



GENI Use Cases

GEC 16 University of Utah

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<http://www.geni.net>



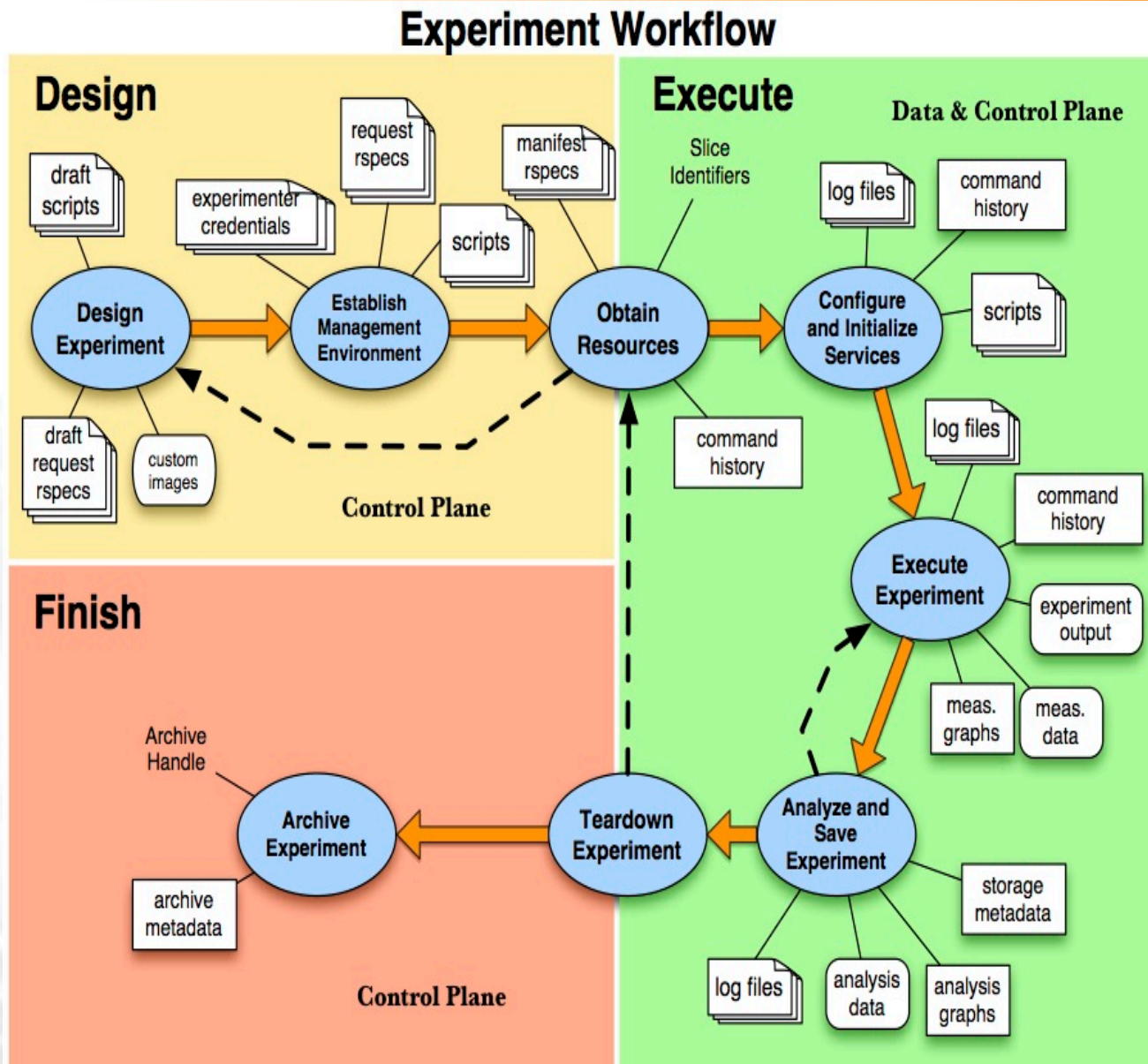
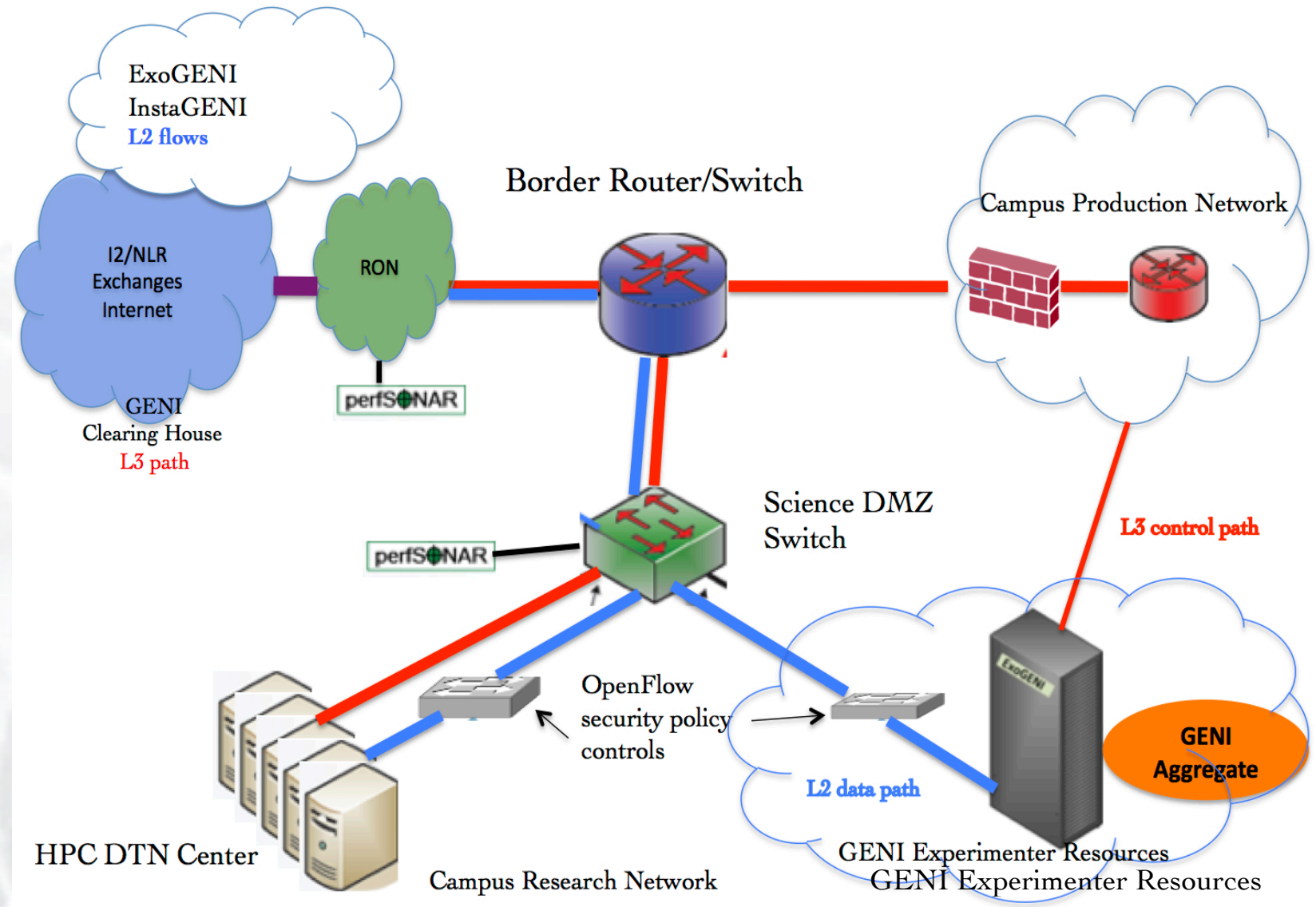


Figure 1: Experiment Lifecycle Steps & Work Products

GENI Campus Functions

- Owners publicize resources available and set policies and access mechanisms associated with use;
- Allow decentralized operation & mgmt of substrate;
- Allow researchers/experimenters to authenticate, create slices across substrate, and run experimental code on virtual machines
- Resources & L2 network path *can be* separate from production network & other compute resources

Standalone Rack On Campus



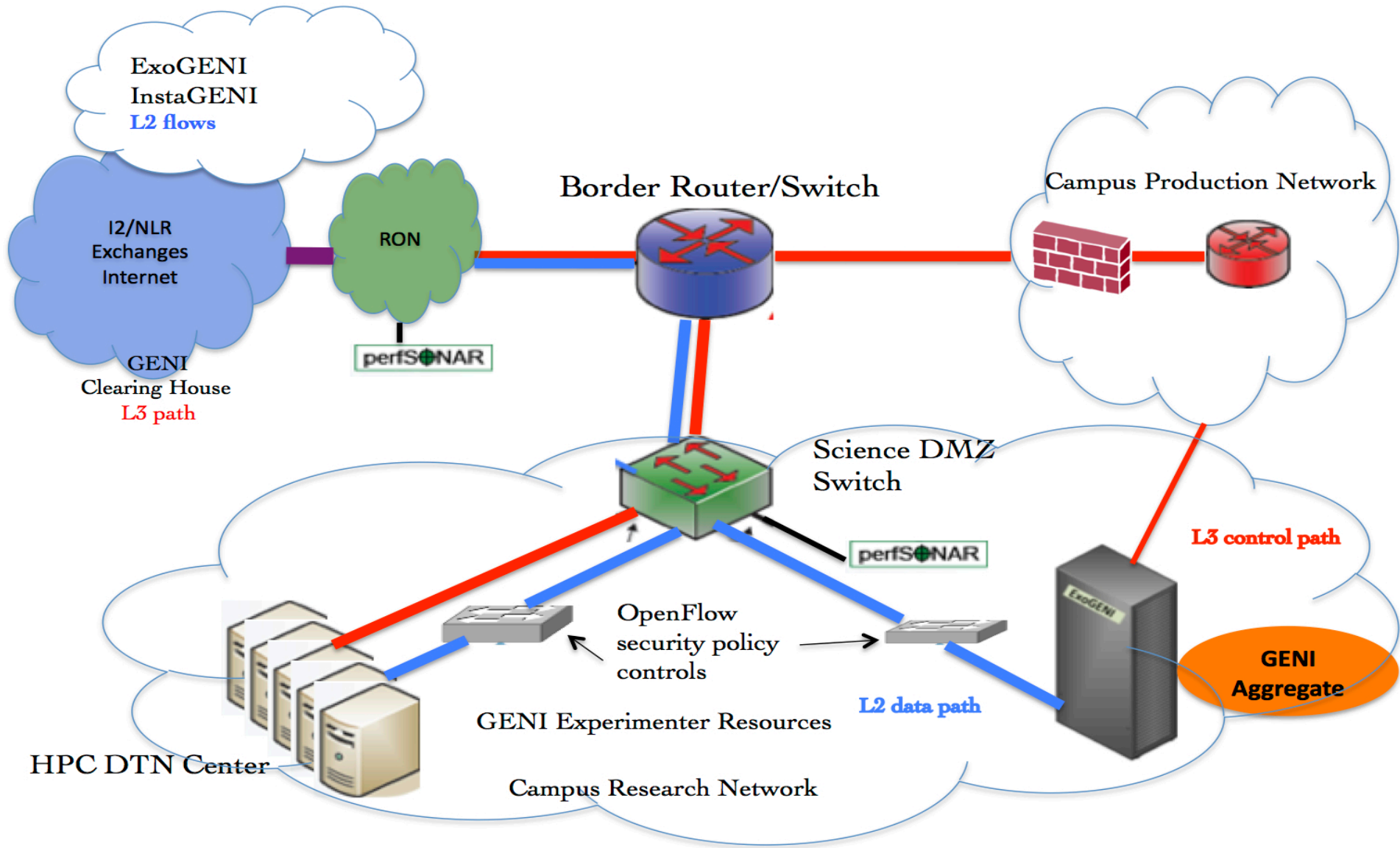
Rack Multi-Aggregate Topology

- L3 control channel connection to Clearinghouse to authenticate, request resources, and receive auth credentials
- L2 data plane connection typically used to set up slice with Aggregates A, B, & C (compute, storage, and network bandwidth)
- Campus network engineer sets up flow policy rules on GENI OpenFlow switch and campus border/edge switch/router; some OpenFlow switches support the functionality to map/translate campus vLANs ports to GENI vLANs using cross connect cables to trunking ports
- Experimenter uses Resource & Experimenter Management Tools to express, build, and analyze their research results

vLAN Campus Options

- Parties negotiate iteratively to agree on address
- Establish static range of addresses
- Use Q-in-Q tunneling to wrap frames marked with your vLAN ID within another vLAN ID
- Configure hardware and software tools with the ability to perform dynamic bandwidth reservation (Stitching with OSCARS) and vLAN translation

Rack Integrated With Campus

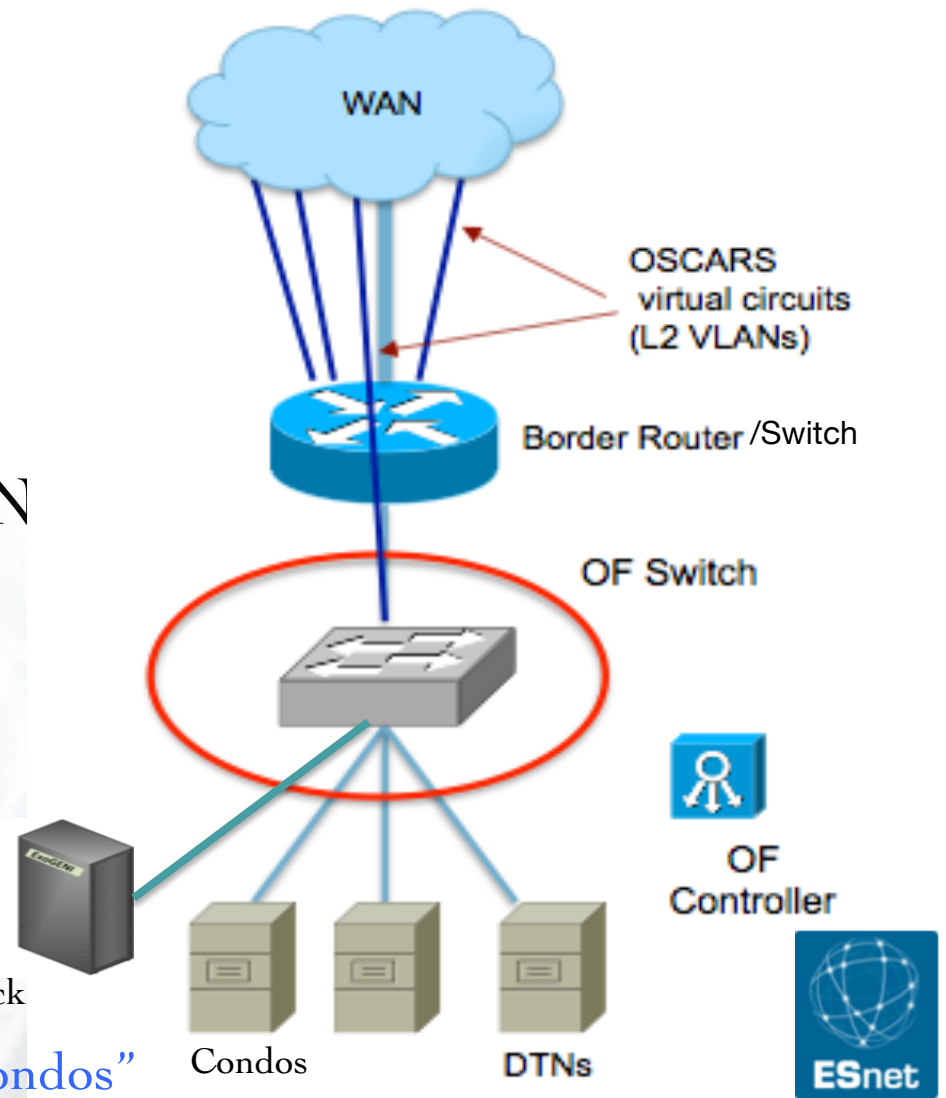


Rack Plus Campus Resources

- Campus faculty or departments choose to make specialized compute, storage, data sets, or experimental tools available to the GENI community and establish use policies for access
- Controlled like any other GENI resource, through the GENI Aggregate Manager API with authentication and authorization certificate chains
- Experimenters use the AM API to discover, request, provision, start, check the status of resources as they are started, extend or renew their reservation, and then return the resources when done

Using OpenFlow

- Multiple Data Transfer Nodes
- OF switch maps flows to circuits via policies & vLAN translation
- OF controller for WAN circuits, bandwidth, and admin policies



Discipline Specific DTNs “Condos”

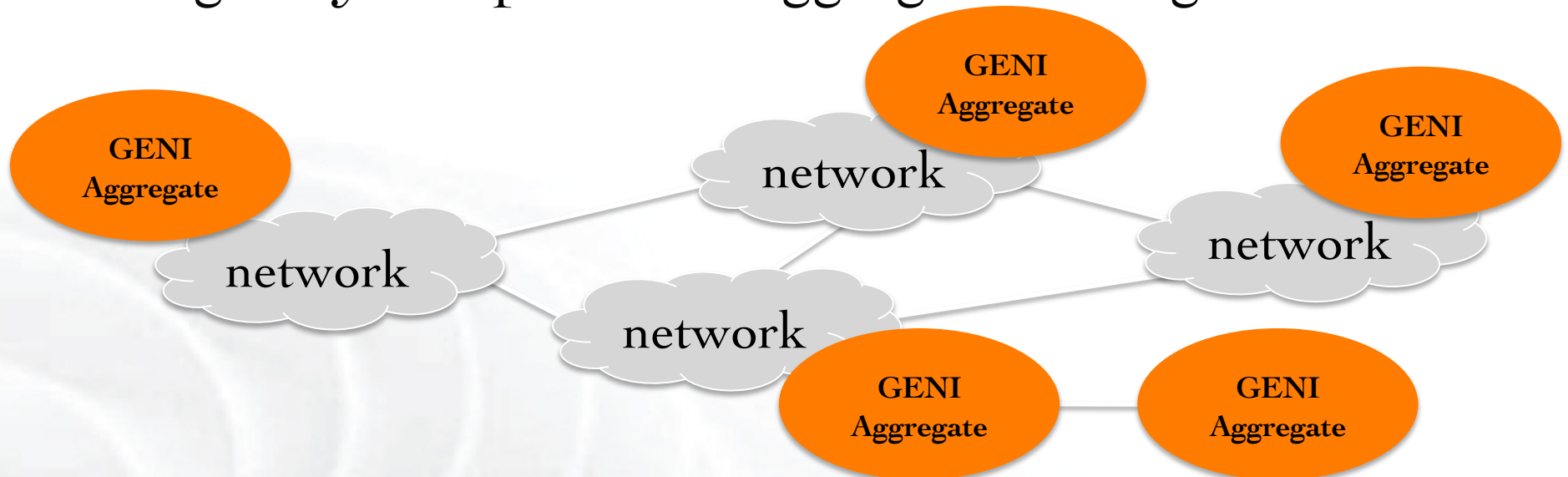
Campus OpenFlow Options

- Link directly to one or more pre-provisioned core vLANs, without using any campus OpenFlow resources. Simple option for experiments that don't need OpenFlow campus resources and merely want to access the GENI mesoscale
- Use OpenFlow to link to one or more pre-provisioned core vLANs, via a cross-connect cable that trunks a campus OpenFlow vLAN onto the core vLANs. This too is a fairly simple option for experiments that want to use OpenFlow campus resources, and use existing core mesoscale vLANs.
- Use OpenFlow to link to any core vLANs by using OpenFlow to configure the switch to perform vLAN translation. This is a more complicated option for experiments that want to use OpenFlow campus resources, and need to use vLANs that aren't provisioned with a physical cross-connect for whatever reason (e.g. large numbers of vLANs, dynamically provisioned VLANs, etc).

- GENI Network Stitching Objective
 - View aggregates as comprising a topology
 - Enable the provision of inter-aggregate network connections as part of multi-aggregate slices
 - Based on Layer2 Ethernet vLANs
- Integrate stitching into standard GENI AM API processes/functions via RSpec
- Map slices with resources and vLANs - no automatic vLAN translation but can assign from static range
- Leverage deployed dynamic network services/infrastructure

Stitching Environment

- GENI Resources organized as independent "Aggregates" managed by independent "Aggregate Managers"



- The intermediate "network(s)" will be of various types and capabilities
 - campus, regional, wide area, exchange points
 - some with dynamic network capabilities
 - some with static VLANs configured

