Multi-domain connectivity services

Datacenter IaaS workshop 2014

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- Introduction: BoD and MDVPN
- Deployment status
- Use cases
- BoD and MDVPN in detail
- Benefits for datacenters and cloud services

- MDVPN slides are partially contributed by Xavier Jeannin / RENATER, the task leader for GN3+ SA3 T3

Introduction: BoD and MDVPN

- GN3+ project actively develops services which provides easier inter-domain connectivity services for NRENs
  - GN3+ SA3 T1: Bandwidth-on-Demand (BoD)
  - GN3+ SA3 T3: MDVPN
- **BoD**
  - **VLAN based L2VPN** point-to-point service
  - **Dynamic** service provisioning across different networks
  - Technology agnostic
- **MDVPN**
  - **VLAN or port based L2VPN** and **routed L3VPN** services
  - Multi-point-to-multi-point virtual LAN services available in the future
  - **Manual** service provisioning, but **in the end-user networks only**
  - Transparent transport over carrier networks (ie. GÉANT and NORDUnet)
  - Base on MPLS, non-MPLS networks can be connected via VPN-proxy

BoD deployment status

- **9 European and 2 US NRENs** are connected to the BoD infrastructure

- Some NRENs like SURFnet, ESnet and Internet2 have long history providing BoD services within their own networks

- NSIv2 protocol standardization have made possible inter-domain services as well
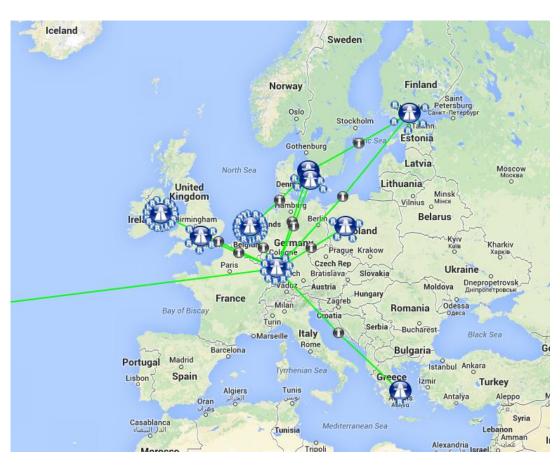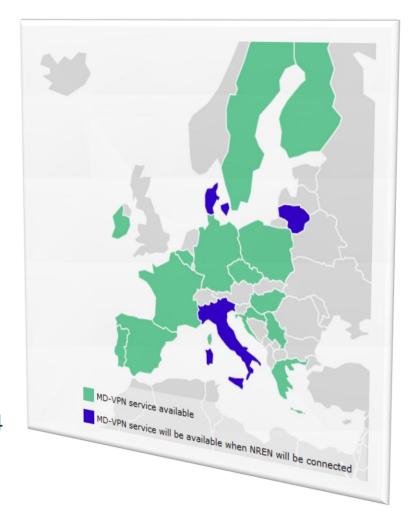

Image: a screenshot from the GÉANT BoD provisioning portal

MDVPN deployment status

- Setting-up pilot phase
  - Setting-up GÉANT pilot, during 2014
  - Feature-proofed on production infrastructure
    - **16 NRENs connected**
    - **3 NRENs committed to connect**
- Pilot generalization phase
  - Service reliability long-term assessment
  - Operation implementation
  - Roll-out the 22/07/2014
  - Service validation period 01/08/2014 – 31/10/2014
- MD-VPN service in the GÉANT portfolio Q4 Year 1

MD-VPN service available

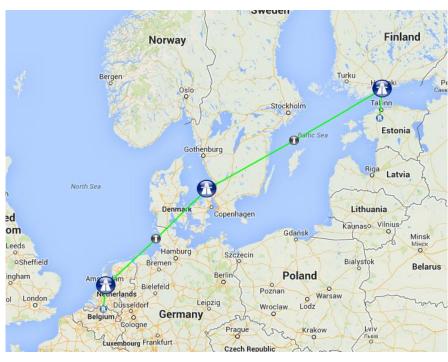MD-VPN service will be available when NREN will be connected

BoD use case: CSC-SURFsara, cross-site VMs

- An ELIXIR related project won an Enlighten Your Research Global award for piloting cross-site VM operation
- Participants from Finland, the Netherlands and the UK
- Use BoD for cloud services to share biomedical data (such as human genomes)
  - Private and secure
- CSC-SURFsara path uses Funet, NORDUnet and SURFnet BoD networks
  - 3 control plane implementations:
    AutoBAHN (Funet)
    OpenNSA (NORDUnet)
    Ciena (SURFnet)
  - 2 data plane implementations:
    MPLS L2VPN (Funet & NORDUnet)
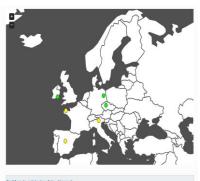   NG-Ethernet/PBB-TE (SURFnet)

MDVPN use case: XIFI

A first scientist project XiFi

XIFI is a project of the European Public-Private-Partnership on Future Internet (FI-PPP) programme
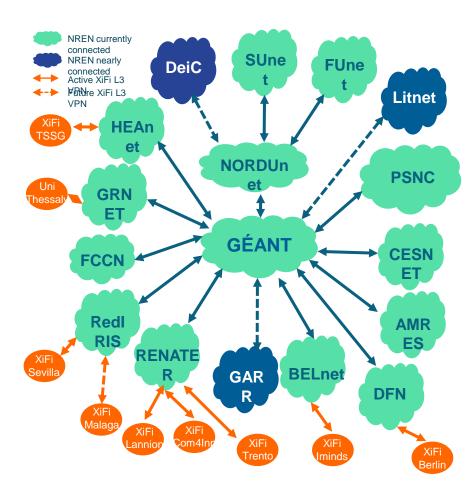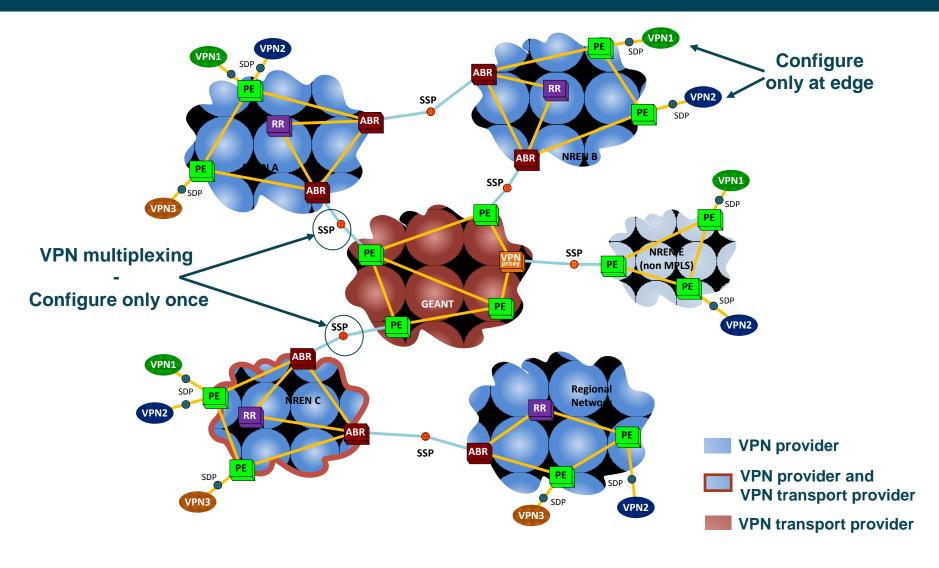

http://infographic.lab.fi-ware.org/status
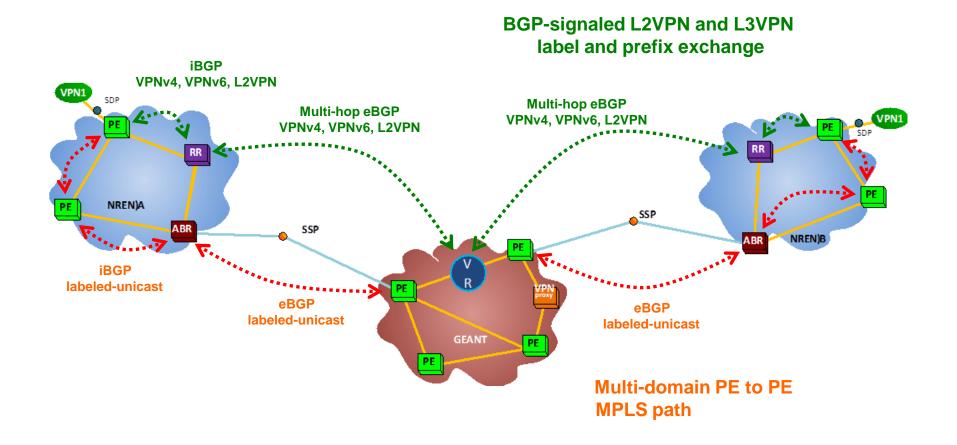
What is MDVPN?
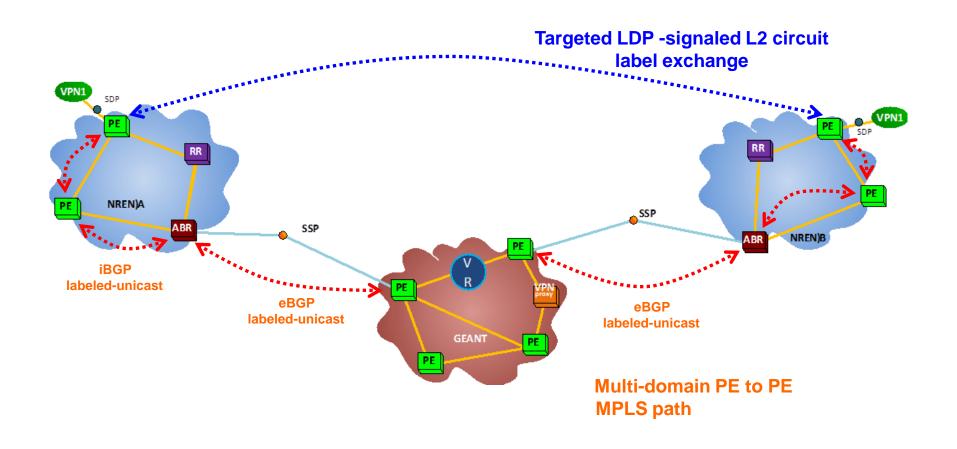
MDVPN: BGP-signaled L2VPN, L3VPN

BGP-signaled L2VPN and L3VPN label and prefix exchange

iBGP
VPNv4, VPNv6, L2VPN

Multi-hop eBGP
VPNv4, VPNv6, L2VPN

Multi-hop eBGP
VPNv4, VPNv6, L2VPN

iBGP
labeled-unicast

eBGP
labeled-unicast

eBGP
labeled-unicast

Multi-domain PE to PE MPLS path
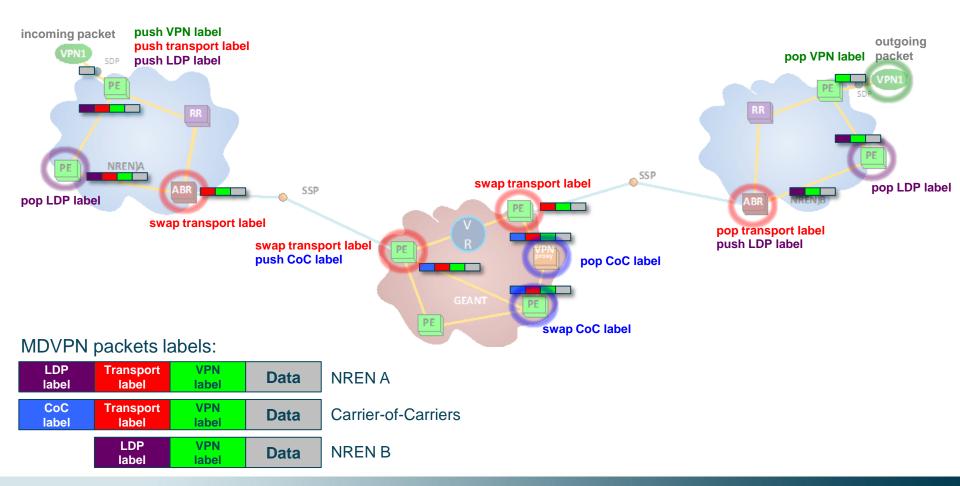
MDVPN: tLDP-signaled L2 circuit

Targeted LDP -signaled L2 circuit label exchange

Multi-domain PE to PE MPLS path
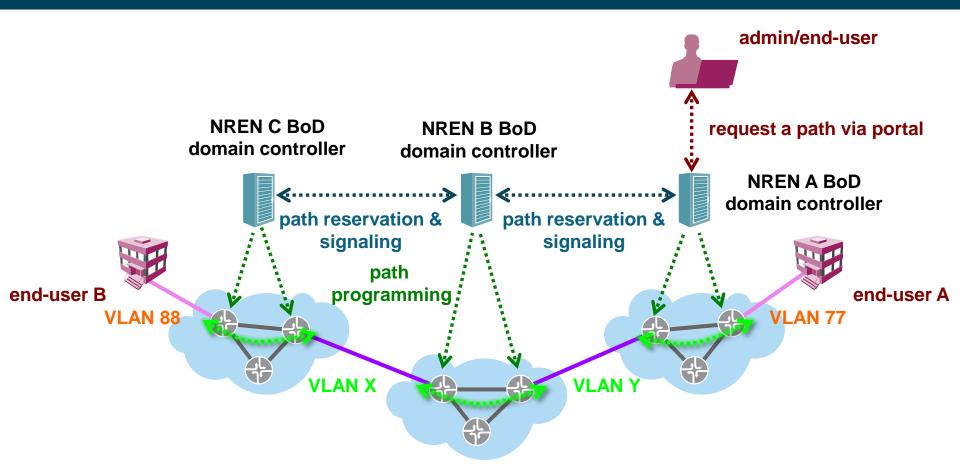
MDVPN data plane label operations

MDVPN packets labels:

LDP label	Transport label	VPN label	Data	NREN A

CoC label	Transport label	VPN label	Data	Carrier-of-Carriers

	LDP label	VPN label	Data	NREN B

BoD path reservation and programming

admin/end-user

request a path via portal

NREN C BoD domain controller

NREN B BoD domain controller

NREN A BoD domain controller

path reservation & signaling

path reservation & signaling

path programming

end-user B

VLAN 88

VLAN X

VLAN Y

end-user A

VLAN 77

Funet-NORDUnet-SURFnet BoD path reservation via AutoBAHN GUI

Request dynamic circuit   Track circuits   BoD Deployments Map

Request Reservation

Mandatory Parameters | Optional Parameters

Start Domain
funet.fi

Start Port
Other ▾   csc2-csc-mankeli

Auto VLAN   OFF

VLAN
1793

End Domain
SURFnet7 production

End Port
Other ▾   Asd001A_F48S01 Te-1-0-04 iperf1 (eth3)

Auto VLAN   OFF

VLAN
1793

Country
FINLAND

Timezone
Europe/Helsinki (Eastern European Summer Time) GMT+03:00

Start Time
2014-09-10T13:30

Start Now
☐

End Time
2014-09-10T13:50

Infinite
☐

Capacity ⓘ
10

Description ⓘ
test

SUBMIT
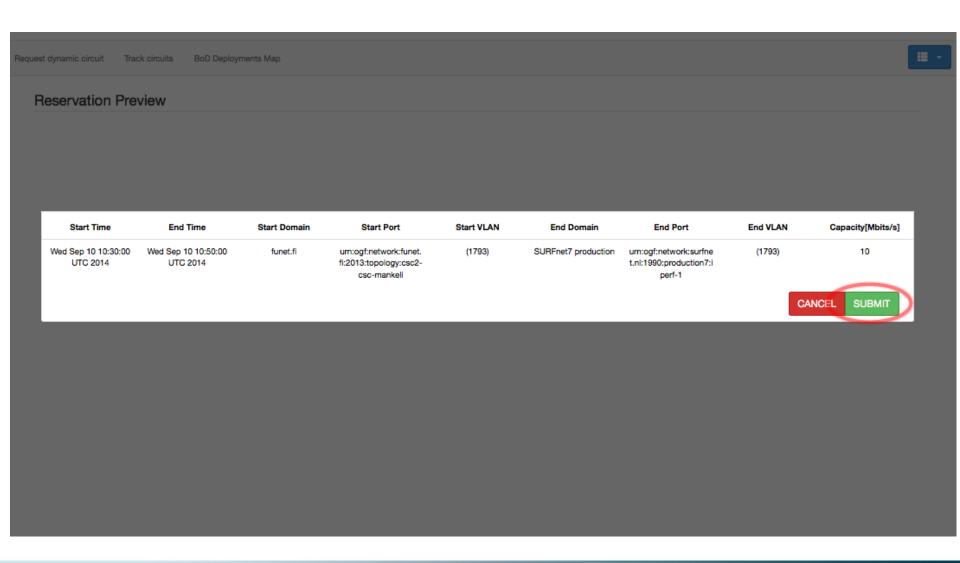
SURFnet requires port authentication, also exclude GÉANT from path computing

GÉANT

Request dynamic circuit   Track circuits   BoD Deployments Map

Request Reservation

Mandatory Parameters | Optional Parameters

Delay [ms]

0

MTU [bytes]

0

AUTO
☑

Start Port Authentication token

End Port Authentication token

xxx

Explicit Domain Routing

Select Included Domains

Explicit Domain Routing

geant.net

Explicit Port Routing

Select Included Ports

Explicit Port Routing

Select Excluded Ports

SUBMIT

Confirm the reservation

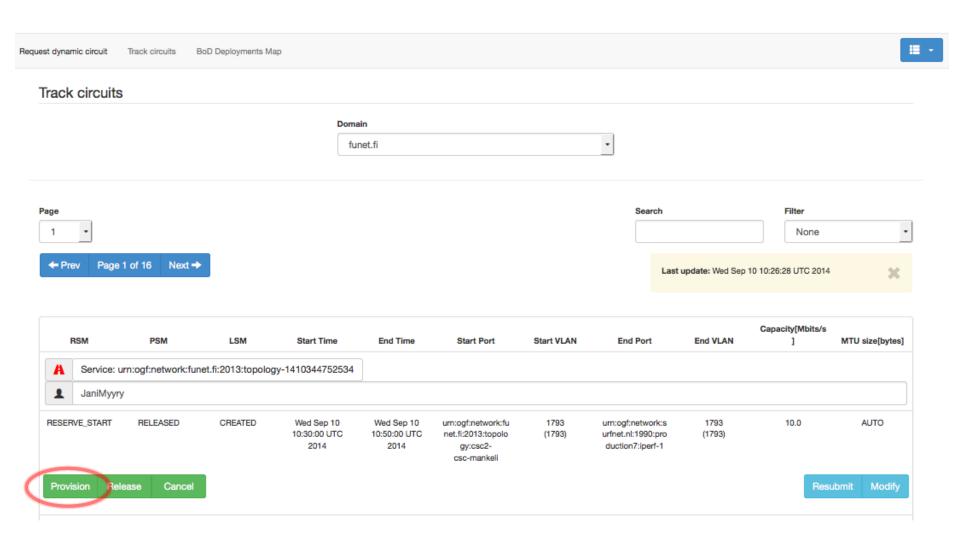# The reservation was submitted

Request dynamic circuit   Track circuits   BoD Deployments Map

Reservation submitted successfully

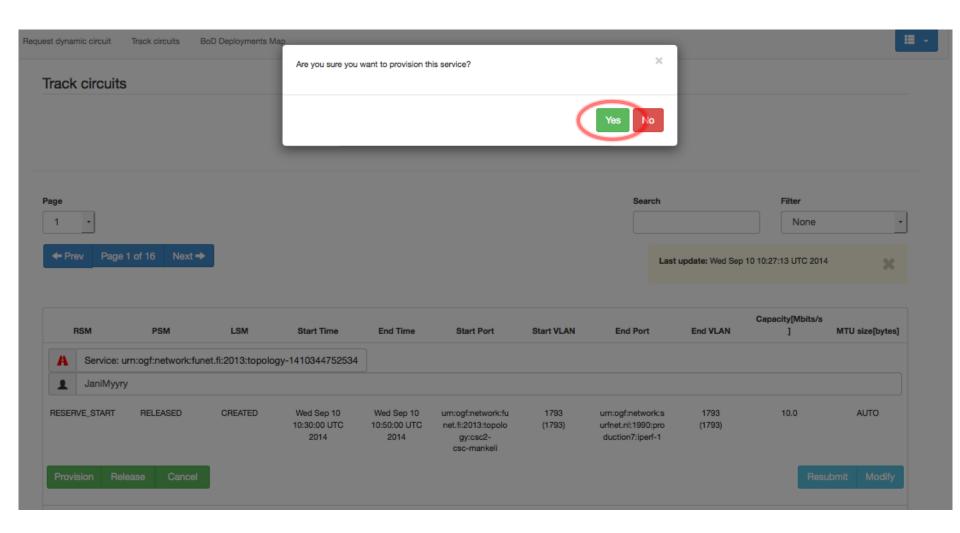To view the reservation information - Click here
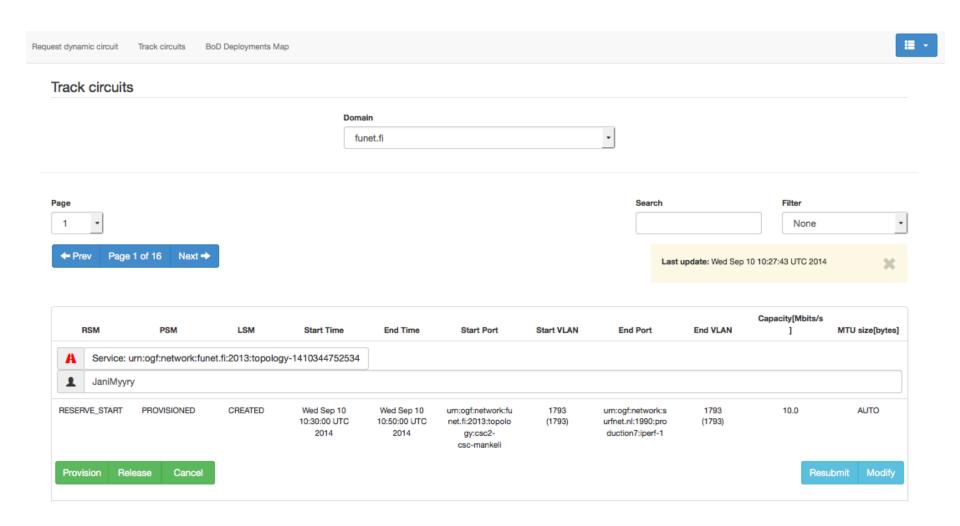
Provision the path

Confirm provisioning

The path is now ready for use

Check it by pinging the remote end

```
From 10.250.93.39 icmp_seq=52 Destination Host Unreachable
From 10.250.93.39 icmp_seq=53 Destination Host Unreachable
From 10.250.93.39 icmp_seq=54 Destination Host Unreachable
From 10.250.93.39 icmp_seq=55 Destination Host Unreachable
From 10.250.93.39 icmp_seq=56 Destination Host Unreachable
From 10.250.93.39 icmp_seq=57 Destination Host Unreachable
From 10.250.93.39 icmp_seq=58 Destination Host Unreachable
From 10.250.93.39 icmp_seq=59 Destination Host Unreachable
From 10.250.93.39 icmp_seq=60 Destination Host Unreachable
From 10.250.93.39 icmp_seq=61 Destination Host Unreachable
From 10.250.93.39 icmp_seq=62 Destination Host Unreachable
From 10.250.93.39 icmp_seq=63 Destination Host Unreachable
From 10.250.93.39 icmp_seq=64 Destination Host Unreachable
From 10.250.93.39 icmp_seq=65 Destination Host Unreachable
From 10.250.93.39 icmp_seq=66 Destination Host Unreachable
64 bytes from 10.250.93.39: icmp_seq=67 ttl=64 time=2069 ms
64 bytes from 10.250.93.39: icmp_seq=68 ttl=64 time=1061 ms
64 bytes from 10.250.93.39: icmp_seq=69 ttl=64 time=53.3 ms
64 bytes from 10.250.93.39: icmp_seq=70 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=71 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=72 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=73 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=74 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=75 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=76 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=77 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=78 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=79 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=80 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=81 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=82 ttl=64 time=35.6 ms
```

```
64 bytes from 10.250.93.39: icmp_seq=1162 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1163 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1164 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1165 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1166 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1167 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1168 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1169 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1170 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1171 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1172 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1173 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1174 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1175 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1176 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1177 ttl=64 time=35.6 ms
64 bytes from 10.250.93.39: icmp_seq=1178 ttl=64 time=35.6 ms
From 10.250.93.39 icmp_seq=1230 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1231 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1232 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1233 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1234 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1235 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1236 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1237 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1238 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1239 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1240 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1241 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1242 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1243 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1244 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1245 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1246 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1247 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1248 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1249 Destination Host Unreachable
From 10.250.93.39 icmp_seq=1250 Destination Host Unreachable
```

BoD and MDVPN benefits (for datacenters and cloud services)

- Enable international collaboration, especially for data-intensive sciences
  - Distributed resources, shared service pools, …
  - Example: LHCONE L3VPN multi-domain service
- Quick provisioning and cost-efficiency, uses existing intra and resources
  - Minimal coordination across the network domains
- Layer 2 services available to inter-connect different sites/DCs/cloud service providers
  - Connections are private and secured from the general Internet
  - Ability to bypass firewalls or other performance bottlenecks, connect directly to the end-users
- Proven technology, MPLS have been used over a decade in production networks.

GÉANT

Connect | Communicate | Collaborate

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