



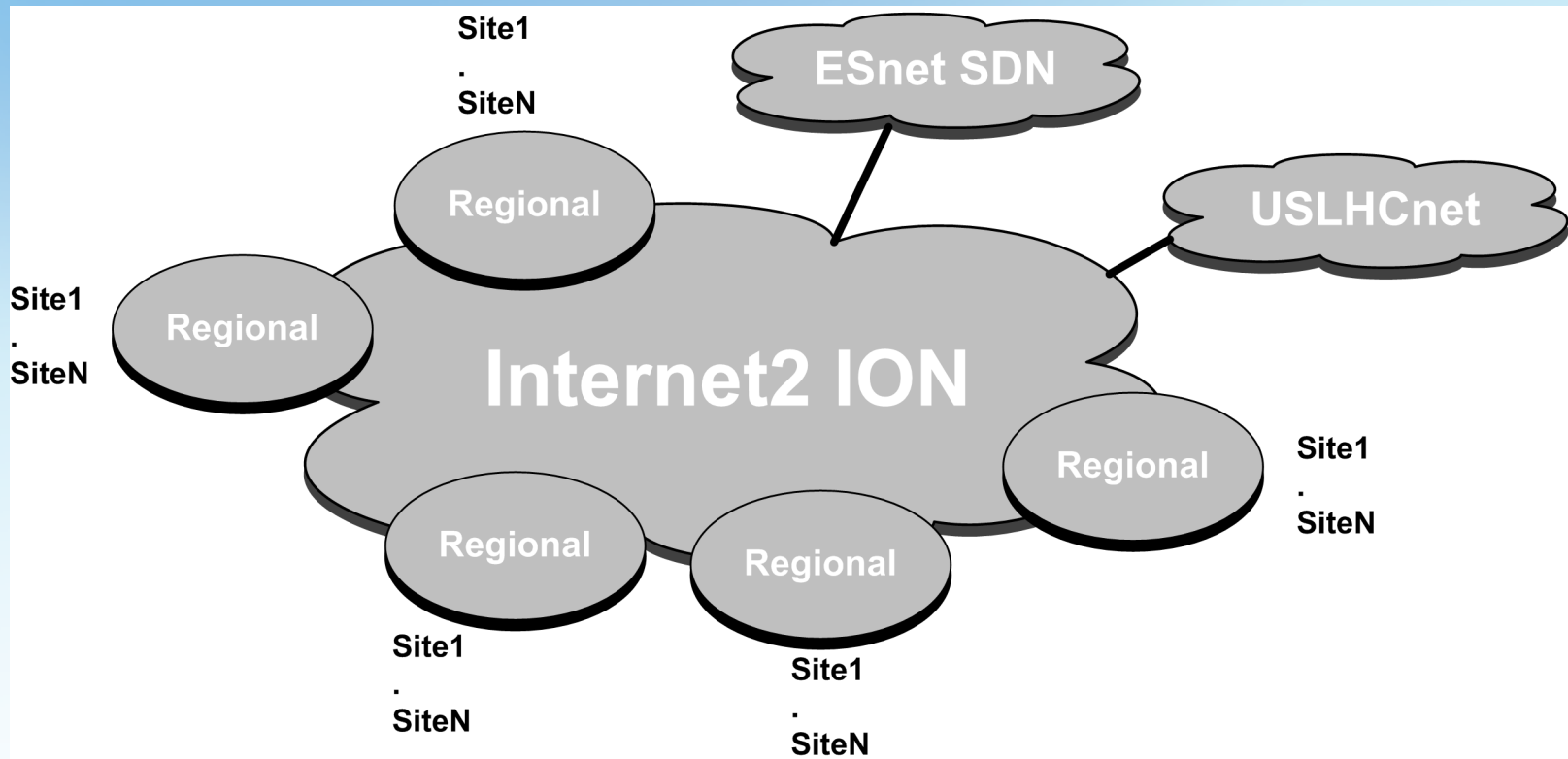
1 February 2010

Eric Boyd, Internet2 Deputy CTO

# **NSF MRI-R2: DYnamic NEtwork System (DYNES, NSF #0958998)**

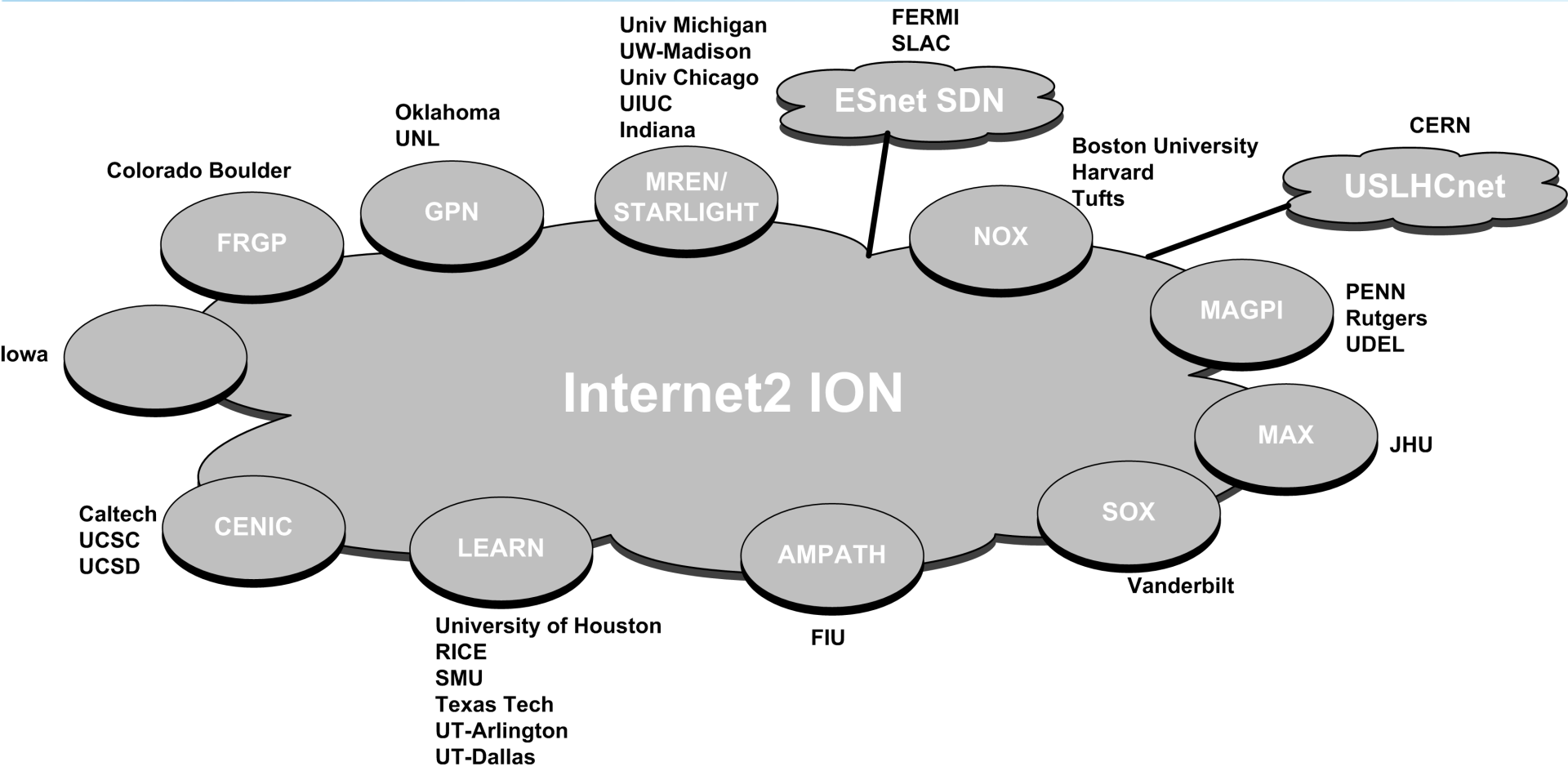
# DYNES Infrastructure Overview

## DYNES Generic Topology



# DYNES Infrastructure Overview

- DYNES Topology
  - based on Applications received
  - plus existing peering wide area Dynamic Circuit Connections (DCN)



# DYNES Project Schedule

- All applications has been reviewed.
  - All will be accepted for DYNES participation
  - Clarifications are needed for some. This could require some changes to the proposed configuration
  - Teleconferences with individual sites will be arranged
- A draft DYNES Program Plan document is available with additional details on the project plan and schedule:
  - [www.internet2.edu/dynes](http://www.internet2.edu/dynes) → DYNES-program-plan-vX.doc

# Dynes Documents

[www.internet2.edu/dynes](http://www.internet2.edu/dynes)

- DYNES: A Nationwide Dynamic Network System – Overview of the DYNES objectives and architecture
- DYNES: Regional Network and End-Site Participation Requirements
- DYNES: Criteria for Site Selection
- DYNES: Application Package
- DYNES: End-to-End Data Flow Architecture
- DYNES: Frequently Asked Questions (FAQ)
- DYNES Regional Network Application
- DYNES End-site Application
- DYNES Program Plan - DRAFT

# DYNES Project Schedule

- NSF proposal defined four project phases
  - Phase 1: Site Selection and Planning (4 months) (Sep-Dec 2010)
  - Phase 2: Initial Development and Deployment (6 months) (Jan 1-Jun 30, 2011)
    - development of DYNES at a limited number of sites
    - sites will be a minimum of Caltech, University of Michigan and Vanderbilt and their regional networks, plus 2-3 additional campuses and at least one of their respective regional networks.

# DYNES Project Schedule

- NSF proposal defined four project phases (cont)
  - Phase 3: Scale Up to Full-scale System Development (14 months) (July 1, 2011-August 31, 2012)
    - full-scale deployment and development at all selected sites
  - Phase 4: Full-Scale Integration At-Scale; Transition to Routine O&M (12 months) (September 1, 2012-August 31, 2013)
    - DYNES will be operated, tested, integrated and optimized at scale, transitioning to routine operations and maintenance as soon as this phase is completed

# DYNES Phase 1 Project Schedule

- Phase 1: Site Selection and Planning (Sep-Dec 2010)
  - Participant Applications Due: December 15, 2010
  - Application Reviews: December 15 2010-January 31 2011
  - Participant Selection Announcement: February 1, 2011
- 33 Total Applications
  - 8 Regional Networks
  - 25 Site Networks

# DYNES Phase 2 Project Schedule

- Phase 2: Initial Development and Deployment (Jan 1-Jun 30, 2011)
  - Initial Site Deployment Complete - February 28, 2011
    - Caltech, Vanderbilt, University of Michigan, Internet2, USLHCnet
  - Initial Site Systems Testing and Evaluation Complete: March 28, 2011
  - Phase 3-Group A Deployment (10 Sites) (March 1-July 1, 2011)

# Phase 3–Group A Schedule Details

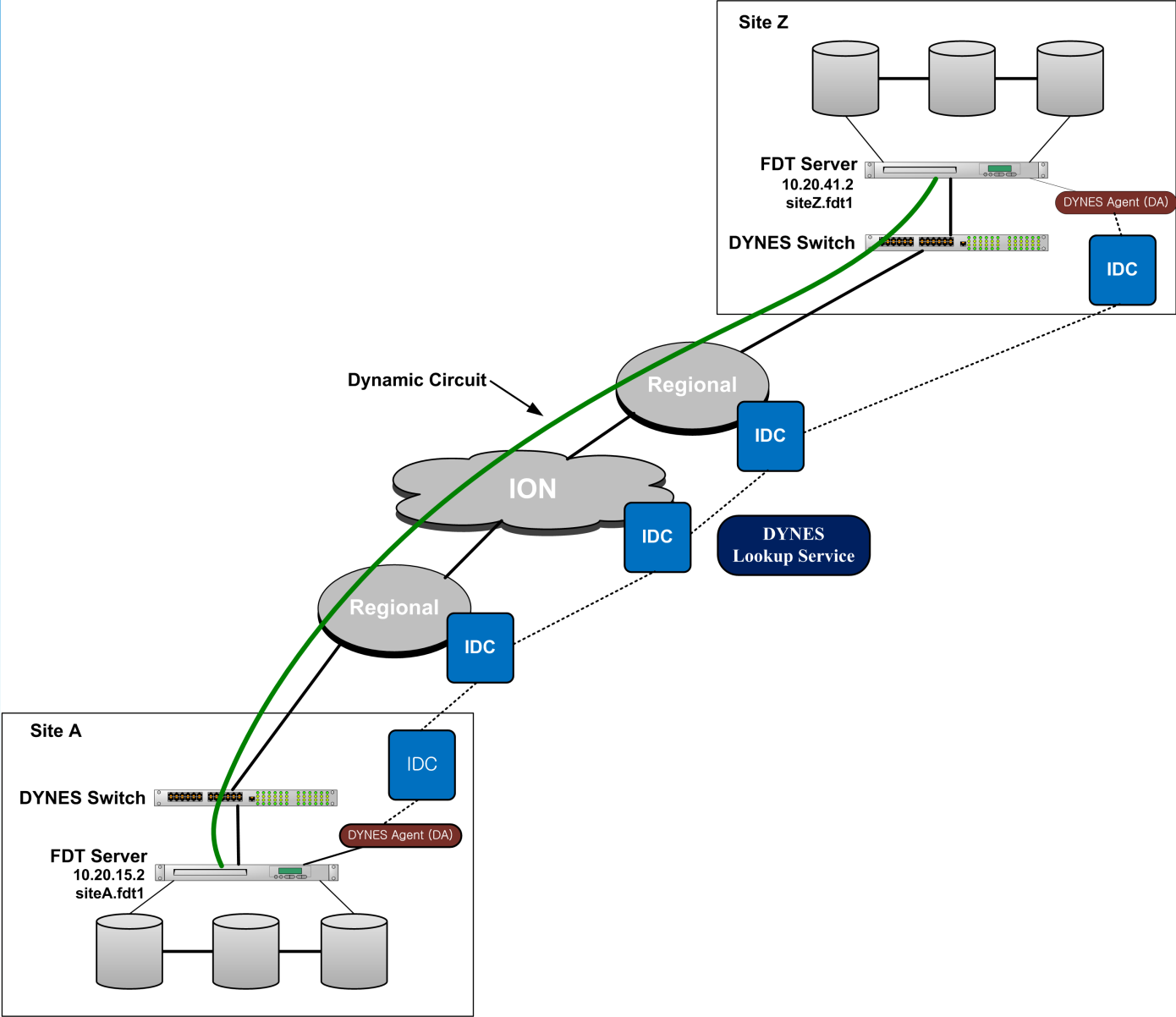
- Phase 3-Group A Deployment (10 Sites) (March 1-July 1, 2011)
- Teleconferences and Planning with individual participants: March 1-21, 2011
- Finalize Phase 3-Group A Equipment Order List: March 21-April 4, 2011
- Place Equipment Order: April 4, 2011
- Receive DYNES Equipment: April 15, 2011
- Configure and Test Individual Participant Configurations: April 18-May 2
- Ship Phase 3-Group A Equipment to sites: May 6 2011
- Deploy and Test at Phase 3-Group A Sites: May 16-June 30, 2011
- Begin Phase 3-Group A: July 1, 2011

# DYNES Phase 3 & 4 Project

## Schedule

- Phase 3: Scale Up to Full-scale System Development (14 months) (July 1, 2011-August 31, 2012)
  - Phase 3-Group A Deployment (10 Sites): Moved to Phase 2
    - Moving this to Phase 2 represents a more ambitious schedule than the original proposal plan. This will allow for some buffer in case unexpected issues are uncovered as part of the initial deployment and testing.
  - Phase 3-Group B Deployment (10 Sites): July 18-August 26, 2011
  - Phase 3-Group C Deployment (15 Sites): September 5-October 14, 2011
  - Full-scale System Development, Testing, and Evaluation (October 17 2011- August 31, 2012)
- Phase 4: Full-Scale Integration At-Scale; Transition to Routine O&M (12 months) (September 1, 2012-August 31, 2013)
  - DYNES will be operated, tested, integrated and optimized at scale, transitioning to routine operations and maintenance as soon as this phase is completed

# DYNES Data Flow Overview



# Dynes DataFlow Information

- Each DYNES Sites will be assigned DYNES Project private address space (10.20/16)
- Each DYNES FDT Server will be assigned a DYNES EndPoint Name (siteZ.fdt1)
- The DYNES FDT Server will include a data storage and reference structure to allow user to identify and indicate the data to be moved via DYNES. This data storage and reference structure will be project dependent. This will allow users to specify the desired data in the form of a DYNES Data Id.
- The combination of the DYNES EndPoint Name and DYNES Data ID will form a "DYNES Transfer URL" (siteZ.fdt.1/datalocationref30)
- Users will need to present a "DYNES Transfer URL" to their local DYNES Agent to initiate the data transfer.

# Dynes DataFlow Information

- **The DYNES Agent (DA) will provide the functionality to request the circuit instantiation, initiate and manage the data transfer, and terminate the dynamically provisioned resources. Specifically the DA will do the following:**
  - **Accept user request in the form of a DYNES Transfer URLs indicating the data location and ID**
  - **Locates the remote side DYNES EndPoint Name embedded in the Transfer URL**
  - **Submits a dynamic circuit request to its home InterDomain Controller (IDC) utilizing its local DYNES EndPoint Name as source and DYNES EndPoint Name from Transfer URL as the destination**
  - **Wait for confirmation that dynamic circuit has been established**
  - **Starts and manages Data Transfer using the appropriate DYNES Project IP addresses**
  - **Initiate release of dynamic circuit upon completion**

# Dynes DataFlow Information

- **The dynamic circuit network infrastructures and control plane will provide for the multi-domain circuit instantiation. The high level workflow is as described below:**
  - Upon receipt of a circuit request from a DYNES Agent, the IDC utilized the DYNES LookUp Service to translate the DYNES EndPoint Names into dynamic circuit source and destination URNs.
  - The initiating IDC then uses these URNs to set up the multi-domain dynamic circuit and notify the DYNES Agent when circuit is ready for use.
  - The IDC will also accept requests from the local DYNES Agent to tear down the dynamic circuit after data transfer is complete.
- **The FDT Servers can also have public IP addresses which can also be utilized for data transfers when dedicated circuits are not instantiated.**
- **In this basic scenario, only the provided FDT server will be integrated into the DYNES instrument. However, other site servers can also be integrated into the DYNES infrastructure.**

# DYNES Standard Equipment

- Inter-domain Controller (IDC) Server and Software
  - IDC creates virtual LANs (VLANs) dynamically between the FDT server, local campus, and wide area network
  - IDC software is based on the OSCARS and DRAGON software which is packaged together as the DCN Software Suite (DCNSS)
  - DCNSS version correlates to stable tested versions of OSCARS. The current version of DCNSS is v0.5.3.
  - It expected that DCNSSv0.6 will be utilized for Phase 3-Group B deployments and beyond. DCNSSv0.6 will be fully backward compatible with v0.5.3. This will allow us to have a mixed environment as may result depending on actual deployment schedules.
  - The IDC server will be a Dell R610 1U machine.

# DYNES Standard Equipment

- Fast Data Transfer (FDT) server
  - Fast Data Transfer (FDT) server connects to the disk array via the SAS controller and runs the FDT software
  - FDT server also hosts the DYNES Agent (DA) Software
- The standards FDT server will be a DELL 510 server with dual-port Intel X520 DA NIC. This server will a PCIe Gen2.0 card x8 card along with 12 disks for storage.
- DYNES Ethernet switch options:
  - Dell PC6248 (48 1GE ports, 4 10GE capable ports (SFP+, CX4 or optical))
  - Dell PC8024F (24 10GE SFP+ ports, 4 “combo” ports supporting CX4 or optical)

# DYNES References

- DYNES, [www.internet2.edu/dynes](http://www.internet2.edu/dynes)
- OSCARS, [www.es.net/oscars](http://www.es.net/oscars)
- DRAGON, [dragon.east.isi.edu](http://dragon.east.isi.edu)
- DCN Software Suite (DCNSS), [wiki.internet2.edu/confluence/display/DCNSS/](http://wiki.internet2.edu/confluence/display/DCNSS/)
- FDT, <http://monalisa.cern.ch/FDT/>