CloudLab

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GEC 21

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Why We're Building CloudLab

- Clouds are changing the way we look at a lot of problems
  - Giving us new ideas of what's possible
  - Impact goes far beyond computer science
- … and have broader impacts with much more potential
  - Transformational for IT-based businesses – enables rapid startup
- … but there's still a lot we don't know, from perspective of
  - Researchers (those who will transform the cloud)
  - Users (those who will use the cloud to transform their own fields)
- To investigate these questions, we need:
  - Flexible, scalable **scientific infrastructure**
  - That enables exploration of **fundamental** science in the cloud
  - Built **by** and **for** the research community

The CloudLab Team

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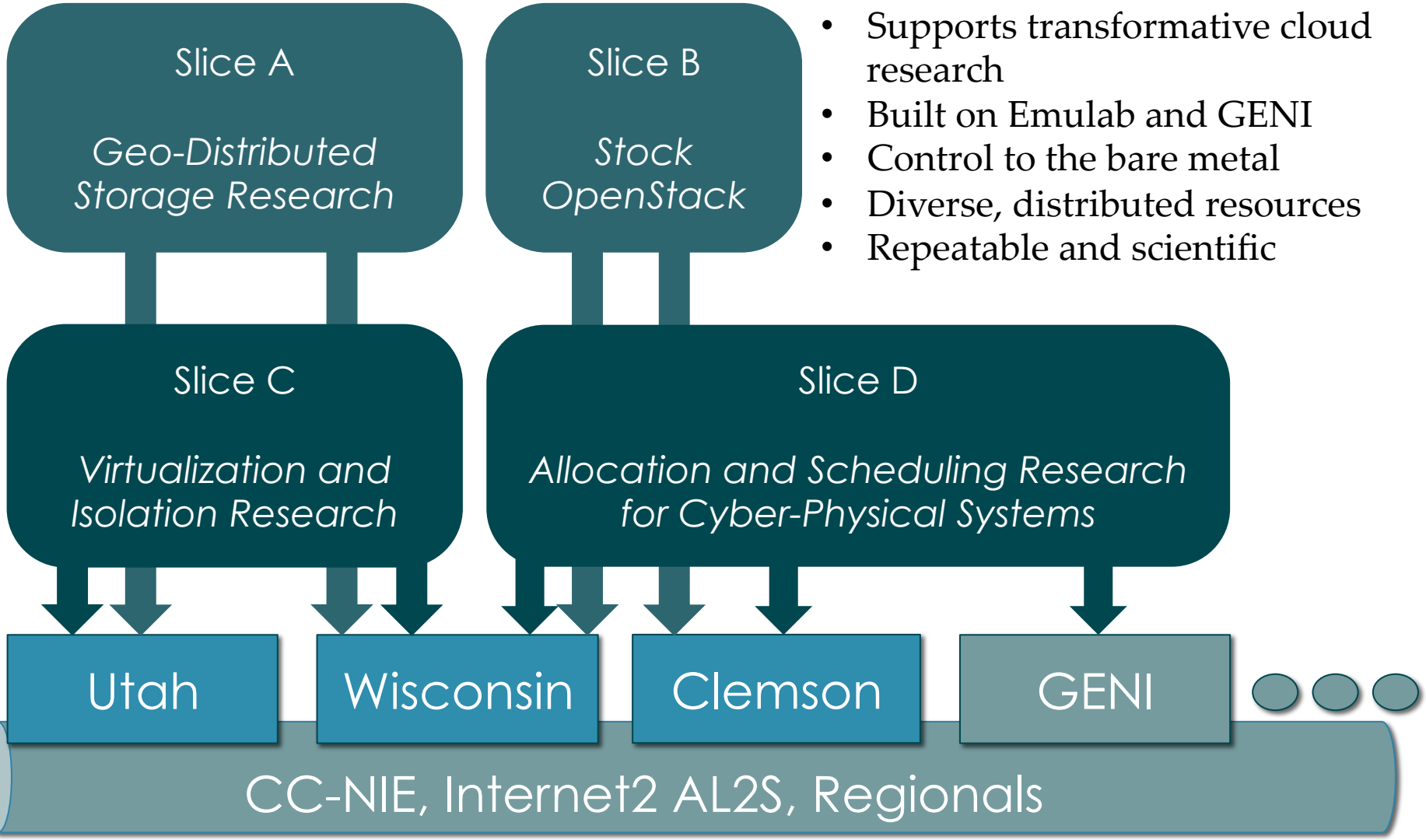
hp CISCO DELL

The CloudLab Vision

- A "meta-cloud" for building clouds
- Build your own cloud on our hardware resources
- Agnostic to specific cloud software
  - Run existing cloud software stacks (like OpenStack, Hadoop, etc.)
  - … or new ones built from the ground up
- Control and visibility all the way to the bare metal
- "Sliceable" for multiple, isolated experiments at once

With CloudLab, it will be as easy to get a cloud tomorrow as it is to get a VM today

What Is CloudLab?



- Supports transformative cloud research
- Built on Emulab and GENI
- Control to the bare metal
- Diverse, distributed resources
- Repeatable and scientific

CloudLab's Hardware

One facility, one account, three locations

- About 5,000 cores each (15,000 total)
- 8-16 cores per node
- Baseline: 4GB RAM / core
- Latest virtualization hardware
- TOR / Core switching design
- 10 Gb to nodes, SDN
- 100 Gb to Internet2 AL2S
- *Partnerships with multiple vendors*

Wisconsin

- **Storage and net.**
- Per node:
  - 128 GB RAM
  - 2x1TB Disk
  - 400 GB SSD
- Clos topology
- *Cisco*

Clemson

- **High-memory**
- 16 GB RAM / core
- 16 cores / node
- Bulk block store
- Net. up to 56Gb
- High capacity
- *Dell*

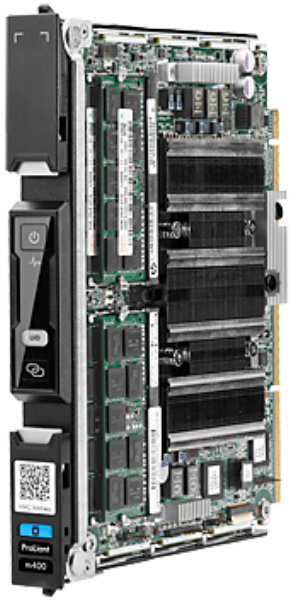
Utah

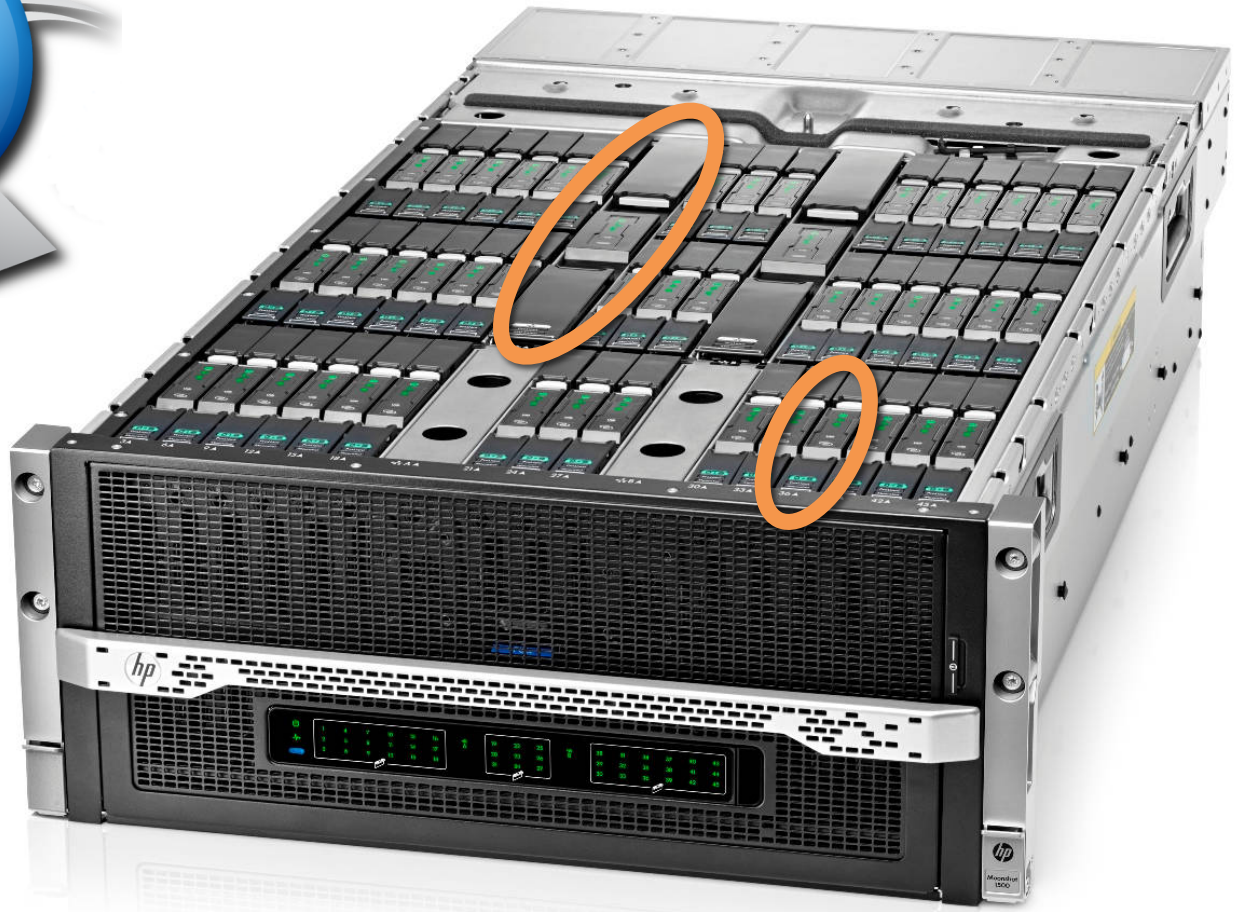
- **Power-efficient**
- ARM64 / x86
- Power monitors
- Flash on ARMs
- Disk on x86
- Very dense
- *HP*

Availability and Schedule

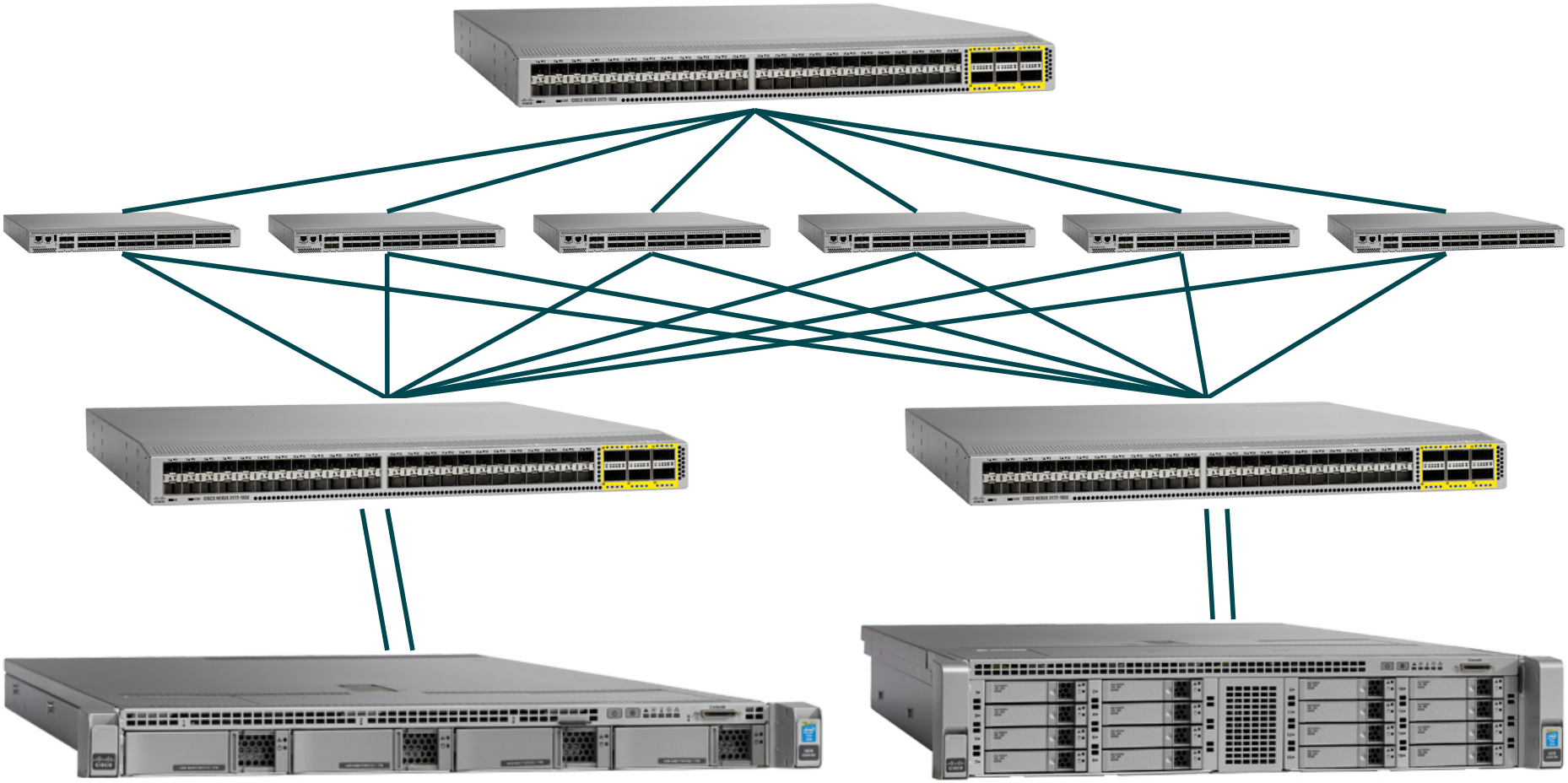
- Availability:
  - **Now: Technology preview available!**
  - Late 2014: Open to early adopters
  - *Early 2015: Publicly available*
- Hardware being deployed in stages:
  - Half on its way this year
  - Refreshes in future years

Utah/HP: Low-power ARM64



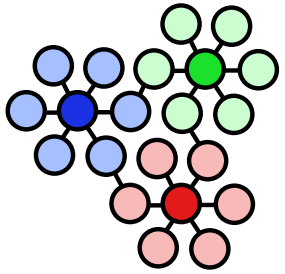


Wisconsin/Cisco: Net. & Storage



Technology Foundations

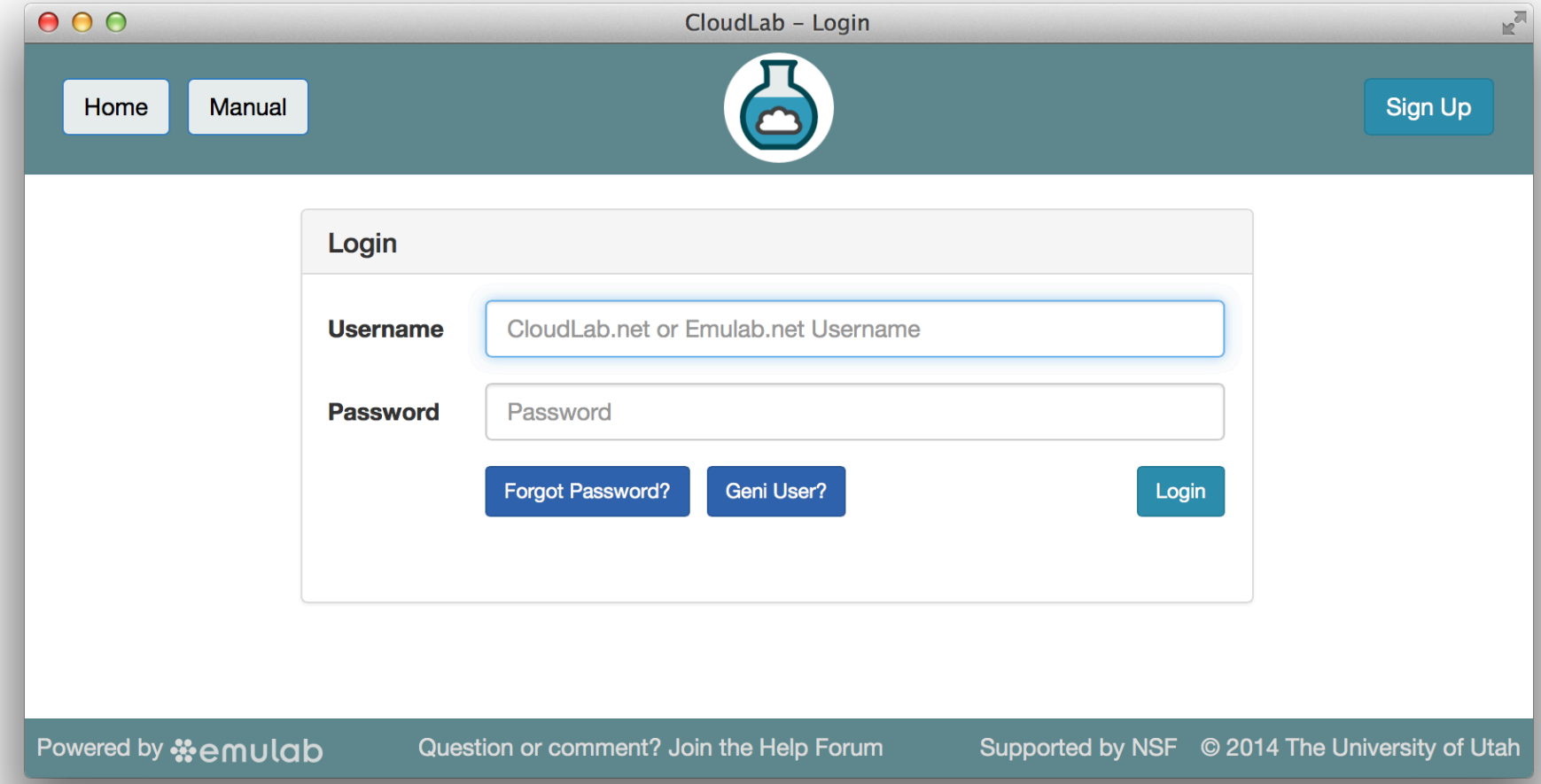
- Built on Emulab and ProtoGENI
- Provisions, then gets out of the way
  - "Run-time" services are optional
- Controllable through a web interface and GENI APIs
- *Scientific instrument* for *repeatable research*
  - Physical isolation for most resources
  - *Profiles* capture everything needed for experiments
    - Software, data, and hardware details
    - Can be shared and published (eg. in papers)



Federated with GENI

- *CloudLab can be used with a GENI account*
- GENI Racks around the country
- Programmable wide-area network
  - Openflow at dozens of sites
  - Connected in one layer 2 domain
- Large clusters (100s of nodes) at several sites
- Wireless and mobile
  - WiMax at 8 institutions
  - LTE / EPC testbed ("PhantomNet") at Utah
- International partners
  - Europe (Fed4FIRE), Brazil, Japan

Demo


CloudLab – Login
Home
Manual
Sign Up
Login
Username
CloudLab.net or Emulab.net Username
Password
Password
Forgot Password?
Geni User?
Login
Powered by emulab
Question or comment? Join the Help Forum
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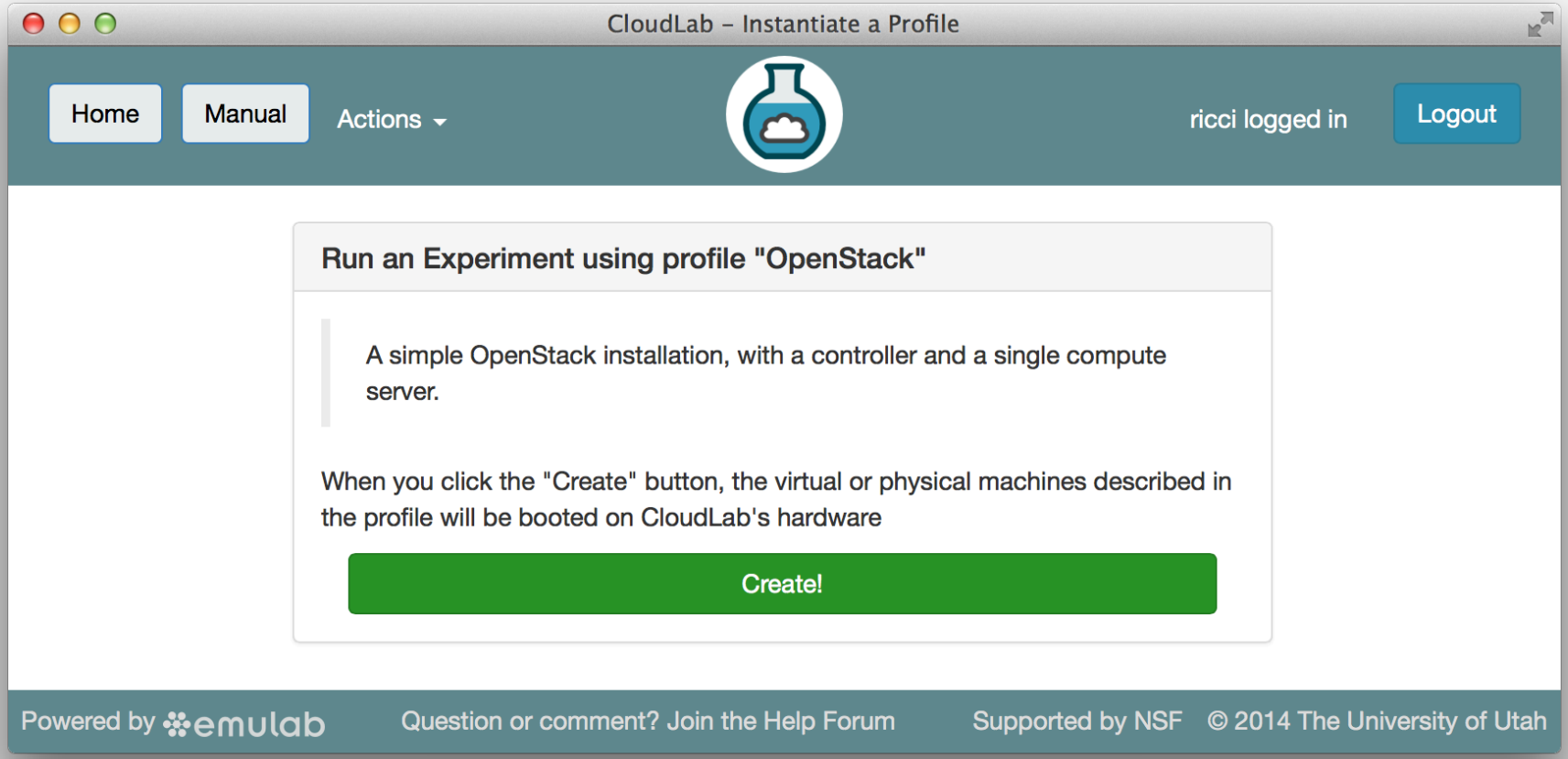
CloudLab – Instantiate a Profile
Home
Manual
Actions
ricci logged in
Logout
Run an Experiment using profile "OpenStack"
A simple OpenStack installation, with a controller and a single compute server.
When you click the "Create" button, the virtual or physical machines described in the profile will be booted on CloudLab's hardware
Create!
Powered by emulab
Question or comment? Join the Help Forum
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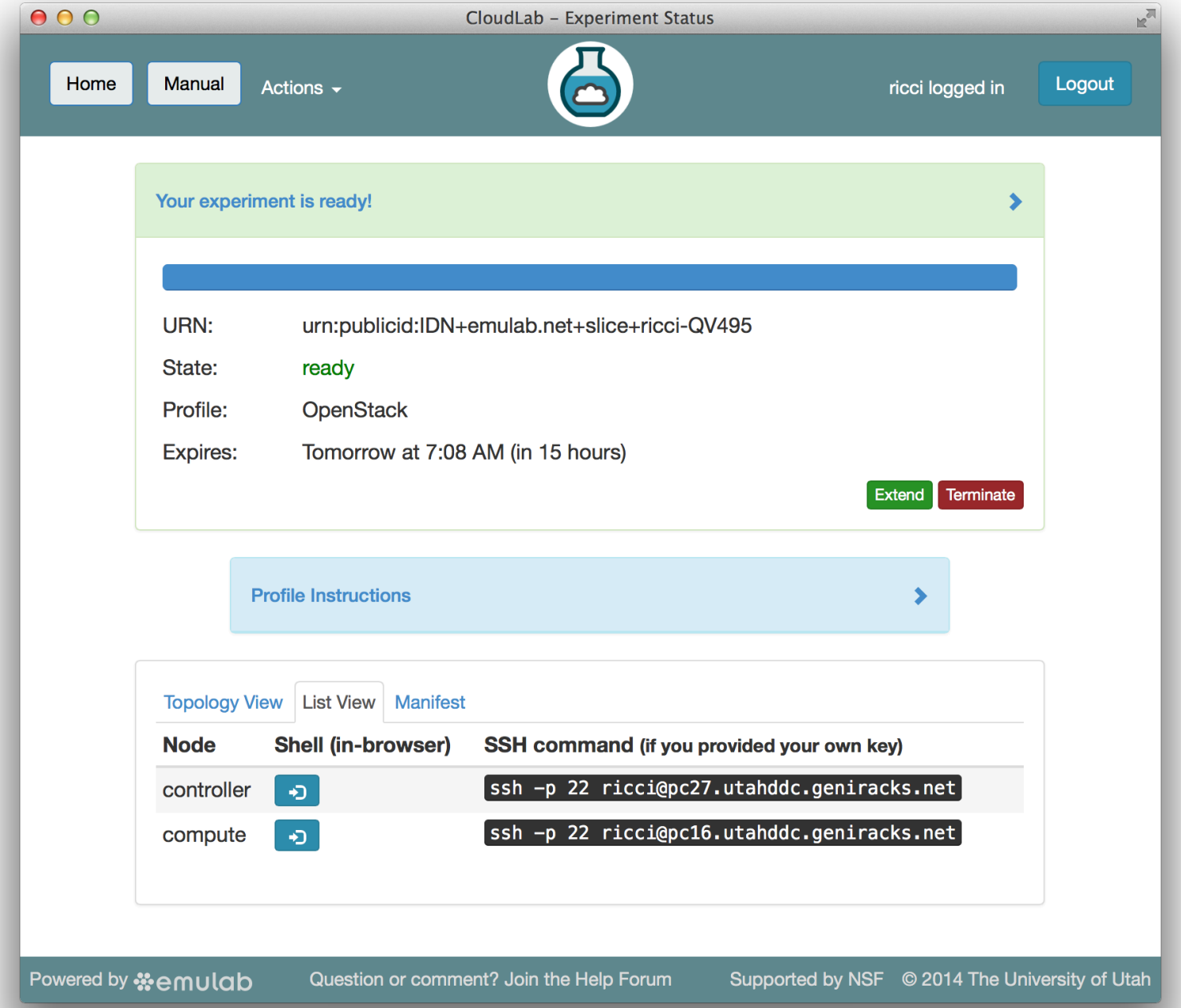
CloudLab – Experiment Status
Home
Manual
Actions
ricci logged in
Logout
Your experiment is ready!
URN: urn:publicid:IDN+emulab.net+slice+ricci-QV495
State: ready
Profile: OpenStack
Expires: Tomorrow at 7:08 AM (in 15 hours)
Extend
Terminate
Profile Instructions
Topology View
List View
Manifest
Node
Shell (in-browser)
SSH command (if you provided your own key)
controller
ssh -p 22 ricci@pc27.utahddc.geniracks.net
compute
ssh -p 22 ricci@pc16.utahddc.geniracks.net
Powered by emulab
Question or comment? Join the Help Forum
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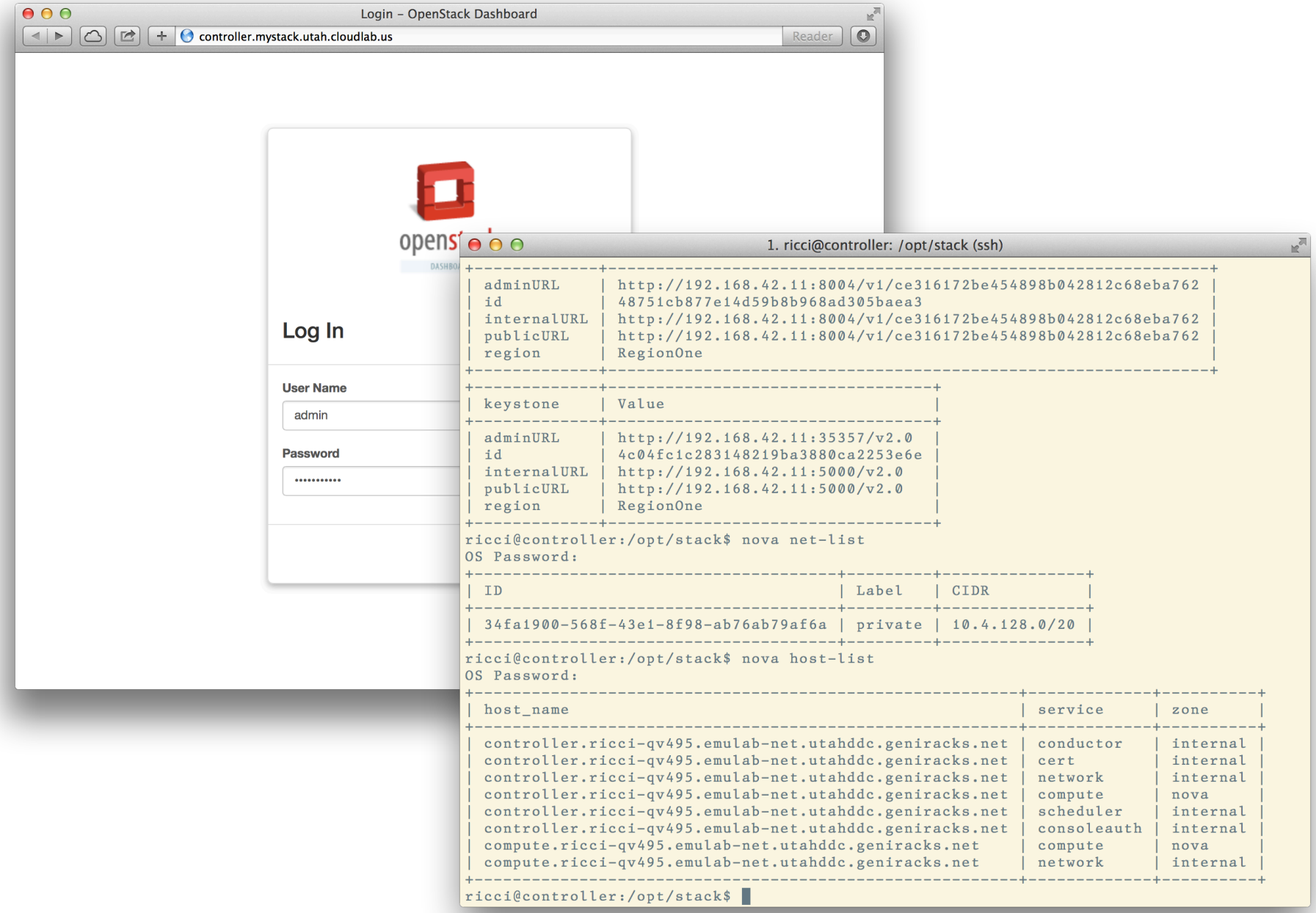
Login – OpenStack Dashboard
controller.mystack.utah.cloudlab.us
Reader
Log In
User Name
admin
Password
1. ricci@controller: /opt/stack (ssh)
adminURL	http://192.168.42.11:8004/v1/ce316172be454898b042812c68eba762
id	48751cb877e14d59b8b968ad305baea3
internalURL	http://192.168.42.11:8004/v1/ce316172be454898b042812c68eba762
publicURL	http://192.168.42.11:8004/v1/ce316172be454898b042812c68eba762
region	RegionOne
keystone	Value
adminURL	http://192.168.42.11:35357/v2.0
id	4c04fc1c283148219ba3880ca2253e6e
internalURL	http://192.168.42.11:5000/v2.0
publicURL	http://192.168.42.11:5000/v2.0
region	RegionOne
ricci@controller:/opt/stack$ nova net-list
OS Password:
ID	Label	CIDR
34fa1900-568f-43e1-8f98-ab76ab79af6a	private	10.4.128.0/20
ricci@controller:/opt/stack$ nova host-list
OS Password:
host_name	service	zone
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	conductor	internal
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	cert	internal
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	network	internal
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	compute	nova
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	scheduler	internal
controller.ricci-qv495.emulab-net.utahddc.geniracks.net	consoleauth	internal
compute.ricci-qv495.emulab-net.utahddc.geniracks.net	compute	nova
compute.ricci-qv495.emulab-net.utahddc.geniracks.net	network	internal
ricci@controller:/opt/stack$

NSFCloud Workshop

- Learn about both NSFCloud projects
- Influence their evolution
- December 11-12, Arlington, Virginia
- Whitepapers due **October 31**
- http://www.chameleoncloud.org/NSFCloudWorkshop/

use your GENI account

Learn more, ~~sign up:~~

www.CloudLab.us

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