

Abstract for a Proposed Presentation for TNC 2018

Organic Self-Adjusting Optical Networks

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Network edges drive new patterns of network traffic, and as a result of these distributed patterns, it is getting increasingly difficult to predict traffic in NRENs for two reasons. First, big data science projects like astronomical observatories or high energy physics colliders, produce massive amounts of data in spurts that need to be distributed to different institutions and data centers for processing and research. Second, the advent of 5G/IoT/MEC platforms will lead to the creation of many new services and thus many new and erratic data flows with widely differing traffic handling and latency requirements.

Underlying this traffic – doing all the heavy lifting of moving bits around – is the optical network. One way to handle the situation of traffic unpredictability is to overprovision the optical network to deal with worst case requirements. But that is never the most attractive direction because of cost. Increasingly what is being talked about are organic networks, that can absorb and respond smoothly to changing traffic demands. These networks also need to adapt to the way customers are changing their enterprise architectures in and around the cloud. The solution is based on continuous and fluid reconfiguration of existing resources – while maintaining high availability – and autonomously initiating requests for additional resources.

The joint presentation by Surfnet and ECI discusses both practical and industry initiatives at making this a reality.

Surfnet

Surfnet will discuss its philosophy of organic network change and how it is implementing a dynamically controllable optical network that maximizes use of existing resources, and can sustain failures with minimal impact to services.

This network must meet multiple needs:

- Edges are constantly changing.
- Big science data challenges mentioned above. (Need to provide ultra-high bandwidth in bursts, such as to move massive data from Dutch Astronomy Institute to different universities, or from CERN to Surfnet-based data centers.)
- Dealing with services transitioning into data centers, and associated agreements with multiple 3rd-party cloud service providers.
- Making available a customer portal allowing university/institute customers to create, modify, and delete services on demand.

Surfnet will outline its two main initiatives on how it is responding to these needs:

- Incorporating the optical layer into SDN control for provisioning. Two main directions are being considered: 1) using its optical network NMS to tune wavelengths on the routers, or 2) using northbound interfaces on the optical network NMS under a higher level service orchestrator.
- Automating many NOC functions based on monitoring, telemetry, and statistics. This will provide proactive provisioning (anticipating and fulfilling resource needs in advance), offices hours

maintenance (working on the network during the day, including taking down connections, without users perceiving service degradations), and generally lowering operational costs.

ECI

ECI will outline its work on taking dynamically controlled networks to the next level, to be self-adjusting and self-growing. Networks will be able to self-optimize and self-configure according to the capabilities of routes and resources to deal with different traffic demands originating from the edge.

Networking algorithms and real-time control are only the starting point. The work also incorporates economic algorithms that can negotiate bandwidth and times-of-day with customers to best match their needs. A perfect example for this would be in dealing with big science demands.

At a certain stage, however, it will become clear that the network can no longer keep up with customer traffic demands at an acceptable level of service and availability. At this stage, the network will generate its “purchase orders” (subject to human approval) of where to add resources.

Together this joint Surfnet-ECI presentation shows practical and research steps on the path to organic self-adjusting/self-organizing networks.

Speakers

Rob Smets, Optical Transport Architect, Surfnet

Rob Smets received his M.Sc. and Ph.D on all optical signal processing from the Eindhoven University of Technology in 1994 and 1999, respectively. In 1999 he joined Lucent Technologies to support the Optical Networking Group. In 2008 he joined The Dutch Organization for Applied Scientific Research (TNO) as an innovator where he specialized as a network architect designing a variety of telecommunication network for different economic sectors. In 2013 he became optical network architect for SURFnet where he is currently responsible for innovating SURFnet’s optical transport layer and bandwidth fabric.

Hayim Porat, CTO, ECI

Hayim assumed the role of CTO on February 2015. Hayim is a key creator of the company’s ELASTIC NETWORK of SDN/NFV, big data, Security and cloud services. Hayim brings vast experience in senior CTO positions in the telecommunications hi-tech industry, amongst which are Chief Cloud and SDN architect in Toga Networks (Israel R&D center for Huawei), principal architect in Tejas and founder and CTO of Ethos. Hayim holds an M.Sc degree in Computer Systems from the Technion and a Master of Business Administration from Tel Aviv University.