5G Development and Validation Platform for global Industry-specific Network Services and Apps

5GTANGO – a 5G PPP Phase 2 project

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Abstract— **5GTANGO puts forth the flexible programmability of 5G networks with i) a NFV-enabled Service Development Kit (SDK) ii) a Store platform with advanced validation and verification mechanisms for VNFs/Network Services qualification (including 3rd party contributions) and iii) a modular Service Platform with an innovative orchestrator in order to bridge the gap between business needs and network operational management systems.**
We propose an integrated vendor-independent platform where the outcome of the development kit that is a packaged NFV forwarding graph of composed services, is automatically tested and validated in the Store for their posterior deployment with a customizable orchestrator compatible with common existing Virtual Infrastructure Managers (VIM) and SDN controllers.
The combination of the proposed toolkit, validation Store and the service platform realises an extended multi-modal NFV DevOps model between service developers, telecom operators and vertical industries, increasing operational efficiency, facilitating the implementation and validation of new services and accelerating the adoption of NFV technologies.

Keywords— *5G, SDN/NFV, DevOps, SDK.*

I. INTRODUCTION

Software Networks are essential to support many aspects of the anticipated functionality offered by 5G Networks. Software Networks refers to a general paradigm shift in telecom architecture from "boxes" to "functions", and from "protocols" to "APIs". In parallel this shift is also driving a convergence between telecommunications and IT infrastructure, producing an IT solution which delivers carrier grade platform upon which 5G is implemented.

While this essential paradigm shift is revolutionizing the telecommunications business, there also exists a large legacy in telecom operators and the suitable transition plan towards Software Networks' operational adoption needs to be carefully demonstrated. Even at this stage before large production deployments by operators, there is an increasingly large variety of SDN and NFV solutions available from a number of vendors, and it is necessary to provide qualification methods which allow services designed by a third party to be vetted [1]. It is also necessary to provide a flexible service platform, which can support Software Networks on a range of different operational models with different maturity levels.

Moreover, the 5G vision of a closer collaboration and higher accessibility to network management between operators and vertical industries will go beyond simply controlling network performance metrics, and require new approaches to network access, service platforms and supporting DevOps workflows for new services and net applications. Network Slicing offers an optimized network environment that can be set for each and every service, thus enhancing the overall network operational efficiency. The proposed scenario [2] is where each vertical industry will require a different configuration of requirements and parameters in the network, and each use case will require its own network slice.

The 5GTANGO project is a 5GPPP Phase 2 project and brings together a strong consortium including network operators, manufacturers, IT providers & system integrators, solution providers and academia. 5GTANGO will uptake and build up on top of SONATA [3] key outcomes (the SDK and Service Platform with MANO framework) to fully realise the concept of dynamic service development and validation for Industry-specific Network Services in 5G environments.

II. CONCEPT

NFV systems still require many manual actions and therefore can hardly cope with the complexity of the new, fast-changing, and flexible network environments, yet. To this end, we need a much higher level of automation at service creation, service qualification, and service operation.

Figure 1 presents the three natural steps for network service usage: Network Service (NS) development using SDK/Dev tools, NS validation (on the Qualification Store) and NS operation (Service platform with orchestrator), each driving by conceptual innovation and concrete tooling/software development.

The three pillars, service development, service qualification and service platform, are closely linked together. We emphasize the need for quick turn-around times in service development and operation, providing both conceptual and tooling support for bringing the DevOps model to the world of network services. Evidently, this will materialize in tools on the development, Qualification Store and the service platform side.
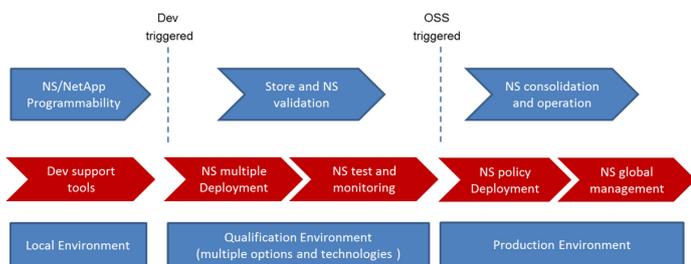
Fig. 1. Key service phases in 5GTANGO.

III. Objectives, Methodology, Research and Innovation Activities, and Ambitions

The main objectives within the 5GTANGO project are:

- Reduce time to market for networked services by shortening service development cycle and by qualifying network services to be adopted. Simplify network service development, service testing and service packaging by offering abstract service programming model and a consistent package of the composed service. Define and automate the testing verification & validation (V&V) process of network services for their qualification over well-known SDN/NFV infrastructures mirroring operational environments.

- Reduce entry barrier to third party developers and support the creation and composition of Virtual Network Functions (VNFs) and application elements as "network services". Offer an open-source NFV-based development platform to build, check and package vertical-specific network services and applications, for third-party service developers. Design and build a validation Store platform for the combination of VNFs and network services and associated qualification testing system.

- To enable new business opportunities with the customisation and adaptation of the network to vertical application requirements. Manage customized policy-driven and virtualized network 'slices' offered to vertical customers according to business requirements in this multi-tenant scenario. Address SLA-enabled services across domains and with clear interconnection to OSS (i.e configurations) and BSS functions (i.e. billing). Manage and orchestrate vertical NS lifecycle (NFV MANO) in an expanding software network value chain: multi-vendor technologies and multi-domain network segments.

- Accelerate the NFV uptake in industry via 'extended' DevOps model and validation at scale of network service capabilities of 5GTANGO platform in vertical show cases. Unleash the potential of NFV DevOps workflow for agile NS validation purposes. Integrate service development and operations. Show case results with two vertical pilots based on Manufacturing and immersive Media cases, with third-party developer support and vertical end-users.

In order to meet these objectives, the approach of the 5GTANGO project consists of four core contributions:

1) Architectural roles (Fig.2) including: (1) a developer of functions and services, (2) a validator and verifier role and, (3) an operator of services.

2) A modular, dependable service platform supporting vertical needs. A key evolution is a more profound separation of concerns by factoring out the V&V steps to the V&V store role. This simplifies the service platform (SP) in particular, the gatekeeper entry on-boarding module, where only much simpler checks (integrity, checking cryptographic signatures, suitability for own infrastructure) will be necessary.

3) A store for Verification and Validation expertise. The V&V component is key to 5GTANGO and not present in existing NFV architectures. Alike to the service platform, it will follow a design where plugins implementing microservices are connected via a message broker to trigger execution of various functions. How many and which functions are present determines which properties can be assured by a given instance of such a store.

4) A NFV-specialized Software development kit. 5GTANGO will provide an SDK that is specialized to support NFV development. It will integrate with the three phases of development and deployment outlined above; it will of course also be based on a microservices approach.
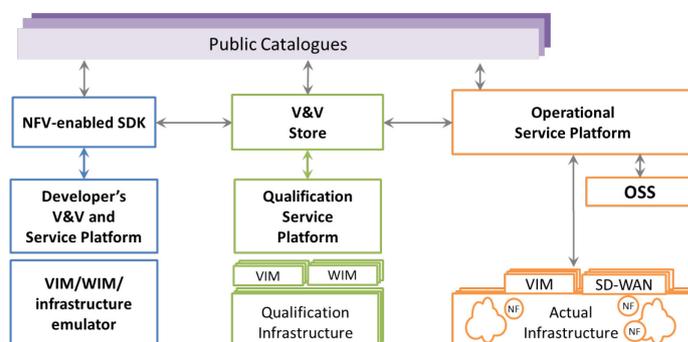

Fig. 2. 5GTANGO's core architectural roles.

References

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