



ANN DOYLE ON  
BEHALF OF SHEL  
WAGGENER

-----  
Director, Global Programs

CUDI MEETING  
OCTOBER, 2013

**Technology Leadership:**

**The Role of NRENs and  
Chief Information  
Officers in the Cloud**

Gracias por la invitación. Es un placer participar en esta importante reunión con ustedes y poderles presentar que esta tomando lugar en Internet2. Gracias a Carlos y a CUDI por la oportunidad de estar aquí y en colaboración con CUDI, esperamos que varias de las cosas que voy a mencionar puedan ser de utilidad para ustedes y sus universidades.

## About Shel



- Senior Vice President of Internet2
- 20 Years in private sector – Sybase, Octel, Lucent
- CIO of the INS Division at Lucent from 1998-2003
- UC Berkeley 2003-2005 to build Research Computing CIO from 2005-2012
- Past Board Member, Quali Foundation, Quali Ready, InCommon, Scholarship Foundation

## About Me



- Direct Global Programs
- Launched and Directed Arts & Humanities Initiative
- Launched and Directed Teaching and Learning Initiatives
- Masters Degree in Higher Education Administration, University of Michigan
- Singer/songwriter in my other life

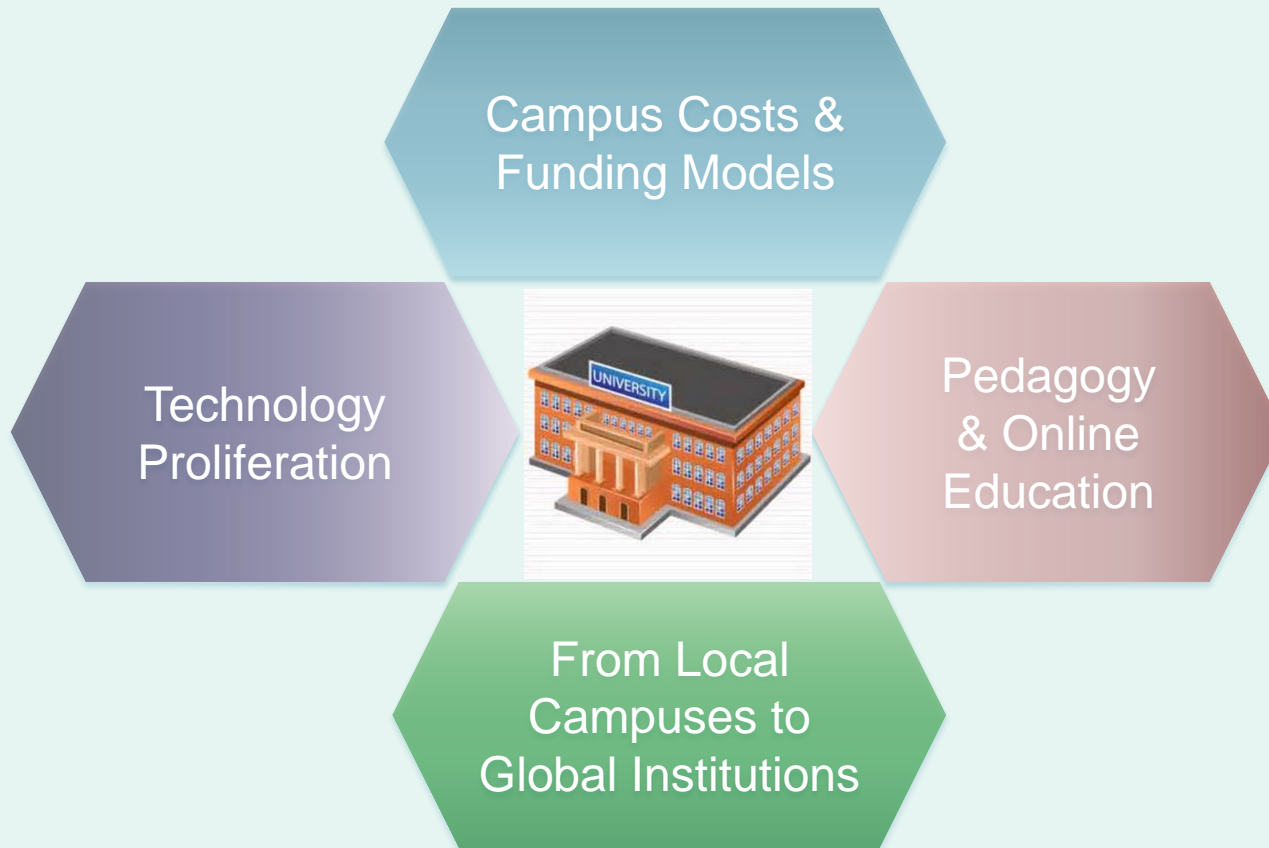
4+  
Years  
Ago

# Above-Campus Services Shaping the Promise of Cloud Computing for Higher Education

*by Brad Wheeler and Shelton Waggener*

*Illustration by Randy Lyhus ©2009  
EDUCAUSE Review, Nov/Dec 2009*

# Recognize Change – In every direction



*"This is a tsunami...  
The potential upside for this experiment is so big that it's hard for me to imagine any large research university that wouldn't want to be involved."*

*—Richard DeMillo,  
Director, Center for 21<sup>st</sup>  
Century Universities*



# Cloud Technology Proliferation

## Prepare your campuses community for cloud services by:

- Share experiences, learn from experiences of others
- Take part in exploring and validating solutions
- Learn methodologies, best practices and get help with training and development
- Leverage trusted identity solutions



**Be prepared for online education which WILL impact your campuses. Change from being technology plumbing to being technology partner:**

- Compete with a new breed of online providers
- Implement new higher education solutions more quickly, more easily and with lower risk
- Offer courses and services to broader national and international markets

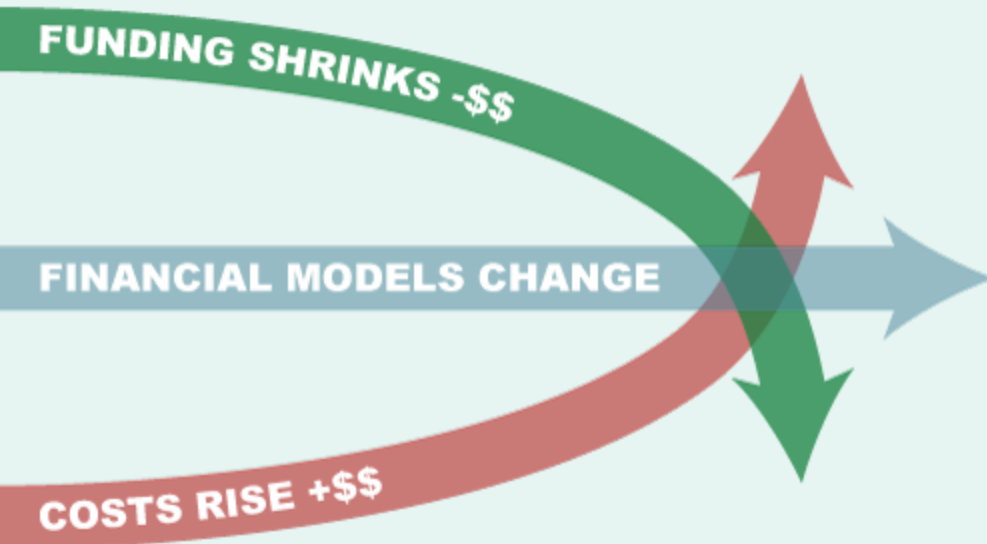




## Campus Costs & Funding Models

### Work across campuses, institutions, nations to align with peer institutions

- Secure best-in-class pricing
- Obtain *customized*, not just *commodity* services
- Eliminate redundant admin/legal costs and efforts
- Mobilize our considerable ingenuity and clout to create our own solutions



*“The cloud computing market will top \$241 Billion in 2020.”*

*—Forrester Research 2012, “Sizing the Cloud”*



## The Cloud (and campuses and learners) will think and act Globally. Local matters – when connected globally.

- Leveraging National Research and Education Networks and international exchange facilities for global connections
- Offering courses and services to broader national and international markets
- Extending services throughout global R&E community with minimal investment but significant increase in benefit
- Leveraging connections throughout community for more efficient, effective solutions

**Globalization  
Is a Reality in  
Education &  
Research**

### *Global Cloud Working Group*

Volunteer charter member National R&E networks representing Europe, Americas, Asia-Pacific, dedicated to the widespread adoption of federated cloud services that benefit the global R&E community

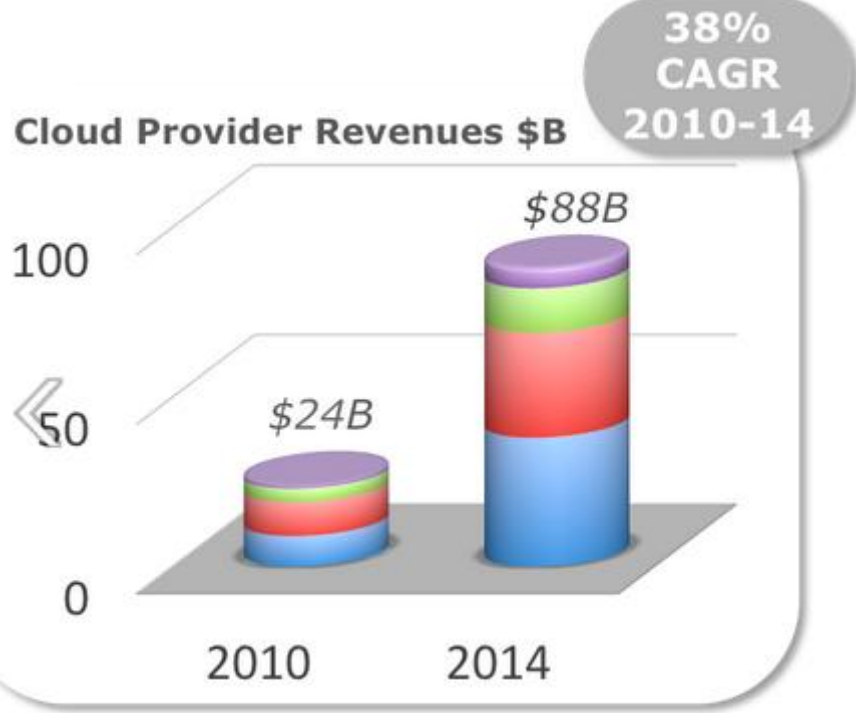
Why does cloud matter?

Because it will coexist  
with traditional  
education.

Is your IT team ready?

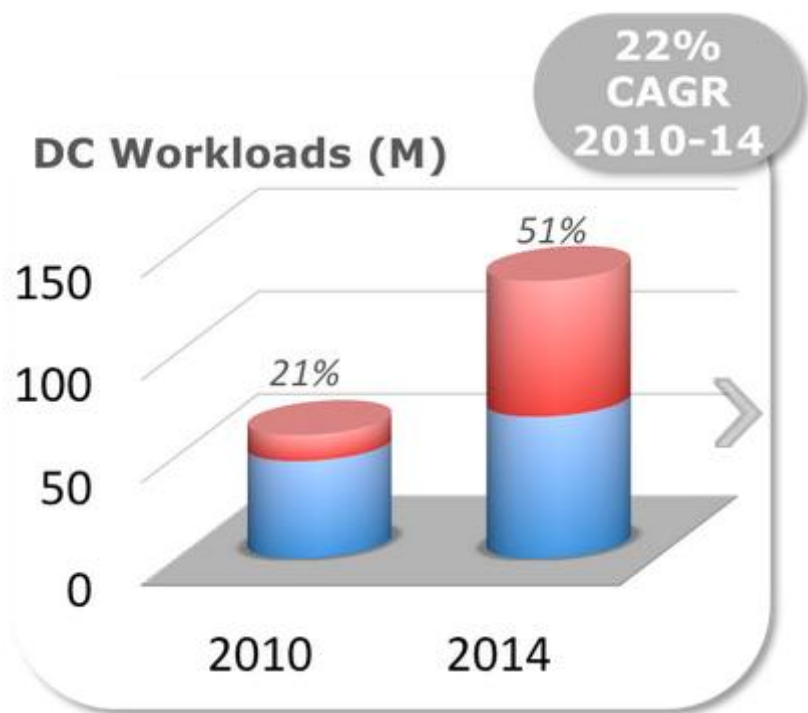


# Yes, the Cloud Market is Growing...



■ VPC ■ SAAS ■ IAAS ■ PAAS

Source: IDC, Gartner, Analysys Mason, Forrester, Cisco



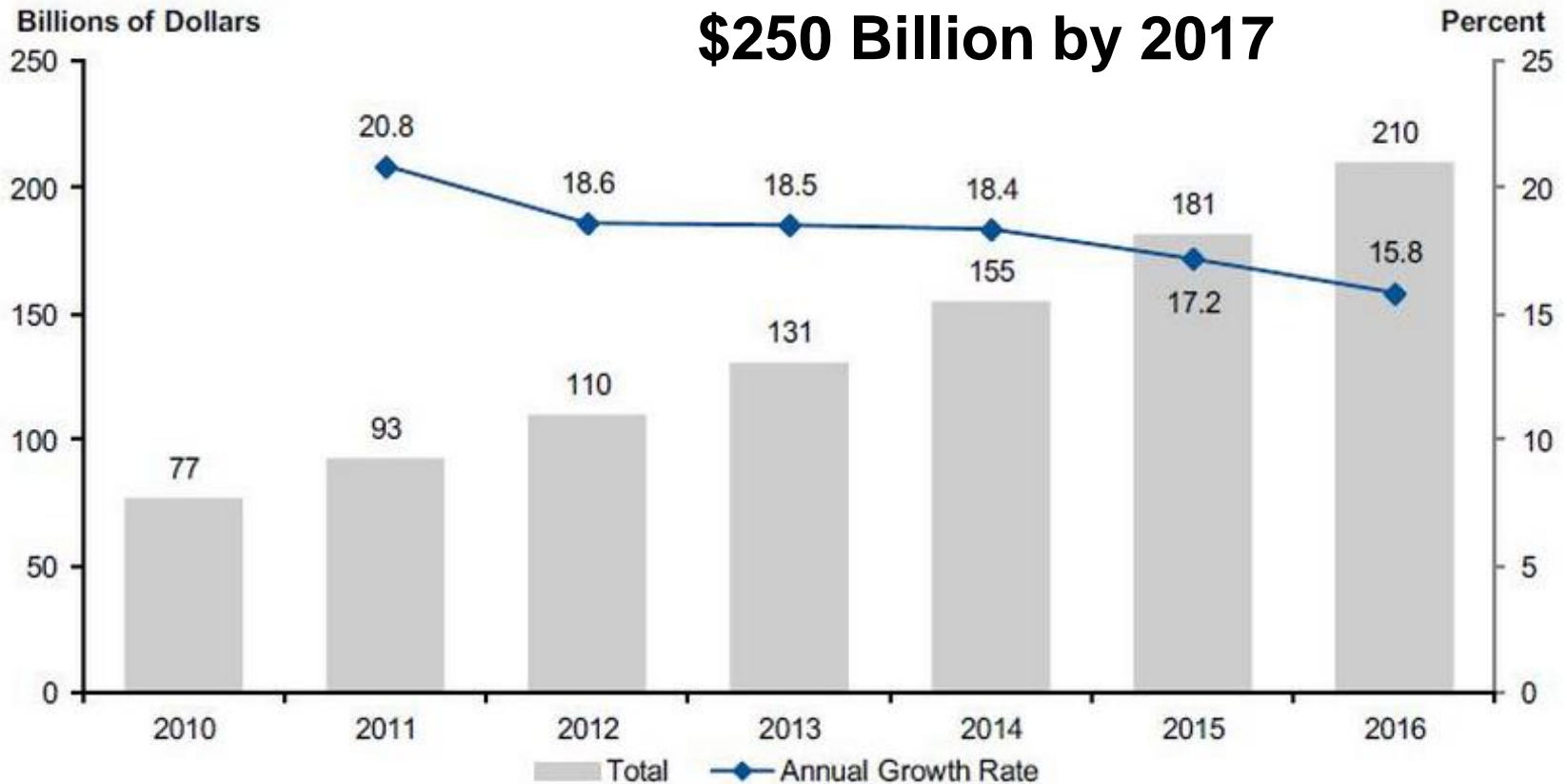
■ Traditional DC ■ Cloud

Source: Cisco Cloud Index 2011




# And growing ...

Public Cloud Services Market and Annual Growth Rate, 2010-2016



Source: Gartner (February 2013)



**IT has often  
operated as a  
craft...**



**Unfortunately its  
HARD to do IT (as a  
craft) at SCALE.**

# The Craft of Traditional IT

**Project Delivery Approach**

**Waterfall**

**Software QA / Testing**

**Mostly manual with little automation**

**Release Frequency**

**Two major, two minor per year**

**Downtime during releases**

**36-48+ hours per release**

**Release Deployments**

**Manual activities on weekends**

**Support model**

**Traditional Application Support approach**



# The Future of Agile IT Leveraging Cloud



360 degree view

Take steps knowing impact to all involved



Approach

Step by step approach with checkpoints



Automated processes

Improvement through automation



Awareness

Educate your teams on what is possible



Measure

Develop & use SMART metrics



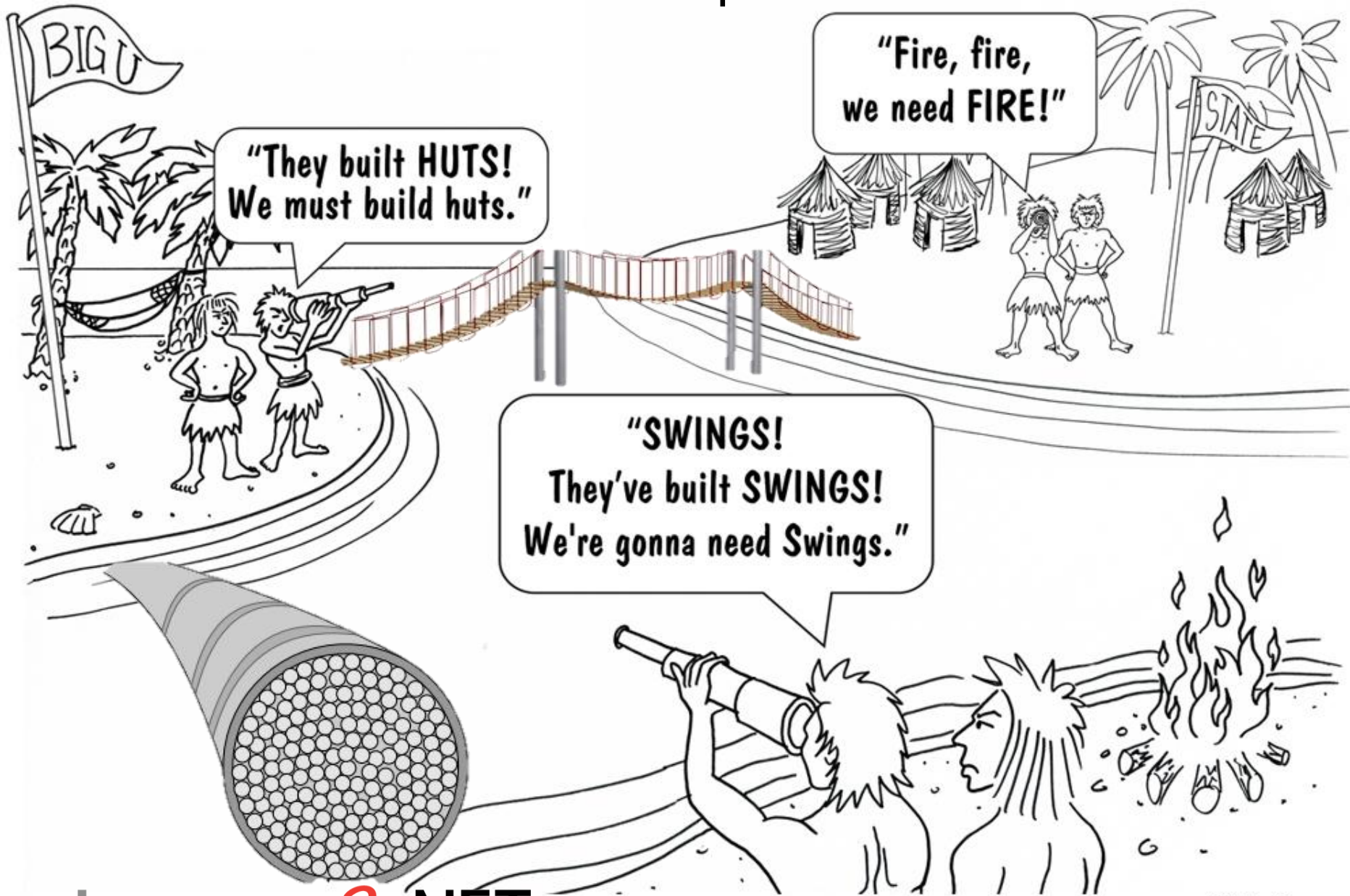
Teamwork

Involve all teams required for successful change

# Cloud and Custom environments can coexist



# But we MUST AVOID Duplication



# Internet2 100G infrastructure topology



20 – 10/2/2013, © 2012

Internet2

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## Criteria for consideration of NET+ Providers

- Can the services scales at least nationally?
- Can it be delivered over global R&E networks?
- Develop a business model that scales globally and serves significant portion of community?
- Will provider work with community to meet unique R&E needs today and into the future?
- Adopts R&E federated identity standards?
- Commits to community's Security, Privacy, Compliance, and Accessibility needs?



# The Global NET+ Program Charter

“Dedicated to the widespread adoption of *federated cloud services* that benefit the global research and education community. In partnership with those we serve, the NET+ provides simple, consistent and streamlined access to highest value cloud services, offered at the best possible terms and conditions, to all participating institutions.”

# Internet<sup>2</sup>NET+

## **What it is not**

a buyer's club

a marketing system where providers  
sell to higher education  
primarily about price

a one-way street

driven by one campus, country,  
NREN or provider

delivered over unreliable  
networks

## ***What it is***

*services tailored for R&E, with  
special pricing and business terms  
a process where providers help  
shoulder the risk as partners*

*primarily about delivering value to  
both higher ed and providers*

*a collaboration to increase rewards  
and reduce overhead*

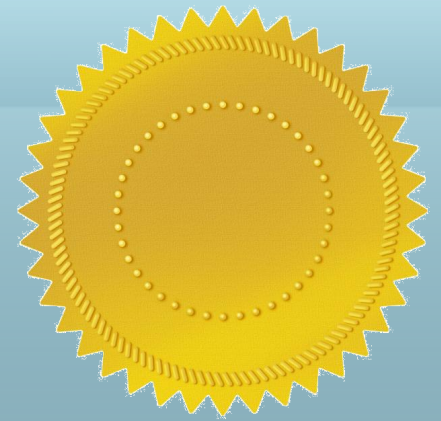
*driven by the real needs of research  
universities to benefit all*

*delivered over the most advanced  
networks around the world*

# Trusted Identity in Education

*Community-developed identity and access management framework of trust enables:*

- Secure, streamlined sharing of protected resources
- Consolidated management of user identities and access
- Delivery of an integrated portfolio of community-developed solutions



The standard for over 500 higher education institutions—and counting!

**InCommon**<sup>®</sup>



**Shibboleth**<sup>®</sup>



**Grouper**<sup>™</sup>

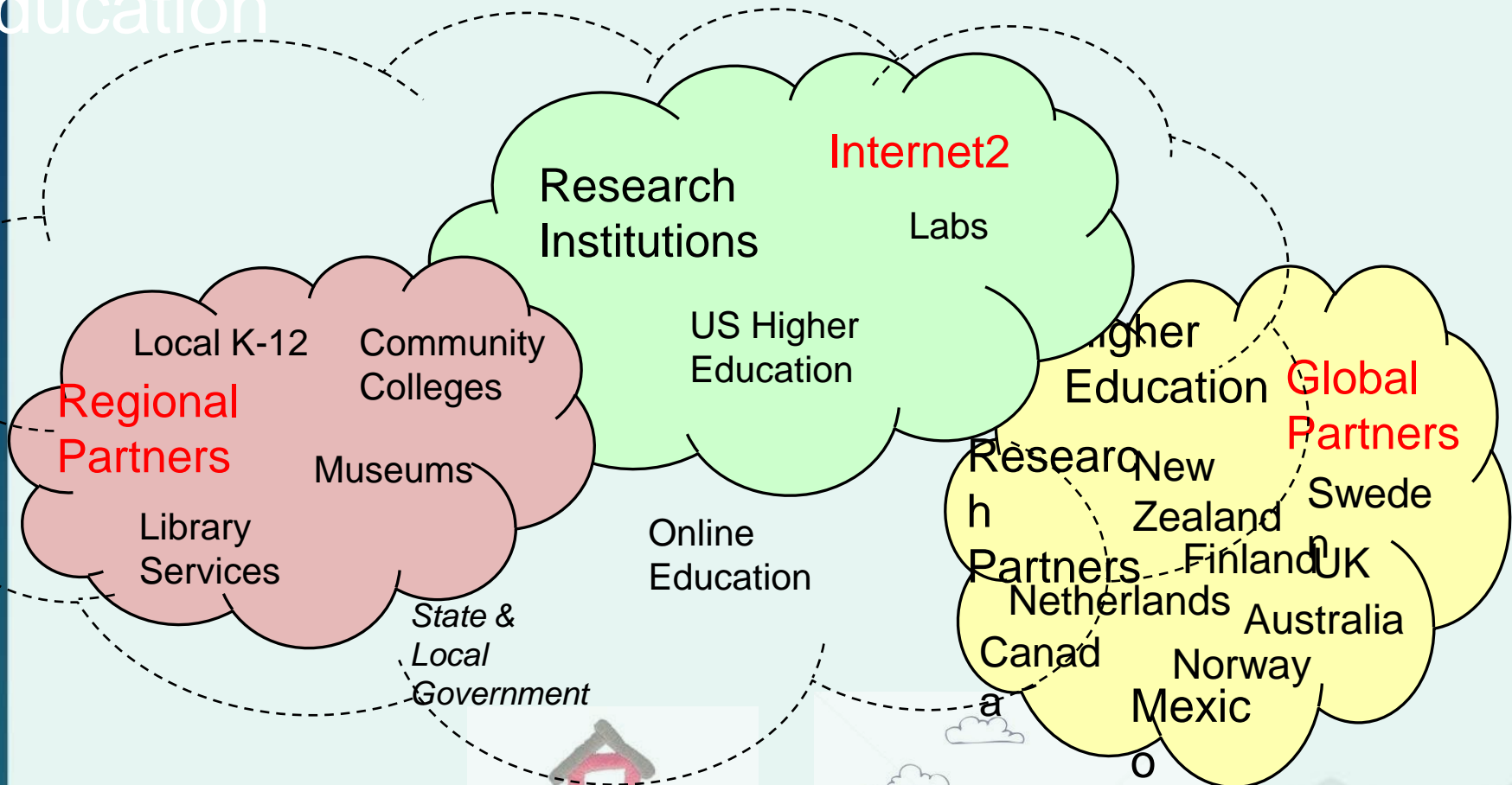


**COmanage**<sup>™</sup>

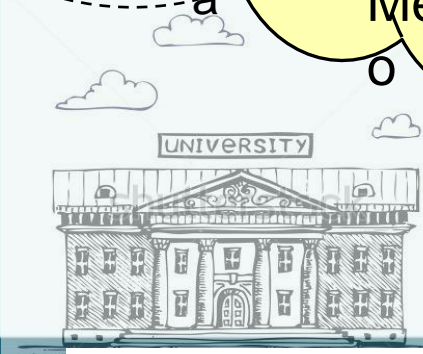
**INTERNET**  
*2*



# The Community: Global Research and Education



Internet **2** NET+



# Range of Services – Consolidated Process & Delivery



**Identity &  
Access  
Management**



**Infrastructure,  
Platform,  
Security**



**Software  
as a  
Service**



**Video,  
Voice and  
Collaborations**



**Digital  
Content for  
R&E**

**Delivered via next-generation, high-speed R&E global networks**

**Built on federated identity and integration architectural standards**

**Administered via global agreements, contracts and provisioning**

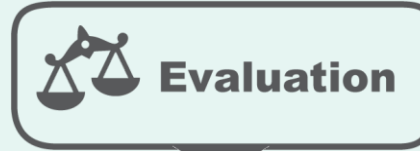
# Cloud Service Lifecycle

*Sponsorship by*  
Internet2 members

*Subscription by*  
members and through  
regional and global partners  
to qualified entities

*Designed by*  
participating campuses,  
providers and Internet2

All delivered at global scale,  
tailored to R&E needs, and  
benefitting all participating  
institutions.



# Internet<sup>2</sup>NET+







cloud service  
lineup expands

**18 services**

**34 services**

 **Research  
Incubator**

Spring 2012	Spring 2013
2	1

	Spring 2012	Spring 2013
 <b>Inquiry</b>	(NA)	2+
 <b>Evaluation</b>	(NA)	7
 <b>Service Validation</b>	6	14
 <b>Early Adopter</b>	8	6
 <b>General Availability</b>	2	4
 <b>Sunset</b>	(NA)	0

# Growing Ecosystem of NET+ Services & Providers



*"We are seeing the...emergence of a meta-university—  
a...dynamic, communally constructed framework of open materials and platforms on  
which much of higher education worldwide can be constructed or enhanced."*

*—Charles M. Vest, President Emeritus, MIT*

# Cloud Success takes more than technology



**CHANGE MANAGEMENT**

**COMMUNITY**

**INTEGRATION**

**TEMPLATES**

**POSITION DESCRIPTIONS**

**SKILLS**

**BEST PRACTICES**

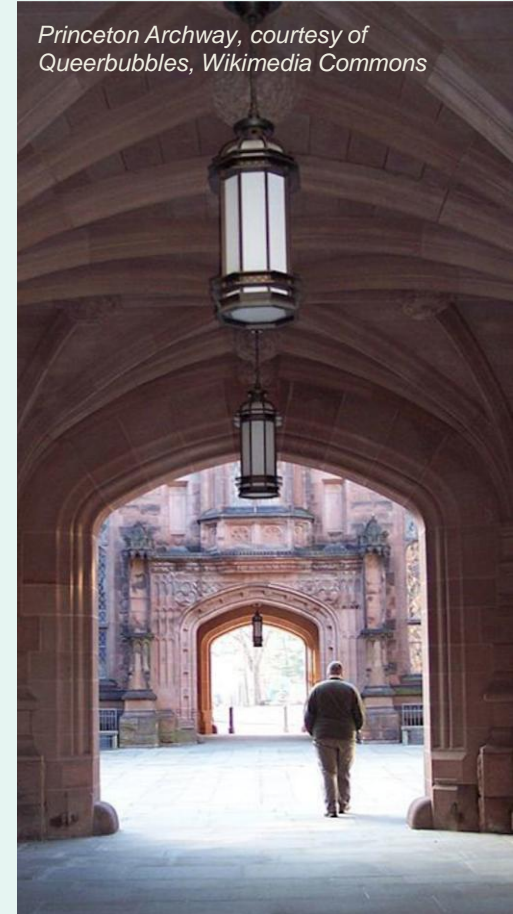
**REPOSITORIES**

**TRAINING: RISK CONTRACTS**

**DEVELOPMENT: CLOUD ELEMENTS**

# How can campuses prepare for the cloud?

- 1 Create campus strategy for internal and external cloud services
- 2 Shift from culture of central control to one of sharing, reuse, and value-added differentiation
- 3 Evaluate Internet2 NET+ portfolio, examine *your* portfolios, consider which projects could benefit from NET+ scale
- 4 Develop campus identity solution built on open standards
- 5 Support service competition choices—*but constrained, not unlimited choices*
- 6 Start implementing cloud-ready language *now* in all contracts
- 7 Create “cloud first” culture by partnering with legal and procurement teams, restructuring internal processes and policies with the cloud in mind



# Examples and status of services



# Amazon Web Services

**Area:** Infrastructure, Platform, and System Security as a Service

**Solution:** Amazon Web Services

**Provider:** DLT Solutions and Amazon Web Services

**Sponsor:** University of Virginia



**DLT SOLUTIONS**



## Service Validation

### Status

- Aggregation and volume discounts
- User friendly self-service portal to provision services
- InCommon integration
- Network peering
- Pilot program to reduce data transfer costs

### Next Steps

Finalize business model and legal agreements

# Windows Azure

**Area:** Infrastructure Platform and System Security as a Service

**Solution:** Large data initiatives, such as genomics, can save on bandwidth charges, shifting those resources toward direct research-related activities.

**Provider:** Microsoft

**Sponsor:** University of Washington



**Microsoft®**



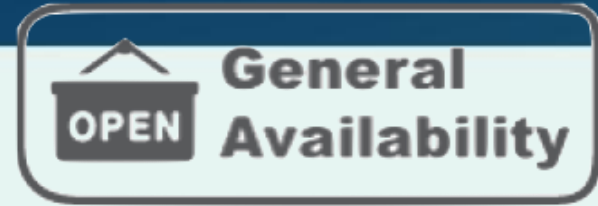
**Early Adopter**

## Status

- Participation is Open
- Internet2 membership not required
- InCommon participation required
- Open to all educational and research institutions

# Box

**Area:** Infrastructure, Platform, and System Security as a Service  
**Solution:** Storage and collaboration service  
**Provider:** Box  
**Sponsor:** University of California, Berkeley



## Status

- 40+ universities
- Network peering being upgraded to 10G
- First phase of accessibility development complete
- New pricing tiers for smaller schools

## Next Steps

Updated agreement & regional / global partner

# CrashPlan PROe

**Area:** Infrastructure, Platform, and System Security as a Service

**Solution:** Endpoint backup for faculty, staff, students

**Provider:** Code 42 Software

**Sponsor:** Multiple Universities



**Early Adopter**

## Status

- Service validation underway
- InCommon integration
- Network connection to Internet2 in progress
- Legal agreement under review
- Universities testing and deploying service already

## Next Steps

Finalize business model and contract to enable early adopter signups



CRASHPLANPRO<sup>e</sup>



**ASU**  
ARIZONA STATE  
UNIVERSITY



THE UNIVERSITY OF  
**TEXAS**  
— AT AUSTIN —

# DocuSign

**Area:** Trusted Identity in Education:  
Identity and Access Management

**Solution:** Electronic signature

**Provider:** DocuSign

**Sponsor:** Temple University



## Service Validation

### Status

- Service validation will kick-off in May
- InCommon integration planned
- Network connection being assessed
- Integrations with other NET+ services planned

### Next Steps

Develop customized business model



# Fuze

**Area:** Video, Voice, and Collaborations  
as a Service

**Solution:** HD Videoconferencing

**Provider:** FuzeBox

**Sponsor:** Saint Louis University

# FUZEBOX<sup>®</sup>



**Early  
Adopter**

## Status

- Early adoption underway
- Open to additional participants
- InCommon integration planned
- Network connection in progress

## Next Steps

Develop custom pricing  
and business model

# Office 365 Education

- Area:** Software as a Service: Academic, Research, and Administrative
- Solution:** Office desktop suite in the cloud and cloud productivity platform
- Provider:** Microsoft
- Sponsor:** Colorado State University and University of Florida



## Service Validation

### Status

- Customized contract
- Additional no-cost support options
- InCommon testing being planned
- Online community of practice site will be established

### Next Steps

Move to Early Adopter phase in next 2-3 months

# eduroam

- Area:** Trusted Identity in Education:  
Identity and Access Management
- Solution:** International Internet access for  
participating institutions
- Provider:** Internet2 and Anyroam
- Sponsor:** University of Tennessee Knoxville

THE UNIVERSITY of TENNESSEE   
KNOXVILLE



WISCONSIN  
UNIVERSITY OF WISCONSIN-MADISON



**Early  
Adopter**

## Status

- Open – Internet2 members and other non-member organizations
- NSF Grant requirements being fulfilled by Anyroam
- Participation and non-member pricing complete

## Next Steps

Finalizing Customer Agreement for full availability by Summer 2013



# A Global Community of collaborators

# Data Tsunami

## Physics

Large Hadron Collider

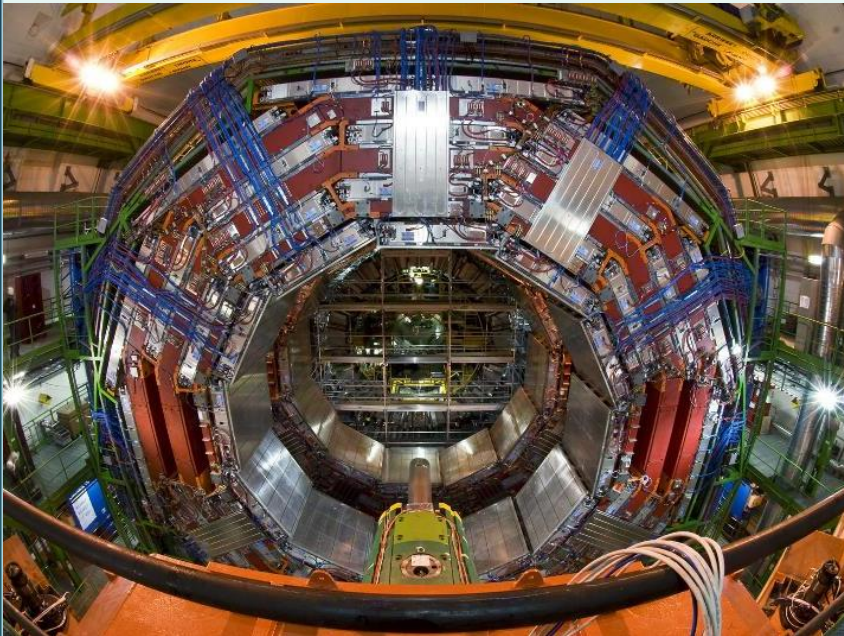


Image by: CERN

## Life Sciences

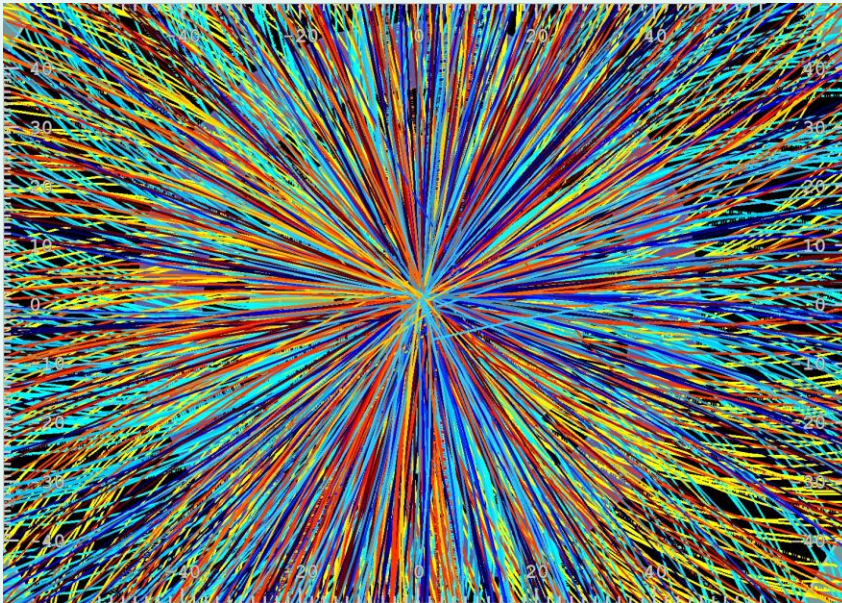
Magnetic Resonance Imager (MRI)



# Visualizing Big Data

## Physics

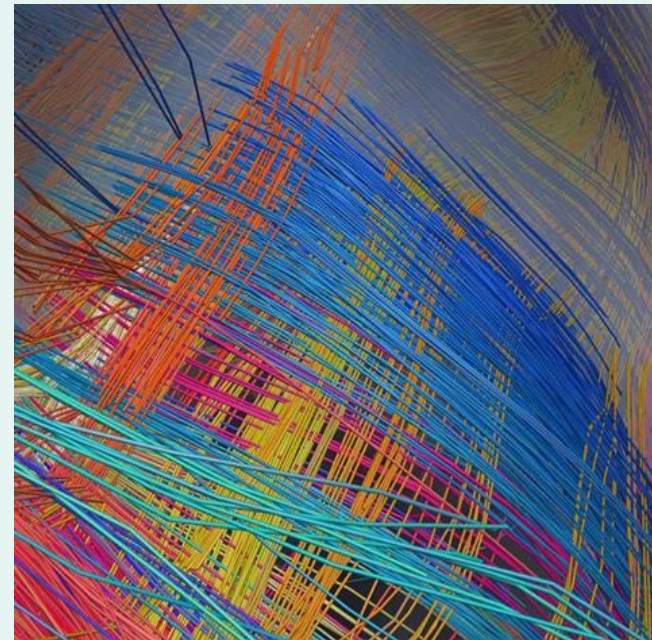
LHC – Lead Ion Collision



Source: CERN (ALICE detector)

## Life Sciences

MRI – Monkey Brain



Source: Van Wedeem, M.D., Martinos Center and Dept. of Radiology, Massachusetts General Hospital and Harvard University Medical School

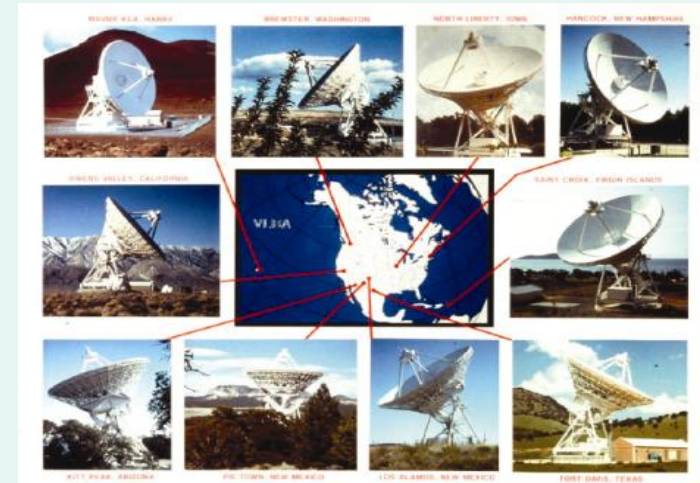
# NEES – Earthquake Research

- Remote control of computer simulations
- Video is crucial for conferencing and as scientific data
- Types of network usage:
  - Remote control of resources
  - Bulk data transfer and distributed data storage
  - Video as data



# VLBI

- Astronomers collect data about a star from earth based antennae.
- End goal is to send data at 1Gb/s from over 20 antennae located around the globe.



Types of network usage:

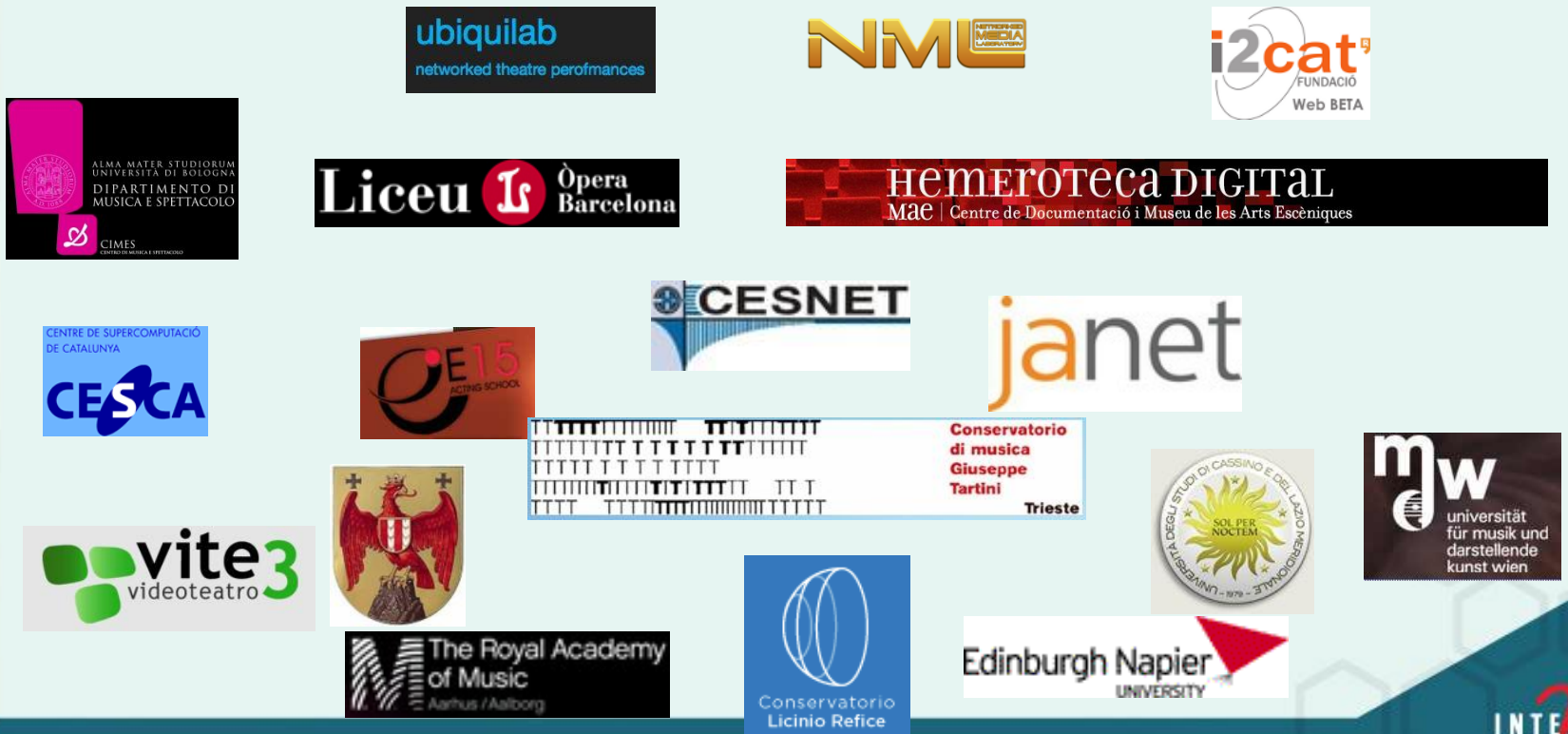
- Long time duration data streaming
- Distributed data storage, real-time dynamic retrieval, and distributed processing

## Key U.S. Arts & Humanities Members

- U.S. University Members – Departments of Music, Dance, Art, English, History etc.
- Affiliate Members –Library of Congress, the Smithsonian, The Philadelphia Orchestra, Manhattan School of Music, Cleveland Institute of Music, New World Symphony
- Corporate Sponsor/Members – Polycom Worldwide, Cisco systems

# Key participants in Europe

EU Universities – Departments of Arts, Literature, History, Music Conservatories, Arts Academies, Theaters, Museums, Libraries, Digital Archives, etc.



# Collections

- Smithsonian Institute and Internet2 partnership
  - 19 museums and galleries
  - The National Zoological Park
  - Nine research facilities
- USC Shoah Foundation Institute For Visual History and Education – 180 terabyte multimedia archive of Holocaust testimonies
- EVIA -- Ethnomusicology repository; 300 plus hours of digital video and metatdata



# Master Classes

## Active involvement...

- Cleveland Institute of Music
- Eastman School of Music
- Indiana University
- Manhattan School of Music
- New World Symphony
- Philadelphia Orchestra
- University of Michigan
- University of Southern California
  
- And many others.....



Michael Tilson Thomas



Pinchas Zukerman

**University of Trinidad & Tobago  
Northern Illinois University  
Janet (UK) offices**

**CKLN launch!!**





# LOLA

*LOW LATENCY AUDIO VISUAL STREAMING SYSTEM*

## The Dream...



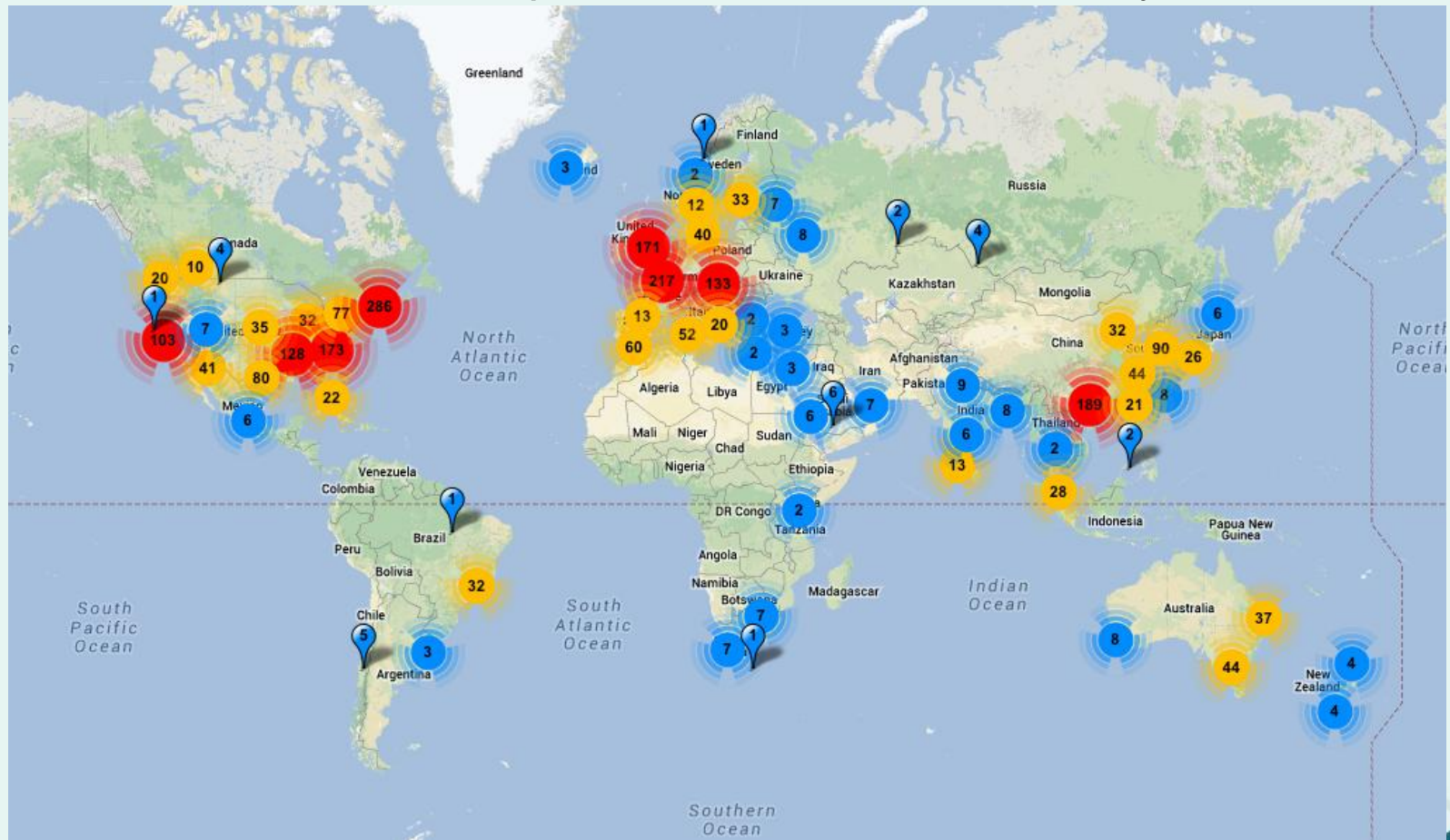
Violinist Marjorie Bagley, University of North Carolina. Greensboro  
Cellist Cheng-Hou Lee, Northern Illinois University (NIU)

# Key Health Science Members

- **112 Academic Medical Colleges (AAMC) and their medical centers**
- **130 Health Science related colleges**
  - Public Health, Nursing, Dentistry, Pharmacy
- **Affiliate Members**
  - NIH, NSF, NASA, NOAA, VA
  - Howard Hughes Medical Institute
- **Pharmaceutical Companies**
  - Johnson & Johnson
- **Industry**
  - Cisco, IBM, Microsoft, SUN, Polycom, and many more
- **Partnership with Health Information Management Systems Society (HIMSS)**

# Democratization of Sequencing

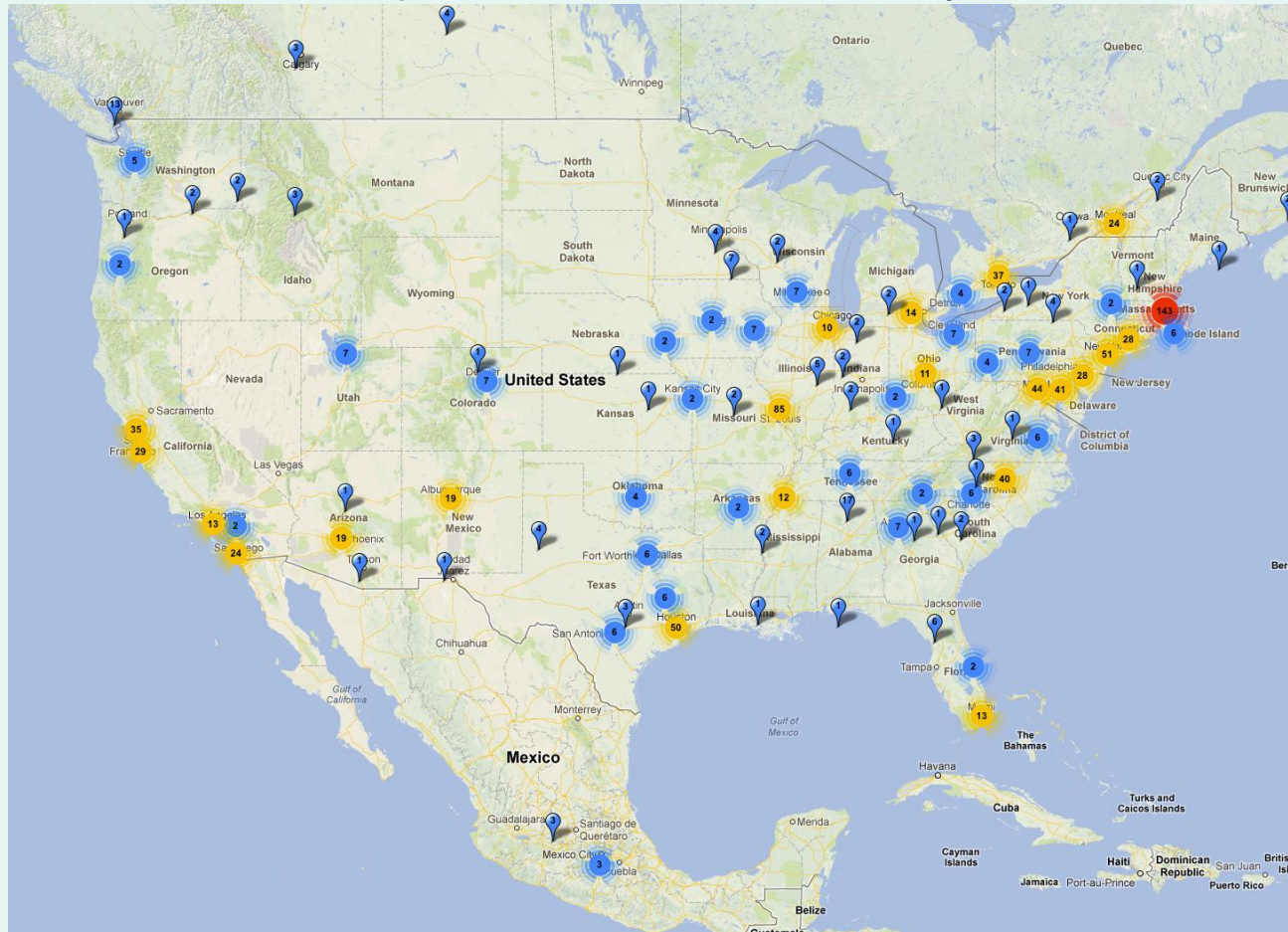
2,386 Genome Sequencers Worldwide – 30 May 2013



Source: [Map of High-throughput Sequencers](#)

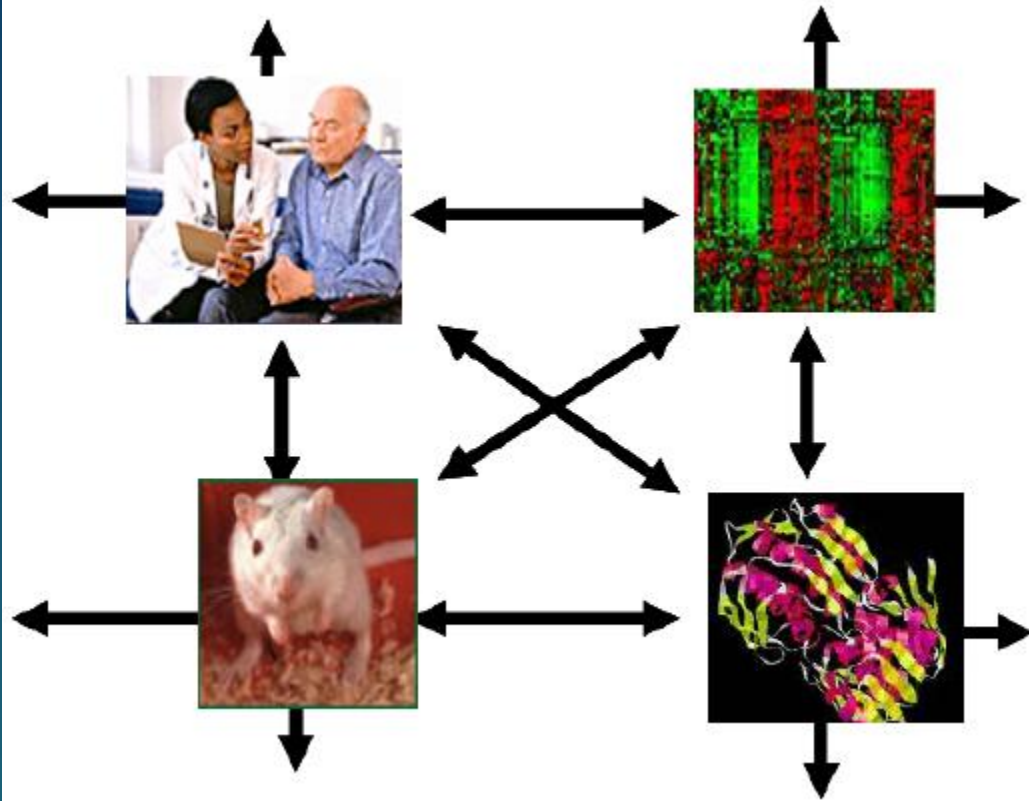
# North American Genome Sequencers

998 Sequencers in NA – 30 May 2013



Source: [Map of High-throughput Sequencers](#)

# Research Team of the Future: Cancer Biomedical Informatics Grid



- Global Cancer Research Community
- Grid deployment to Cancer Centers
- Bioinformatics infrastructure
- Public data sources

# Medical Education Challenges

