

THE EVOLUTION OF THE GÉANT TESTBEDS SERVICE (GTS)

Since its inception in 2012, GTS has developed significantly and the latest iteration is planned for release in early 2019 as a supported production service. Bram Peeters, Chief Network Operations Officer gives CONNECT a brief overview of the GTS R&D evolution and considers where application opportunities lie within the GÉANT ecosystem.

The first iteration of GTS was the GÉANT OpenFlow Facility (GOFF). It consisted of 5 nodes with a fully meshed 1Gbps network supporting 2 servers in each node, one supporting computational VMs, the other providing an OpenFlow switching fabric. This enabled the testing of complete OpenFlow based networking environments, in a facility that more closely matched real world scenarios than lab environments. Even in this early experimental phase, GTS was of considerable value for the network researcher community. More importantly, GTS itself provides a 'testbed' functionality to GÉANT to help understand and focus on identifying what capabilities a service like GTS should have and what impact it could subsequently contribute.

Multiple GTS iterations have allowed GTS technology to become more robust, scalable and secure to, for example, allow multiple users to concurrently use the testbed without these impacting on each other. GTS became usable for much broader experimental research, beyond and above the pure networking fabric. GTS has now developed into an open test facility for a wide range of distributed systems and network based concepts. This is important because applications and systems have moved away from being tied to specified

hardware into orchestrated, virtualised environments that can - depending on requirements - be hosted anywhere and by anyone.

From IoT services, integrated supercomputing facilities to distributed business automation tools, these systems all need to be able to work across real-world networking infrastructures with real network delays, noise, latency and other impact factors. Although software simulations and lab setups can provide a lot of insight, system architectures and concepts need to be exposed to a real network. GTS can provide a safe and geographically distributed incubator facility that:

- Provides configurations to simulate a wide range of networks from high bandwidth, low latency networks to less than perfect configurations. This means that network behaviours can be studied under varying yet controllable conditions.
- Ensures the user's network is isolated from other users, ensuring that any problems or extreme network behaviour can be safely contained, fully insulated and therefore do not affect other users.

As an example, the testing of a new DDOS mitigation concept would be impractical on a live network architecture.



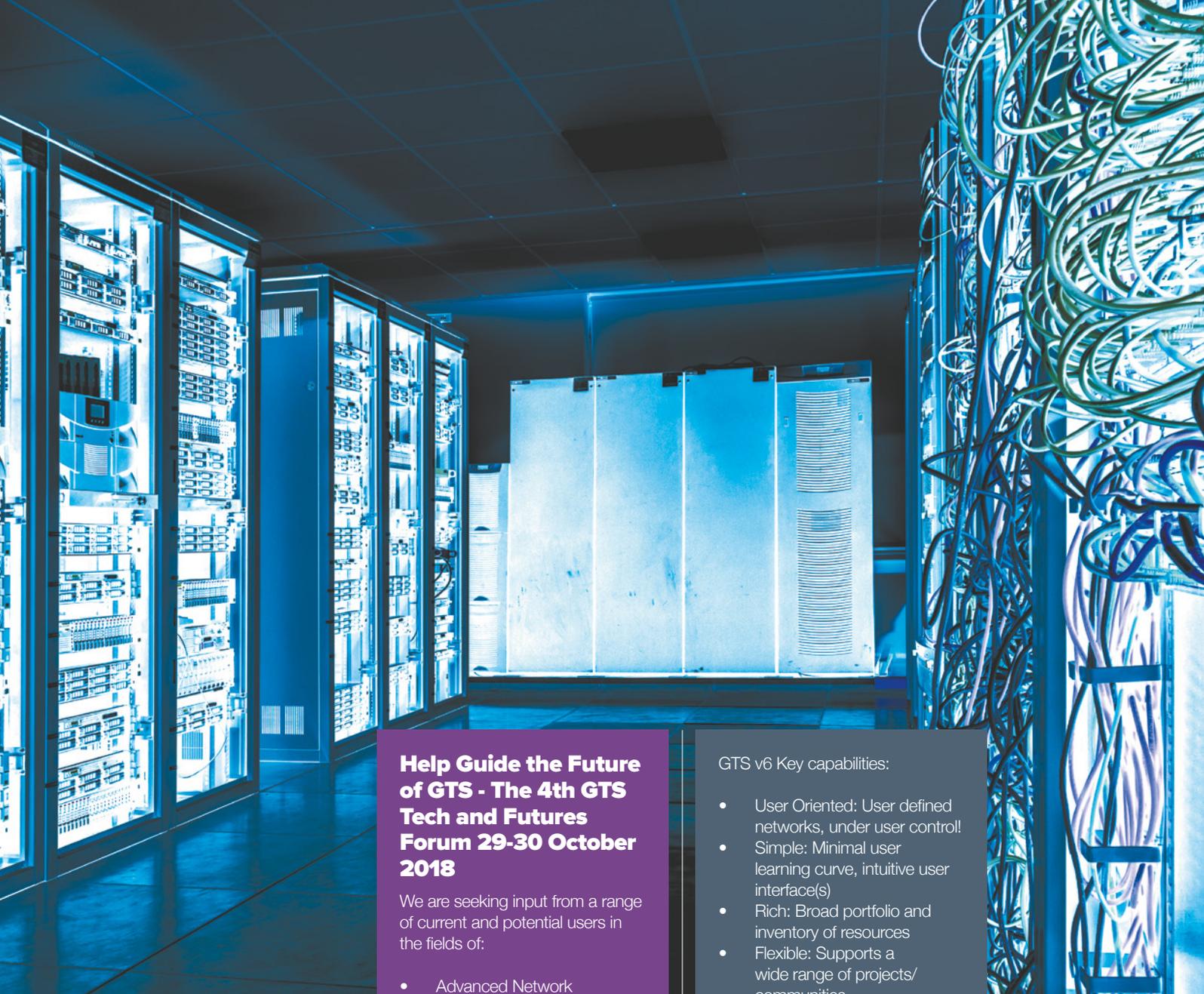
It could be tested using GTS technology without any disruption risk to underlying R&E traffic.

In its current iteration (v6) GTS can be an infrastructure for at least two use case scenarios:

- It can be a platform for network research on the scale of a real network.
- It can also be used as a platform that enables proof of concept (PoC) testing of distributed environments.

But in the future GTS has the potential to offer much more:

- Connecting GTSv6 to other environments will be important. We are already in the process of providing the required compatibility to be able to connect to the Fed4Fire federated community of testbeds (SFA Interoperability Wrapper).



- Connecting GTS to multi-domains enables it to play a significant role in enabling advanced network researchers to develop the next generation of multi-domain services for R&E. Such a multi-domain, cross-border, collaborative approach is a typical key strength as well as a key challenge for the global R&E community.
- Once accredited as a Fed4Fire federated testbed, that can be selected by users via Open Calls, GTS can play a key role amongst other key enablers of advanced research prototyping, incubating and can play a role within the developing visualisation paradigm.

These abilities will help to increase the potential of GTS for the whole community.

Help Guide the Future of GTS - The 4th GTS Tech and Futures Forum 29-30 October 2018

We are seeking input from a range of current and potential users in the fields of:

- Advanced Network Technology Researchers
- Advanced Network Technology Developers
- Network Architecture Teaching Modules teaching in HE / class room environments
- Network Managers / Administrators
- Heads of Network Infrastructure Departments at NRENs and NREN end user communities

Please reserve a place in your diary for the 4th GTS Tech and Futures Forum to take place Monday 29 October, 12pm to Tuesday 30 October, 2pm, 2018 at BELNET's Offices in Brussels.

If you are currently involved using any aspect of GTS technology and are able to share an interesting use case please contact anke.russell@geant.org

GTS v6 Key capabilities:

- User Oriented: User defined networks, under user control!
- Simple: Minimal user learning curve, intuitive user interface(s)
- Rich: Broad portfolio and inventory of resources
- Flexible: Supports a wide range of projects/communities
- Agile: Rapid prototyping, rapid reconfiguration
- Secure: Support high risk experiments, contain blast radius
- Scalable: Support global experimentation, full 'line rate' performance, large experiments, many users/projects
- Reliable: 24x7 availability, robust predictable/repeatable behaviour
- GTS Web based 'Point-n-Click' Graphical User Interface (GUI)
- Drag and drop editor

gts.geant.org