.

**Monitoring:** We can also offer measurements or monitoring of network performance, which can be done before, during and after the experiment is executed. This will allow you to evaluate the impact of your experiment on the facility. For this to be most accurate it is important that the network performance is evaluated along the same traffic path as the experiment is using.

The figure on the other side of the page shows a conceptual architecture of a 5G facility, the hosted 5G network, the testing tools and their traffic paths, and a couple of examples of experiment traffic paths.

## Questions from Experimenters

**How do I measure or evaluate the footprint of my experiment on the facility?**

- You can measure the network performance on the slice you are using both before and after the experiment is running to evaluate the delta. This can be done by using test campaign 1. Note that the Hawkeye endpoints should be placed and connected such that they evaluate the same traffic path as the experiment is using.

**How does the 5G network capabilities and its limits influence the QoE experienced from the point of view of my experiment?**

- You can evaluate this by running your experiment while creating different conditions for the 5G network slice. This can be done by running the experiment alone, then running again while putting 50% synthetic load on the slice, and finally running the experiment while generating 100% load on the slice. For this use campaign 3.

**How does my experiment behave and perform when having to compete for resources on the 5G slice?**

- You can evaluate the performance of your experiment while other users and UEs are generating traffic on the same traffic path through the network. This can be done by imitating users and application traffic. For this use campaign 2. Note that the Hawkeye endpoint UEs should be connected to the same radio tower that is used by the experiment.



# 5G-VINNI

## 5G Verticals Innovation Infrastructure

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**Contact WP4 for support:**

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**Experiment scheduling:**

Ask your facility site owner to schedule experiments.

5G PPP



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## Testing and Monitoring Tools

**IxNetwork:** Apply load on the NFVI hosting the 5G Network by generating traffic on the infrastructure network between Load Module VMs.

**LoadCore:** Apply load on the 5G SA core by generating user plane traffic and sending from emulated DN and RAN through the UPF to emulated DN.

**Hawkeye:** Apply load on the path between endpoints deployed on UEs connected to the radio and VMs hosted in the data center (co-located with the 5G SA core).

### Example Campaigns:

- 1: [UID: tm\_cam\_1\_monitor] Measure network performance KPIs on E2E path between UE and VM (Hawkeye, E2E, throughput, latency, jitter, packet loss)
- 2: [UID: tm\_cam\_2\_syn\_user] Create E2E load per Hawkeye UE endpoint (Hawkeye, synthetic traffic)
- 3: [UID: tm\_cam\_3\_syn\_5gc] Load the 5G slice user plane through the UPF [50%, 100%] (LoadCore, synthetic traffic)
- 4: [UID: tm\_cam\_4\_syn\_infra] Load the infrastructure network [50%, 100%] (IxNetwork, synthetic traffic)

These are example campaigns that can be triggered as needed. Should you have the need for another specific combination to fit exactly your experiment please reach out and we can most likely accommodate your need.

