SC18 Network Research Exhibition: Demonstration Preliminary Abstract

Mercator: Multidomain Network State Abstraction

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Abstract

Multi-domain network resource reservation systems are being deployed, driven by the demand and substantial benefits of providing predictable network resources. However, a major lack of existing systems is their coarse granularity, due to the participating networks' concern of revealing sensitive information, which can result in substantial inefficiencies. We present Mercator, a novel multi-domain network resource discovery system to provide fine-grained, global network resource information, for collaborative sciences. The foundation of Mercator is a resource abstraction through algebraic-expression enumeration (i.e., linear inequalities / equations), as a compact representation of the available bandwidth in multi-domain networks. We also develop an obfuscating protocol in Mercator, to address the privacy concerns by ensuring that no participant can associate the algebraic expressions with the corresponding member networks. We also introduce a super-set projection technique to increase Mercator's scalability.

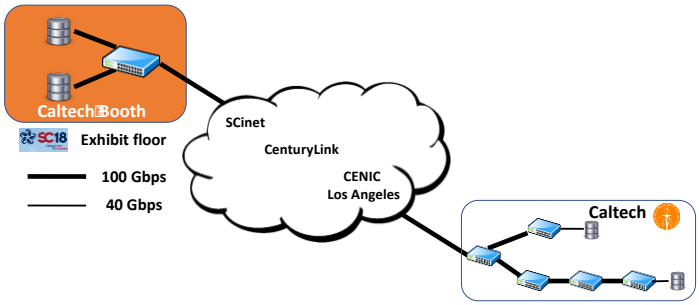
Goals

The demonstration shows how Mercator can discover fine-grained, global network resource information across domains, and how such information can be used to orchestrate end-to-end scientific data flows.

In particular, our demo showcases a three-domain scenario, with one at the SC18 exhibit floor and two at Pasadena, California. In this scenario, Mercator discovers the fine-grained network bandwidth availability and sharing of a set of flows, obfuscates such information using our customized obfuscating protocol, and sends them back to the user. Upon receiving the network resource information, the user uses a state-of-the-art optimization solver to compute and reserve the optimal network bandwidth allocation for the target flows.

Resources

This demo is composed of three domains. In particular, we will use two DTNs and one switch in the Caltech booth at SC18 exhibit floor to form one network. This network will be connected to the Caltech SDN testbed located at Pasadena, California via a 100 Gbps WAN circuit, provided by SCinet, CenturyLink and CENIC Los Angeles. In the SDN testbed, several switches and DTNs will be used to form two other domains.



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