

The Changing Face of Cyberinfrastructure



Beyond Today's Internet: Experiencing a Smart Future

Mark Berman
mberman@bbn.com
www.geni.net



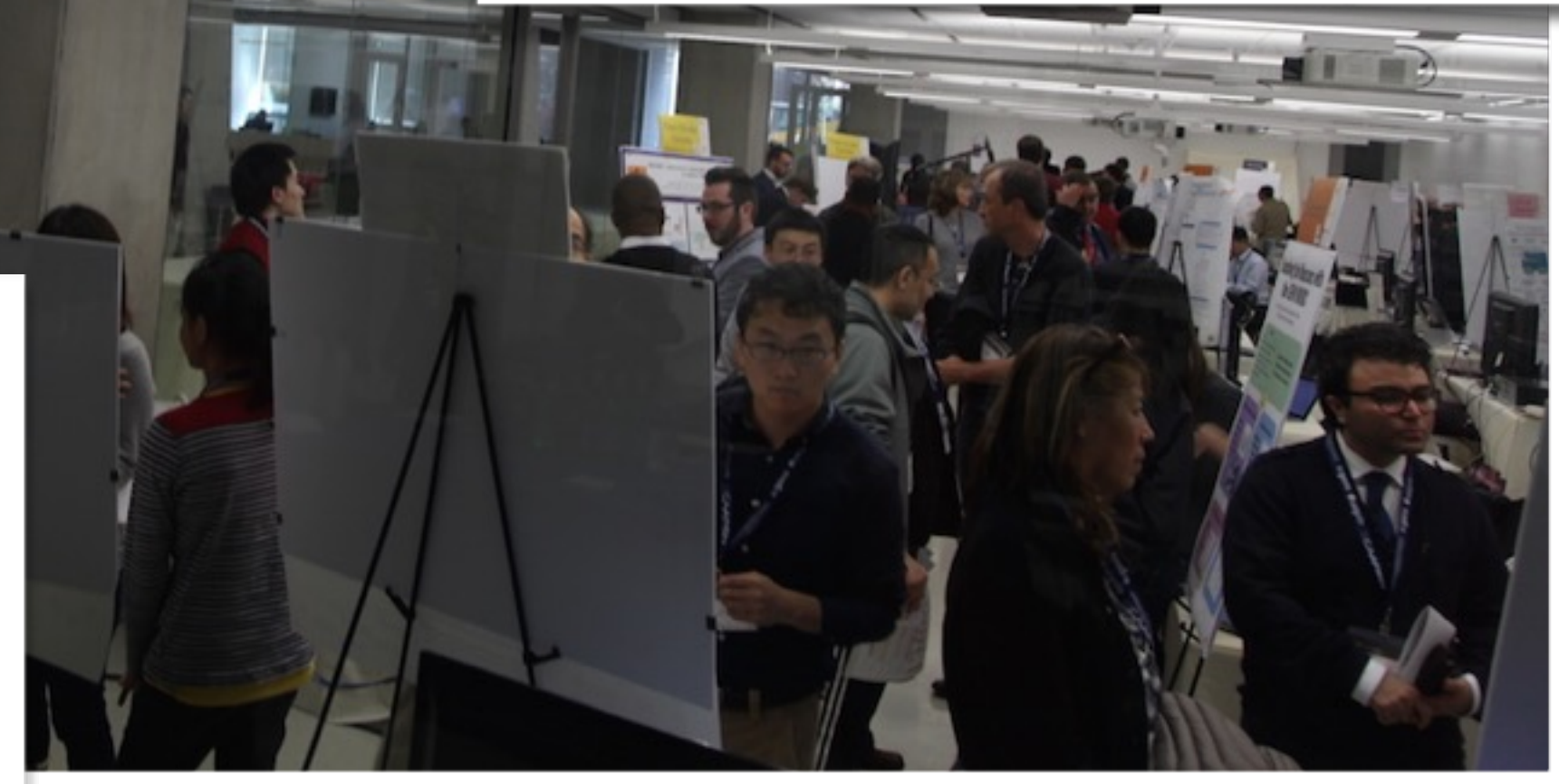
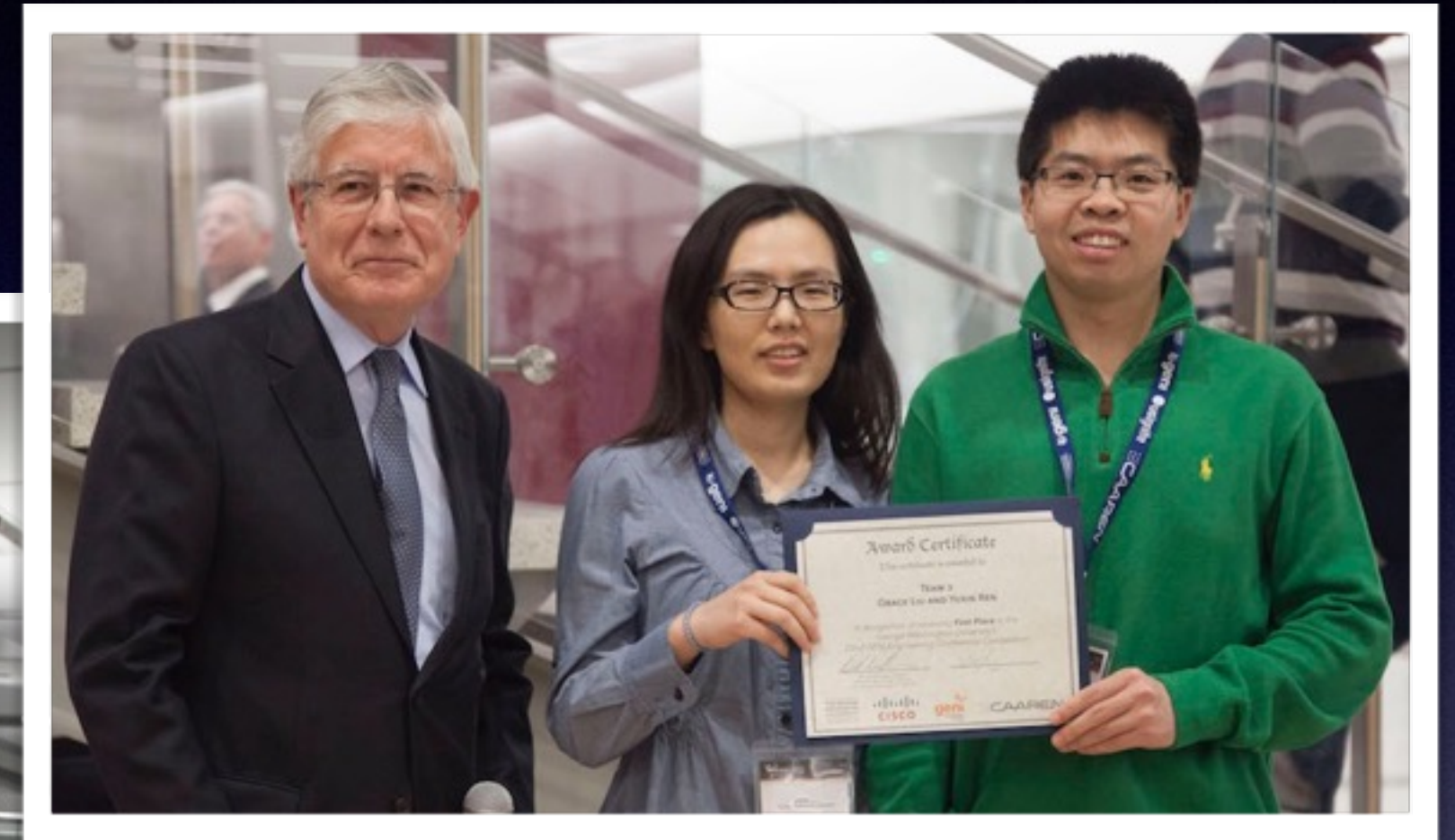
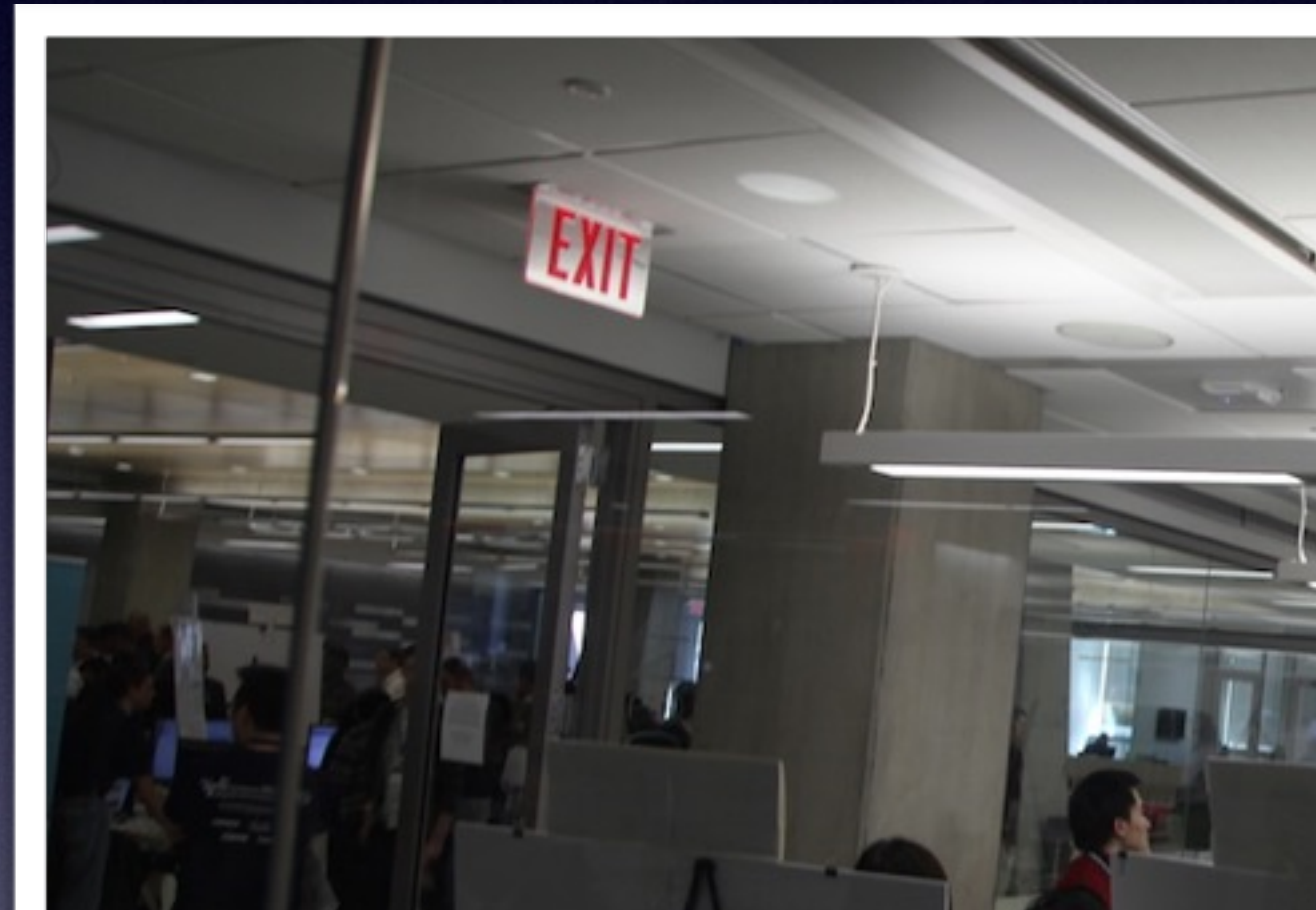
March 25, 2015



Thank You to Our Hosts!

George Washington University

- Tim Wood
- Brian Ensor
- Donald DuRousseau
- Andrew Gallo
- Angela McKinney
- Cynthia Spitzer
- Kara Gillespie



And Special Thanks



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Cyberinfrastructure Lives to Serve

All applications and services rely on cyberinfrastructure.

High performance applications and services need precision cyberinfrastructure

- The right resources
- In the right place
- Running the right software



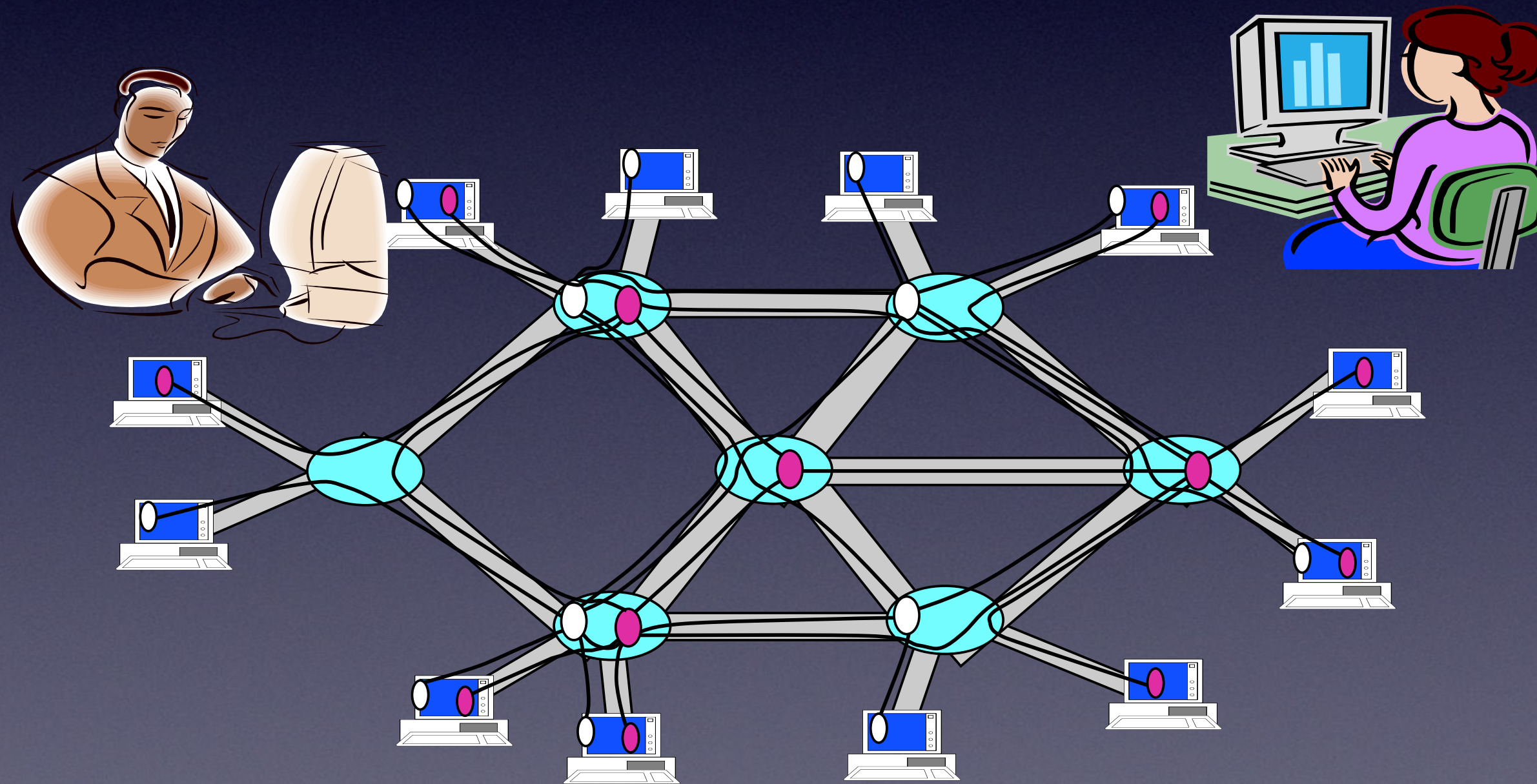
Two Key GENI Concepts

Install the software I want throughout my network slice
(into firewalls, routers, clouds. ...)

And keep my slice isolated from your slice, so we don't
interfere with each other

Deep
Programmability

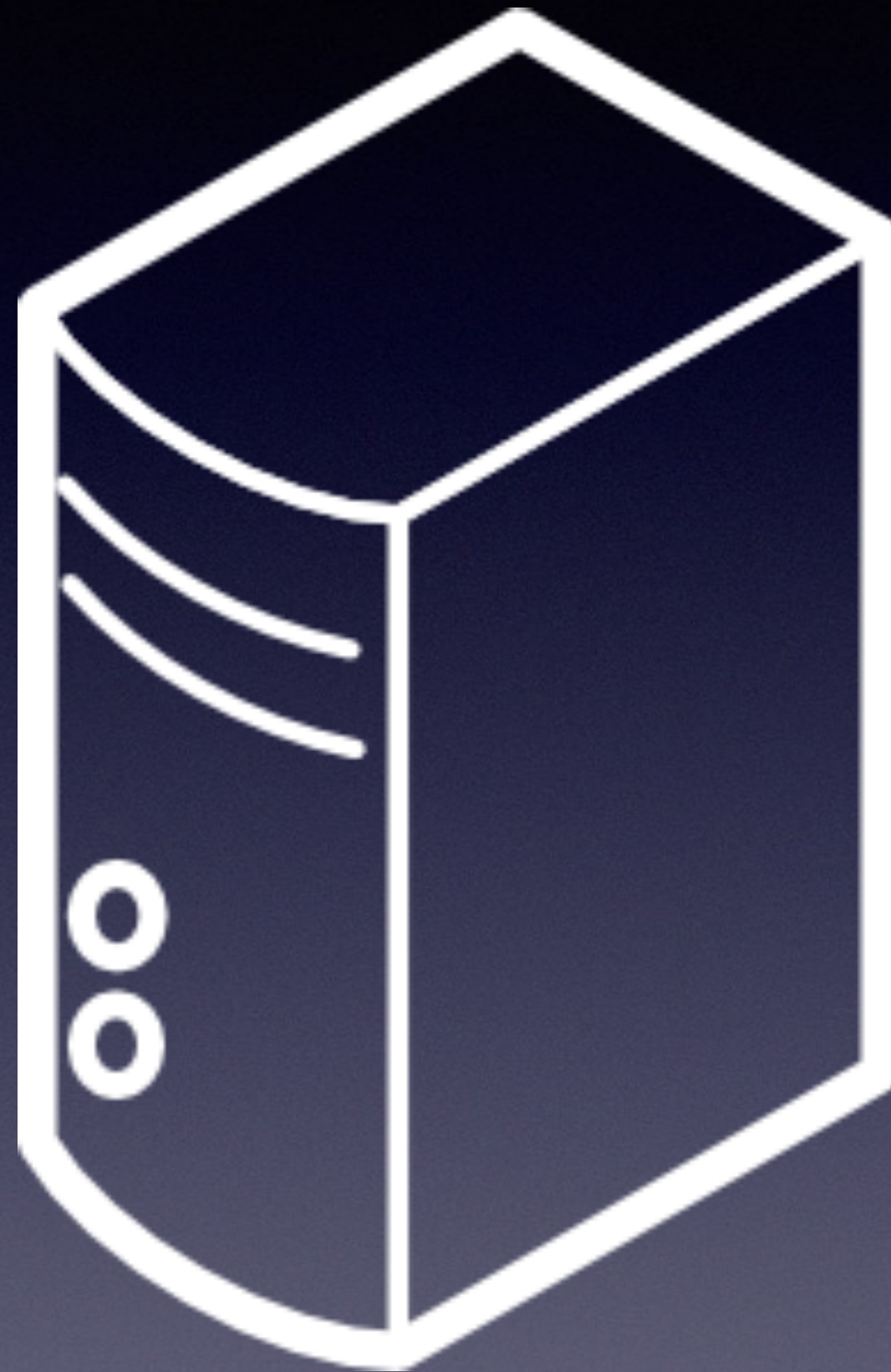
Slicing



We can run many different “future
Internets” in parallel.

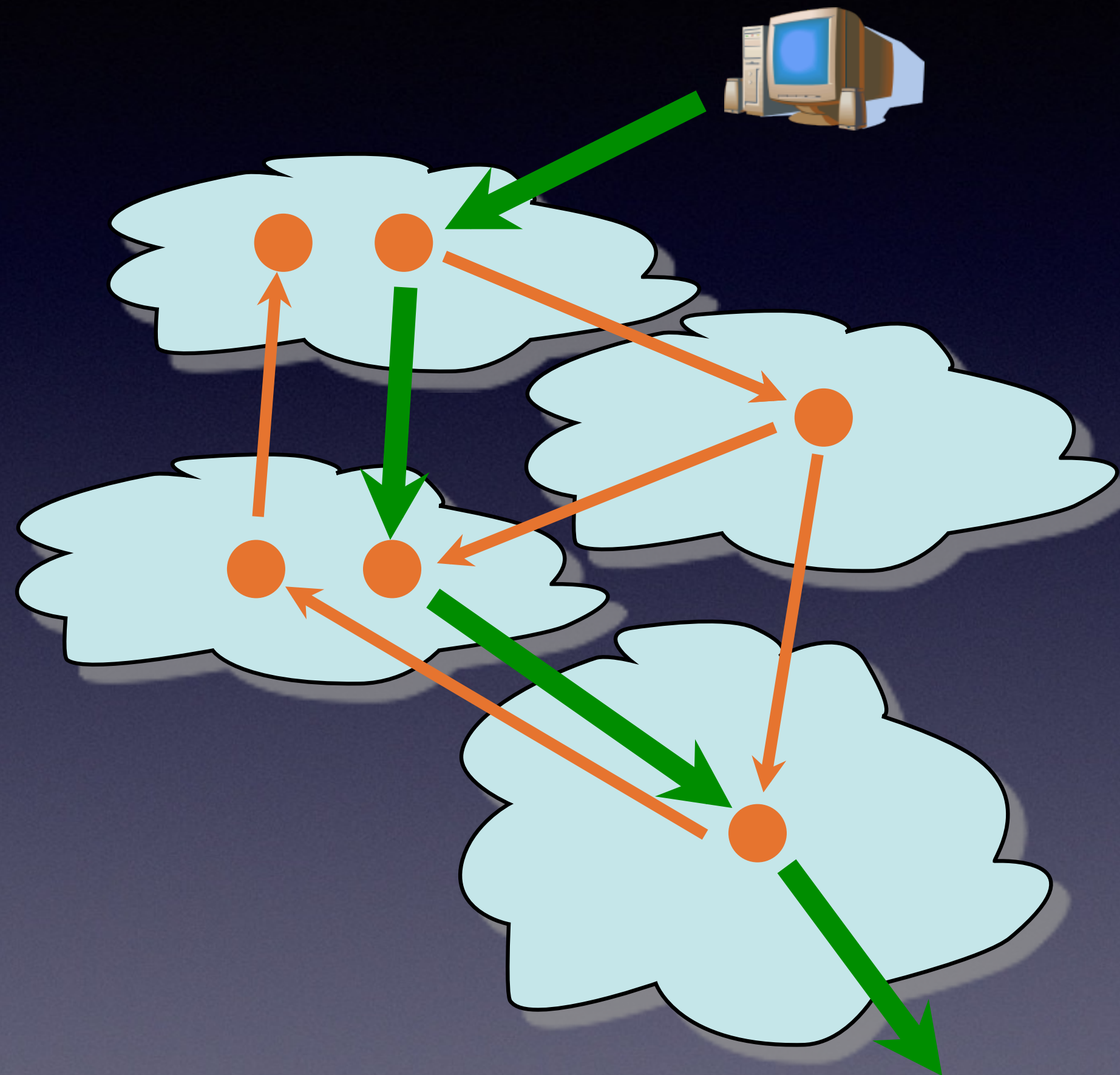
Program Everything

Program Everything



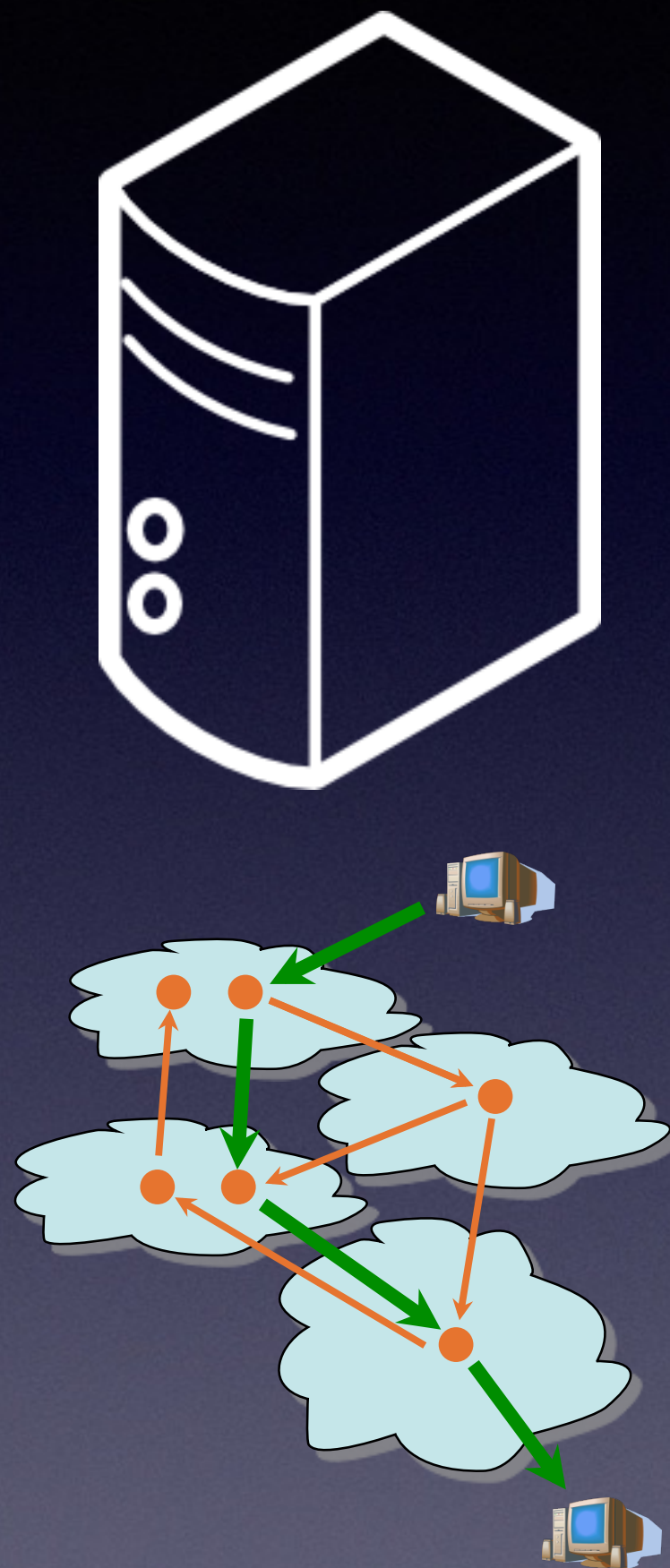
Computers

Program Everything



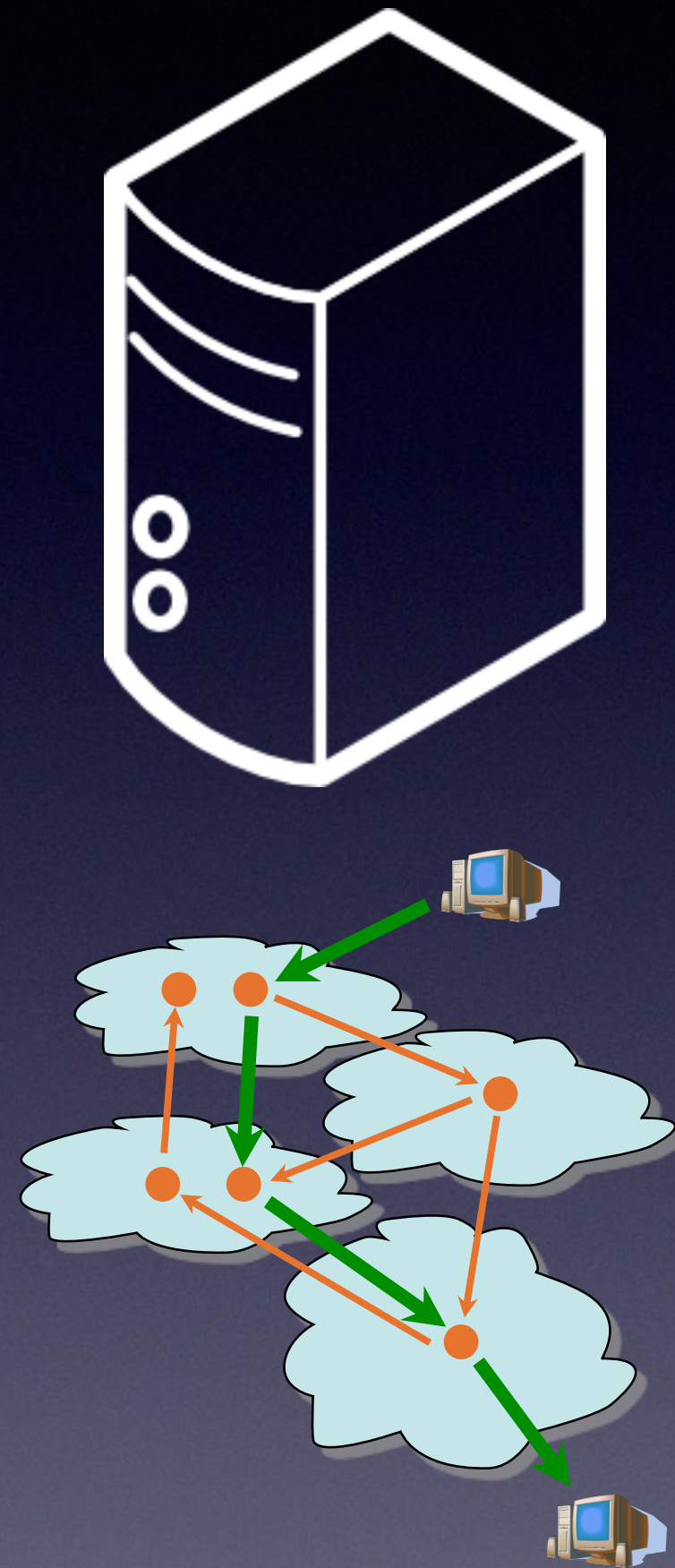
Networks

Program Everything



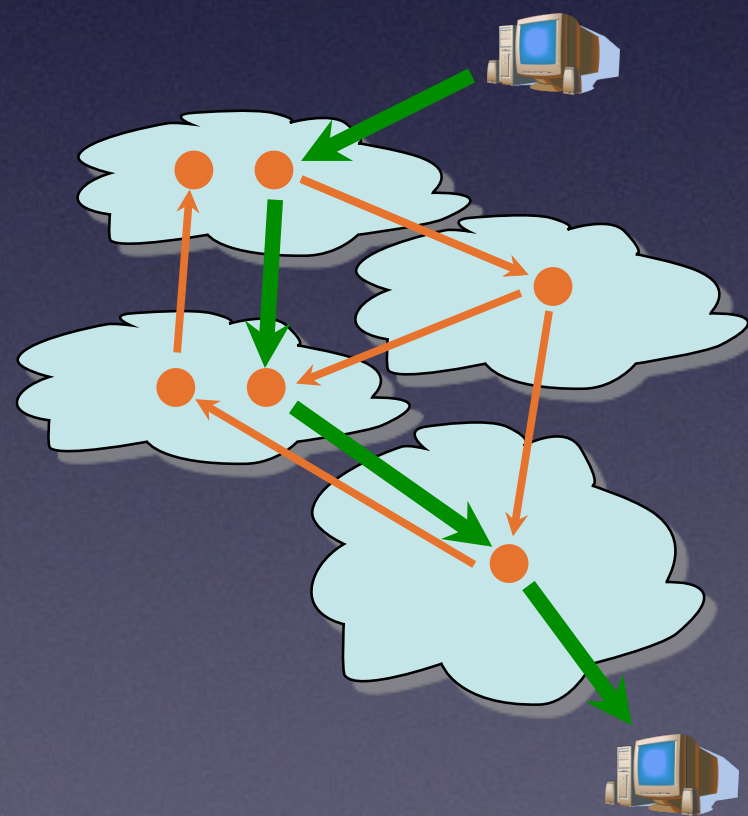
4G Cellular

Program Everything

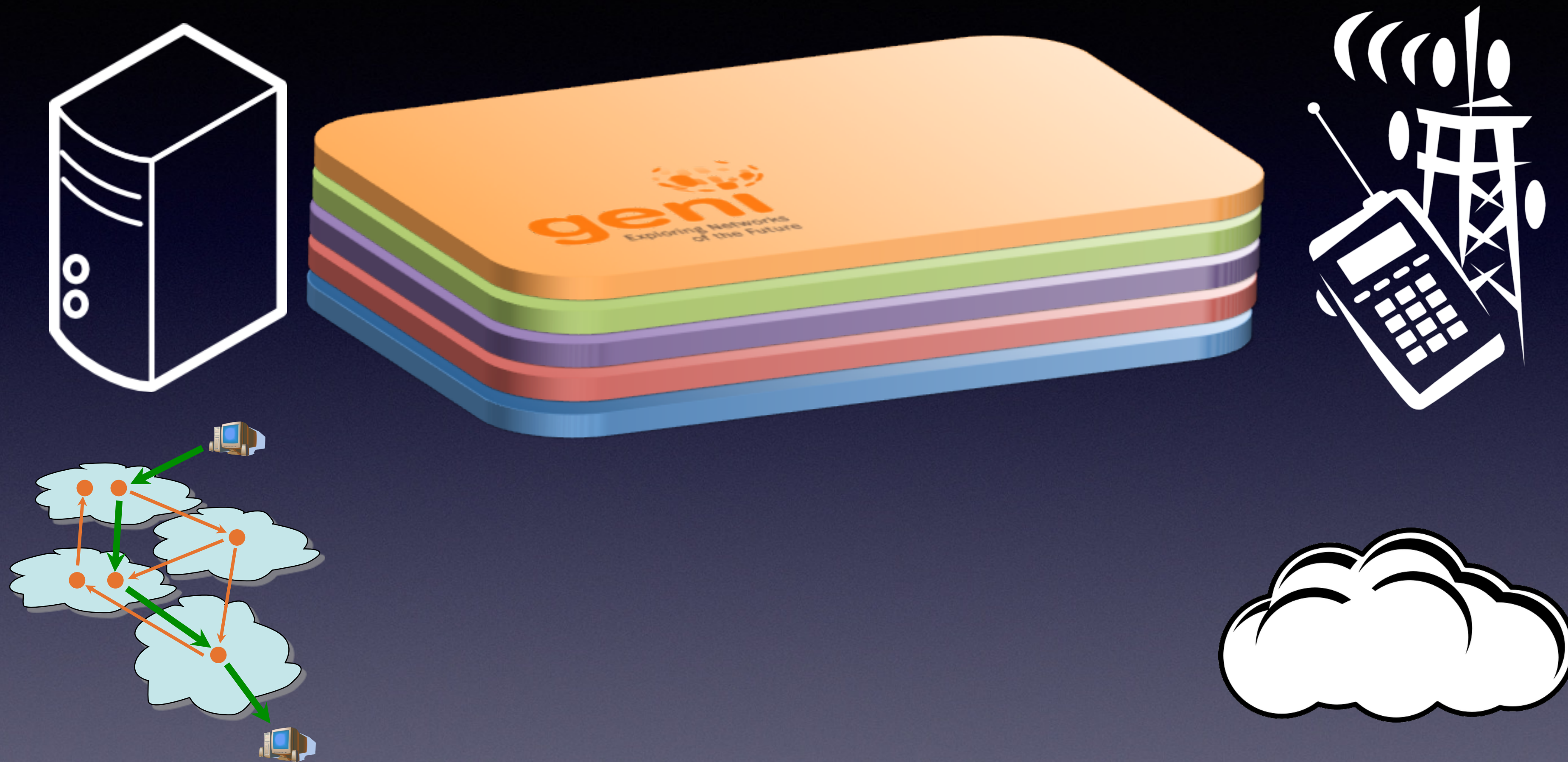


Clouds

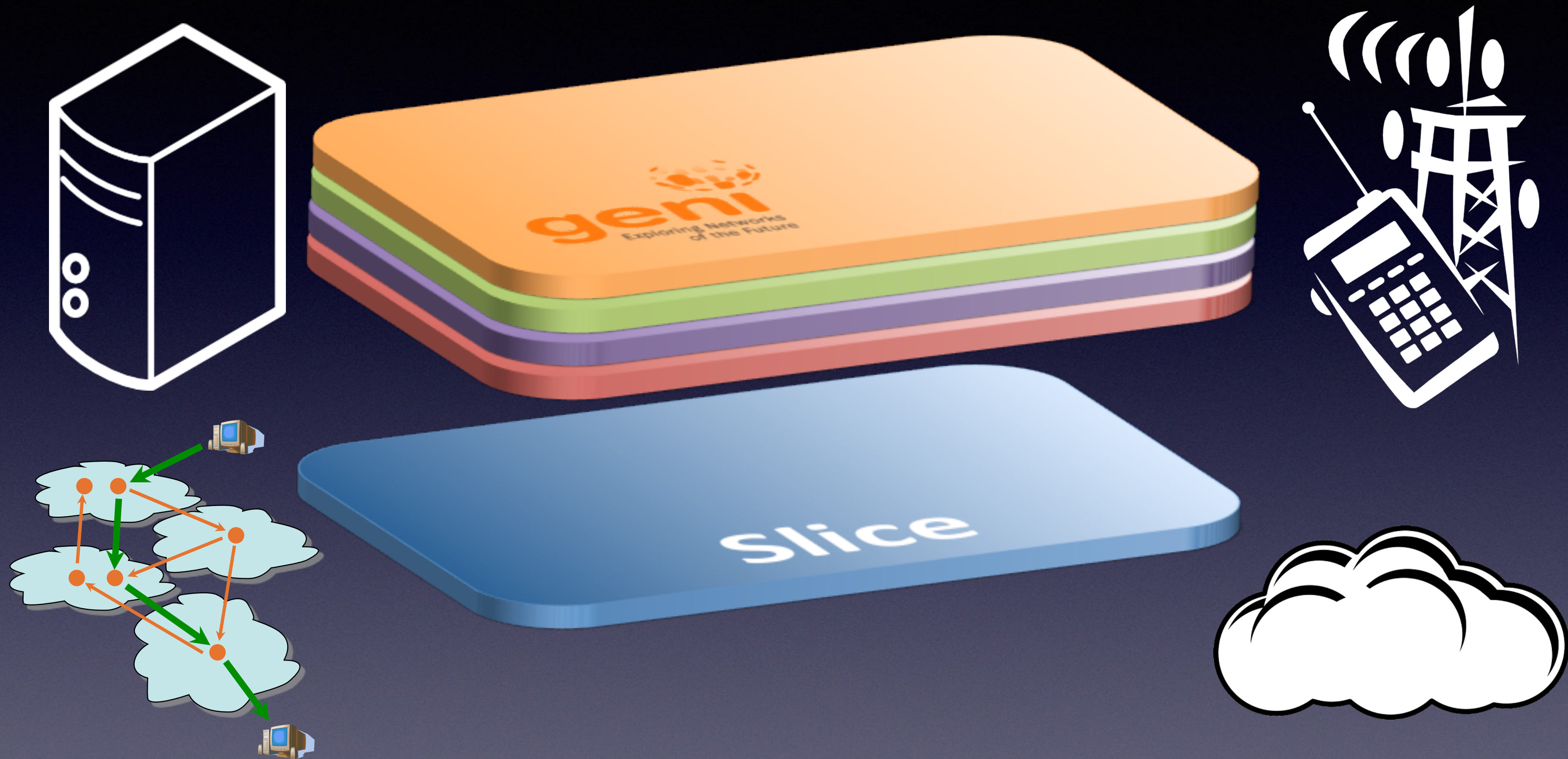
Program Everything



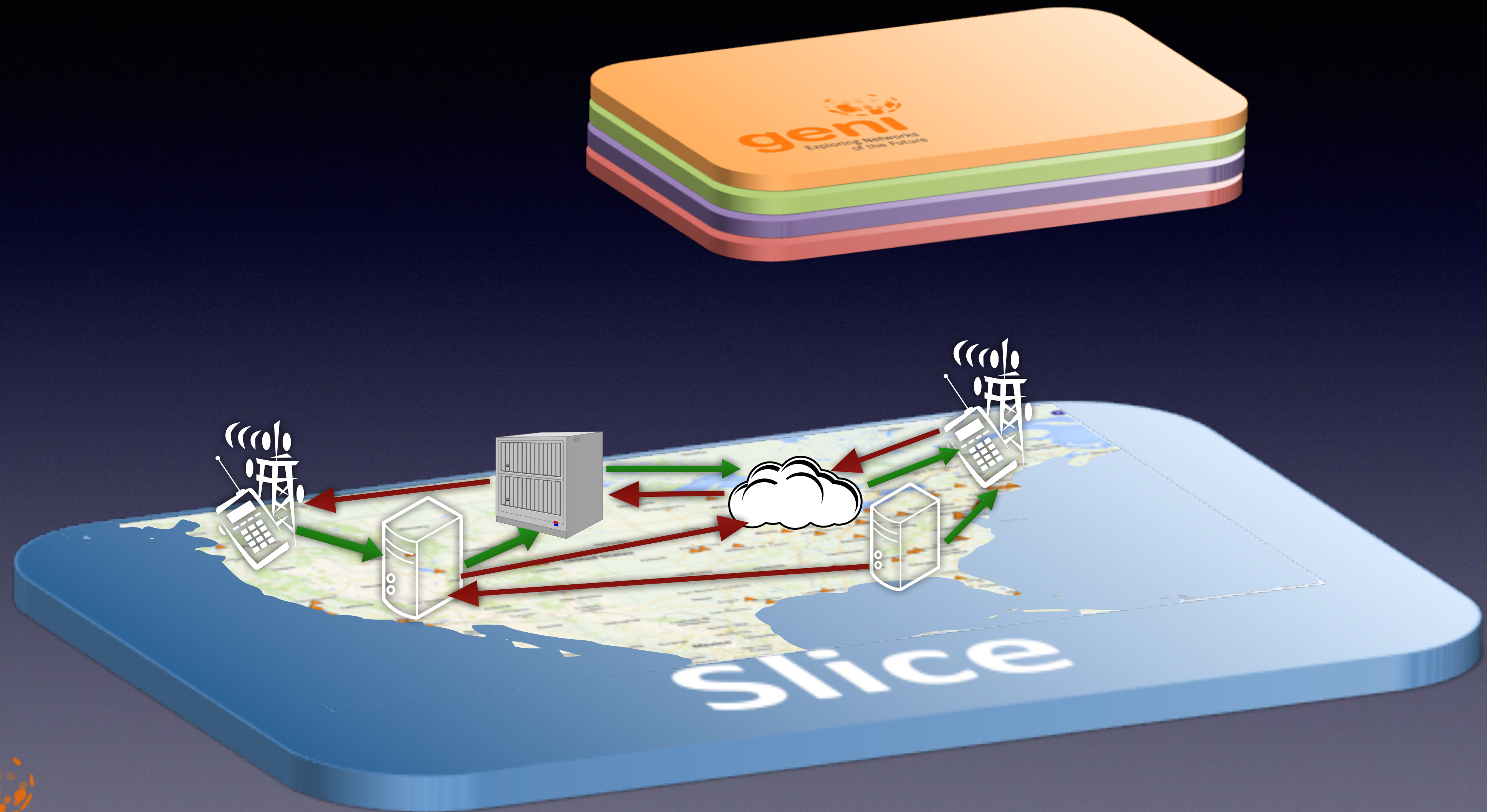
End-to-end Integrated Slices



End-to-end Integrated Slices



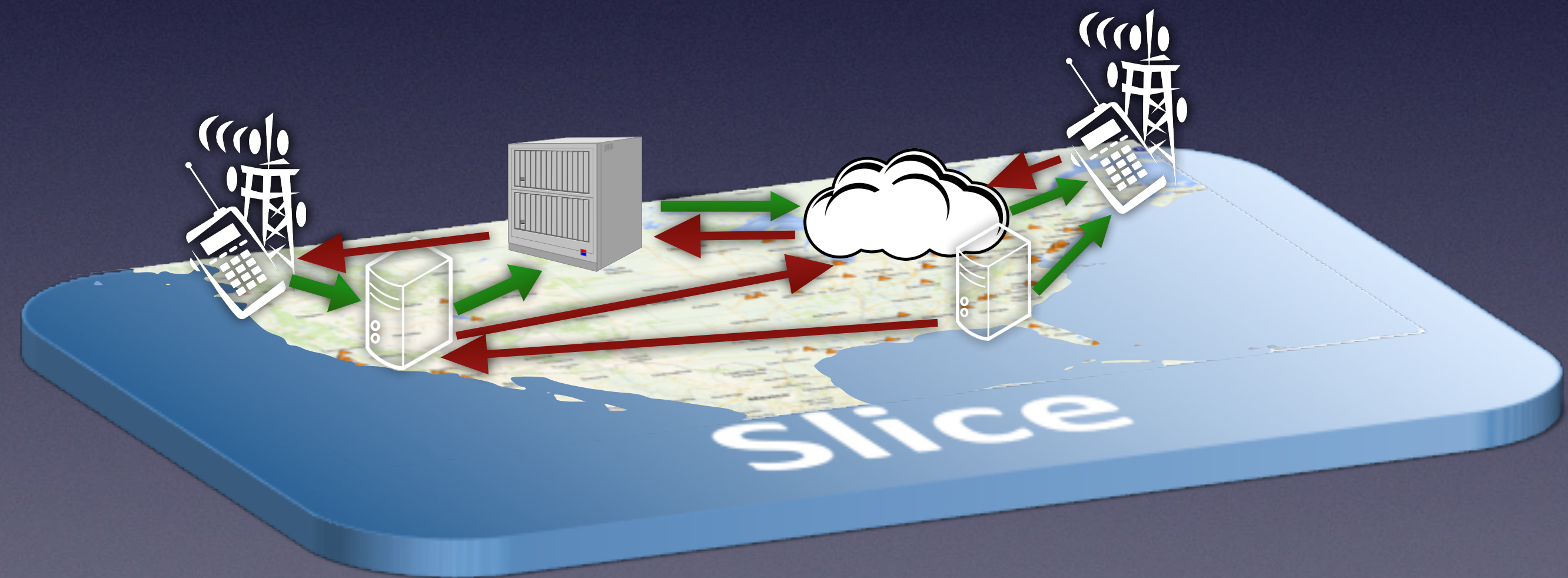
Precision Cyberinfrastructure



Precision Matters



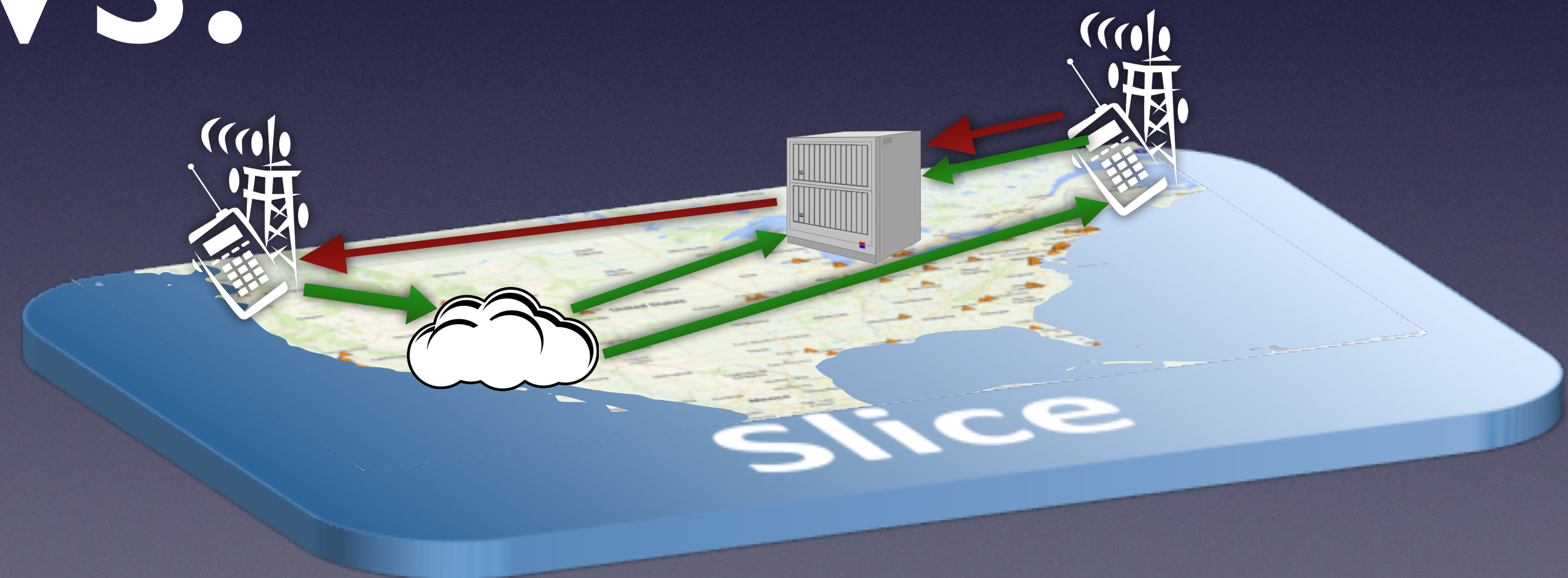
Precision Matters



Precision Matters



VS.

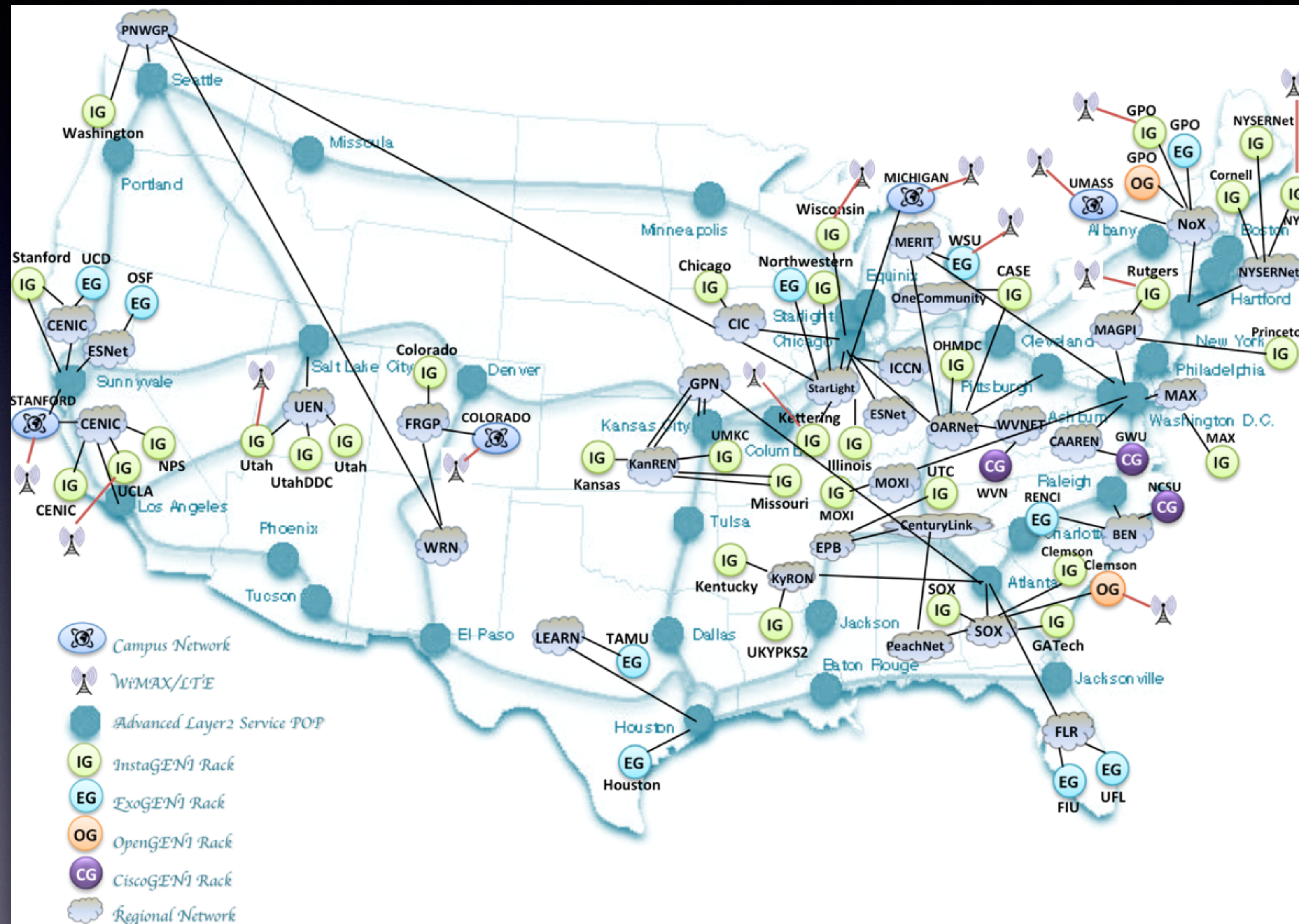


Precision Matters



GENI's Sliced Infrastructure

GENI's Sliced Infrastructure



Nationwide Precision Cyberinfrastructure

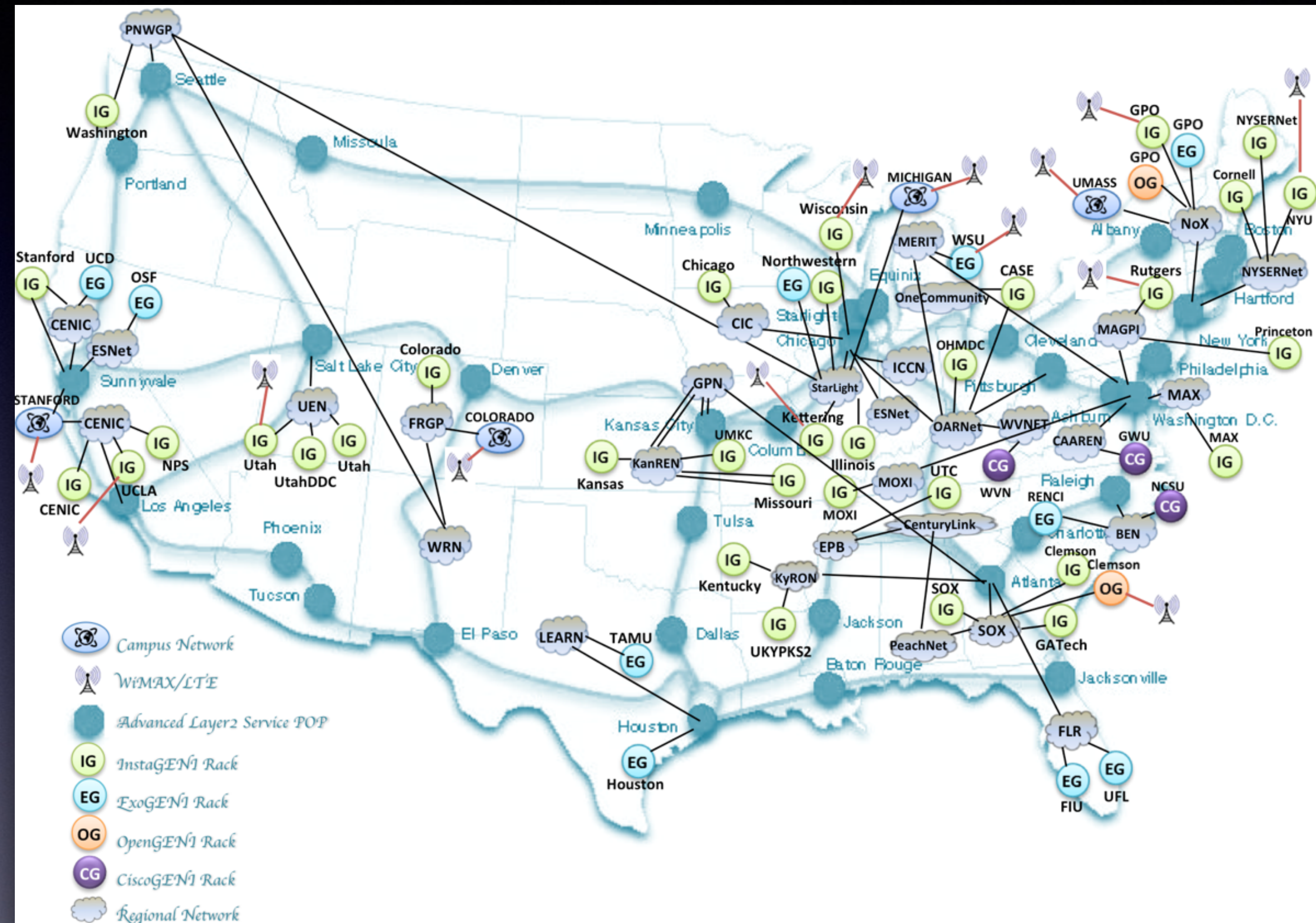
GENI-installed cyberinfrastructure

- GENI Racks - 58 racks in current deployment
- GENI Wireless - 26 base stations at 13 sites

All are sliced and deeply programmable

Interoperable CISE cyberinfrastructure includes

- NSF Cloud
- Campus Cyberinfrastructure (CC-*)
- US Ignite cities
- ACI-REF

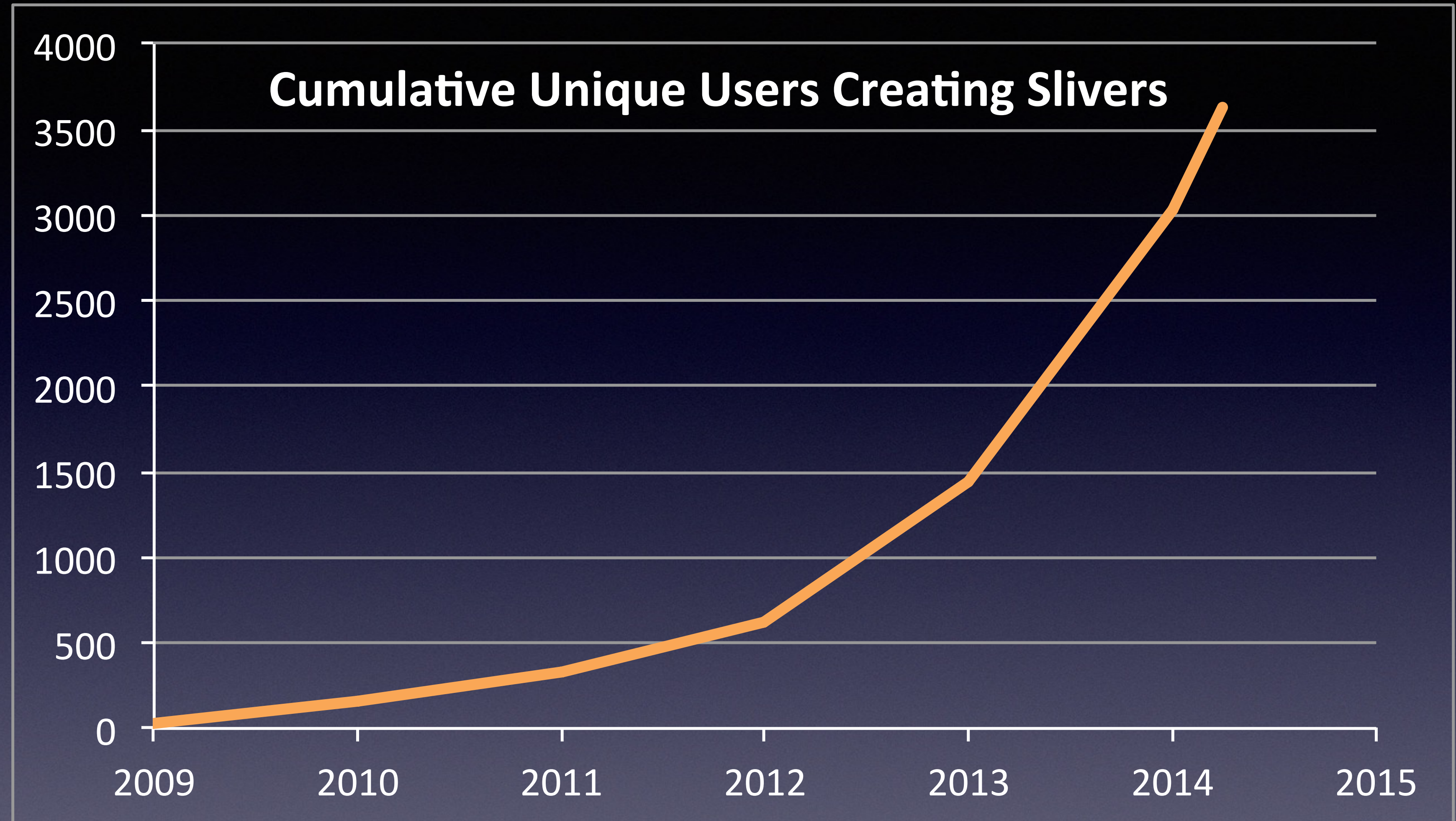
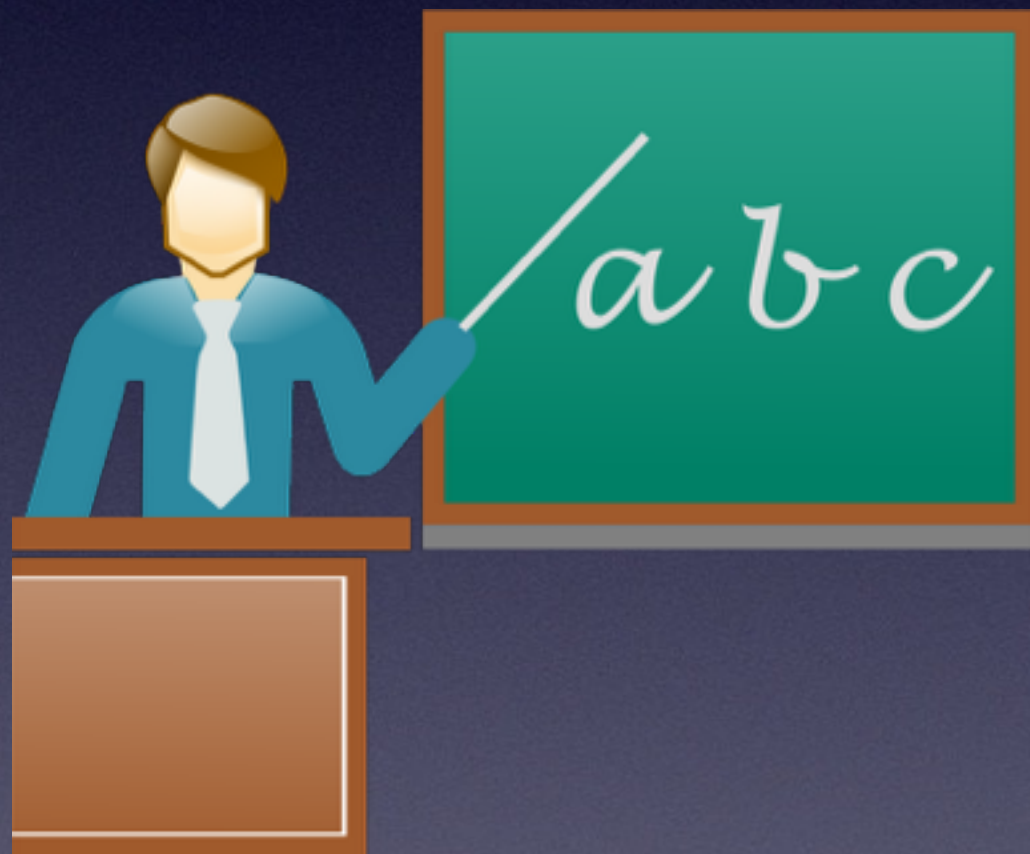


Sliced R&E networks

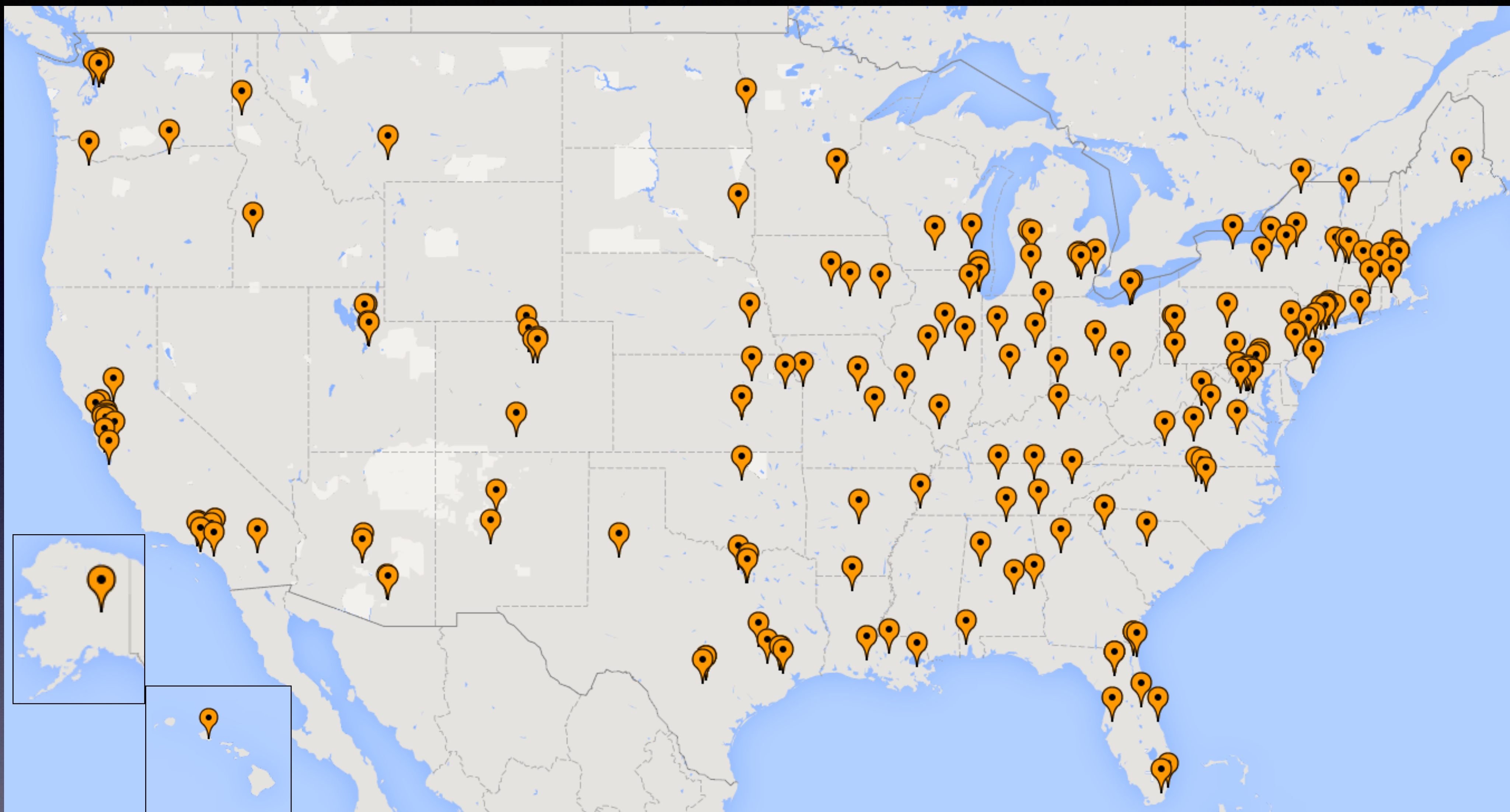


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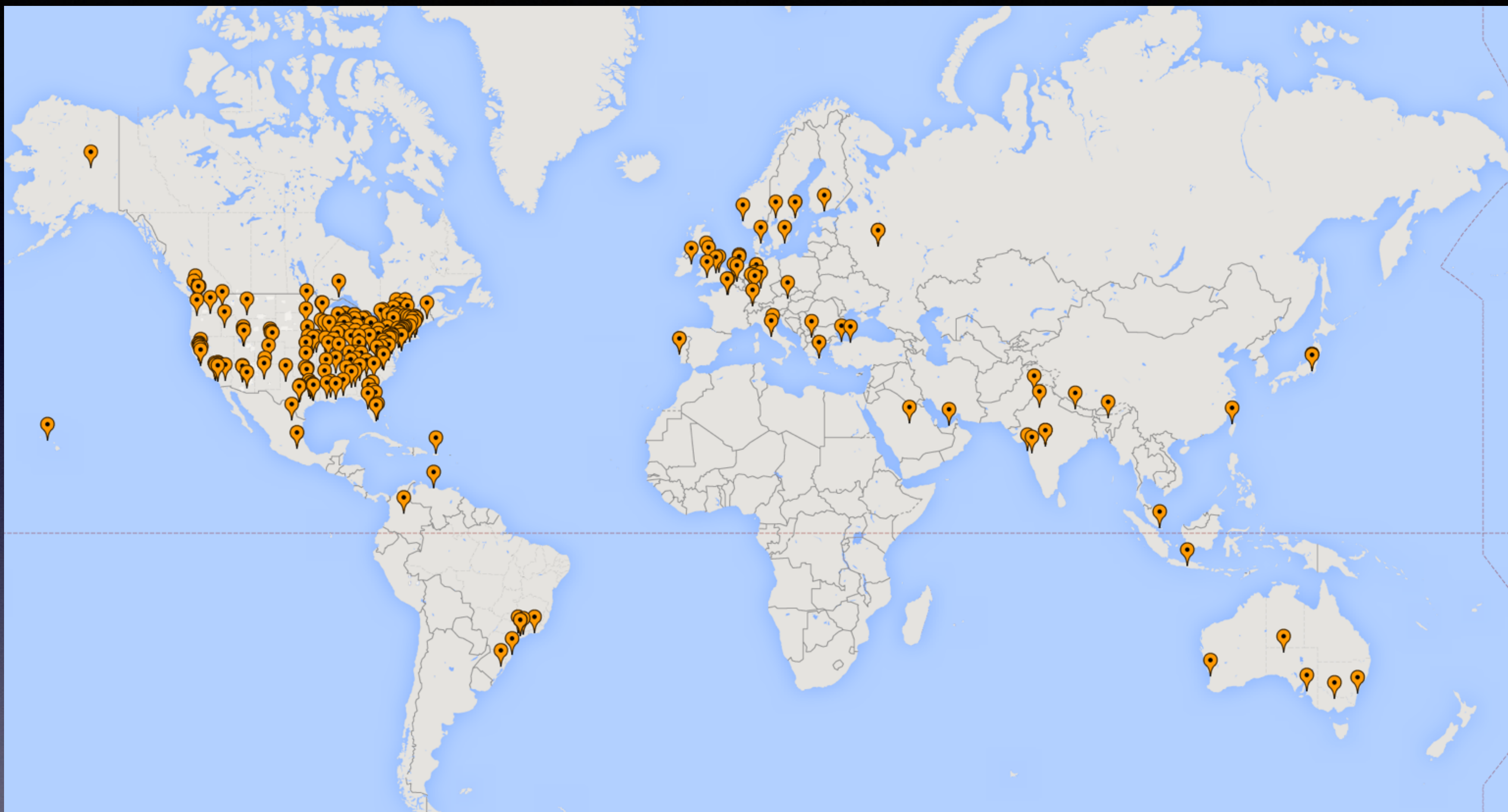


GENI is supporting thousands of researchers, educators, and students and their experiments.



GENI Users Span the US

March 25, 2015



What are they all doing?

GENI / US Ignite Demo Session

- 60+ demonstrations
- Six countries
- Education
- Health
- Public safety
- Advanced networking
- Manufacturing
- Environment



Precision Cyberinfrastructure Patterns

On-demand science: Bioinformatics, remote microscope, storm surge modeling

Locavore data & real-time interaction: Collaborative pollution viewer, Mars rover in education

Dynamic infrastructure: Software-Defined Exchanges & Infrastructure (SDX/SDI), Science DMZ as a Service

Today's demonstrations provide a sample of advanced cyberinfrastructure applications.

Today's Demos

Not Real or not Live

Traffic mishaps
(simulated)

Hurricanes
(we replay historical data)

Both Real and Live

Advanced infrastructure

Programmable networks

Applications - science and society

Participants - students, teachers, police

Maps

Workflows & data*

* Some workflows or data sets shortened for the sake of time.

What's next?

How Can We Accelerate Progress?

Deploy and federate more deeply programmable and sliceable cyberinfrastructure

- Networks, HPC, clouds, cyberphysical systems, ...
- Both new and existing cyberinfrastructure

Pursue research into flexible and dynamic control structures*

- More flexible and heterogeneous resource combinations
- Highly dynamic precision cyberinfrastructure configurations

* Ref: Final Report, NSF Workshop on the Development of a Next-Generation Cyberinfrastructure, December 2014.



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