Final 5G EVE Webinar

New 5G EVE platform features – Performance diagnosis

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This Project has received funding from the EU H2020 research and innovation programme under Grant Agreement No 815074

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Performance Diagnosis Tool

- Motivation
  - Verticals require automated tools to ensure the reliability and high performance of the services running on top of the 5G network
  - Verticals require effective methods and tools for the appropriate allocation of virtual resources fine-tuned to the needs of their 5G services
  - Need for automated prediction and localization of faults and service degradations, which will then trigger the generation of automated decisions for improving the performance or mitigate the possible faults
  - Diagnostic tools can maximize the impact of 5G vertical application testing

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Performance Diagnosis Tool

- Solution
  - Design and develop a 5G Performance Diagnostic Tool as an in integral part of 5G EVE platform
  - Diagnostic Tool
    - targets the maximization of the impact of the testing and validation procedures
    - monitor the health status of all the nodes in the service graph and identify any performance degradations
    - offers insights regarding the observed performance by applying post-process analytics on the collected metrics and KPIs
    - execute root cause analysis (RCA) to identify the elements that generate the impairments
    - compare the performance of candidate service deployments (service profiling)

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Performance Diagnosis Tool

- Performance Diagnosis Tool capabilities
  - Estimates the health status of all involved nodes using Self Organizing Maps (SOMs)
  - Execute Root Cause Analysis (RCA) using RCA algorithms based on adjacency lists
  - Offers service profiling insights

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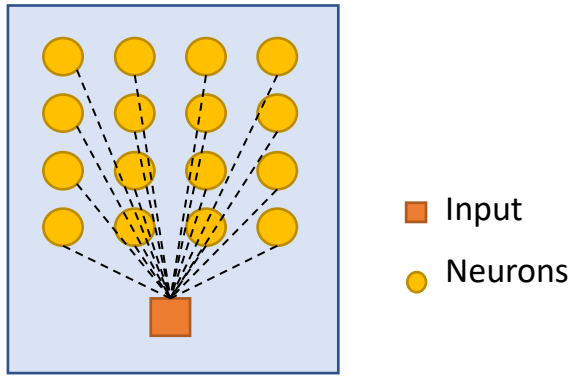
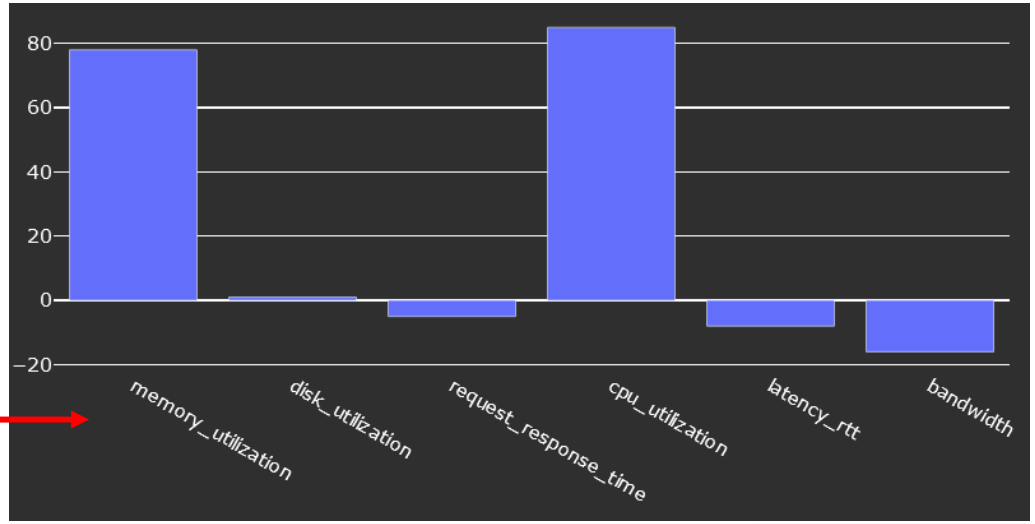
Performance Diagnosis Tool – Node health status estimation using SOM

- A SOM (self-organizing map) is a type of artificial neural network that is trained using unsupervised learning and apply competitive learning
- Training:
  - unsupervised modelling
  - heterogeneous metrics used (system, network and application level)
  - weight values are calculated for each neuron
  - a respective model is produced for diagnosis
- Deployment:
  - nodes' metrics are fed to the trained SOM after the experiment has finished
  - the health status of each node is determined by comparing a) the neurons' weights and b) the node's collected data
  - the % deviation of the metrics from the model's weights is continuous monitored and shown
  - the most possible cause (metric) of the deviation is estimated

Self Organizing Map





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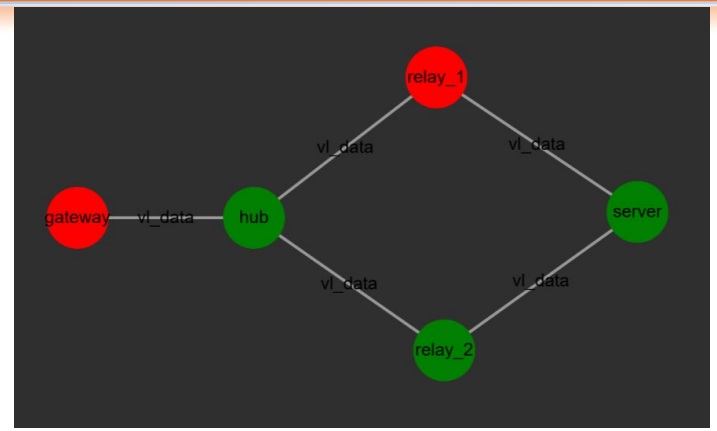
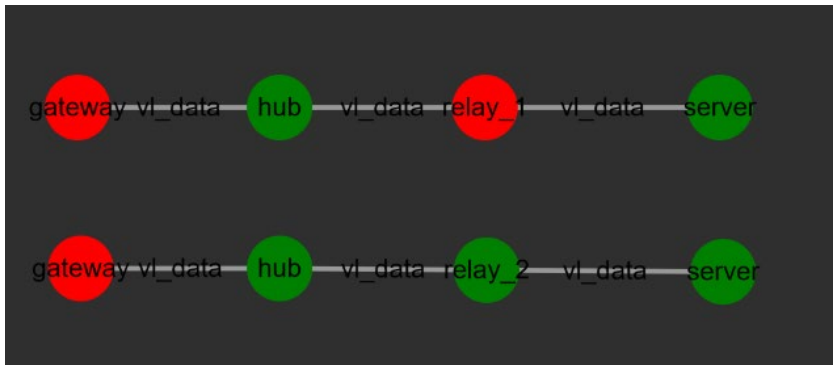
Performance Diagnosis Tool - Root cause analysis (RCA)

- Inputs:
  - health status results from SOM algorithm
  - service topology information is used as an n-node undirected graph represented as an adjacency list
- Deployment:
  - Step 1: determines the status of individual elements in the network, using the service topology, for each available network path
  - Step 2: checks non-reachable nodes that are blocked by others (non-healthy nodes), to identify the latter as root causes
- The final results depicts the detailed health status of the nodes (SOM) and the path status of the topology (RCA)



Service topology + Health status



Network paths + Health status

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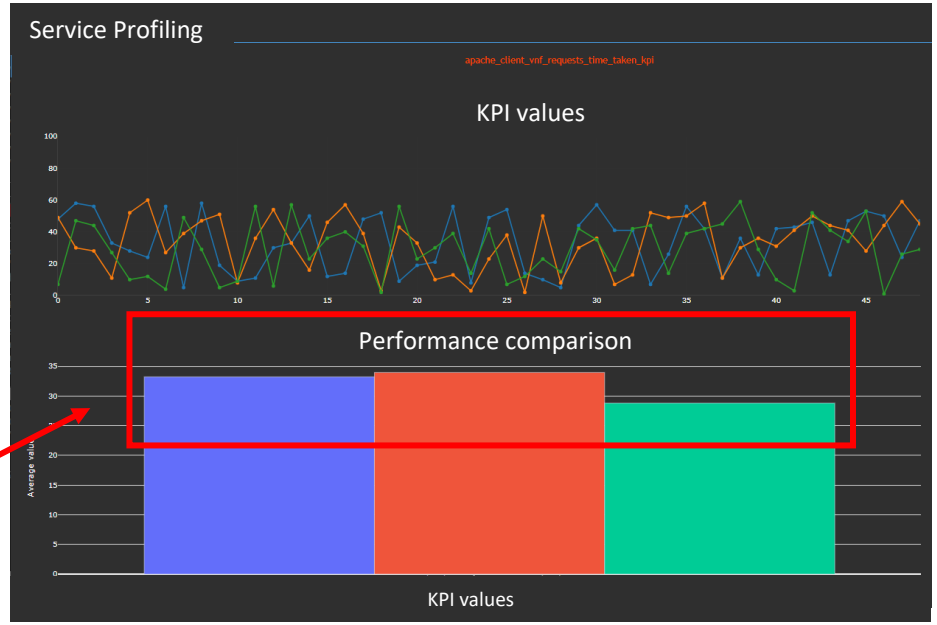
Performance Diagnosis Tool – Service Profiling

- Inputs:
  - KPIs generated during the experiment
  - Candidate service deployments (allocation of virtual resources)
- Deployment:
  - Step 1: collect the results of executions for each unique deployment
  - Step 2: calculate the resulting performance per deployment option correlated with the service deployment characteristics



Service profiling results for 3 deployment options

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Performance Diagnosis Tool

- Who can use the diagnostic tool?
  - Any vertical/experimenter who plan to use the 5G EVE platform for service validation (UCs inside or outside of 5G EVE project)
  - Any vertical/experimenter who plan to use the 5G EVE platform for identifying any possible performance degradations or impairments and apply RCA on them
- How an experimenter can use the tool? ← **Demo (phase 1)**
  - During experiment design phase in 5G EVE portal, the experimenter should select the "Performance Diagnosis Support" option.
  - During experiment design, metric and node names should follow defined naming conventions (presented in the demo and in 5G EVE user manual)
  - All the necessary information are collected through 5G-EVE's Interworking Layer (Network Service Descriptors, metrics from the central Kafka broker)
- Where the results of diagnostic tool are presented? ← **Demo (phase 2)**
  - The diagnostics results are presented on the final validation report available on the 5G EVE portal

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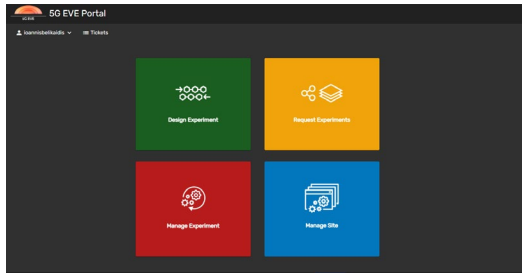
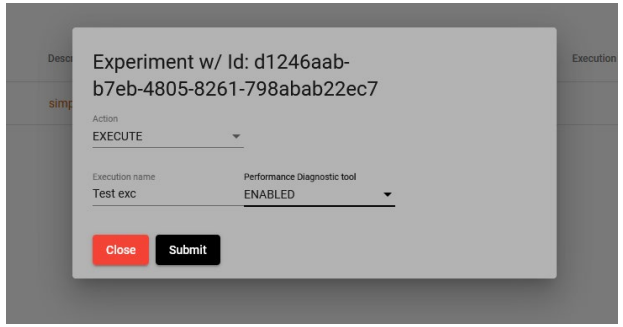
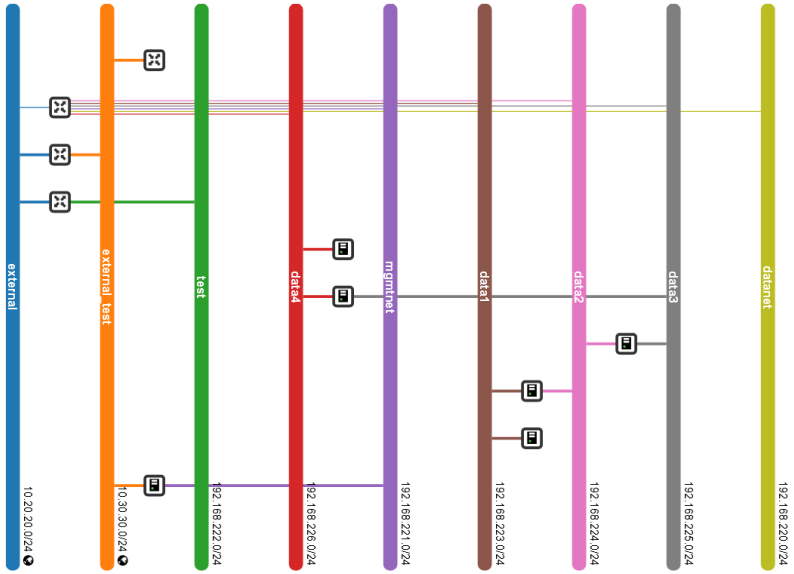
Demo: Phase 1: Vertical actions to use the diagnostic tool

Experiment Design

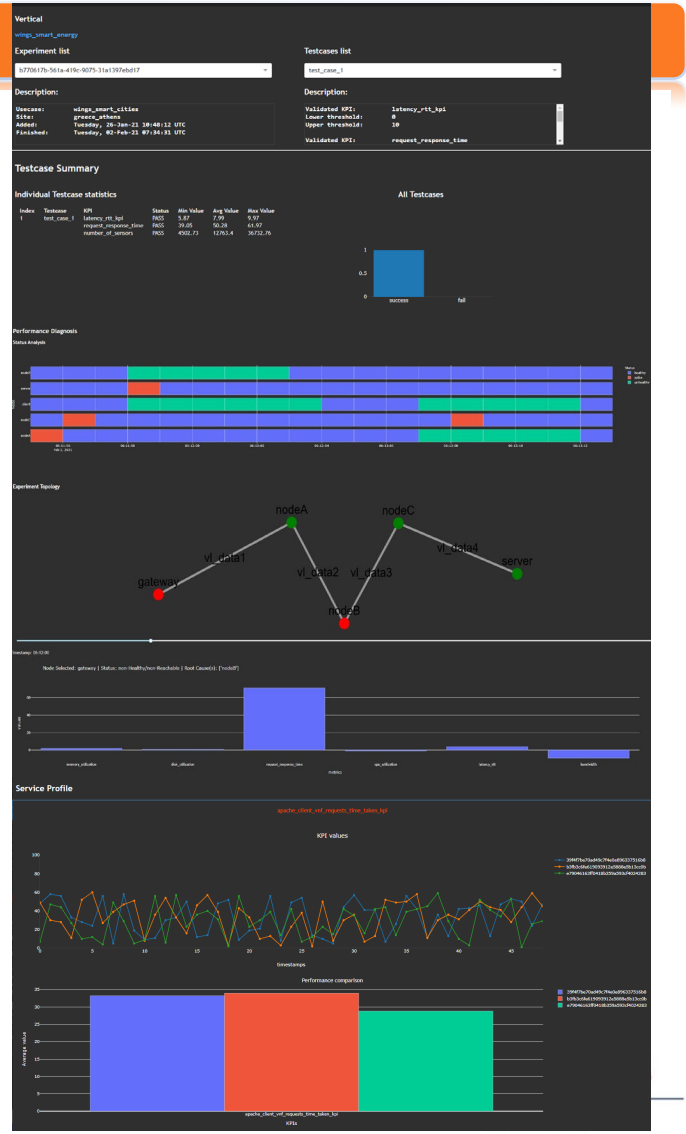




Service deployment as VNFs



Performance diagnosis results



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Demo video 1

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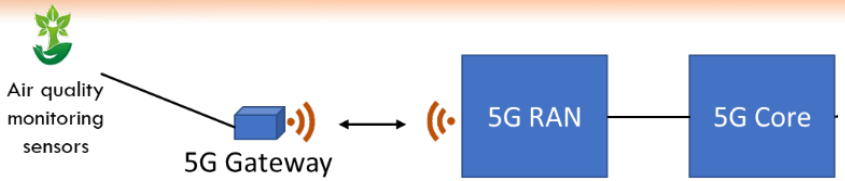
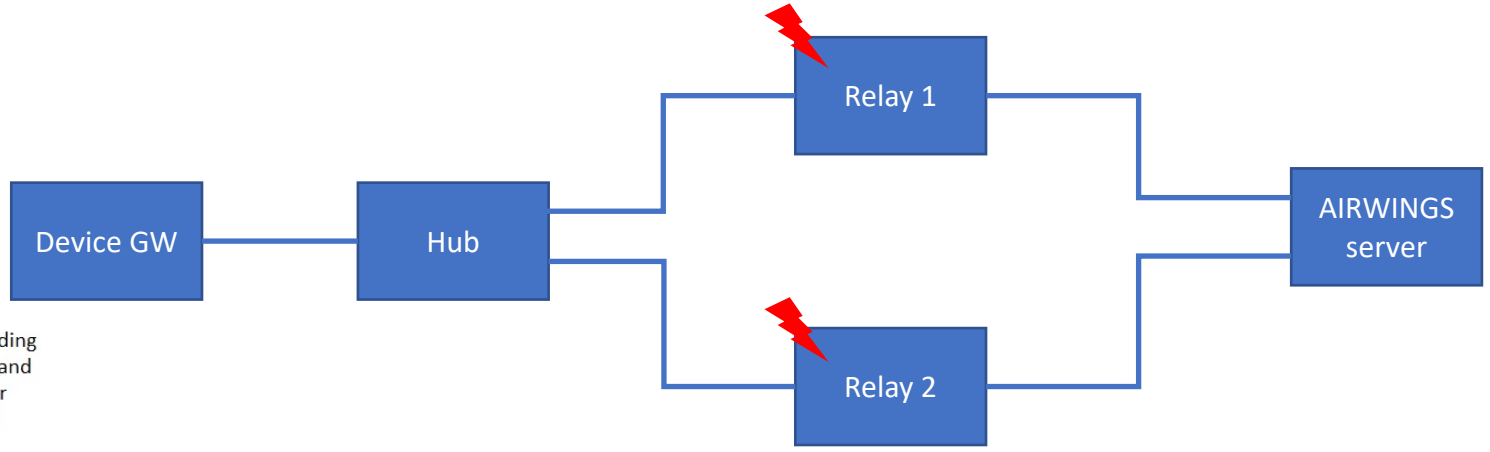
Demo: Phase 2: Application of diagnostics on Smart City Use Case



- Deployment emulates the Smart City Use Case
- The AIRWINGS Service is deployed in a VNF using the 5G-EVE infrastructure
- A VNF emulates the functionality of AIRWINGS sensors, sending packets of data to the AIRWINGS Server, through relay nodes (VNF)
- To demonstrate the usage of the diagnostics tool, fault injection is introduced randomly to one of the two intermediate VNFs



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Demo video 2

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Thank you!

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