

FABRIC and International Testbed Collaboration

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(Please see PDF attachment for a nicely formatted 2 page pdf with figures.)

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This document is a response to the GEFI 2019 call for position statements. This statement includes two major contributions that will be interesting to the GEFI community. First, is an announcement of the *20 Million NSF networking testbed collaboration*.

Announcing FABRIC

The NSF on September 17, 2019 announced a *20 Million collaborative project, led by RENCi - UNC Chapel Hill, to create a platform for testing novel internet architectures that could enable a faster, more secure Internet*.

A series of government-funded programs from the 1960s through the 1980s established the computer networking architectures that formed the basis for today's internet. FABRIC will help test out new network designs that could overcome current bottlenecks and continue to extend the Internet's broad benefits for science and society. FABRIC will explore the balance between the amount of information a network maintains, the network's ability to process information, and its scalability, performance and security.

The core FABRIC team includes RENCi, the University of Kentucky, the Department of Energy's Energy Sciences Network (ESnet), Clemson University, and the Illinois Institute of Technology. Contributors from the University of Kentucky and ESnet will be instrumental in designing and deploying the platform's hardware and developing new software. Clemson and Illinois Institute of Technology researchers will work with a wide variety of user communities—including those focused on security, distributed architectures, scientific applications and data transfer protocols—to ensure FABRIC can serve their needs. In addition, researchers from many other universities will help test the platform and integrate their computing infrastructure and scientific instruments into FABRIC.

The construction phase of the project is expected to last four years, with the first year dedicated to software development, finalizing technical designs, and prototyping. Subsequent years will focus on rolling out the platform's hardware to participating sites across the nation and connecting it to major national computing facilities. Ultimately, national and international experimenter communities will be able to attach new instruments or hardware resources to FABRIC's uniquely extensible design, allowing the infrastructure to grow and adapt to changing research needs over time. Currently the FABRIC team is looking to build a community of experimenters and facility partners to provide insight into the testbed design through community workshops starting early 2020.

Antwerp CityLab (imec/UA) - Chameleon/ExoGENI Collaboration

In July 2019, Paul Ruth traveled to Antwerp and Ghent, Belgium, to kick off a research collaboration with several members of Prof. Johann Marquez-Barja's research group that operate the Antwerp CityLab as part of IDLab/IMEC. The intent of the meetings were to foster an emerging collaboration between CityLab, ExoGENI, and NSF Cloud Chameleon with the goal of supporting global networking experiments that span all of these testbeds.

The CityLab in Antwerp is a great place to deploy Smart City experiments requiring low-latency local edge computing capabilities. However, it has limited access to regional private clouds and large remote clouds. An emerging collaboration between CityLab, ExoGENI, and NSF Cloud Chameleon aims to enable tiered experiments that use regional private clouds (ExoGENI at University of Amsterdam) and large remote clouds (NSF Cloud Chameleon). The goal of this collaboration is to enable experiments spanning the three testbed as seen in the figure.

The meetings began with presentations to Paul Ruth by IDLab researchers Jeroen Famaey and Johann Marquez-Barja about the roles of IMEC-IDLab and the many different testbeds that IDLab operates (including Antwerp's CityLab). The remainder of the day was focused on discussions about how to enable experiments spanning the three testbeds. The discussions resulted in a much better understanding of the possibilities and limitations of enabling these experiments. A second day of meetings was in Ghent, Belgium and was hosted by Brecht Vermeulen at the IDlab-IMEC facilities in Ghent. Brecht is responsible for Fed4Fire which is needed to "stitch" ExoGENI circuit to CityLab. The meetings in Ghent included very low-level discussions about how the stitched circuit would be implemented. One unexpected outcome of the meeting was that we now plan to use a generic way to stitch ExoGENI to Fed4Fire. This more generic technique will enable stitching between ExoGENI and several other Fed4Fire testbeds including CityLab and Grid5000. The resulting plan is currently being deployed.

We plan to continue deploying the mechanisms required for experiments spanning Chameleon, ExoGENI, and Fed4Fire testbeds. We hope to present initial experiments at the 2019 GEFI workshop and perform a more robust experiment that will result in a published paper. As FABRIC is developed this initial collaboration will spur international collaboration with NSF's newest networking testbed.

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