MPLS-based traffic shunt

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Agenda

- DDoS Protection
- Deployed mitigation methods
- MPLS-based traffic shunt
- Conclusion
- Securing the infrastructure ?
  - To be discussed at the nsp-sec BoF Tuesday evening !

Distributed Denial of Service Protection

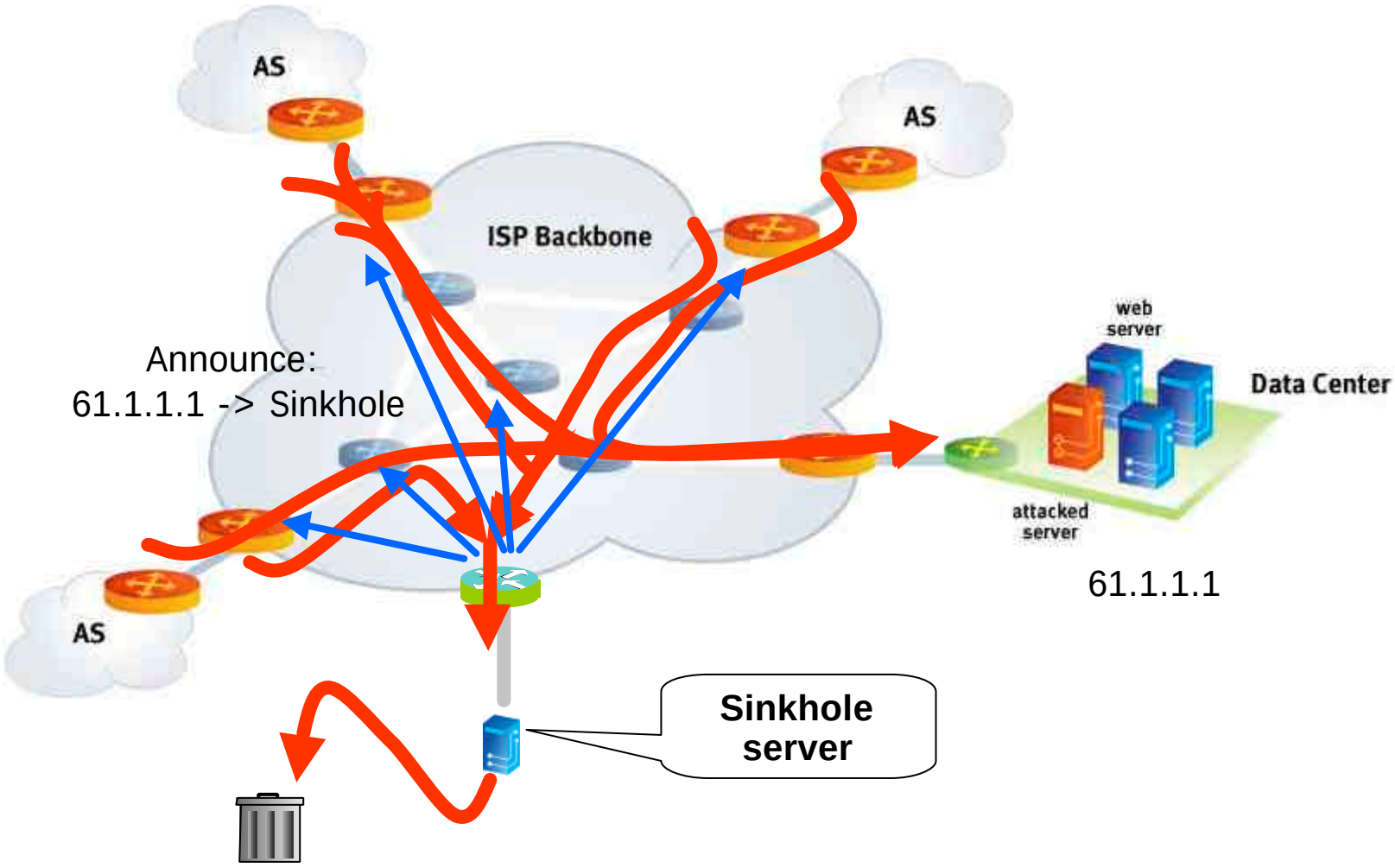
- Data-center vs infrastructure approach
- Why strict filtering isn't (always) the answer
  - usually means the attacker "won"
  - some traffic can't be filtered at the router level
    - layer 4+
    - traffic requiring *real* state information (not only "bit is set)
    - after "everything on top of IP" the trend is "everything on top of HTTP"… wanna filter 80/tcp ? ;-)
  - is your network's physical and logical structure enabling you to filter at the Edge and not in the Core ?
  - you are tired of arguing with your network architecture team ("we are here to transport packets" vs "the Internet firewall" ;-)

COLT

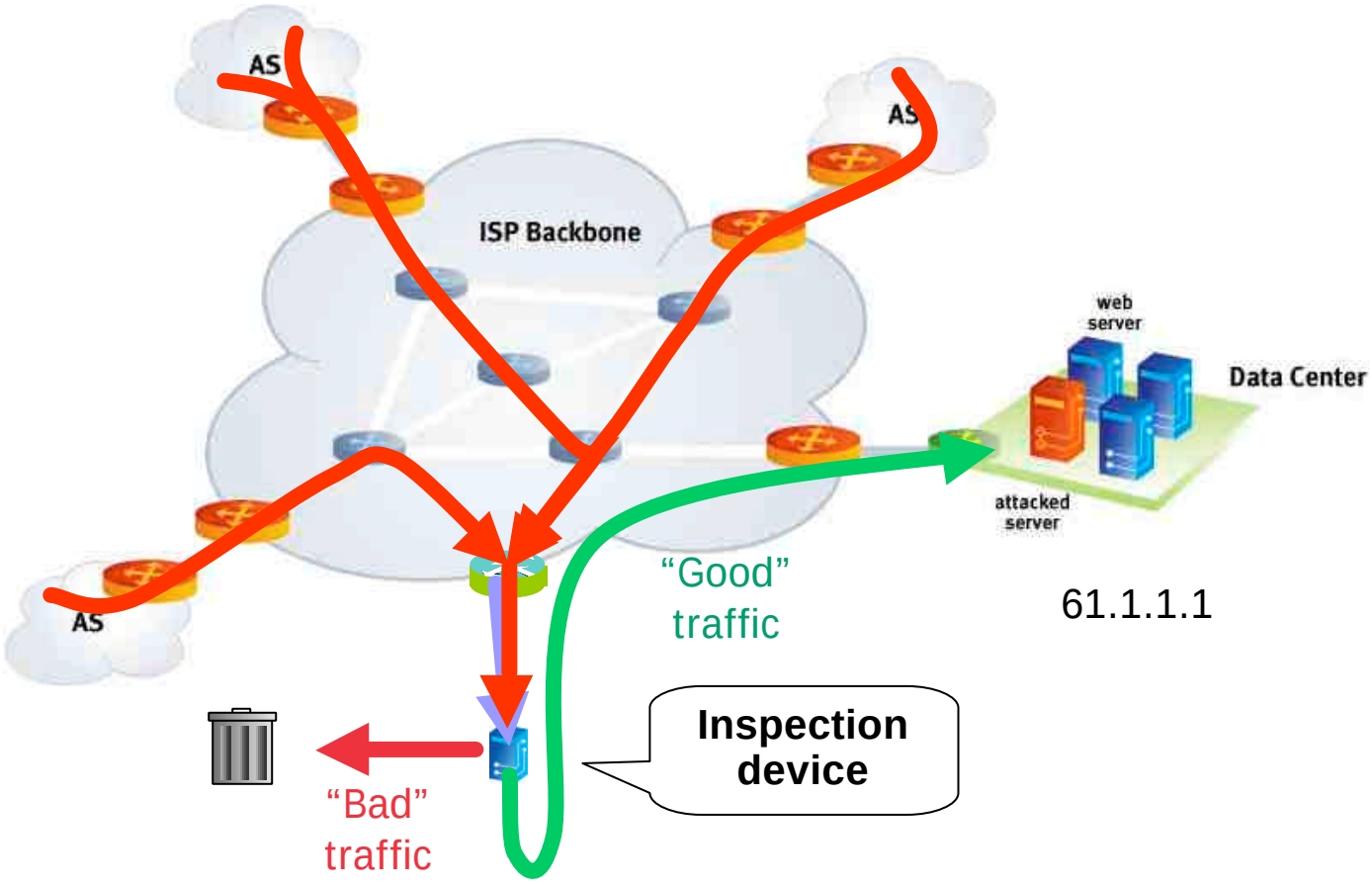
Deployed mitigation methods

- What do/should SPs support/do ?
  - (propagated) blackholing
  - (de-aggregate and) stop to announce - bad practice ?
    [dampening, BGP table size, filters, etc.]
  - sinkholes
  - rate-limiting
  - ACLs
    - iACLs (infrastructure)
    - tACLs (transit)
  - re-coloring

Sinkhole


AS
AS
ISP Backbone
Announce:
61.1.1.1 -> Sinkhole
web
server
Data Center
attacked
server
61.1.1.1
AS
Sinkhole
server

Traffic Shunt



Sinkhole vs Shunt

- Sinkhole
  - Uni-directional
    - Data in, no data out
  - IP based
  - Blackholing traffic, forensics
  - [CenterTrack, NANOG17]
- Shunt
  - Bi-directional
    - Data in, processed and data out
  - Tunnels: GRE, MPLS, L2TPv3, etc.
  - DDoS cleaning, reserve proxy, traffic analysis
  - [Bellwether, NANOG19]

IP-based Traffic Shunt

- Tunnels examples
  - From the peering/upstream routers to the inspection device
  - From the inspection device to the CPE/end-system
  - A mix/combination of both

- Limitations
  - Careful setup required to avoid loops
  - Returned traffic must not pass through a peering router
  - Cisco GSRs and Juniper require a dedicated interface card to act as a tunnel server (GRE/IPIP)
  - Processing overhead

MPLS-based Traffic Shunt

- Advantages
  - Doesn't require a special/dedicated interface card
  - No extra HW load or SW (IOS 12.0(17)ST+ and JunOS 5.4+)
  - If your network is MPLS-enabled, operations knowledge should be there: no need for the network to be MPLS-only! "Normal" routed IPv4 traffic can be carried in parallel
  - Minimal (initial) static configuration with dynamic LSPs (iBGP triggered)
  - Low (zero ?) overhead [did someone just say "why not use Policy Based Routing" ? ;-]
  - A MPLS-speaking inspection device isn't required (option)

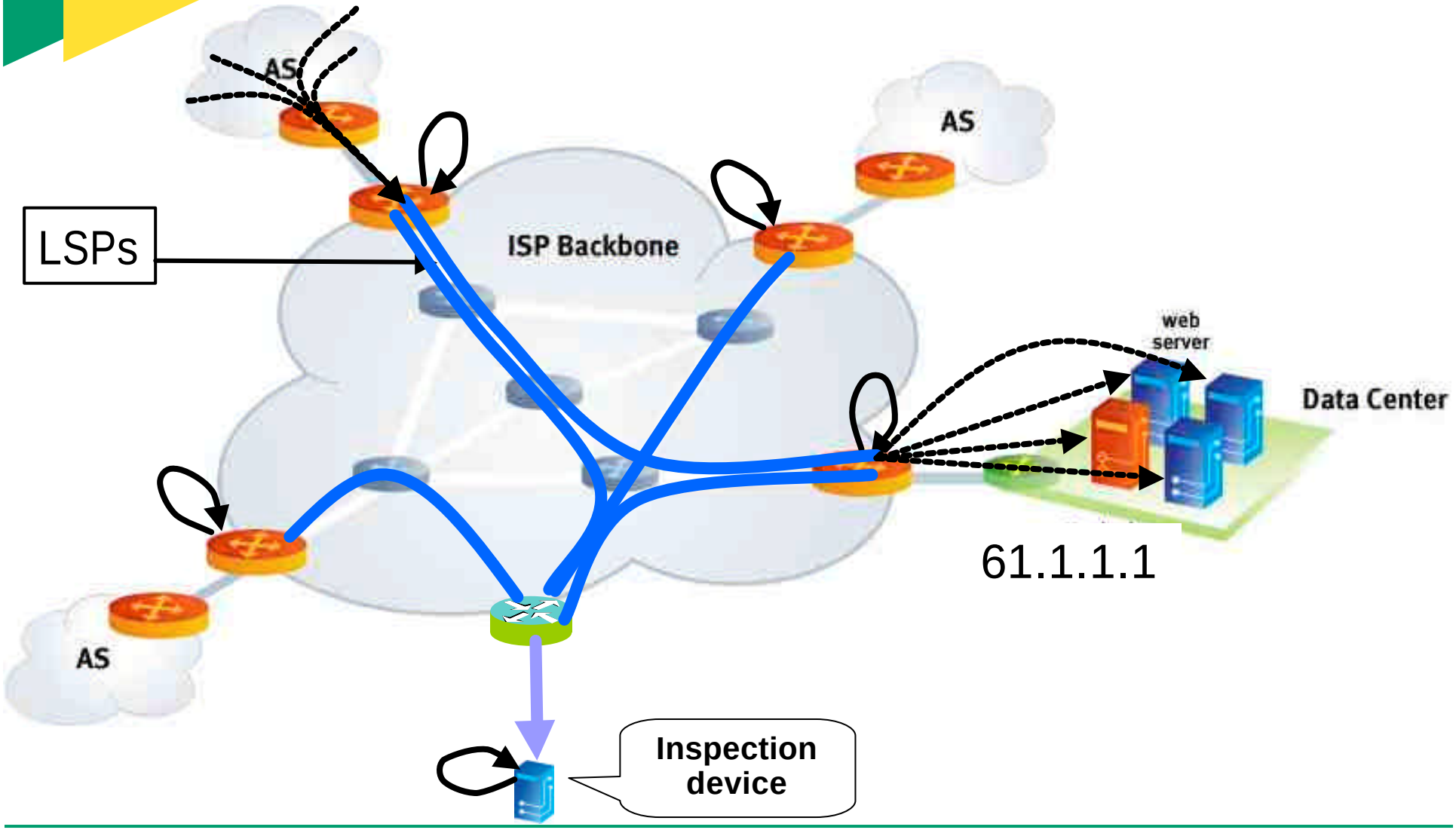
MPLS-based Traffic Shunt

- Advantages (cont.)
  - Enables you to overcome the “this device is in-line only” and “you need one inspection device per peering/upstream)” limitations: profile traffic and (potential) victims, select key POPs/IXes and deploy there
  - Not on the critical path and quite scalable
  - LDP only carries the loopback address of the inspection device
- Caveats
  - You may carry the traffic through the backbone (depending on how distributed your deployment is)
  - Latency: a few more ms (extra hops/distance)
  - Peering Router that also acts as an Access Router (unless you (can) use more specific routes)

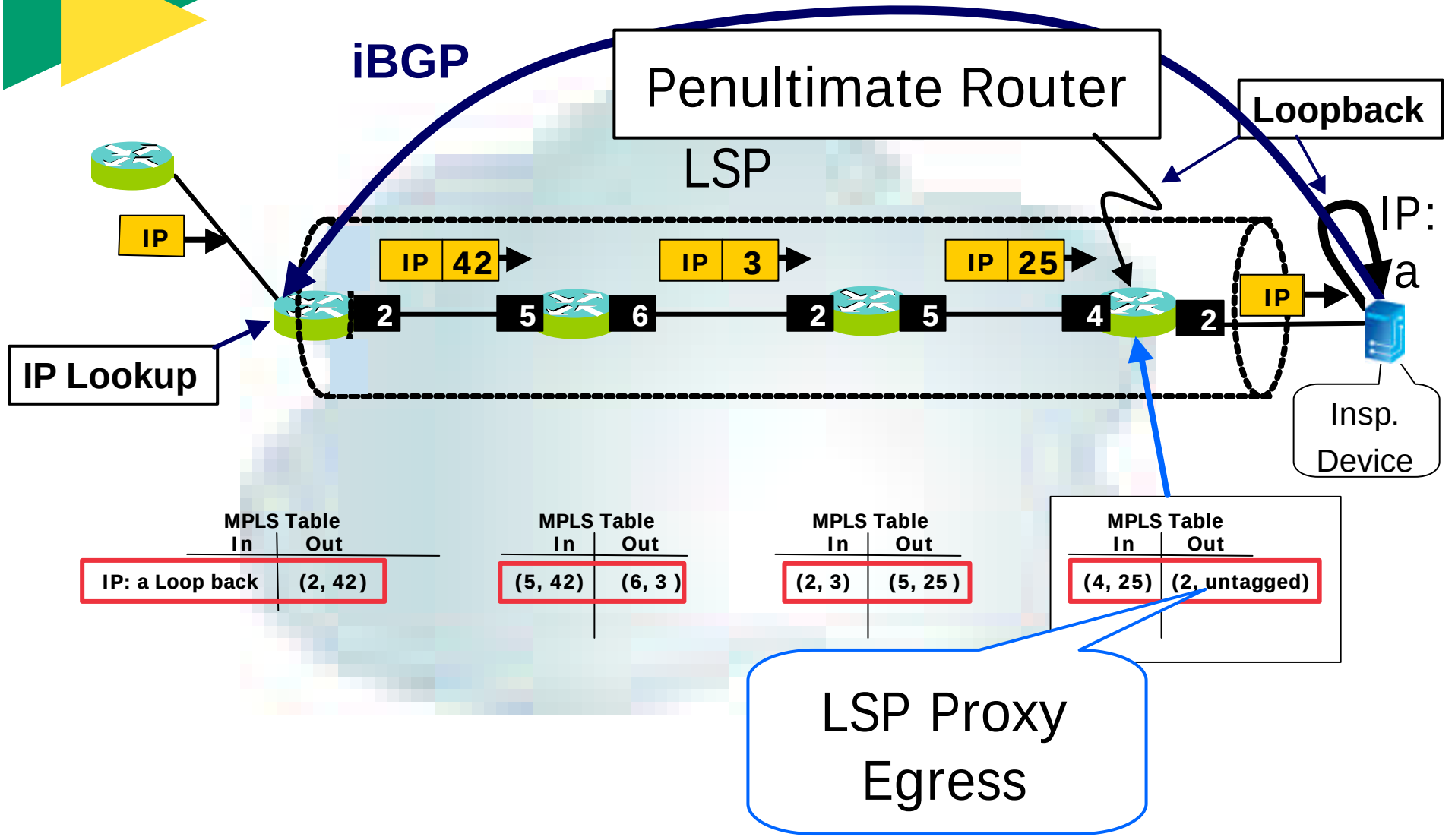
MPLS-based Traffic Shunt

- Two methods
  - Pure MPLS using Proxy Egress LSP (*)
    - Penultimate hop popping
    - RFC 3031
  - MPLS VPNs using VRFs
    - see: http://www.nanog.org/mtg-0306/afek.html [NANOG28]

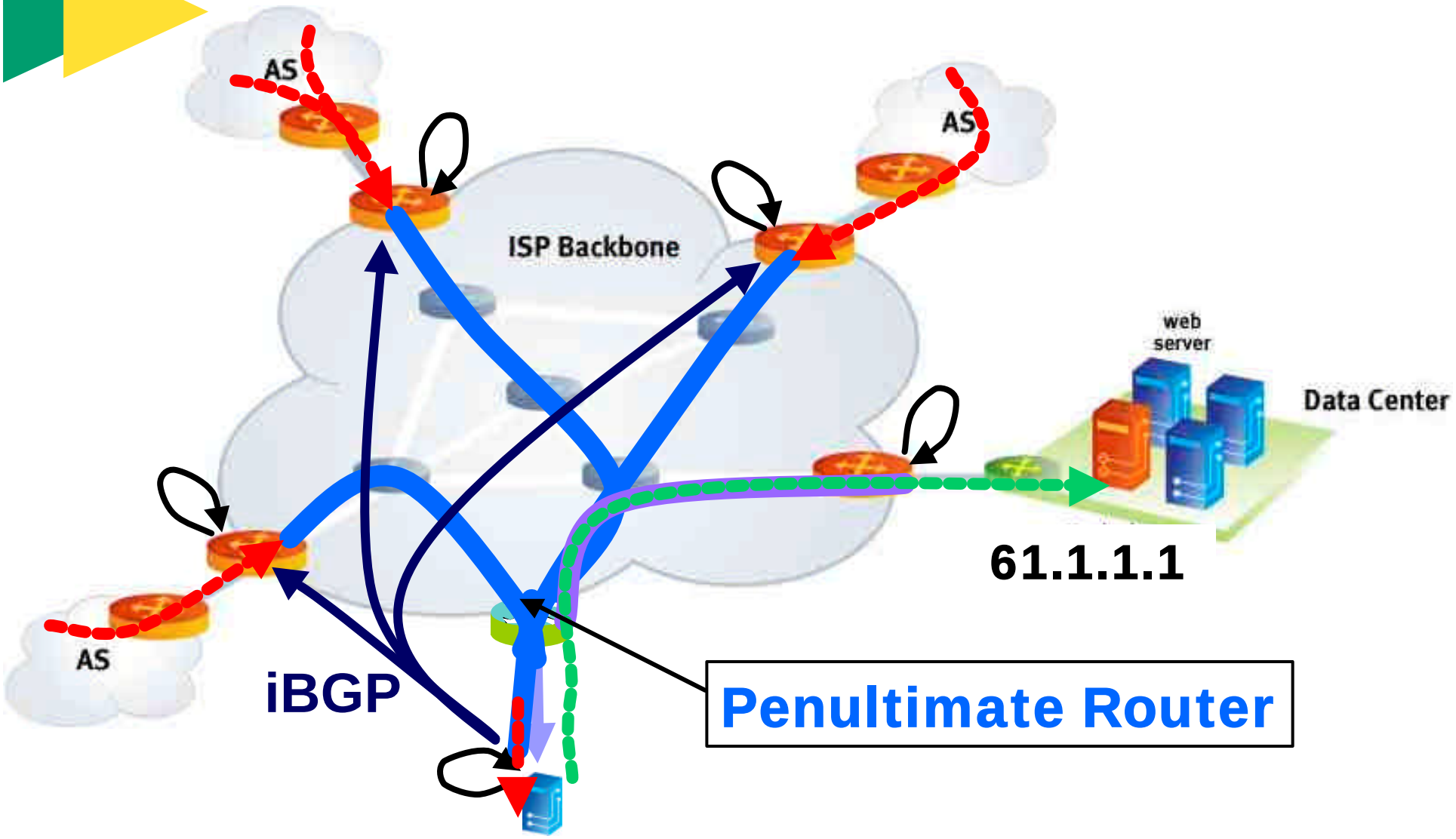
MPLS LSPs based on loopbacks



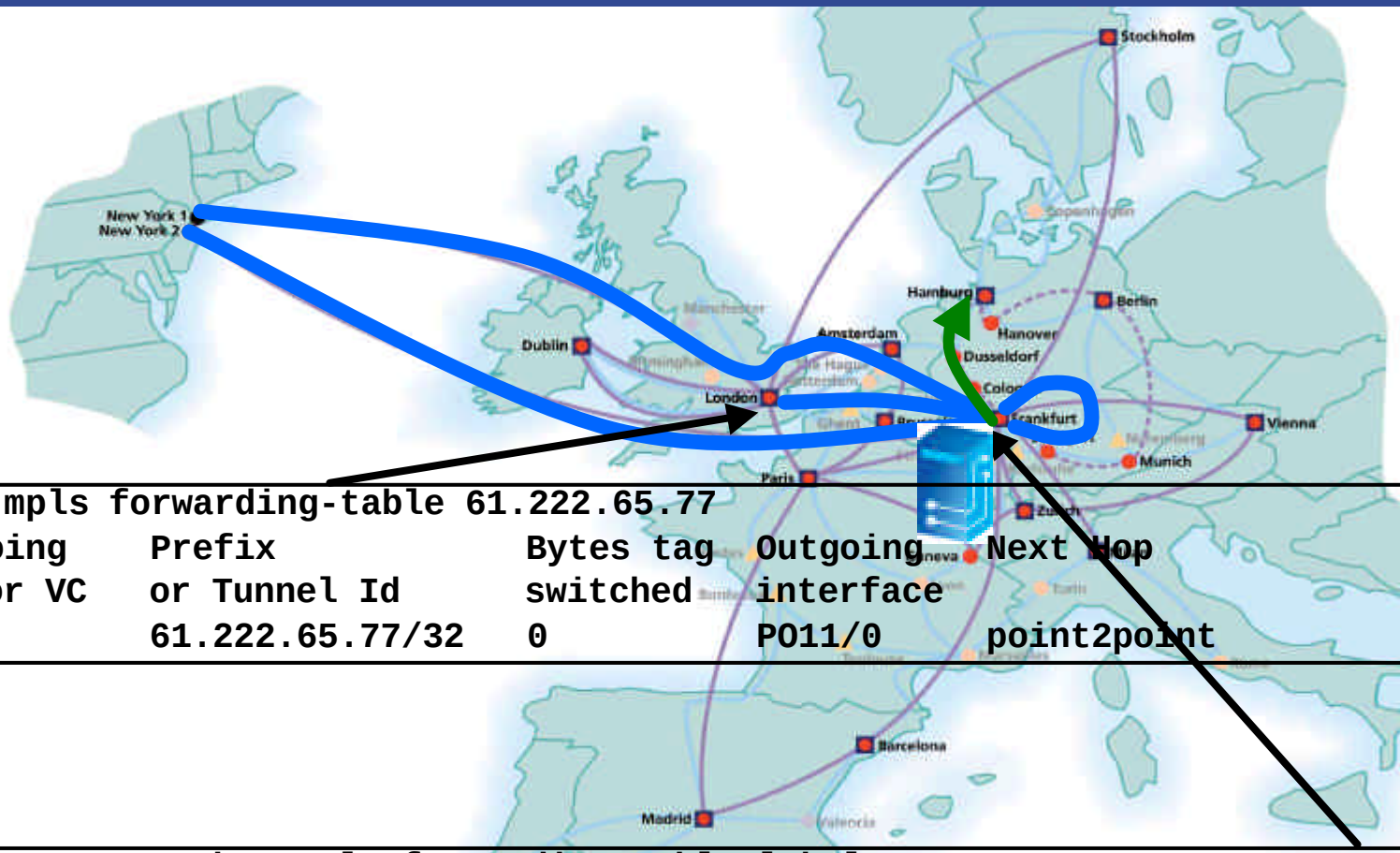
MPLS LSP Proxy Egress



MPLS LSP Proxy Egress



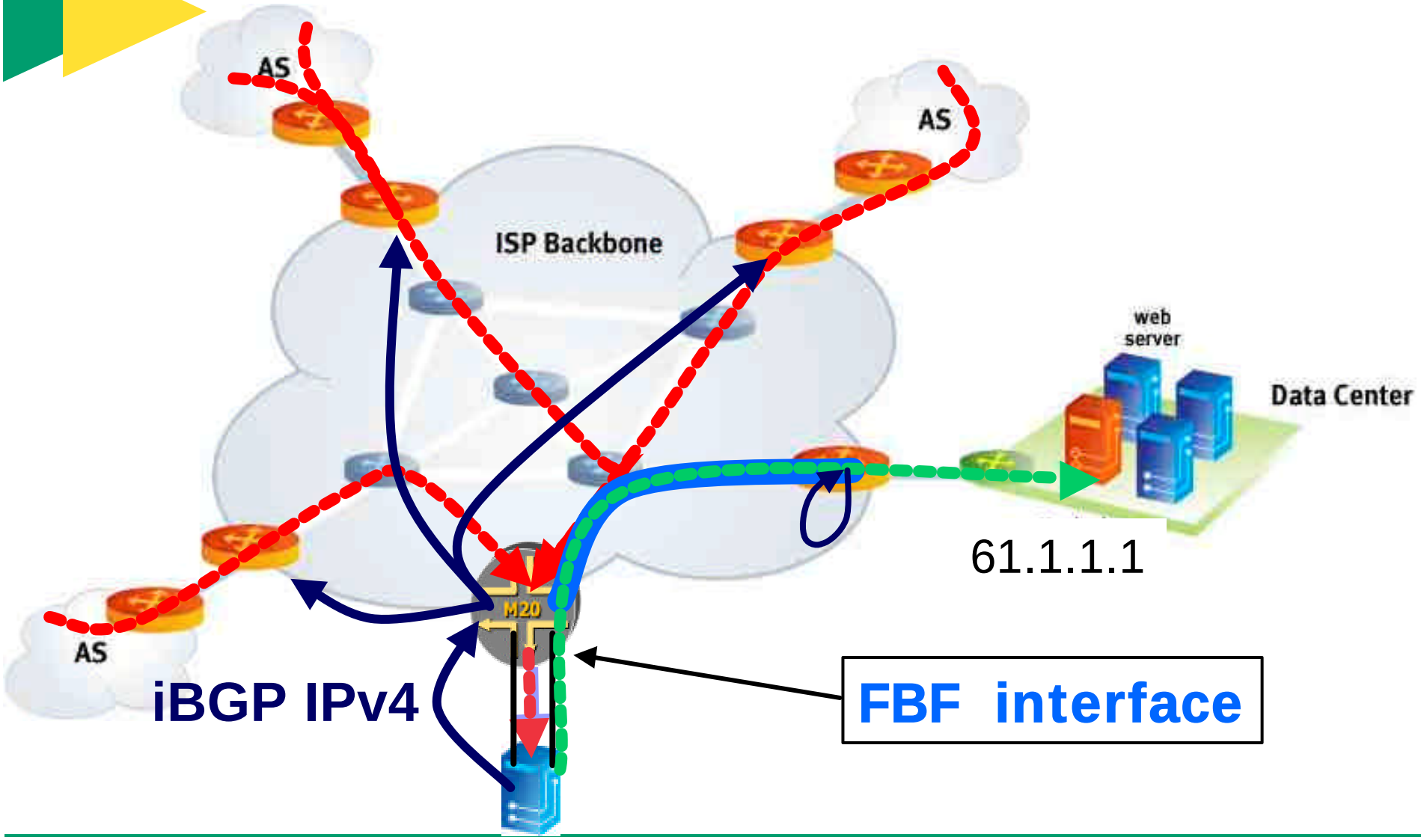
Deployment example




```
LONDON#show mpls forwarding-table 61.222.65.77
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
503    560         61.222.65.77/32  0          PO11/0      point2point
```

```
FRANKFURT#show mpls forwarding-table labels 16
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Untagged    61.222.65.77/32  24831266   Gi6/0       61.44.88.111
```

The Juniper way (courtesy of Riverhead)



Conclusion

- Actually deployed, not only in the lab
- Proved easy to deploy, maintain and use
- Improved DDoS detection, mitigation and analysis/post-mortem in conjunction with Netflow-based detection solution and customer profiling (filtering templates)
- Any question ?
- Technical Notes & configurations examples: boaz@riverhead.com

Thank you