

BGP-Mux “How To” and Quick Facts

Who should read this document?

This document is written as a quick guide for operators who are considering deploying BGP-Mux in their network.

What is BGP-Mux?

BGP-Mux is a routing platform that acts as a BGP mediator between virtual networks in research facilities and real ISPs. Each virtual network connects to BGP-Mux as if it would connect to an upstream ISP. At the same time, the upstream maintains only one connection to BGP-Mux.

Why Should I Deploy a BGP-Mux?

Deploying BGP-Mux in your network helps the the research community. Each BGP-Mux provides an additional connection point to the Internet, allowing more diverse connectivity for network researchers.

Who is Deploying BGP-Mux?

Initially, universities and commercial providers are deploying BGP-Mux. We currently have deployments at Georgia Tech, University of Wisconsin-Madison, and PSGNet. We are also working with research labs and commercial providers to deploy additional BGP-Mux'es. A current list of sites who have deployed the BGP Mux is listed on the GENI Project Wiki: <http://groups.geni.net/geni/wiki/DTunnels>.

How Do I Deploy BGP-Mux?

BGP-Mux is easy to deploy and does not consume much resources. BGP-Mux, in practice, is just a server in your rack that peers with a BGP-speaking router in your network. Deployment has several requirements:

- **Server.** BGP-Mux software can be installed on a commodity Linux server. We can provide the server, or operators can allocate one of their machines.
- **Upstream connectivity.** The BGP-Mux server connects to a router running BGP (e.g., university's border router). BGP-Mux and the upstream router must have Layer 2 connectivity (e.g., VLAN) and must share a common subnet. BGP-Mux and the upstream router could also connect indirectly, over multiple routing hops, using the eBGP multi-hop feature. This configuration should be used only if direct connectivity is impossible because it requires operators to maintain static routes on each intermediate hop between the BGP-Mux and the upstream router.
- **BGP session.** The upstream BGP router should provide a full Internet routing table to BGP-Mux. BGP-Mux advertises the following Internet resources:

- **AS number:** AS 47065
- **IP prefix:** 168.62.16.0/21

The upstream router should advertise this prefix (and the sub-prefixes of up to 24-bit length) and AS number to all of its neighbors. In addition, neighboring ASes often use route filters and need to be notified to allow the BGP-Mux prefix to get through. Our AS import/export policies are recorded in the public routing registry. The rules in the sample configuration presented below can allow the routes to propagate.

Sample Provider-Side Configuration

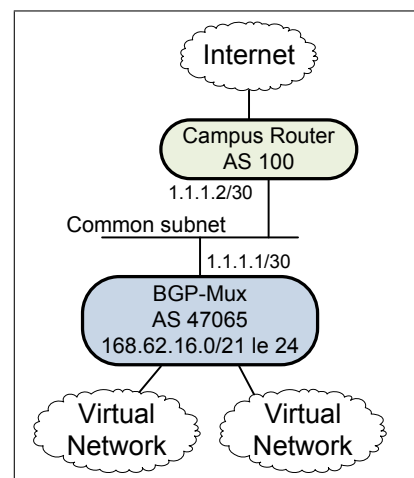


Figure 1: Example BGP-Mux setup.

```
router bgp 100
  neighbor 1.1.1.1 remote-as 47065
  neighbor 1.1.1.1 description BGP-Mux
  neighbor 1.1.1.1 route-map MUX in
  !
  ip prefix-list MUX seq 5 permit 168.62.16.0/21 le 24
  !
  route-map MUX permit 5
    match ip address prefix-list MUX
  !
  route-map MUX deny 10
```

More Information

Please contact the lead developer, Valas Valancius (valas@gatech.edu) or Professor Nick Feamster (feamster@cc.gatech.edu). The BGP Mux project wiki also contains more information, including access to software, presentations, and demonstrations. <http://groups.geni.net/geni/wiki/DTunnels>

Frequently Asked Questions

How does BGP-Mux ensure that virtual networks do not disrupt BGP routing?

We use route filtering and damping to protect the Internet from experiments behind BGP-Mux. We allow only routes that belong to BGP-Mux to propagate through the Mux. We also damp the announcements from clients using a default half-life of 15 minutes, a penalty threshold of 750, and a flap penalty of 1000.

How much bandwidth will BGP-Mux consume?

Most initial experiments perform only simple measurements. Nevertheless, we implement traffic shaping in the data plane to limit upstream bandwidth for both ingress and egress traffic to 10 Mbit/s. We are also open to any comments from upstream ISPs, and we will implement the suggested policing/shaping policies.

Does BGP-Mux need direct connectivity to my BGP router?

Direct Layer 2 connectivity (using VLANs or even a direct cable patch) is desirable. A connection between BGP-Mux and a BGP router over multiple hops is possible but inconvenient—your BGP upstream provider will need to maintain static routes at the intermediate routers.

Can operators use TCP-MD5 extensions to connect with BGP-Mux?

No. BGP-Mux is running on the Linux operating system with Quagga control plane which does not offer stable TCP-MD5 support. We will deploy TCP-MD5 as soon as it becomes more mature.

Can operators use BFD with BGP-Mux?

Not yet. We are testing several Bidirectional Forwarding Detection (BFD) implementations, and we will deploy one if it proves stable enough.