



LHC Open Network Environment Architecture Overview and Status

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LHCONE meeting

Amsterdam, September 26th, 2011

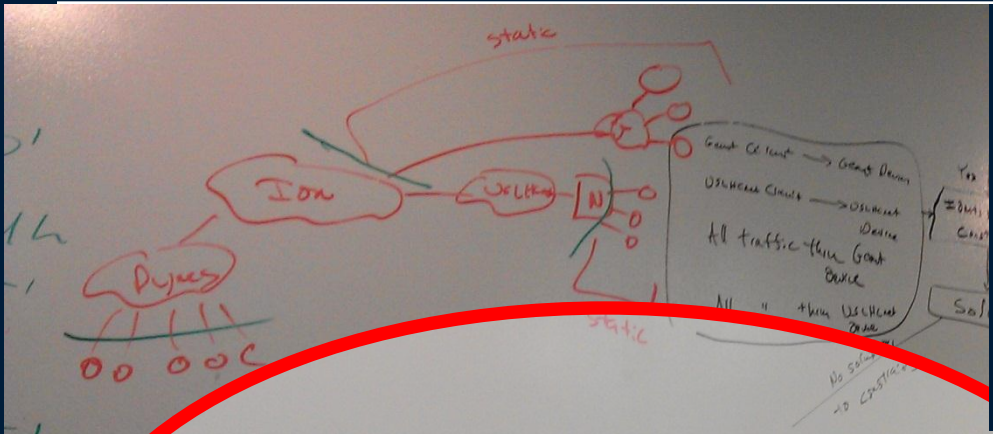


(Some) Points from DC meeting

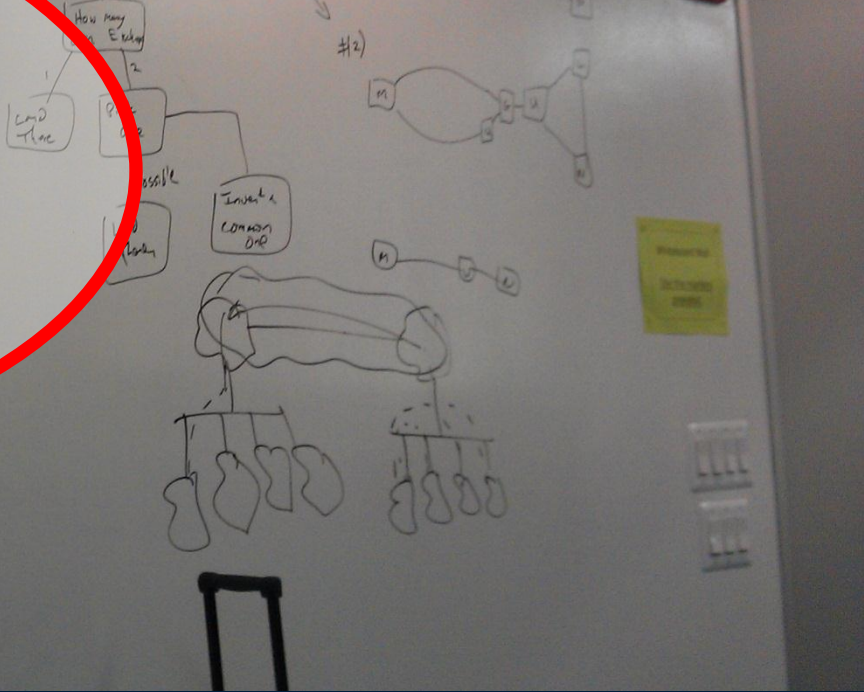
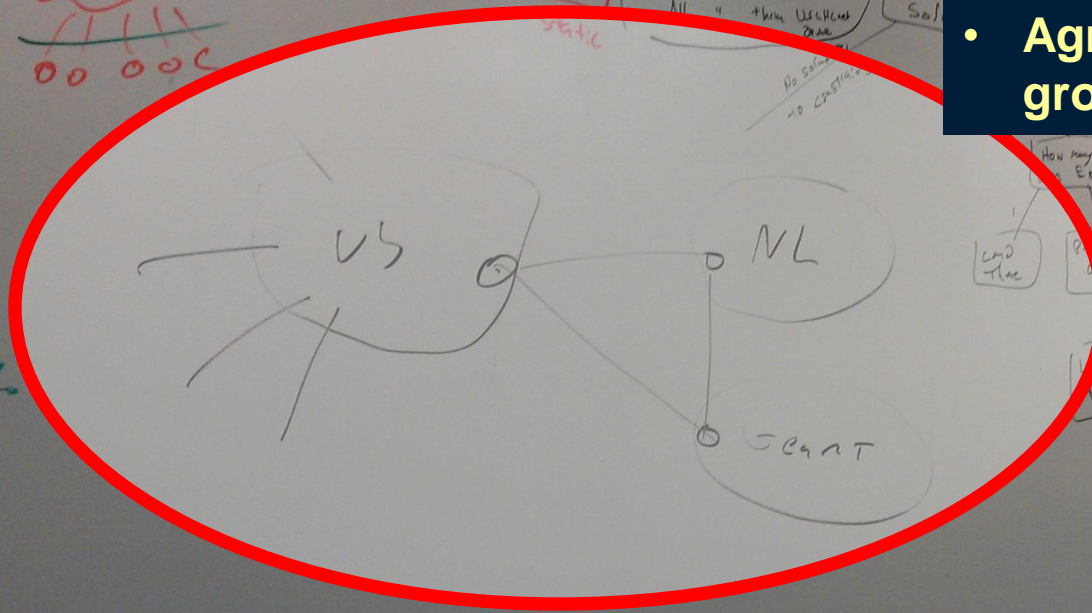


- **4 committees/WGs formed:**
 - Steering
 - Technical and Architecture
 - Operations (incl. monitoring)
 - Users and Stakeholders
- **Discussion on transatlantic resilience**
 - Prototype is really a pilot, resilience matters
 - Efficient use of multiple TA resources/paths, several variants were discussed
- **Goal was set, by this meeting “to have major progress on ‘Joes solution’ and make progress on P2P”**
 - Technical/architecture group to work on this

“Joe’s Solution”

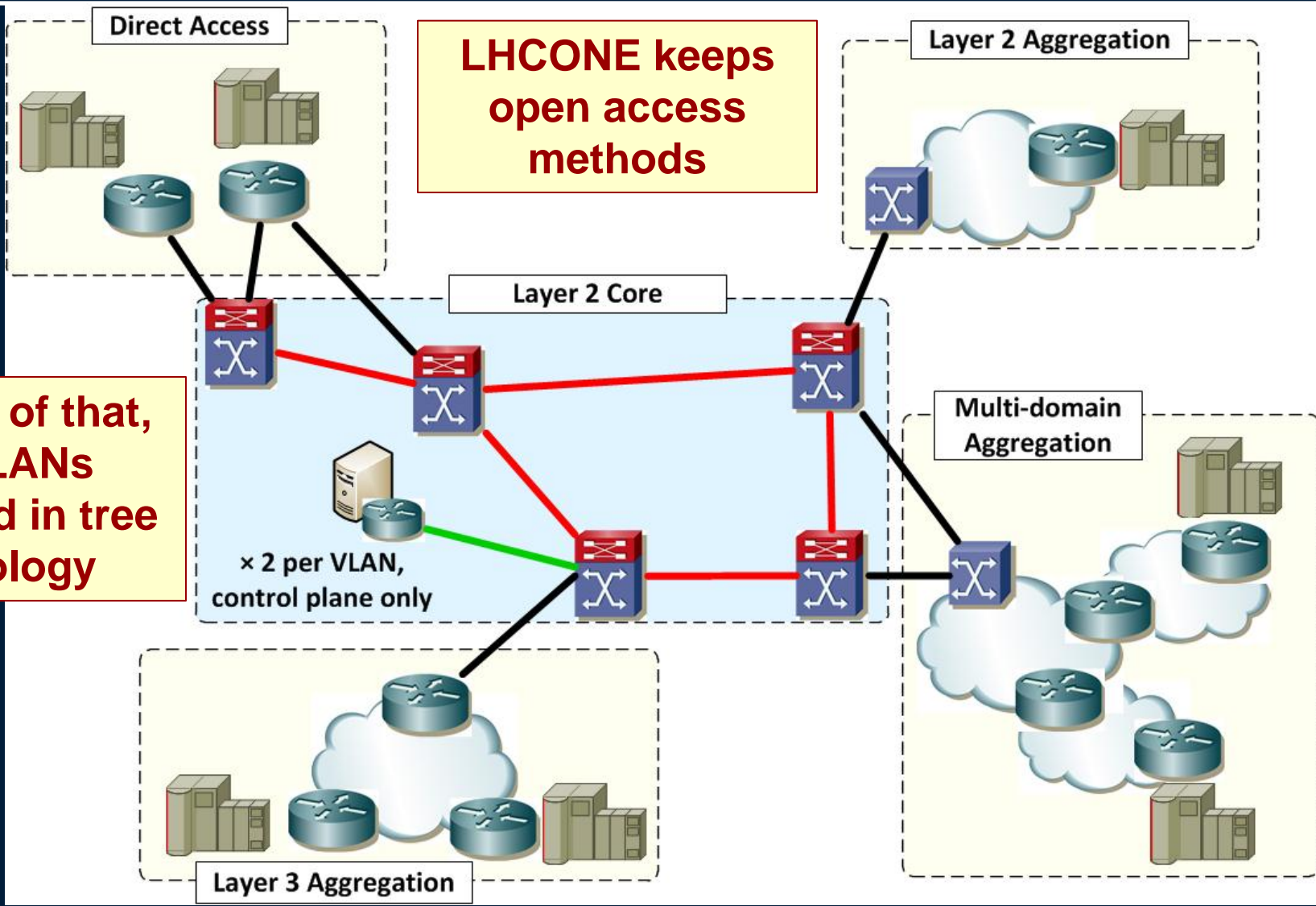


- **Two “issues” identified at the DC meeting as needing particular attention:**
 - Multiple paths across Atlantic
 - Resiliency
- **Agreed to have the architecture group work out a solution**





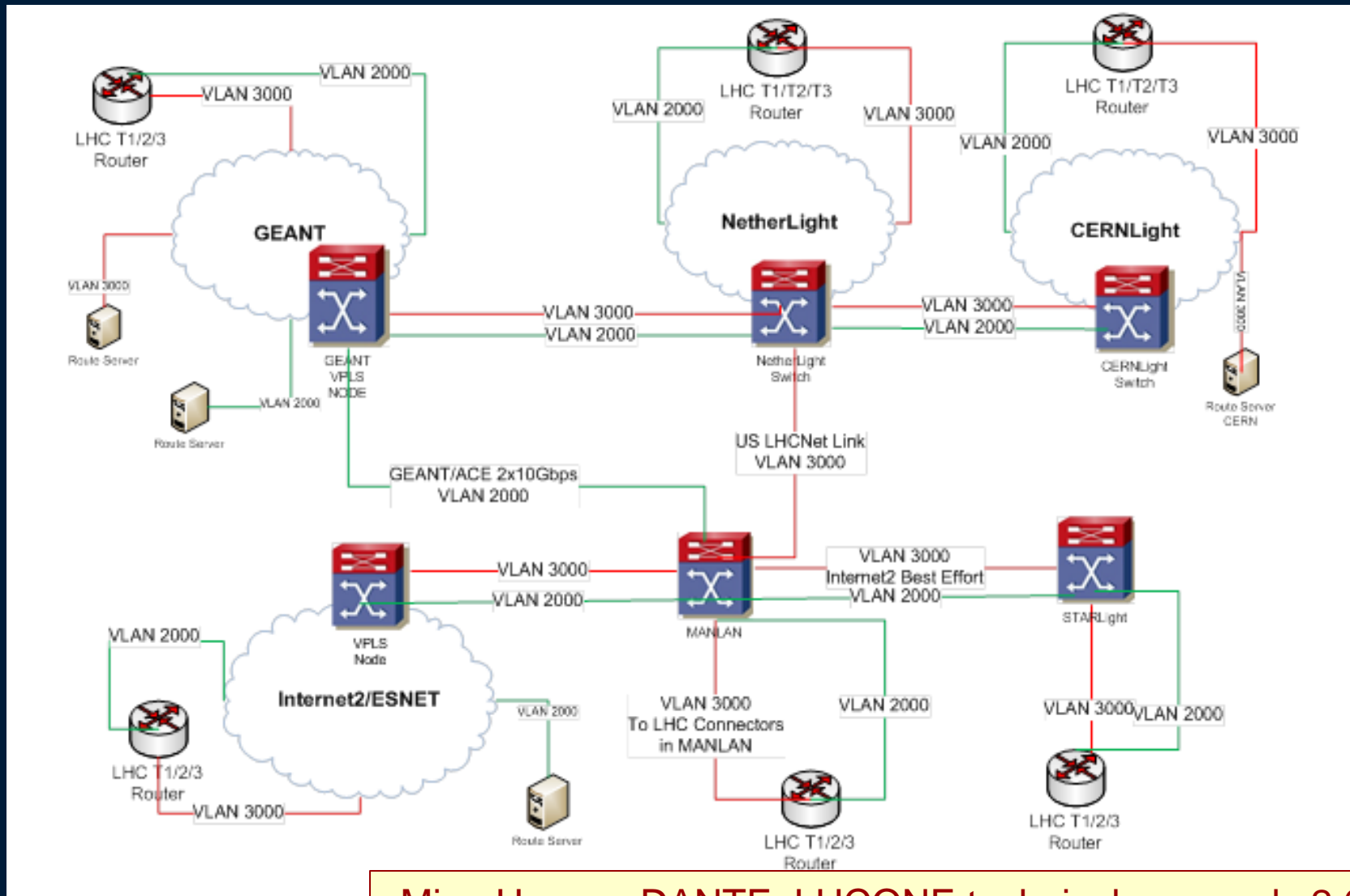
Layer 1, Conceptual



On top of that,
2 VLANs
overlaid in tree
topology



Pilot Implementation



Mian Usman, DANTE, LHCONE technical proposal v2.0



Pilot implementation, cont.



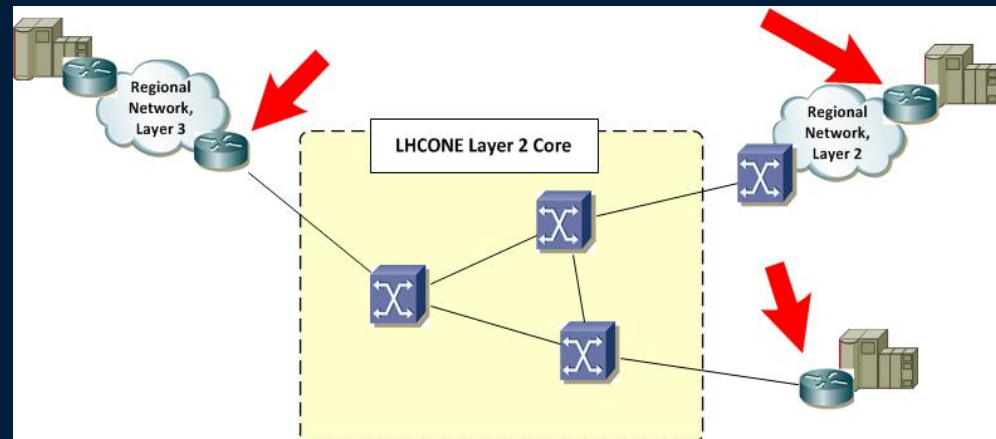
- **Domains interconnected through Layer 2 switches**
- **Two vlans (nominal IDs: 3000, 2000)**
 - Vlan 2000 configured on GEANT/ACE transatlantic segment
 - Vlan 3000 configured on US LHCNet transatlantic segment
- **Allows to use both TA segments, provides TA resiliency**
- **2 route servers per vlan**
 - Each connecting site peers will all 4 route servers
- **Keeping in mind this is a “now” solution, does not scale well to more transatlantic paths**
 - Continued charge to Architecture group



Site requirements, v1.2



- For end-sites and aggregation networks
- Connect on a router (BR) interface
- Jumbo enabled (MTU 9000)
- Connect to both vlans
 - Vlan translation where necessary
- No broadcast or multicast
- Peer with all 4 route servers
- Exchange of routes through BGP4 only
- Sites to use only IP addresses assigned to them
 - One IPv4 and one IPv6 address assigned per VLAN
- Advertise **only LHC-related** subnets!
- Sites have 3 options, but have to announce their choice:
 - Prefer vlan 3000, use 2000 as backup
 - Prefer vlan 2000, use 3000 as backup
 - Use ECMP



**DISCUSSION
POINT!**





DETAILED STATUS (SEPARATE SLIDES)

Bill Johnston



Next LHCONE Focus: Operations

Some Considerations



- **Need good monitoring of all components**
 - See Jason's presentation at DC meeting
- **Need a framework for interaction between stakeholders**
 - Clarify Roles and Procedures
- **Need a framework for Traffic Engineering**
 - This was the target from network perspective
 - Has to be global
 - Won't work with "black boxes"
 - "Empowered users" – if we had dedicated resources, **users** should be able to optimise resource utilisation
- **Need the Operations Committee/Working Group to take active role**

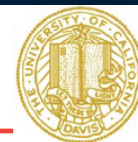


Traffic Engineering in LHCONE Multipoint Service



- LHCONE was created to (among others) make TE possible
- Primarily, in pilot implementation, the only TE method is route preference by end-sites
 - Two static VLANs
- To engineer traffic properly, a global framework is needed
 - Who performs optimisation?
 - Based on which criteria?
- E.g. local TE done in aggregation networks need to take impact on the core network into consideration
- Note: networks alone can only be reactive!

TE vs. NE vs. NP



- Traffic Engineering (TE)
 - “Put the traffic where the bandwidth is”
- Network Engineering (NE)
 - “Put the bandwidth where the traffic is”
- Network Planning (NP)
 - “Put the bandwidth where the traffic is forecasted to be”

Blocking probability

- TE – online, dynamic, provisioning problem, ms time scale
- NE – intermediate problem, months time scale Exhaustion Probability
- NP – offline, static, dimensioning problem, 5-yr time scale Cost (\$\$\$)



Dynamic P2P Service

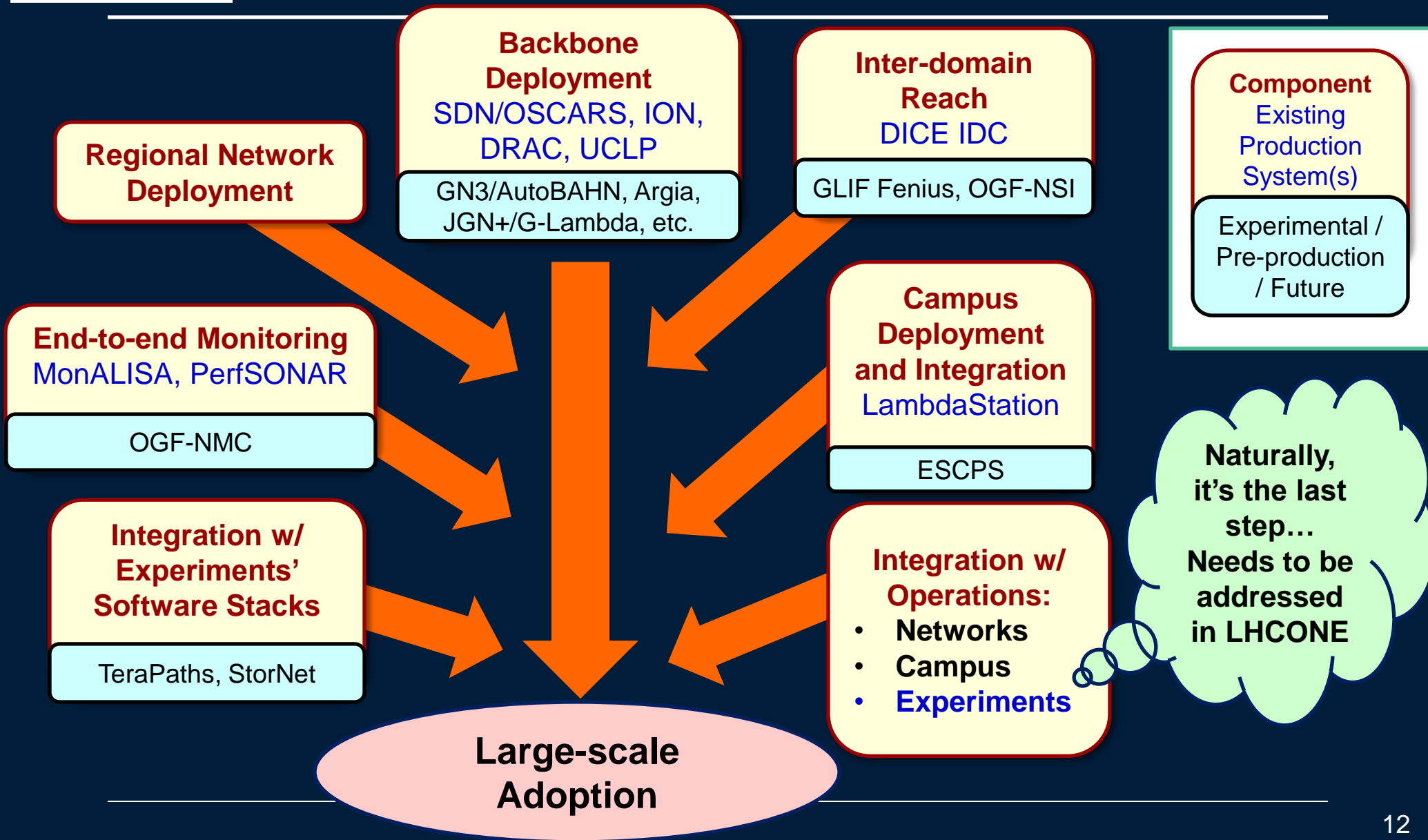


- **Multipoint service provides logical traffic separation**
 - With limited possibility to do traffic engineering
- **(Dynamic) Point-To-Point/Lightpaths service will provide dedicated network resources**
 - Where needed, when needed
- **Provides real application interface between networks and users**
- **Could be seen as automated TE, directly driven by user demand**

- **Rapid progress in the space of standardised multidomain dynamic circuit provisioning**
 - OGF NSI standard
 - GLIF meeting in Rio de Janeiro (Sept 13/14): impressive demonstrations
 - NSI plugfest (control plane)
 - RNP dynamic circuit demo (OSCARS, DYNES)
 - **DICE common dynamic circuit services expected soon**



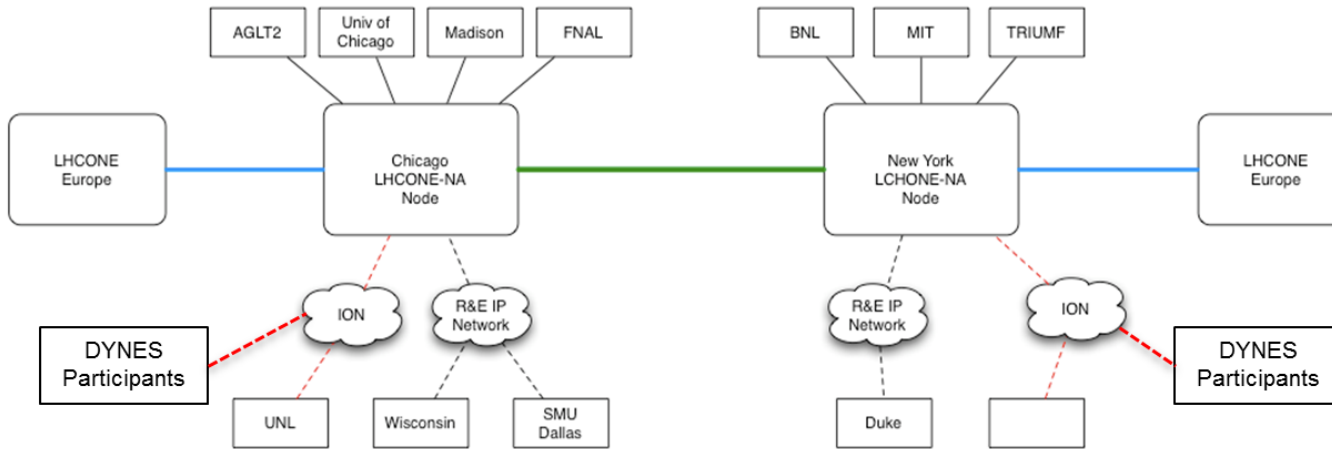
Towards Large Scale Dynamic Circuits in LHC Data Processing



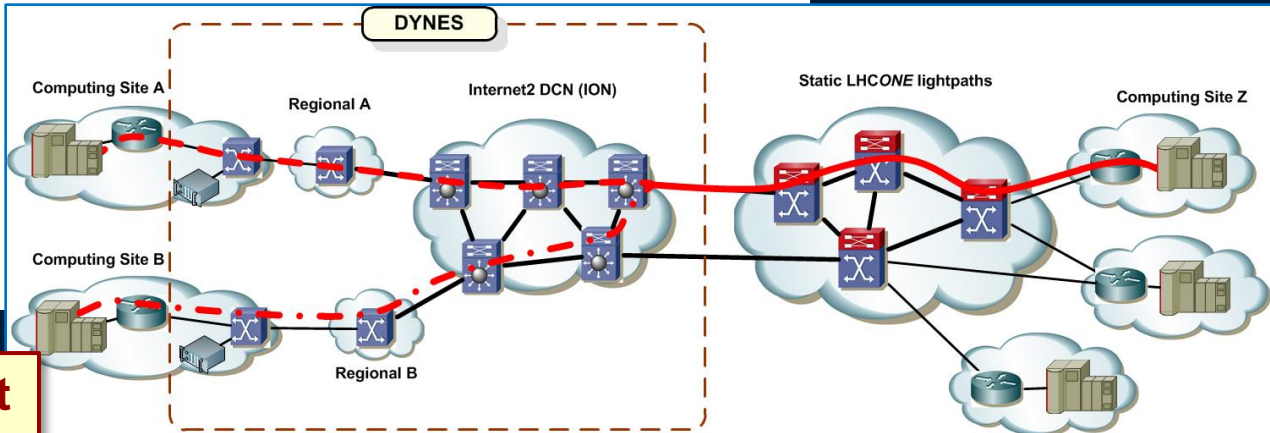
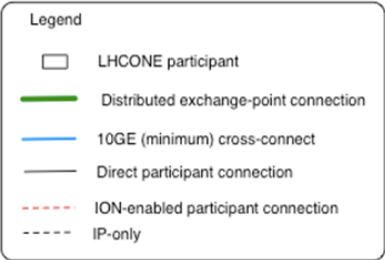


Dynamic Lighpaths

DYNES + LHCONE



- DYNES Participants can dynamically connect to Exchange Points via Internet2 ION Service
- Dynamic Circuits through and beyond the exchange point?
- Static tail?



- Hybrid dynamic circuit and IP routed segment model?





Architecture Working Group



- **At some point, the pilot shall be “handed-over” to Operations**
- **Two tasks for the Architecture group (my view):**
 - **Focus on dynamic services?**
 - Interface between LHCONe and DYNES
 - Involvement with HEP projects related to dynamic lightpaths (StorNet, ESCPS)
 - Leading to construction of end-to-end dynamic lightpath service
 - **Multipoint service is really a pilot with known limitations**
 - Work out long-term, scalable solution for efficiently using multiple paths at Layer 2
- **Opinions?**



THANK YOU!

<http://lhcone.net>

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