ANGEL
An Agile IoT Interoperability Platform

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GOALS

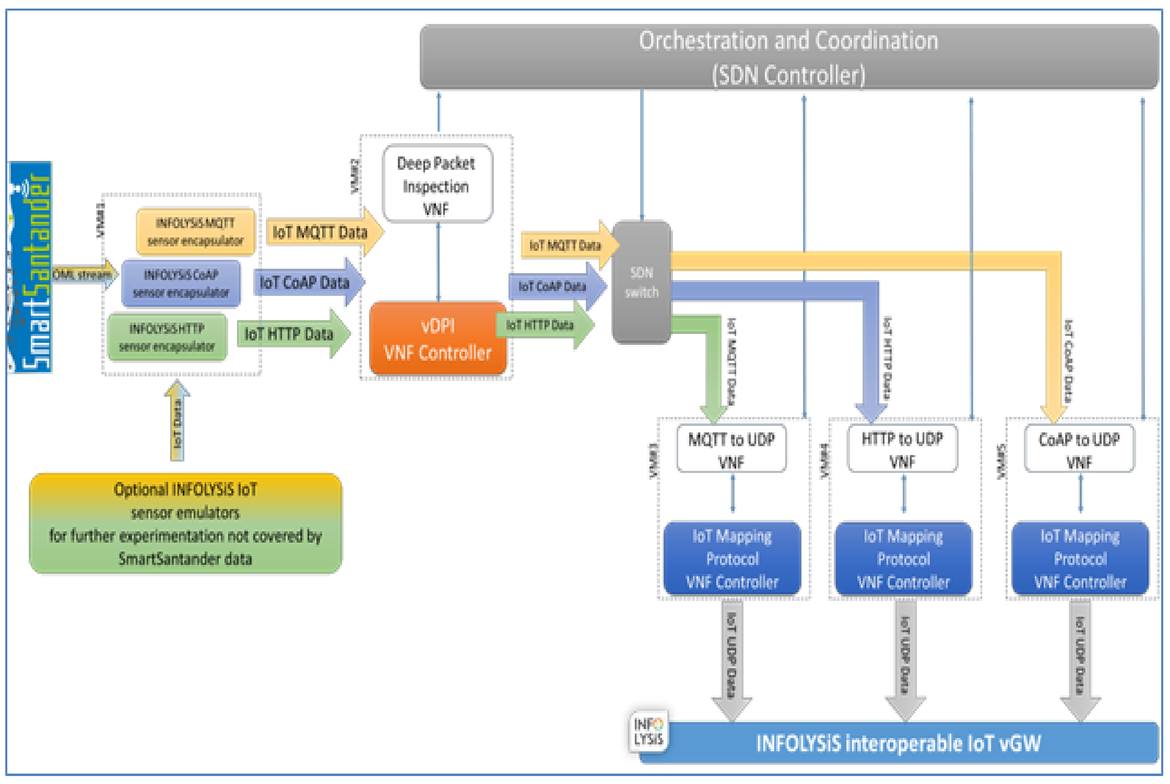
Making IoT data interoperable, homogeneous, ready for exploitation!

- Assess the effectiveness of using on top of an SDN domain, a Deep Packet Inspection (vDPI) function combined with virtual functions that map IoT protocols to UDP in order to provide an agile platform for IoT interoperability
- Design and develop an SDN-app that provides an agile logic in the automatic provision of IoT interoperability on top of IoT nodes/sensors, based on the automatic sensing of the IoT protocols by the vDPI and mapping of each IoT data flow to UDP data protocol
- Abstract, via the INFOLYSiS interoperable IoT vGW, the IoT sensors' control plane by exploiting the deployed and instantiated mapping VNFs on top of the OFELIA/i2cat island for achieving IoT interoperability

CHALLENGES

- The IoT interoperability challenge within the framework of 5G using SDN/NFV technologies
- Dealing efficiently and cost-effectively with a mix of IoT streams such as MQTT, CoAP or HTTP IoT protocol data, which a typical IoT GateWay (GW) cannot handle
- Achieving smooth integration of the IoT devices and their services into one networked system under a single data protocol
- Lack of an agile infrastructure, leading to a simpler configuration of the network, which is suitable for IoT interoperability goals
- Ensure operational efficiency and no data loss via the use of SDN/NFV and vDPI technologies for offering IoT Interoperable data

DEMO SETUP



RESULTS

ANGEL experiment successfully met and documented the following results:

- Automatic sensing by the vDPI of CoAP, MQTT, HTTP IoT protocols
- Success rate >95% in the SDN-based traffic steering to mapping VNFs
- Mapping of each IoT data flow to UDP data protocol with zero packet loss
- Successful self-organization of the ANGEL platform for the 4 different protocol combinations (CoAP-MQTT, CoAP-HTTP, MQTT-HTTP, CoAP-MQTT-HTTP)
- Design and development of an SDN-app suitable for providing an automatic way of IoT interoperability for 3 different data protocols
- Provision of SDN-app capable of adapting on the fly, once new IoT data flows have been detected with a delay <2 sec
- Successful service chaining of each mapping function and the vDPI of the ANGEL platform for the 4 different protocol combinations.

MORE RESULTS

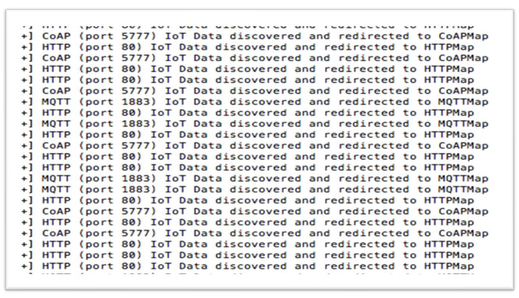


Fig. 1: vDPI detection of CoAP, MQTT & HTTP

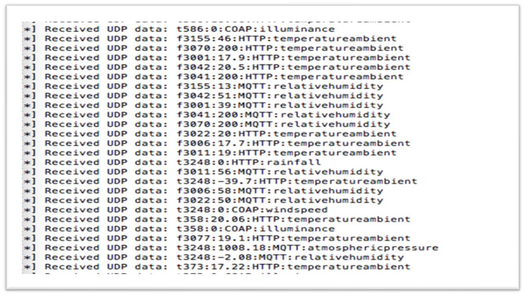


Fig. 2: Interoperable UDP-based IoT data

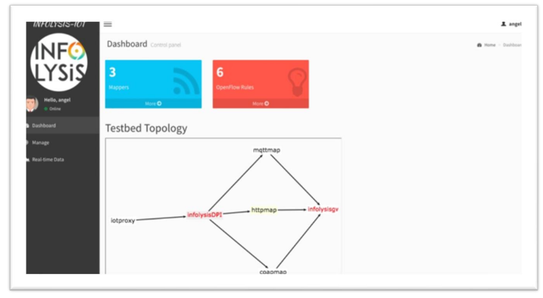


Fig. 3: INFOLYSiS Dashboard: Real-time experimental VNFs topology

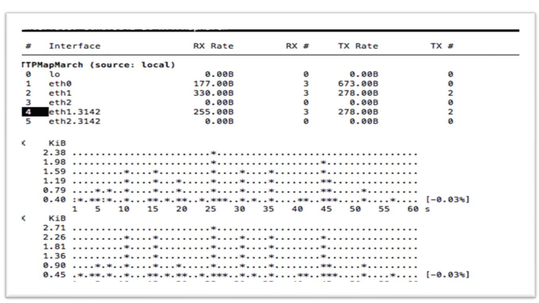


Fig. 4: HTTP mapping

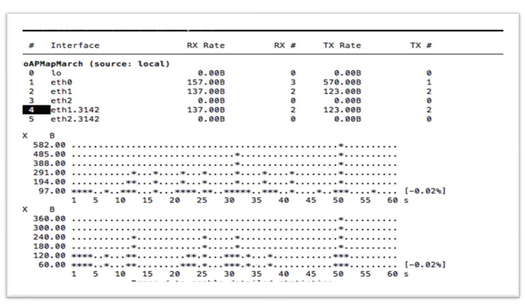


Fig. 5: CoAP mapping

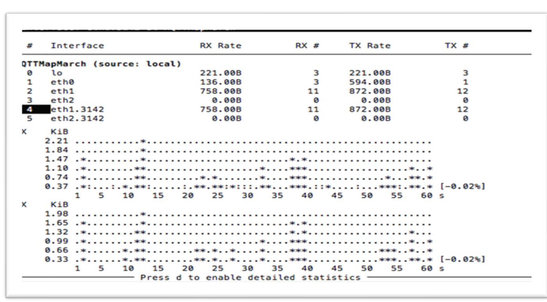


Fig. 6: MQTT mapping

CONCLUSIONS

- ANGEL experiment highlighted the opportunity of IoT interoperability provision by the forthcoming 5G networks
- Researched IoT interoperability through the agility provided by SDN, NFV and DPI,
- Demonstrated the intelligence to analyze and handle heterogeneous IoT data flows in real-time
- Combined the agility of vDPI function with the flexibility of mapping protocol functions - VNFs (i.e. CoAP, MQTT, HTTP to generic UDP data traffic)

FEEDBACK TO Fed4FIRE+

- Complete and operational OpenFlow/Cloud testbed for experimenters
- Diversity of available resources based on each experimenter's requirements
- Out-of-the-box interoperability of different testbeds
- Easy setup and execution of the experiments
- Concise and comprehensive documentation
- High responsiveness of the Fed4FIRE+ team to any problem or issue raised