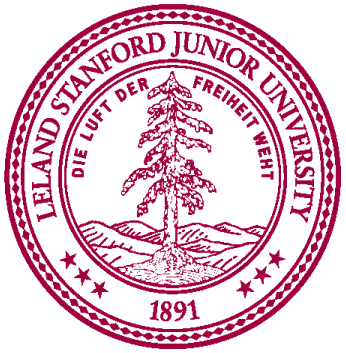


OpenFlow at GEC10

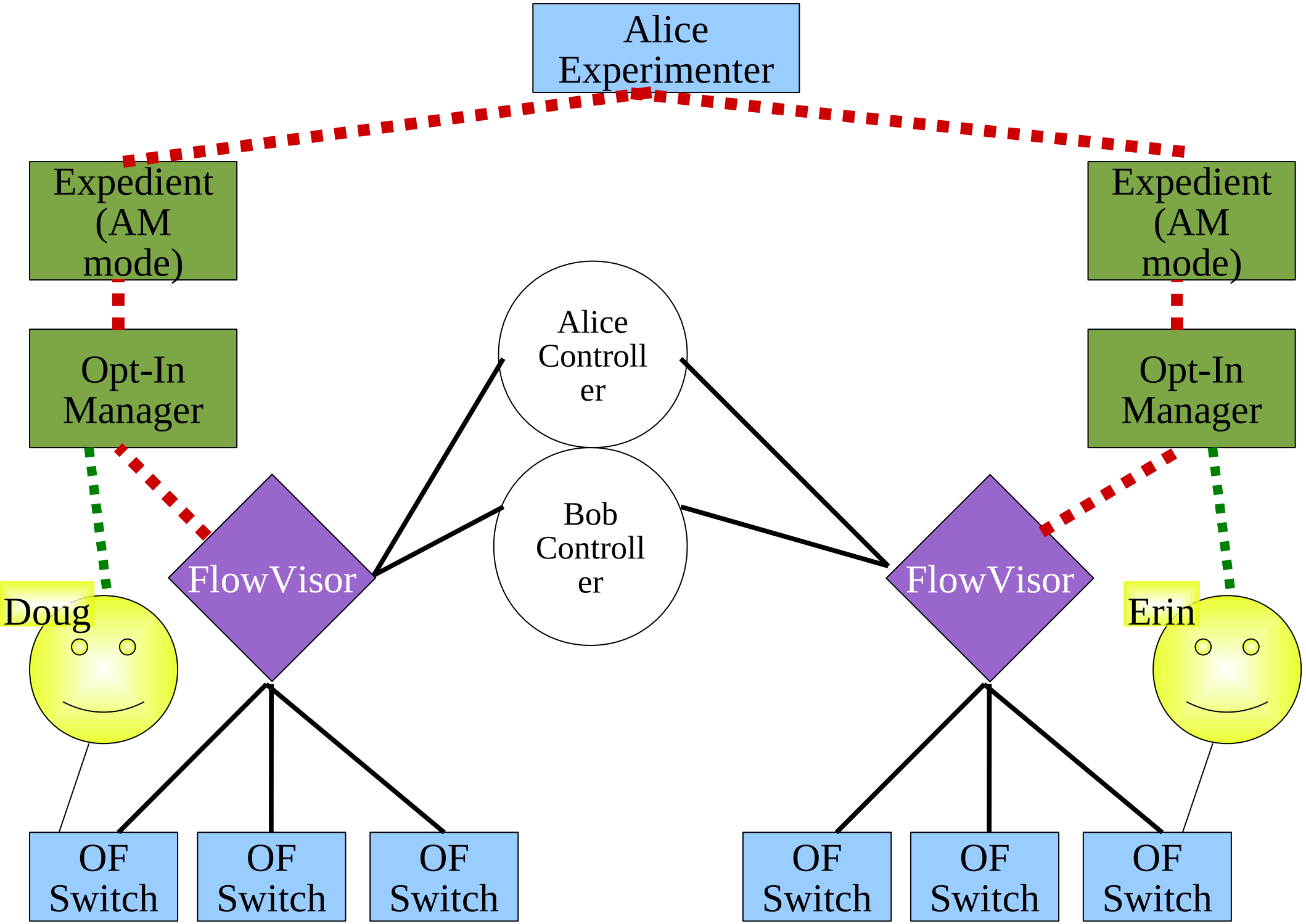
Rob Sherwood

March 16, 2011

Outline

- Overview of OpenFlow on GENI
  - FlowVisor, Opt-In Manager, Expedient
- OpenFlow and Rspecs
  - Current
  - Moving towards ProtoGENI v2 Rspecs
- OpenFlow and Stitching (next talk)
  - Current
  - Comments on proposals

OpenFlow on GENI


Alice Experimenter
Expedient (AM mode)
Expedient (AM mode)
Opt-In Manager
Opt-In Manager
Alice Controller
Bob Controller
FlowVisor
FlowVisor
Doug
Erin
OF Switch
OF Switch
OF Switch
OF Switch
OF Switch
OF Switch

Rspecs

OpenFlow Resources

- Switches are nodes
  - 8 byte DPID as unique ID
  - Ports: decimal integers 1-65535
- Links are unidirectional dpid:port pairs
  - $sDPID:$sPort --> $dDPID:$dPort
- Each link has an allowed “FlowSpace” with ranges
  - dl_vlan=1235-3000, ip_saddr=128.8.128.0/24, tp_dport=80-80
- Other info:
  - Controller URL: tcp://alice.controller.org:6633
  - User account/passwd for FlowVisor API

Current OpenFlow Rspec

- Advertise
  - No flowspace – Opt-In manager trick
  - Mostly just topology information
  - No bandwidth information
- Request
  - Subset topology (“bound request”)
  - FlowSpace per link: lots of duplication
  - No bandwidth reservations
- Translates to omni_spec (by hand)

Thoughts on ProtoGENI v2 Rspec

- Stick with “bound” requests for now
  - No need for ticket, manifest rspecs?
- Create a FlowSpace extension
  - 12+ OpenFlow tuples: ranges?
  - For links, switches, slices?
- Create a bandwidth reservation extension
- Bottom line:
  - “have rough consensus; now need running code”

Slice Stitching

Current Stitching

- Hard code touch points
  - PlanetLab, ProtoGENI, other OpenFlow aggregates
  - Advertised in Expedient (in Clearing House mode)
- Experimenter “hand” stitches
  - Via rspec using “tree model”
  - Intra-OpenFlow: automagic topology discovery
- Problems
  - Doesn't scale
  - Error prone
  - “Sub-optimal user experience”

OpenFlow and Proposal

- Agree at high-level
- Two level discovery hierarchy
  - Global, inter-AM view
    - Static information: touch points
  - Local, intra-AM view
    - Dynamic information: link status, bandwidth availability
- Likely need to add OpenFlow linktype
  - Assumes VLAN = Bandwidth reservation
  - Describe virtual-wire-like functionality

“No horse in this race”

Perceived Hard Problems

- Mixed chain and tree stitching
  - Can we have a common AM-level API?
  - Can a chain node pretend to the the stitching service for a tree node? Security?
- How static is our static data?
  - Can/should it be dynamically inferred?
  - How do we detect errors?
- How similar is this to an IGP/EGP split?
  - Assumes intra-AM connectivity

Comments on Rob Ricci's Slides

- Two fundamental use cases
- Loose source routing
  - Hide technical details
  - Experimenter: Just make it happen
  - “Chain mode”
- Strict source routing
  - Expose technical details
  - Experiment: I care about the topology
  - “Tree mode”
- Use cases motivate different solutions

Comments on Jeff's Slides

- DAG might be a solution to tree + chain mixing
  - Inherently?
- This problem still suffers from conflicting naming conventions
  - Not directed at Jeff in particular
  - Largely historical
  - Potential point for GPO leadership

Conclusions

- Rspec and stitching proposals seem like they should work
  - read: “have rough consensus”
- Proof is in pudding
  - read: “need running code”
- Flexibility of extension mechanisms critical