LHC Open Network Environment

an update

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LHCONE: 1 slide refresher

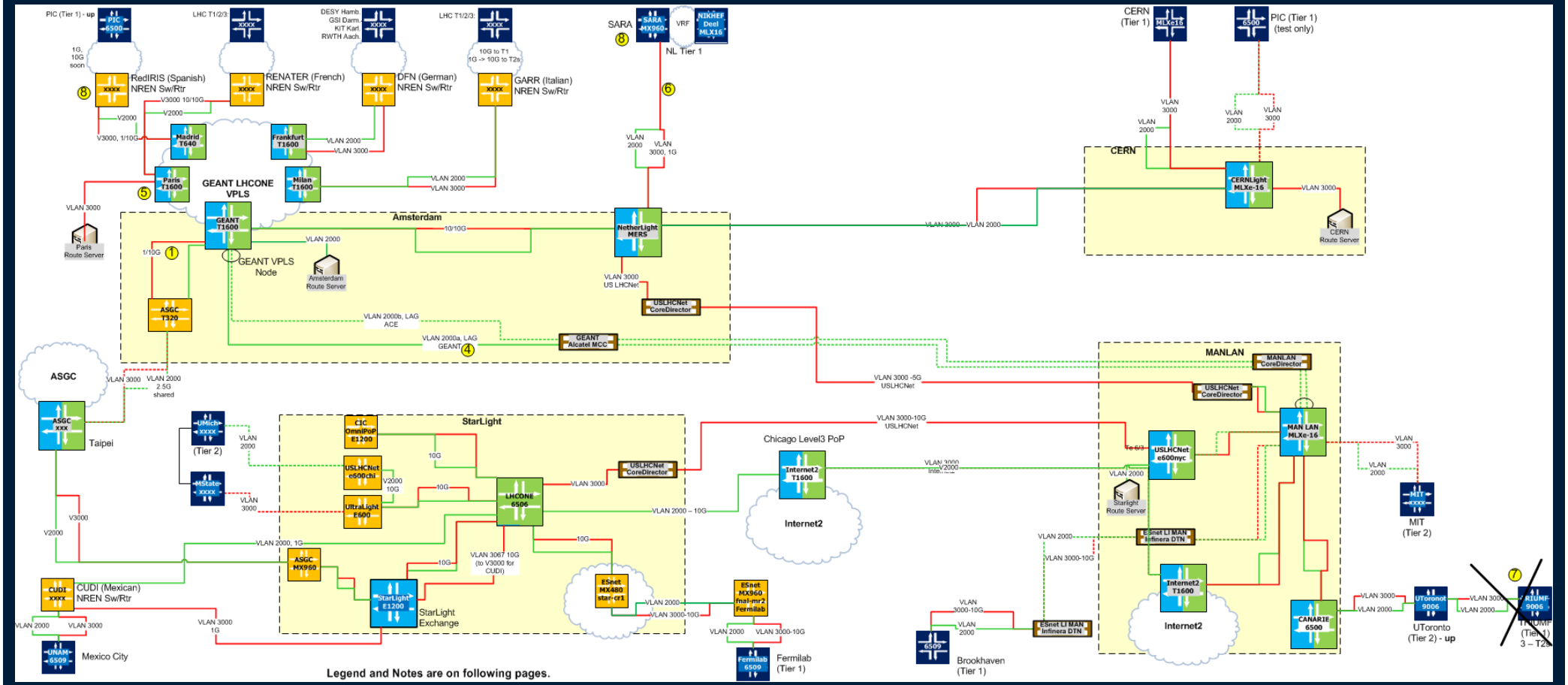
- In a nutshell, LHCONE was born (out the 2010 transatlantic workshop at CERN) to address two main issues:
  - To ensure that the services to the science community maintain their quality and reliability
  - To protect existing R&E infrastructures against the potential “threats” of very large data flows that look like ‘denial of service’ attacks
- LHCONE is expected to
  - Provide some guarantees of performance
    - Large data flows across managed bandwidth that would provide better determinism than shared IP networks
    - Segregation from competing traffic flows
    - Manage capacity as # sites x Max flow/site x # Flows increases
  - Provide ways for better utilisation of resources
    - Use all available resources, especially transatlantic
    - Provide Traffic Engineering and flow management capability
  - Leverage investments being made in advanced networking

So far,…

- **During 2011, LHCONE consisted of two implementations, each successful in its own scope:**
  - **Transatlantic Layer 2 domain**
    - Aka vlan 3000, implemented by USLHCNet, SURFnet, Netherlight, Starlight
  - **European VPLS domain**
    - Mostly vlan 2000, implemented in RENATER, DFN, GARR, interconnected through GEANT backbone (DANTE)

- **In addition, Internet2 deployed a VPLS based pilot in the US**
- **Problem: Connecting the VPLS domains at Layer 2 with other components of the LHCONE**
- **The new multipoint architecture there foresees inter-domain connections at Layer 3**

LHCONE Layer 1 connectivity (Bill Johnston)



LHCONE Timescales

- The WLCG has encouraged us to look a at longer-term perspective rather than rush in implementation

- Pressure lowered by increase in backbone capacities and increased GPN transatlantic capacity
  - True in particular in US and Europe, but this should not lead us to forget that LHCONE is a global framework
- The large experiment data flows will continue to increase and alternatives to managing such flows are needed

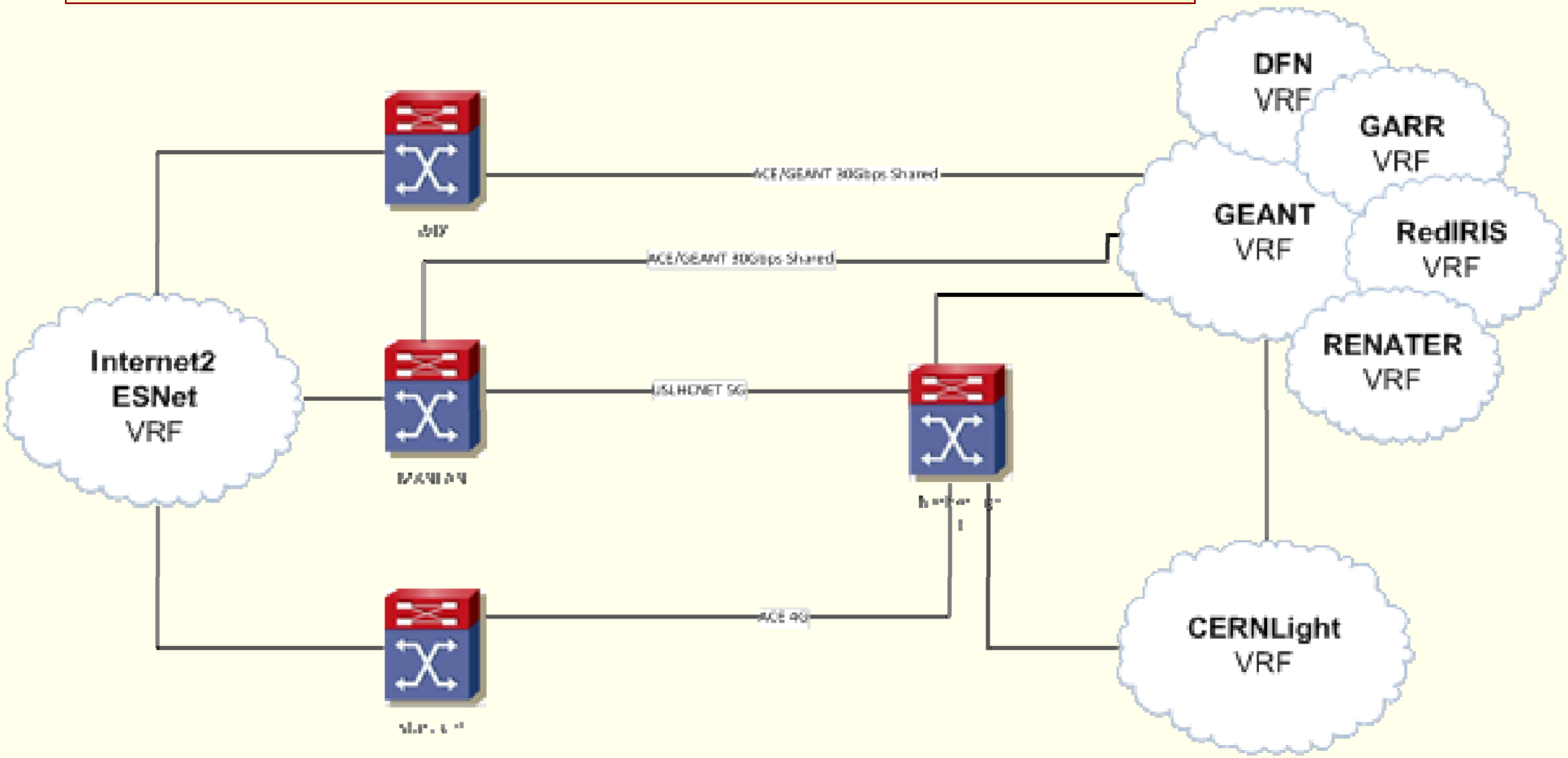
- LHC (short-term) time scale:
  - 2012: LHC run will continue until November
  - 2013-2014: LHC shutdown, restart late 2014
  - 2015: LHC data taking at full nominal energy (14 TeV)

LHCONE activities

- With all the above in mind, the Amsterdam Architecture workshop (Dec. 2011) has defined 5 activities:
  1. VRF-based multipoint service: a “quick-fix” to provide the multipoint LHCONE connectivity as needed in places
  2. Layer 2 multipath: evaluate use of emerging standards like TRILL (IETF) or Shortest Path Bridging (SPB, IEEE 802.1aq) in WAN environment
  3. Openflow: There was wide agreement at the workshop that SDN is the probable candidate technology for the LHCONE in the long-term, however needs more investigations
  4. Point-to-point dynamic circuits pilot
  5. Diagnostic Infrastructure: each site to have the ability to perform end-to-end performance tests with all other LHCONE sites
- Plus, overarching,
  6. Investigate what impact (if any) will LHCONE have on the LHC software stacks and sites

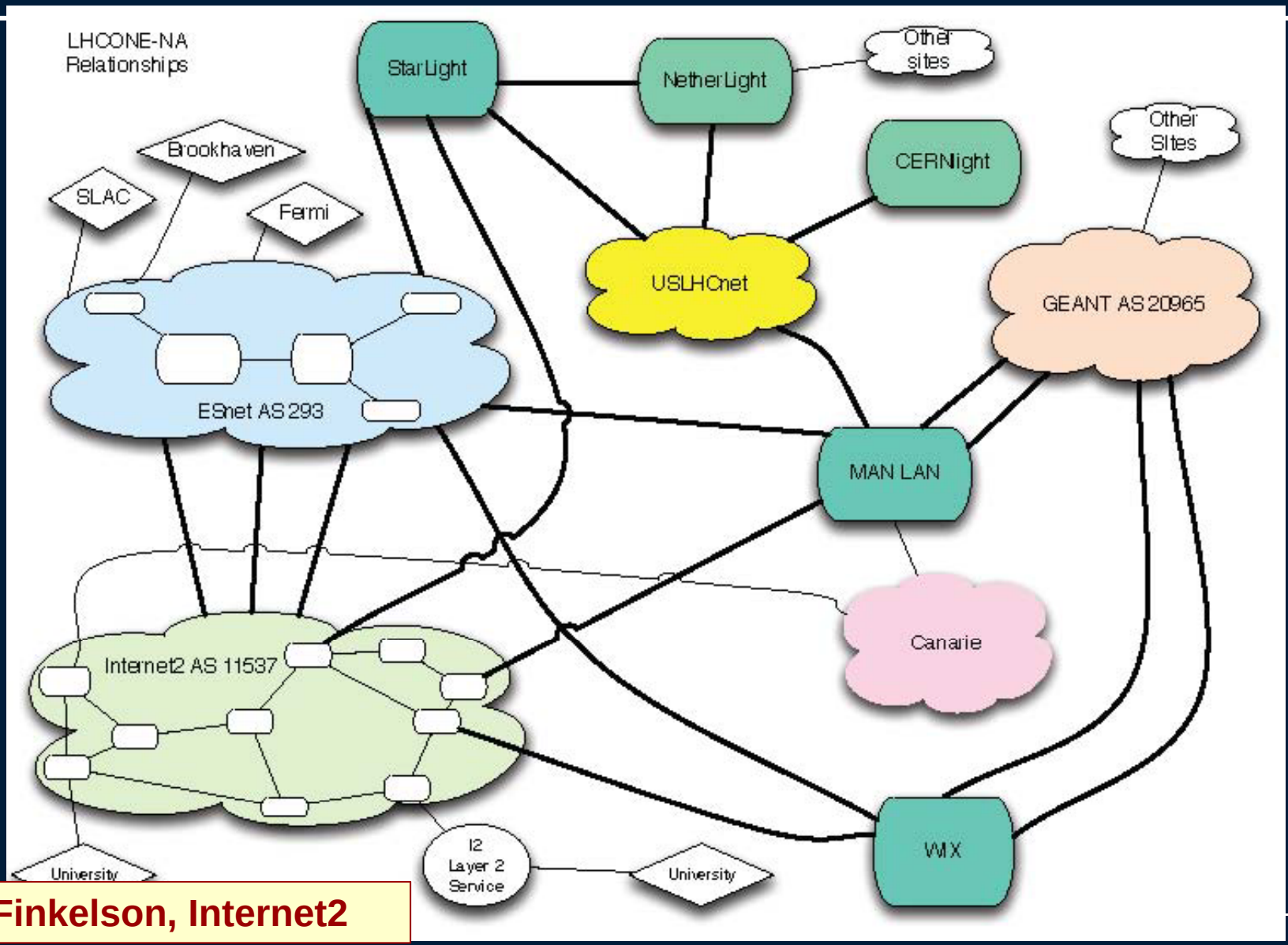
VRF implementation

Switched core, routed core,… take your pick



M. Usman, DANTE

VRF implementation (II)



D. Finkelson, Internet2

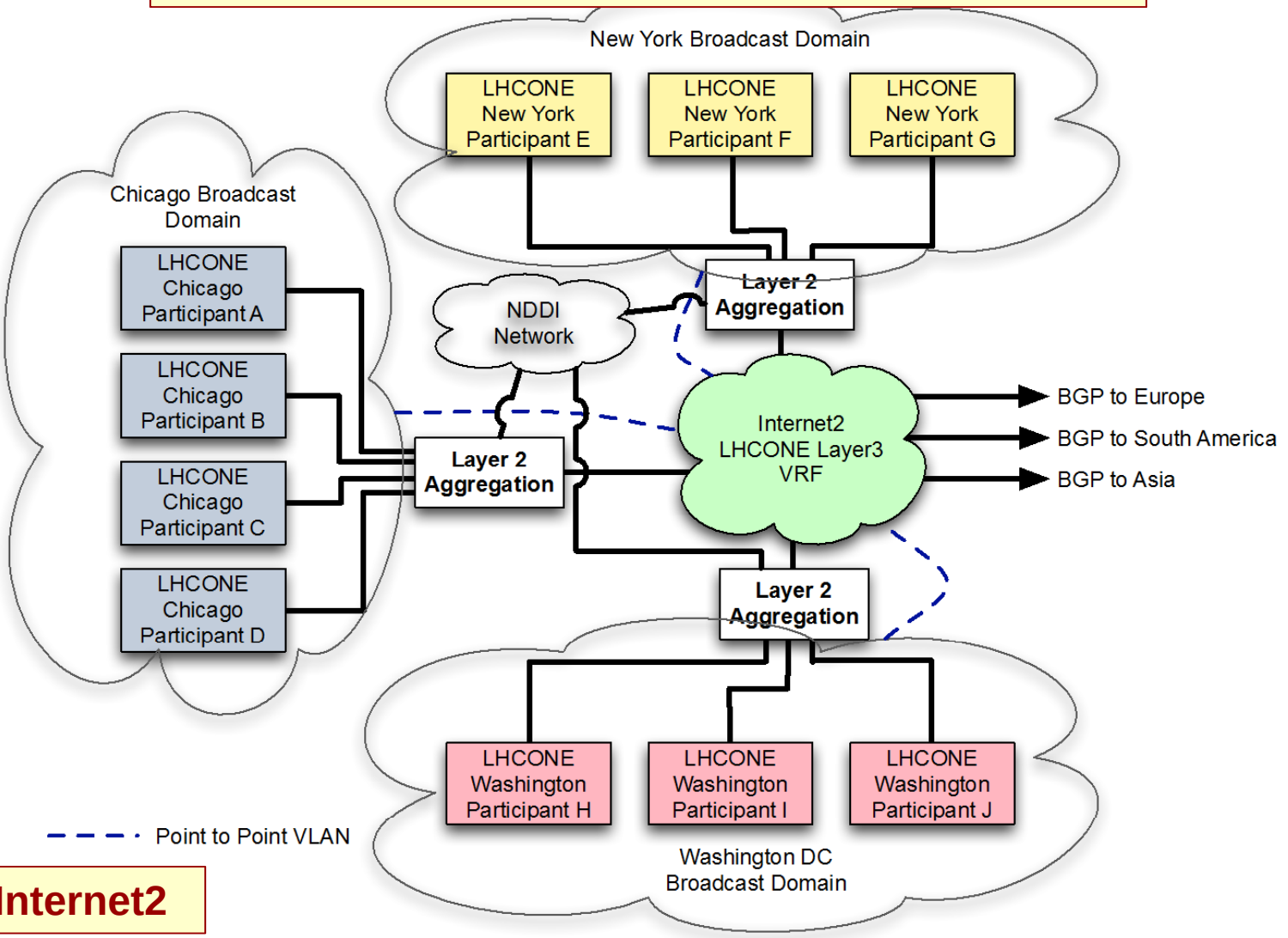
Milestones

- Activities 2-4 are pilot and/or R&D
- Based on the LHC schedule, we need to reach production-readiness by early-mid 2014

- Next LHCONE meeting in Berkeley, Jan. 30/31, 2012 (https://indico.cern.ch/conferenceDisplay.py?confId=160533)
- Rough target milestones:
  - Jan 2012: VRF solution operational
  - Mid 2013-early 2014: phased migration from VRF
  - Late 2014: full production use
- Finer milestones: At the Berkeley meeting, the activity leaders are expected to report on timescales for their relative pilots – what can be achieved by
  - Mid 2013
  - Beginning 2014

Phased transition from …

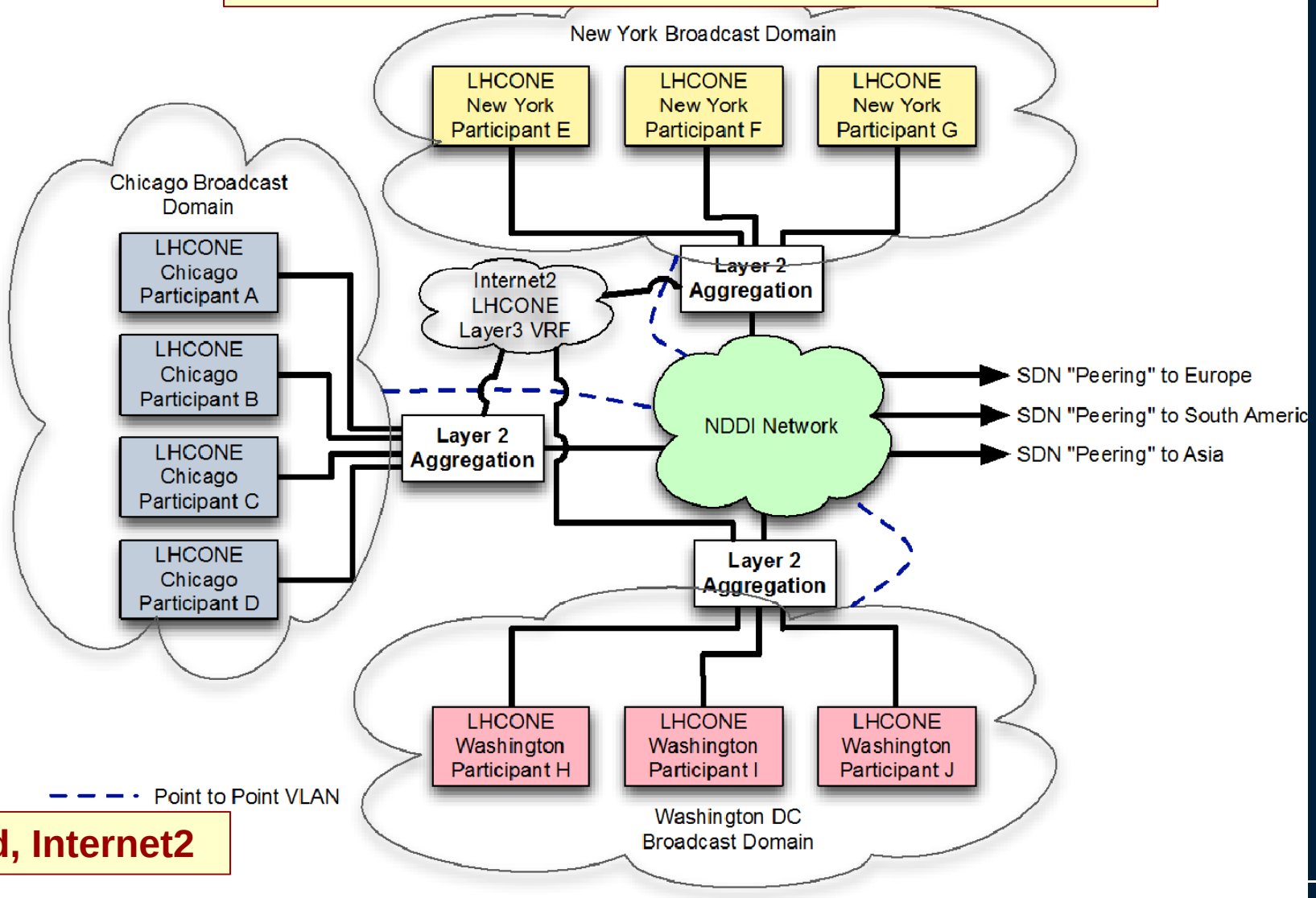
(Shown only US portion of LHCONE)



E. Boyd, Internet2

…to:

(Shown only US portion of LHCONE)



E. Boyd, Internet2

Summary

- LHCONE is pursuing dual strategy:
  - Implement a short-term solution, solving a subset of issues
  - Work on a long-term solution using new and leading edge developments in networking
- It's not too late for you to get involved
- Next LHCONE meeting: Berkeley, Jan 30/31, 2012
  (Video conferencing in preparation, check out the meeting web site)
- Watch for updates: http://lhcone.net

THANK YOU!

http://lhcone.net

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