# Inter-domain SDN Task Force

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# Global context in which GLIF operates is changing very rapidly …

- In April, 2011, Google announced that SDN was in production between all of its data centers and challenged industry to respond
- October, 2012, Internet2 launched a production, nationwide 15k+ route-mile OpenFlow-based 100G Advanced Layer 2 Service
  - Other than funding, there's no reason this can't be done on by every network operator and every GOLE operator in this room today …
- Internet2 has committed to supporting the full GENI API by Q2 2013
  - There's no reason that couldn't be done by every network operator and GOLE operator in the room in 2013
- All of the major hardware vendors are in a race to implement OpenFlow 1.0 and then OpenFlow 1.3
  - They are focused on data centers …
  - … R&E community cares about WAN
  - Eric's Estimate: This will be the production "norm" by Summer 2013 …
  - … we have 9 months to make an impact while the vendors are still listening

# Challenges GLIF Tech could tackle

- Today: We can connect OpenFlow “islands” with Layer 2 VLANs …
- Tomorrow: What does it mean to “peer” OpenFlow domains
  - Start with the use case, then worry about what protocol to share the data
  - E.g., different domains have different flow mod rules … what would you do differently if you knew your peer network’s controller state?
- Today: We know how to create a “network research service” within a single domain
- Tomorrow: What does a multi-domain “network research service” look like?
  - GPO: “Slice around the world” … implement across GLIF?
  - Network virtualization in a multidomain context?
- What else?

# Next Steps proposed in October

- Build a testbed (JGN-X, Transpac3, Internet2, ACE, SURFNET)
- Write a charter (Eric Boyd / Steve Wolff)
- Begin attacking the problem

# Agenda

- Charter
  - Sent to mailing list
- Problem Statement
  - Eric Boyd
- Testbed Status
  - Dale Finkelson
- BREAK
- Start Answering the Problem
  - Ronald van der Pol (SURFnet)
  - Tom Lehman (MAX)
  - Ezra Kissel (Indiana University)

# DRAFT Charter: Purpose

- The purpose of the GLIF OpenFlow Interdomain Task Force is to develop the theory and practice of the interconnection of OpenFlow domains within a time frame short enough to influence the architectures and products of vendors, to which the concept is foreign. It is expected that October, 2012 through October, 2013 is a likely window in which a significant impact could be fashioned.
- In this case, an OpenFlow domain is preliminarily defined as a network or exchange point that implements OpenFlow under the control of a single controller (at least within a slice or virtual network). It is expected that the Task Force will refine this and other necessary definitions.

# DRAFT Charter: Problem Statement (In Order)

- Determine a framework to extend working GLIF capabilities up and down the stack from interdomain VLANs to add support for software defined networking concepts and specifically interdomain OpenFlow. (ex, add knowledge and ability to access flow characteristics of neighboring domains).
- Determine what new network algorithms could do to improve network behavior (performance, security, efficiency, etc.) with information from neighboring domain(s).
- Determine what information would need to be shared between domains to implement such network algorithms
- Determine what protocol(s) (existing, extension of existing, or new) are appropriate share such information

# DRAFT Charter: Specific Tasks

- Actively solicit vendor participation in its work;
- Survey the several current experiments to interconnect OpenFlow domains which are under independent administrative control;
- Provide means for experiments to exchange information such as methodology, results, pitfalls, etc.;
- Coordinate, to the extent desired by the participating experiments, plans for future experiments; and
- Spawn, as appropriate, independent groups to suggest interconnection standards, best current practices, and similar recommendations.
- Provide input to the GLIF architecture working-group discussing next-generation GLIF/GOLE architectures

# DRAFT Charter: Outcomes

- Preliminary presentations about work in progress or ideas in this space will be solicited by the chairs and presented to the GLIF Tech at the January 2013 TIP meeting.
- Additional work products of the GLIF OpenFlow Interdomain Task Force will also be commissioned at the January 2013 TIP.
- As soon as feasible, the GLIF OpenFlow Interdomain Task Force will prepare a white paper and slideshow for presentation at the ONF or other appropriate industry forum.

# DRAFT: Problem Statement

- Imagine an N-node OpenFlow-based network A
- Now, split that network into two N/2-node OpenFlow-based networks, B1 & B2, connected by a Layer 2 VLAN
- A != B1 + B2
- What information do we need to share between two networks? (Global maximum vs. 2 local maximum)
- What would B2 do with B1's information? (Would this materially impact B2's insertion of flow rules?)
- What trust is needed?
- Is the goal A == B1 +B2 or does something less suffice?
- Need a definition of what we are trying to do before we have any discussion of what protocol(s) might be appropriate

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