Position Statement
SFI[2] - Slicing Future Internet Infrastructures project
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Network slicing is a new research topic that allows the virtualization of multiple logical and physical networks to provide Network-as-a-Service (NaaS) for distinct use cases. Network slicing potentially allows customized deployment of service and tenant requirements such as complex multi-network configuration. In achieving that purpose, enablers like software-defined networking (SDN) and network function virtualization (NFV) are essential.

Since 2011 several experimentation environments with different scopes have emerged in Brazil, targeting at different research technologies, among them: FIBRE[1] (*Future Internet Brazilian Environment for Experimentation)*, based on OpenFlow experimentation; FUTEBOL[2] (*Federated Union of Telecommunications Research Facilities for an EU-Brazil Open Laboratory)*, for experimentation involving optical and wireless communications; CloudNEXT[3] (Cloud ComputiNg EXperimental Testbed), for experimentation on cloud computing using bare-metal resources; 5GINFIRE[4], for experimentation in 5G networks based on NFV and cloud usage; FIWARE Labs[5] for IoT development; and finally NECOS[6],[7] (*Novel Enablers for Cloud Slicing)*, focused on the creation of slices that encompass different clouds with distributed resources. Many of these experimentation environments are research projects that are close to the end.

Given this scenario, the SFI2 project has the goal of providing a single multidomain and slice-based provisioning solution among these testbed infrastructures. SFI2 aims to simplify the creation of complex networks with minimum configuration effort based on the intelligent orchestration of multi-domain slicing, offering Slice--as--a-Service (SlaaS) for future Internet developers. Figure 1 presents the SFI2 rationale based on the integration of distinct experimental

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[1] https://www.fibre.org.br/
[2] http://futebol.inf.ufrgs.br/
[3] http://cloudlab-brasil.rnp.br/testbed
[4] http://wiki.5ginfire.eu/5-ginfiretestbeds/ufu
[5] https://fiwarelab.rnp.br
[6] http://www.h2020-necos.eu/
[7] https://www.youtube.com/watch?v=8l9mzVf48oM

facilities, deployed across several administrative domains, using a standard slice definition focusing on the experimentation of advanced services and applications.
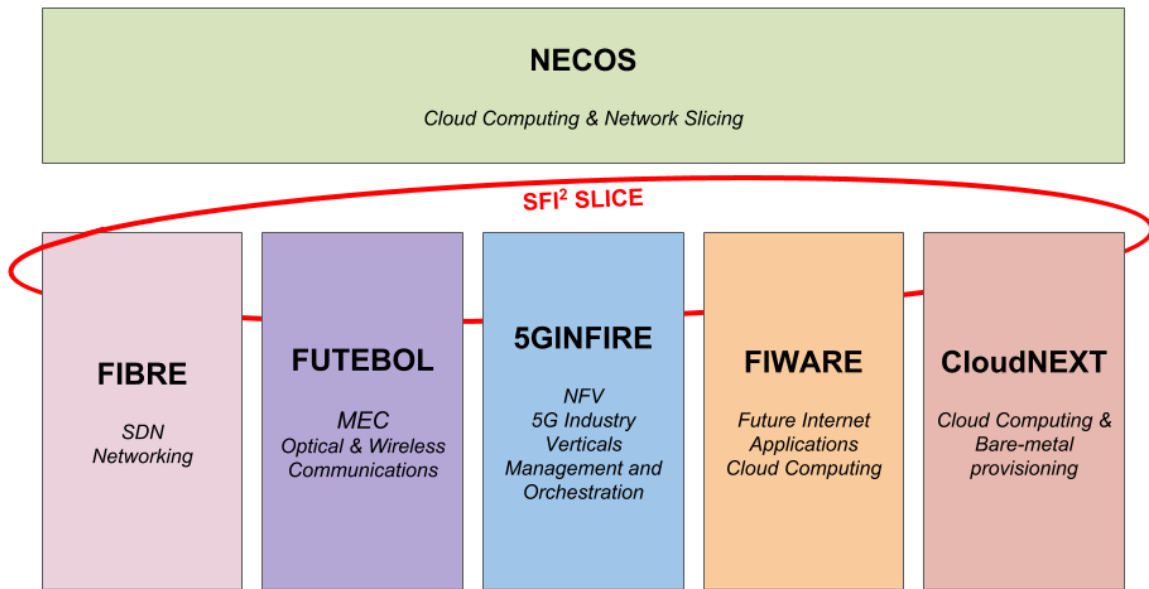

Figure 1. SFI2 Rationale

The SFI² approach features a set of innovative characteristics. It allows for slicing to be deployed either at the physical infrastructure level or at the VIM (Virtual Infrastructure Manager)/ WIM (Wide-area network Infrastructure Manager) management level with relatively small changes in the software components of one alternative in respect to the other. The tenant's orchestrator interacts directly with VIM/ WIM elements created on-demand, or with shim objects of the virtualized VIM/WIM at each local domain. From the tenant's point of view, these alternatives offer more control on the resources. From the service providers point of view these low-level slicing approaches can be considered lightweight because they do not require large slicing capable VIM/WIM or orchestrators in support of slicing, and the providers can participate directly in a slice marketplace.

For achieving that, intelligent resource orchestration among multiple domains is required introducing a whole new set of research challenges such as, novel resource allocation algorithms, novel techniques for traffic forecasting and dynamic workload arrival processing and novel submission control policies based on multiple user requirements like multiple tenant policies, system SLAs (Service Level Agreements) and user QoE (Quality of Experience).

By the integration of these existing experimentation infrastructures in Brazil, FIBRE, FUTEBOL, 5GINFIRE, NECOS and CloudNEXT, jointly with the adoption of new intelligent self-management practices, with less human intervention, the SFI2 project also expects to help reduce operational costs of these infrastructures.

By the date of the submission of this statement, SFI² is still under evaluation by the funding agency. In case of approval, it will last for 5 years.

References:

[1]Y. Xiao and M. Krunz, "Dynamic Network Slicing for Scalable Fog Computing Systems With Energy Harvesting," IEEE Journal on Selected Areas in Communications, vol. 36, no. 12, pp. 2640–2654, Dec. 2018.

[2]V. Sciancalepore, K. Samdanis, X. Costa-Perez, D. Bega, M. Gramaglia, and A. Banchs, "Mobile Traffic Forecasting for Maximizing 5G Network Slicing Resource Utilization," in IEEE INFOCOM 2017 - IEEE Conference on Computer Communications, 2017, pp. 1–9.

[3]F. Z. Yousaf et al., "Network Slicing with Flexible Mobility and Qos/Qoe Support for 5G Networks," in 2017 IEEE International Conference on Communications Workshops (ICC Workshops), 2017, pp. 1195–1201.