Access Control for a Database-Defined Network

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Introduction

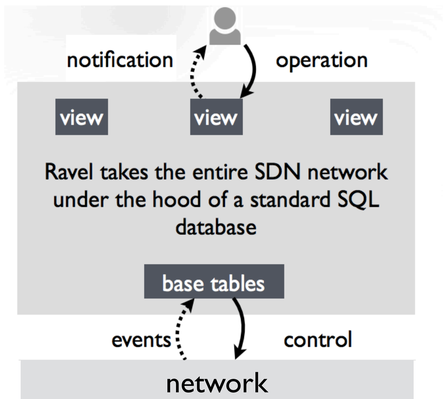
- Software-defined networking (SDN) allows insertion of software to manage network through centralized controller
- Security is a crucial, but still less well studied aspect of SDN
- Ravel, a database-defined controller, like many others currently exposes all network states to its users

Motivation

- Security is an important area of SDN that has not been sufficiently studied
- This project adds access control (as an application) to Ravel

Database-Defined Network

SDN: control distributed set of devices with a centralized controller

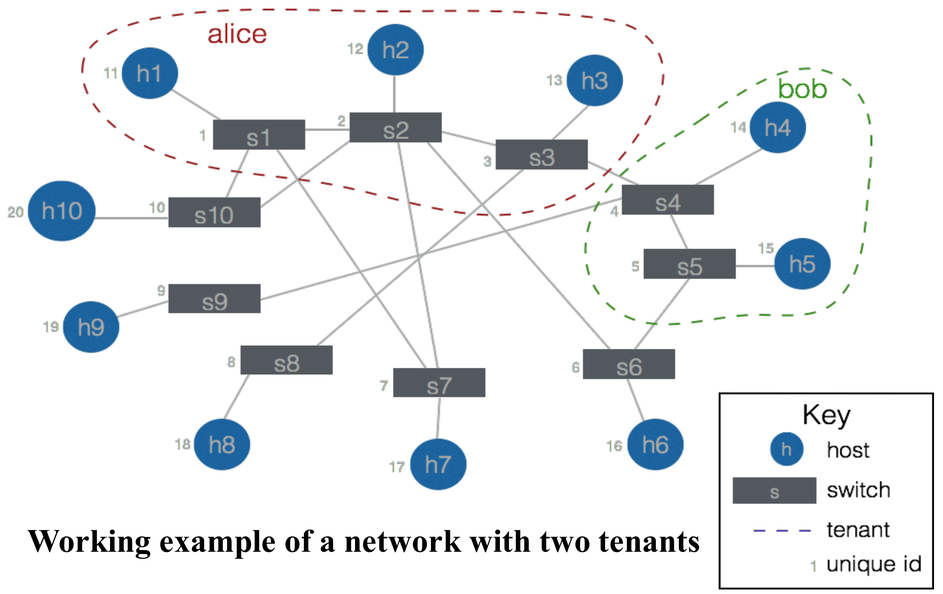


Ravel is the realization of SDN by database

- SQL interface
- *Views:* user-defined abstractions for individual applications
- *Orchestration:* coordinate updates between multiple applications

Security

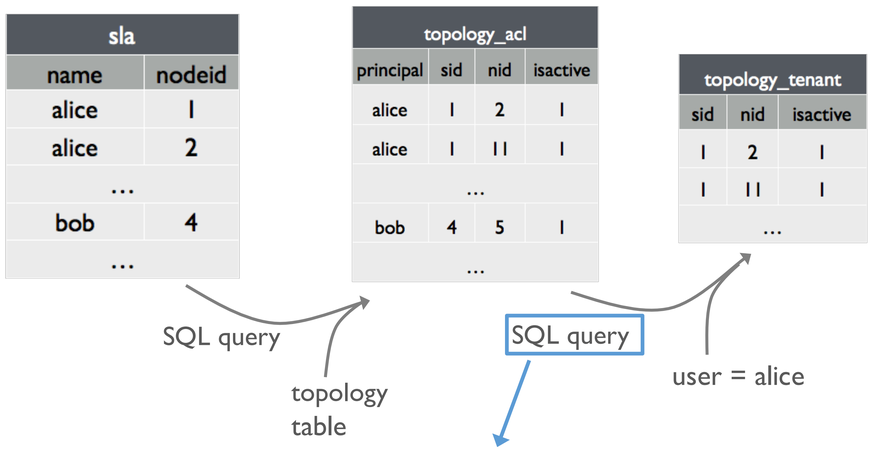
- Ravel does not yet have security implemented
- This project adds access control, a specific aspect of security



Working example of a network with two tenants

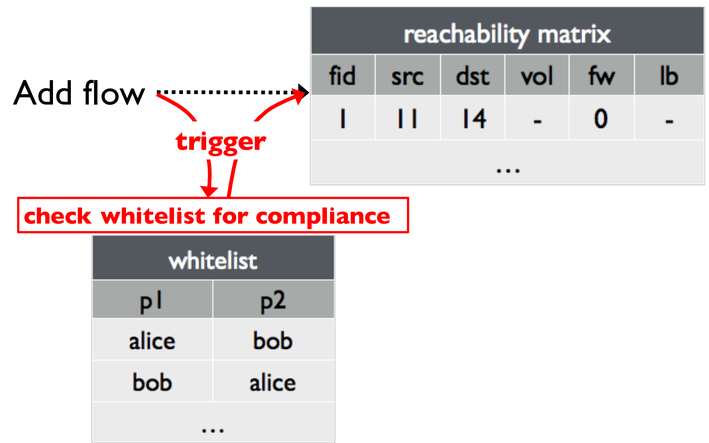
Access Control for Network Resources

Service-level agreement (SLA)



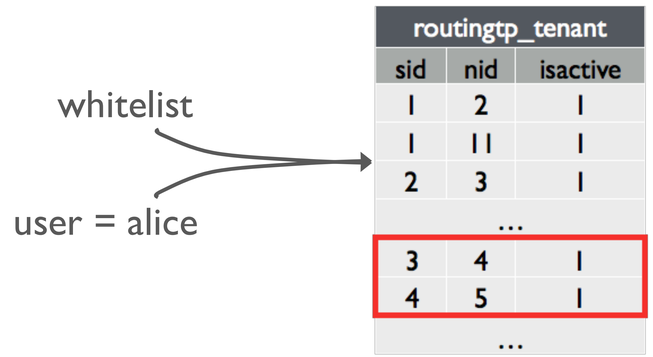

```
CREATE OR REPLACE VIEW topology_tenant AS (
    SELECT sid, nid, isactive FROM topology_acl
    WHERE principal = current_user);
```

Access Control for Network Updates



Challenge: Controlling Network Updates

Goal: Select a path through only nodes compliant with a user's SLA.



- Create **routingtp_tenant view** to achieve this goal
- Calculate a path that contains only nodes listed in this view

Ravel: *ravel-net.org*
Demo: *github.com/ravel-net/REU-access-control*