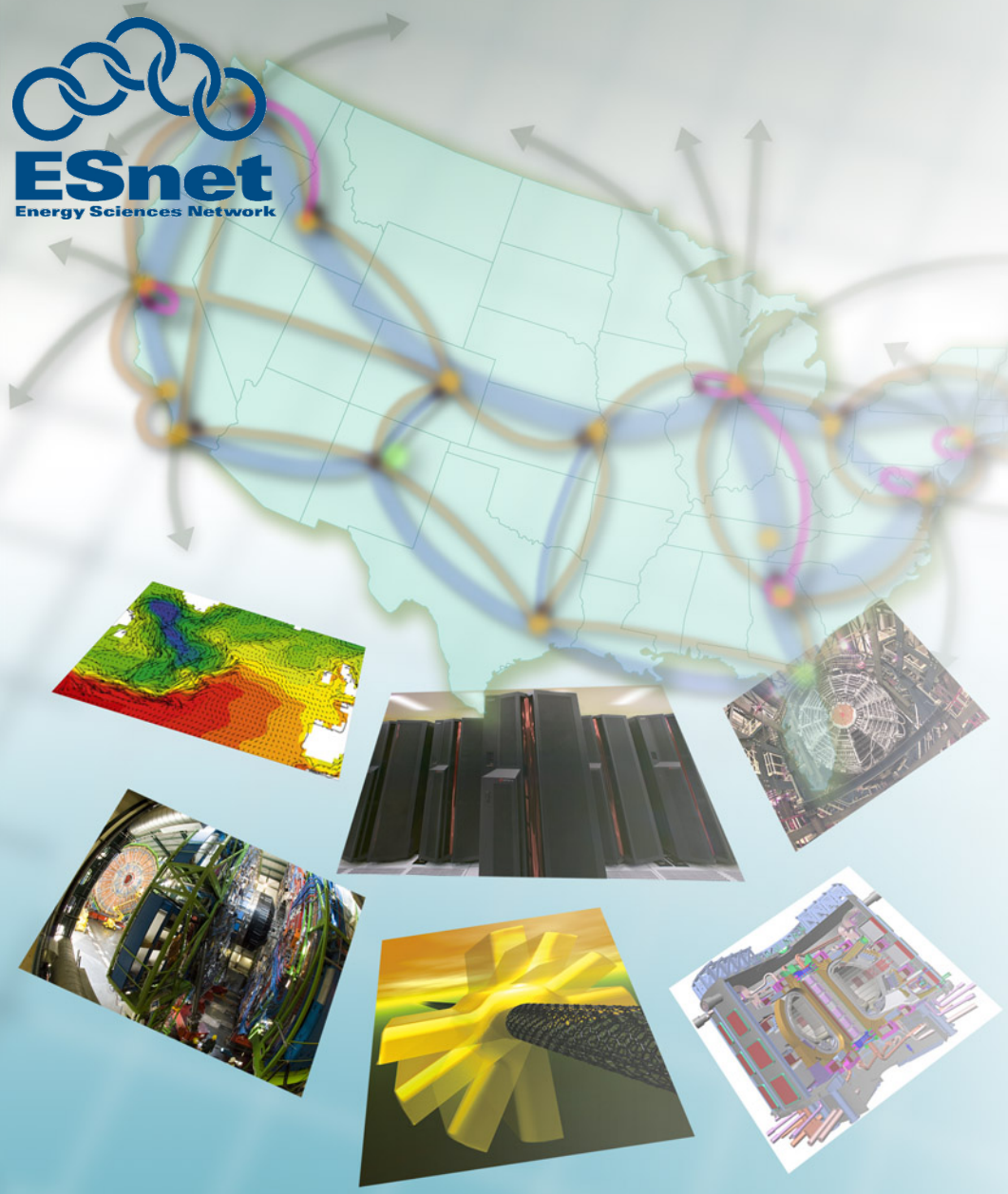
ESnet
Energy Sciences Network



SDN and OSCARS how-to

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Networking for the Future of Science

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Why use SDN?

- Provides tools to do traffic engineering on big science flows (vs. small enterprise).
- For these big flows:
  - Traffic isolation allows impolite protocols
  - Guaranteed WAN bandwidth
  - More efficient long-latency flows
  - Use appropriate layer (L2 : cheaper)
- SDN can help your site network (and ESnet!) be more efficient and cost-effective.

Preparing for SDN

Discover

- Which are the big apps? Who are the people?
- Establish rapport, dialogue & procedures.

Measure

- Deploy PerfSONAR
- Measure performance, identify weaknesses

Remedy

- Fix low-hanging fruit in the site network / hosts (e.g.: host TCP tuning)

Using SDN

Experiment

- Evaluate SDN L3 service

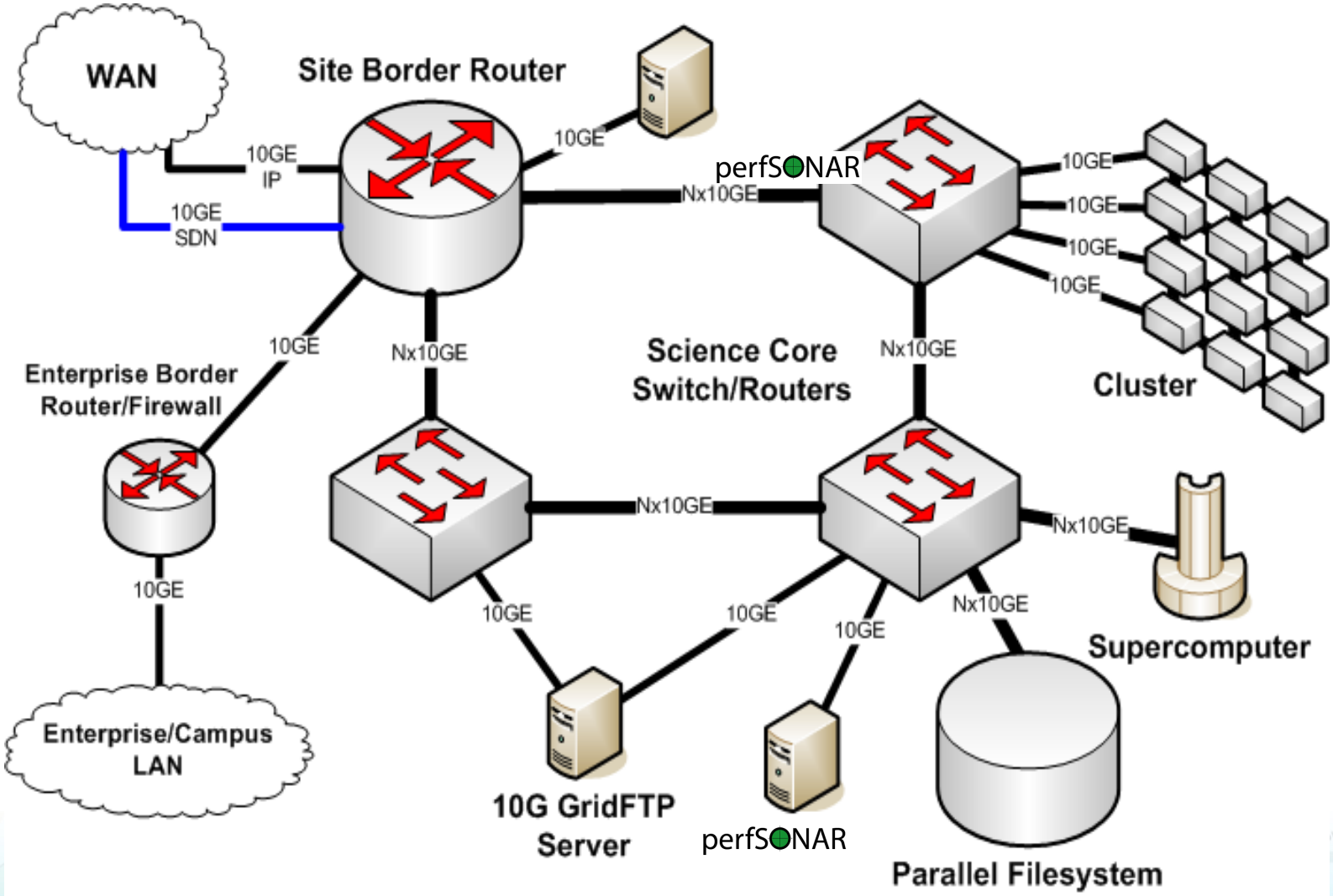
Deploy

- Reconfigure site to support chosen SDN configuration

Integrate

- Mesh SDN VC scheduling into workflow

Separate Enterprise and Science Networks



Baseline SDN setup

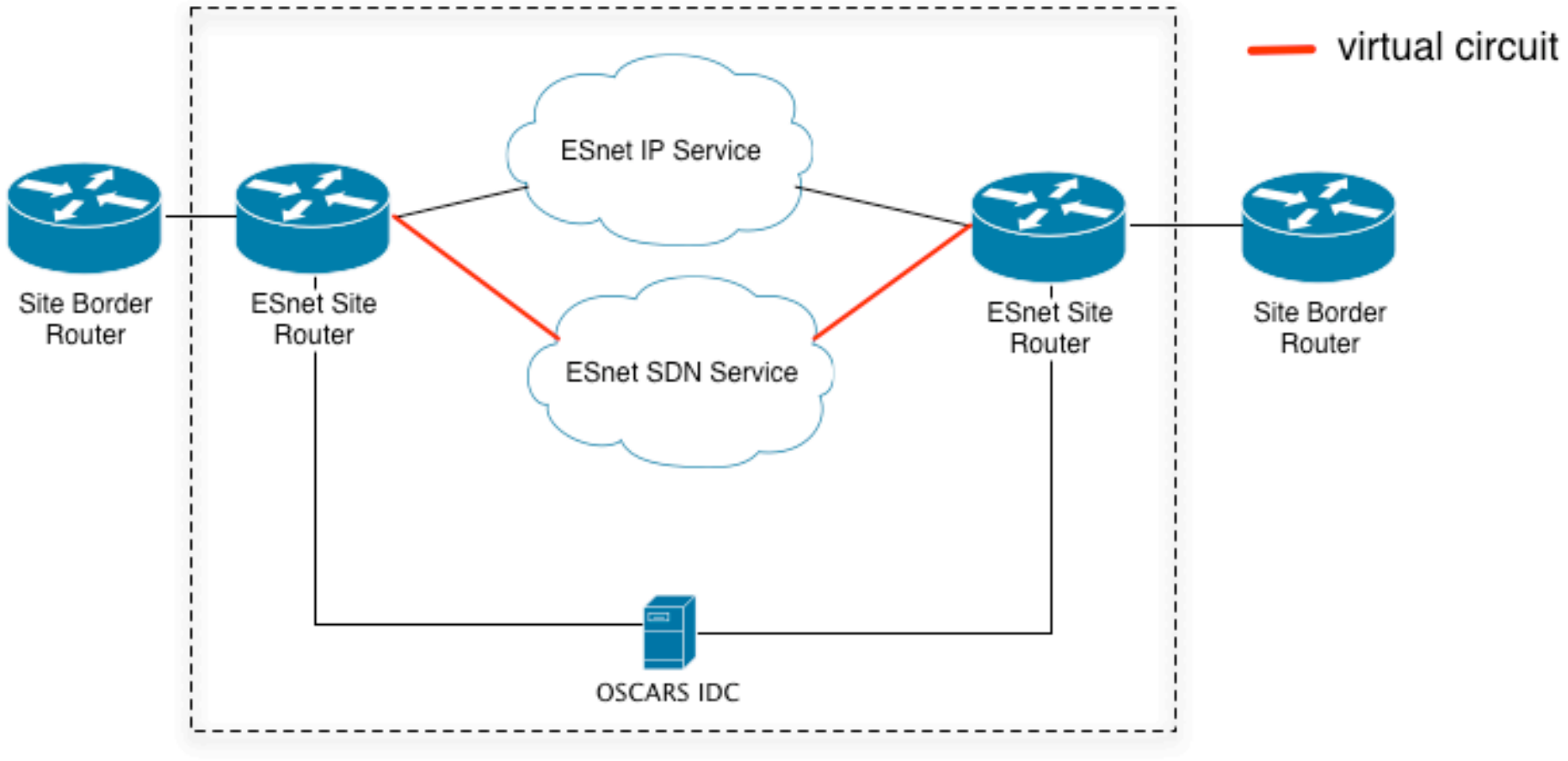
- Use case: A data source / sink at an ESnet site.
  - The site network is configured once (at most) , statically.
  - Other endpoints can now be connected to it over SDN.
  - Minimal site setup needed
- Allows site to separately manage & engineer big flows.

Minimal L3 VC service

- Site decides schedule, bw, and a flowspec:
  - Source / destination subnets
  - DSCP bits
- **Zero** config needed in either site / app.

- VC is by default unidirectional
- Hops onto / off ESnet will take regular IP route

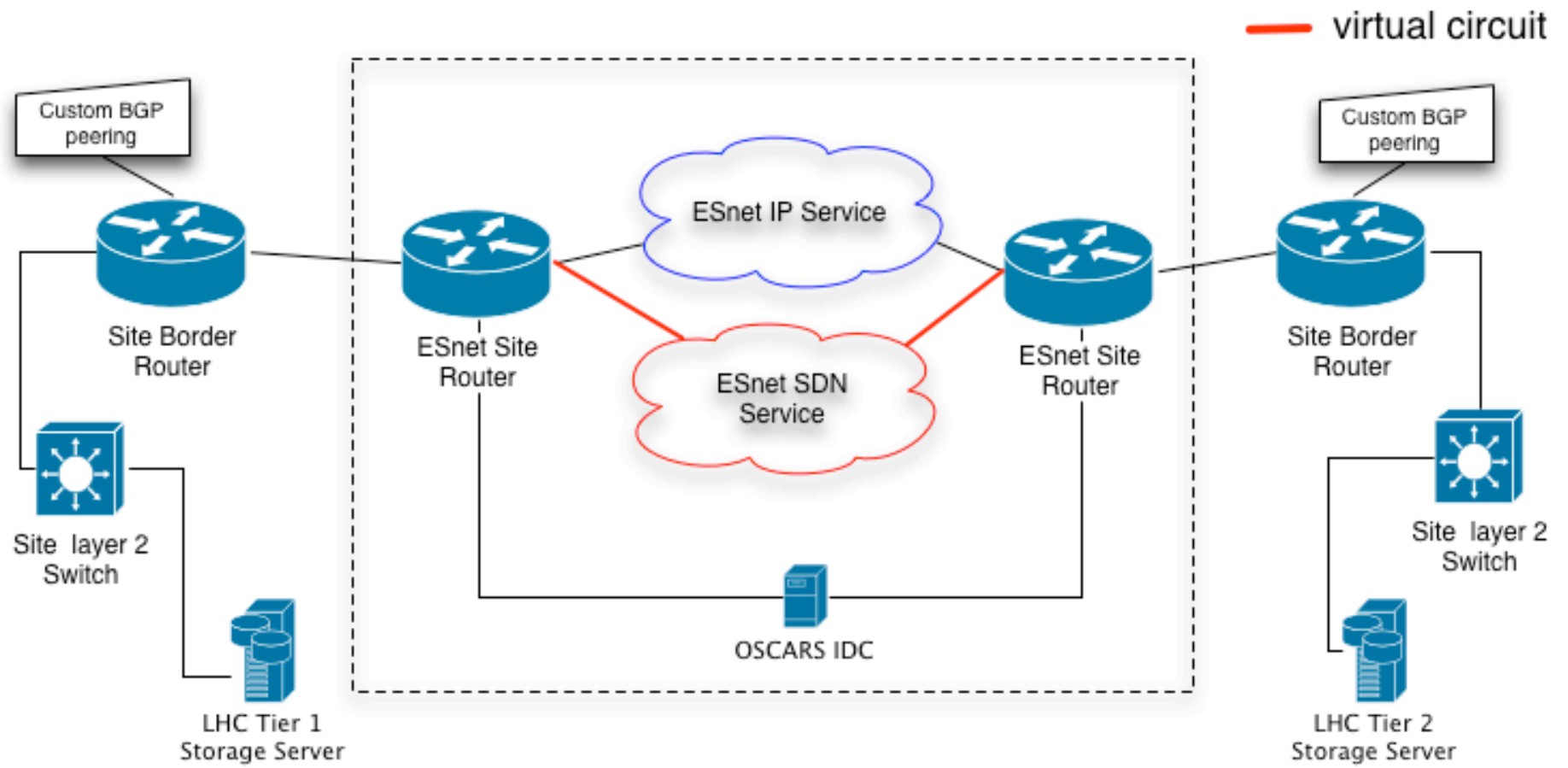
L3 VC service



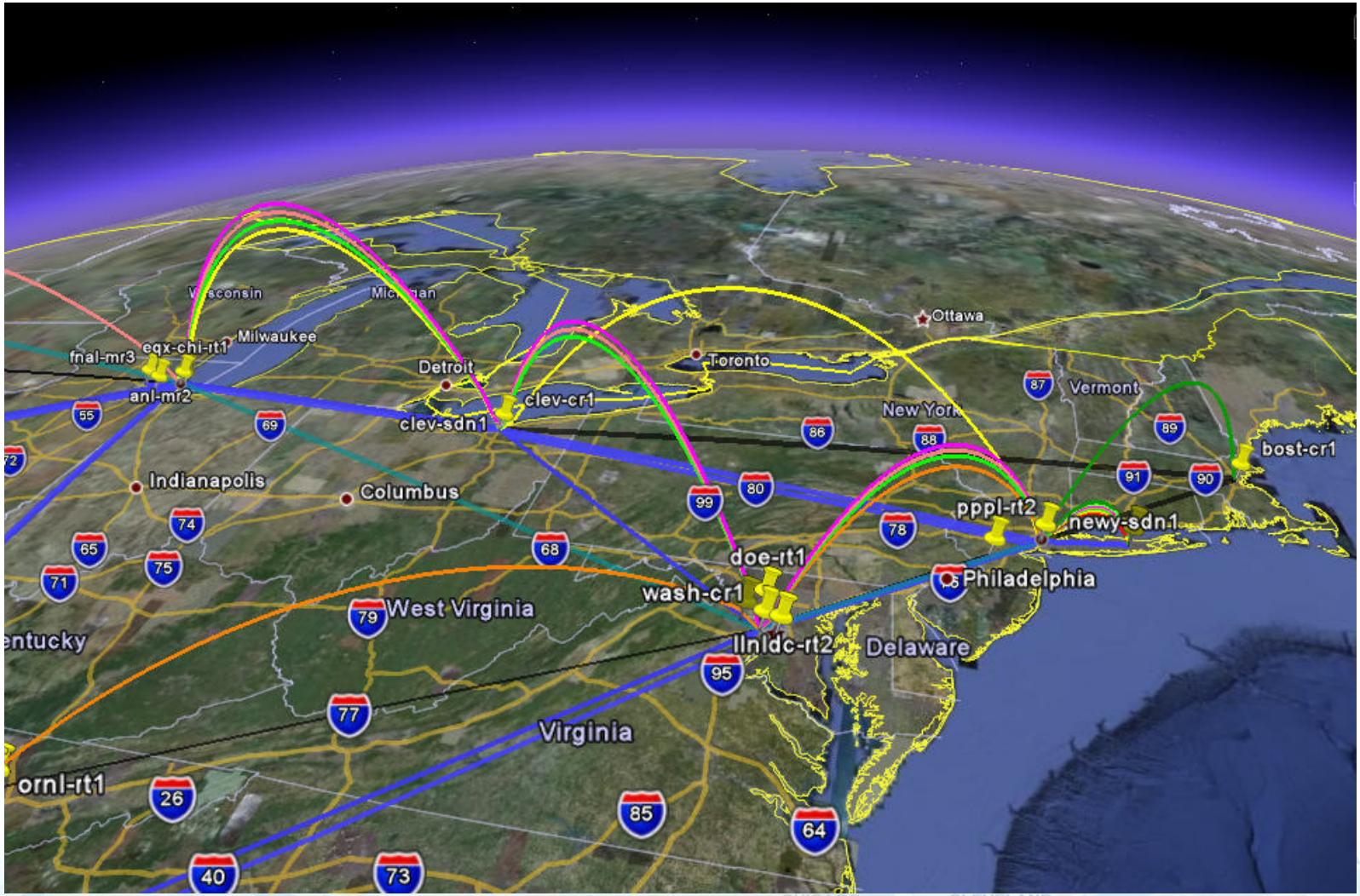
Minimal L2 VC service

- Site decides destination, bandwidth, VLAN
- Big flows arrive at a subinterface
  - Much easier to manage inside the site
- Site config needed: VLAN plumbing.
- VC participant sites must arrange routing
  - ESnet **highly** recommends use of a dynamic routing protocol for this.

L2 VC service



Expanding SDN



Active SDN endpoint

- Use case: More than one data intensive application at the site need to use the same network resources.
  - The site has decided to programmatically schedule and control virtual circuits on SDN.
- Site configuration:
  - Should install & configure OSCARS client software
  - Need to have a DOEGrids certificate and related OSCARS user account

Active SDN endpoint (cont.)

- Advantage: Good measure of control, better utilization of resources

- Applications that bring up VCs only when they absolutely are needed
  - helps bring both site and ESnet networking costs down.

Integrated SDN site

- Use case: Evolution of the active endpoint, with data intensive applications transparently and dynamically configuring VCs.

- This usually means that the site hosts and / or network need to be dynamically reconfigured.
- The site can use a solution like TeraPaths / LambdaStation / Phoebus to automate the process.
- Can integrate this with overall data and computing workflow

Integrated SDN site (cont.)

- Advantages:
  - Almost / fully transparent to applications.
  - Can do sophisticated scheduling.
  - Can guarantee QoS inside the site network.

- The site has almost created its own internal virtual circuit service, stitched to the SDN service
- Next step: run an IDC!