



LHCONE meeting

Berkeley, Jan 30/31, 2012

Welcome



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 LHC 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



LHCONE 2011 activities



- **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 therefore foresees inter-domain connections at Layer 3**



LHCONE Future Development



- **Fork in the path forward:**
 - A solution for “now”
 - To make sure the immediate needs are satisfied
 - A long-term view at the LHC shutdown time scale
 - Leveraging next generation technologies
 - Requires some R&D investment to assure global scalability
- **Time scale: coordinate with LHC schedule:**
 - 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 future activities



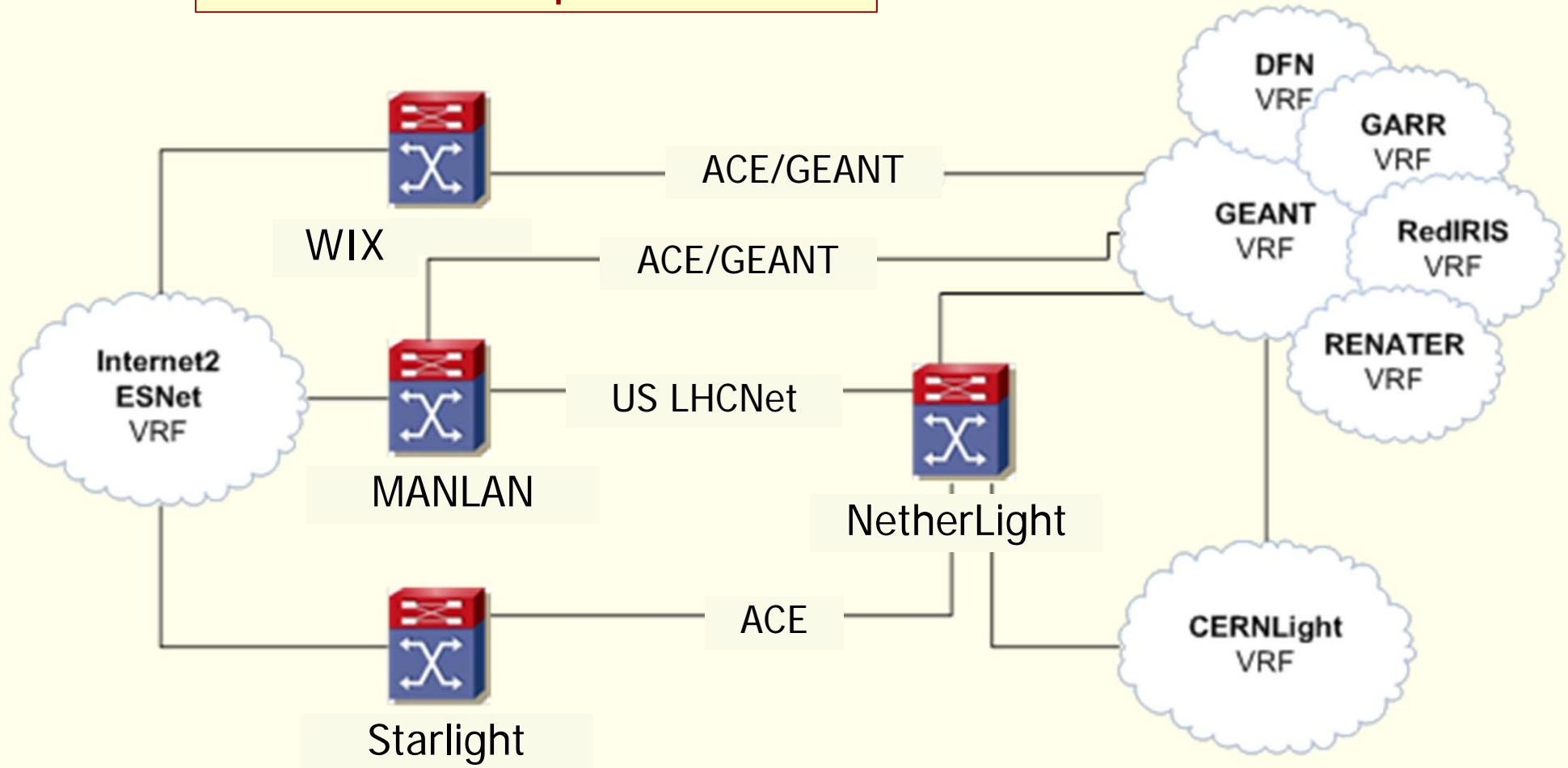
- **The Amsterdam Architecture workshop (Dec. 2011) has defined 5 activities:**
 1. **VRF-based multipoint service:** a “quick-fix” to provide the multipoint LHCONE connectivity as needed in places today
 2. **Layer 2 multipath:** evaluate use of emerging standards like TRILL (IETF) or Shortest Path 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 proposal

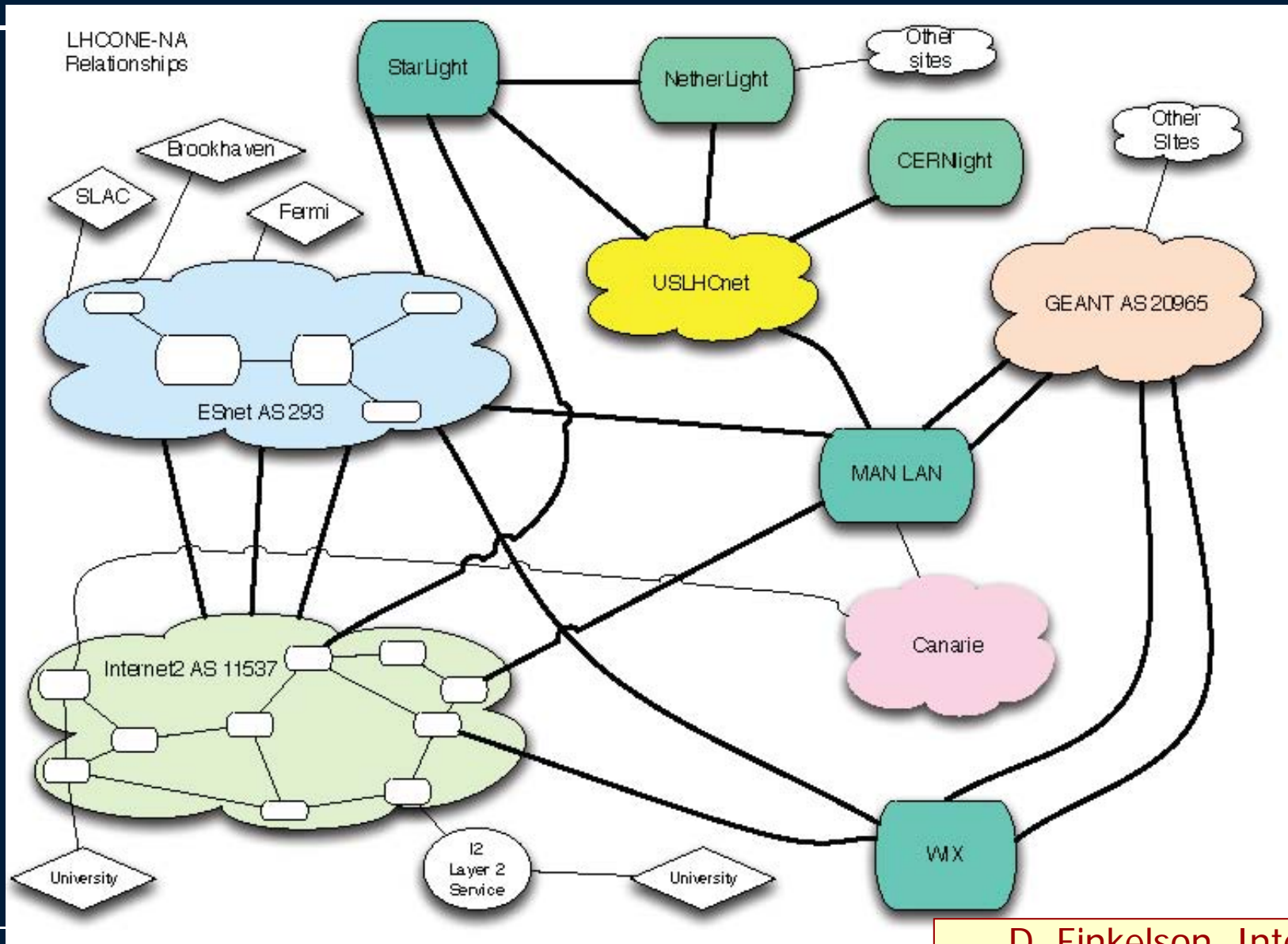


The short-term solution for LHCONE multipoint service



M. Usman, DANTE

VRF implementation (II)





Milestones



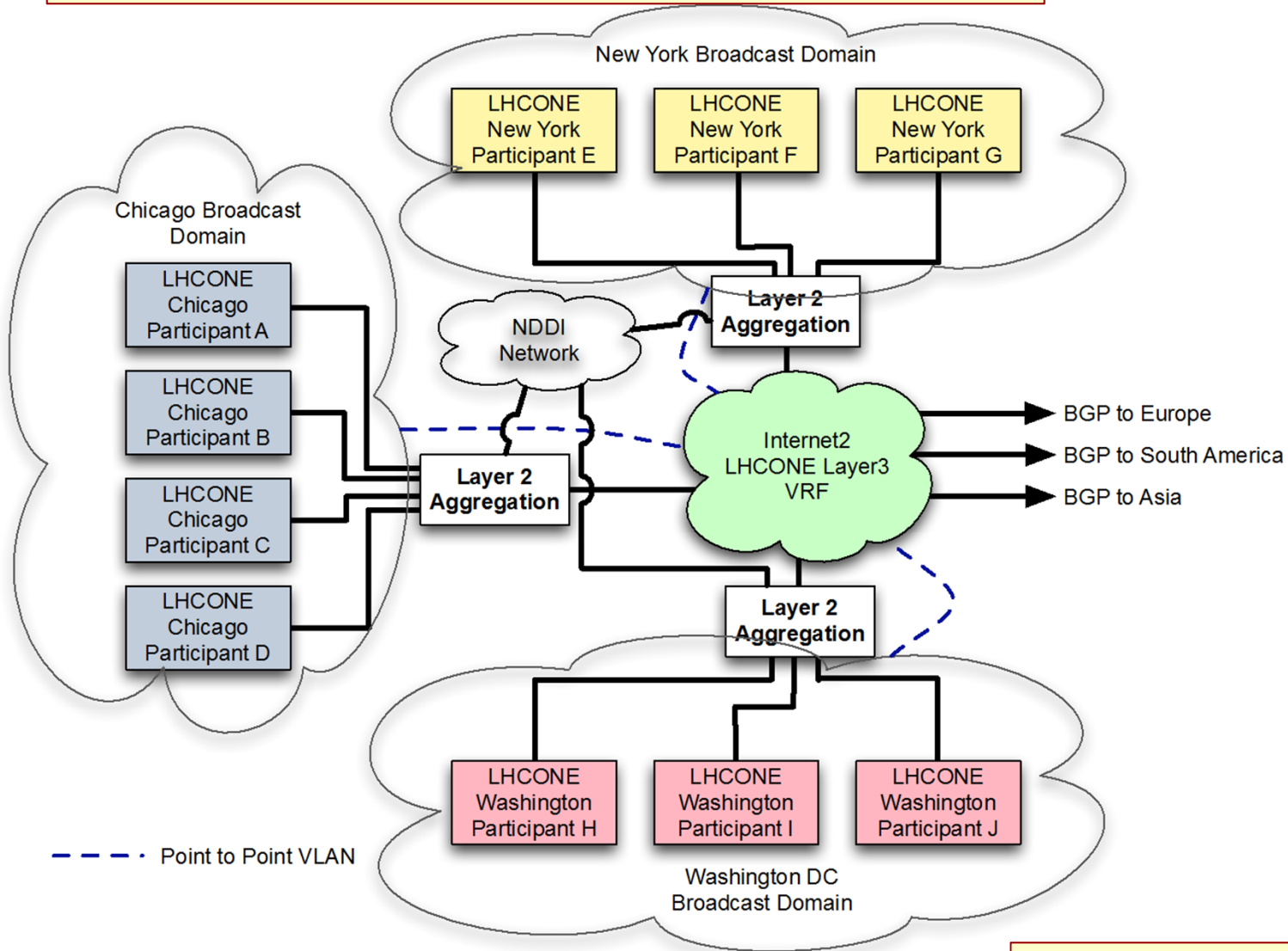
- **Activities 2-4 are pilot and/or R&D**
- **Based on the LHC schedule, LHCONE needs to reach production-readiness by early-mid 2014**
- **Rough target milestones:**
 - Jan 2012: VRF solution operational
 - Mid 2013-early 2014: phased migration from VRF
 - Late 2014: full production use
- **Kick-off sessions at this meeting**
- **Finer milestones: define here what can be achieved by**
 - Mid 2013
 - Beginning 2014
- **Transition from VRF temporary solution to SDN in time for LHC restart**



Phased transition from ...

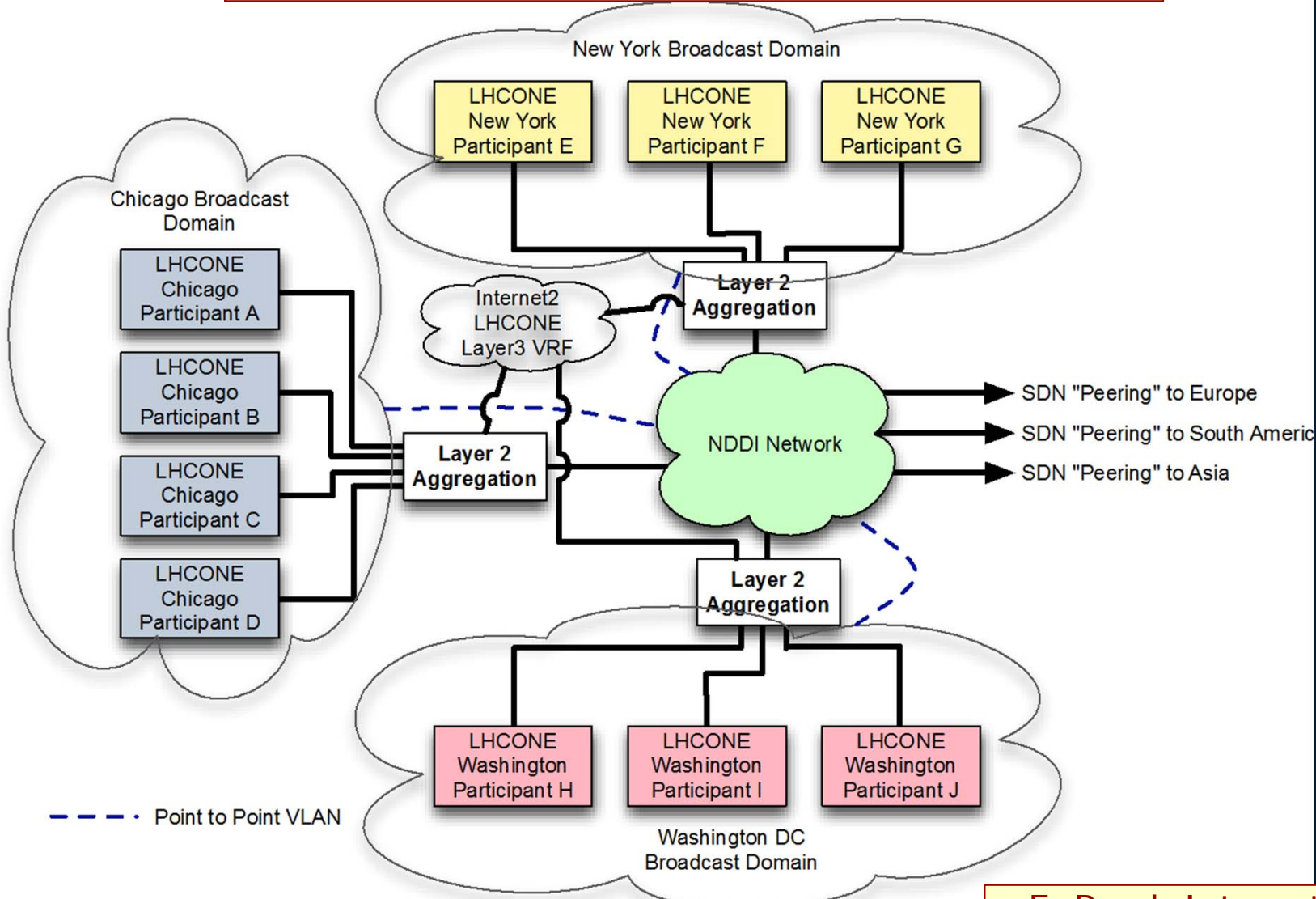


(Shown only US portion of LHCONE)



E. Boyd, Internet2

(Shown only US portion of LHCONE)





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
- **This meeting's agenda: a session dedicated to each activity**
- **As usual, updates will be posted on <http://lhcone.net>**