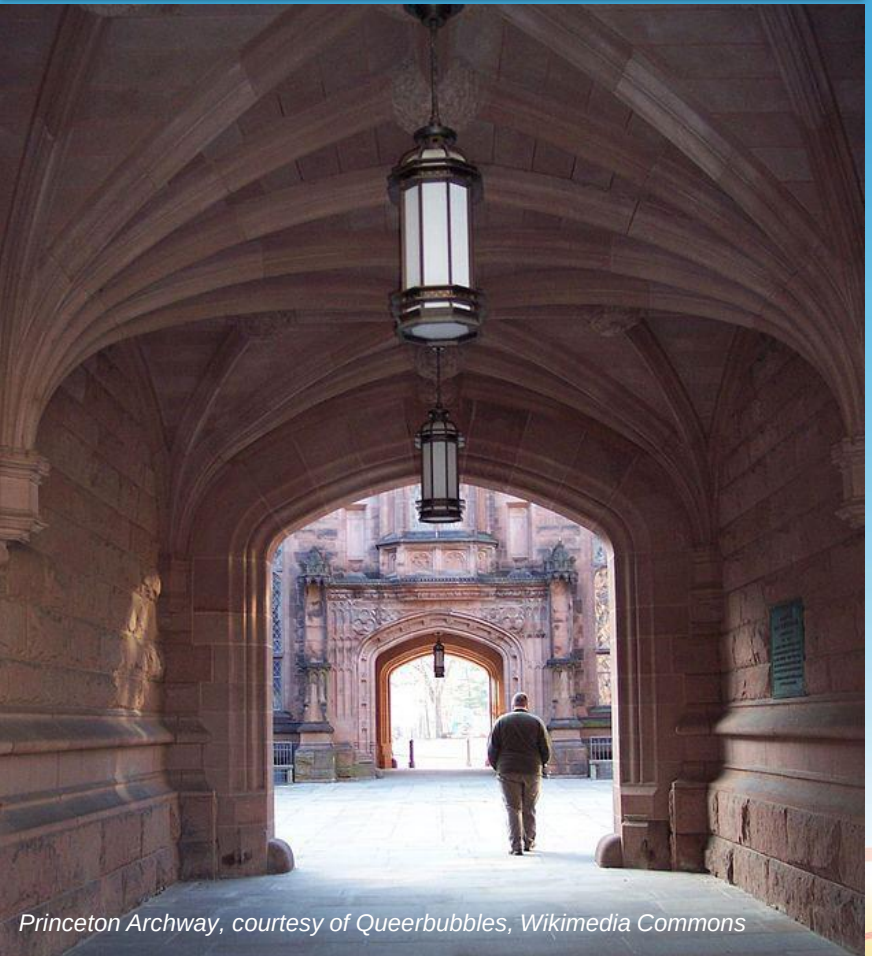

What will global innovators do with the next Innovation Platform?
INTERNET®
2

Birth of the commercial Internet



Princeton Archway, courtesy of Queerbubbles, Wikimedia Commons

- Many technologies have roots on university campuses and networks that connect them
- Personal Ethernet services in an era of dial-up and 9.6 lines created massive campus “innovation test beds”
- Push to open “standards,” abundant bandwidth, removing constraints sparks innovation

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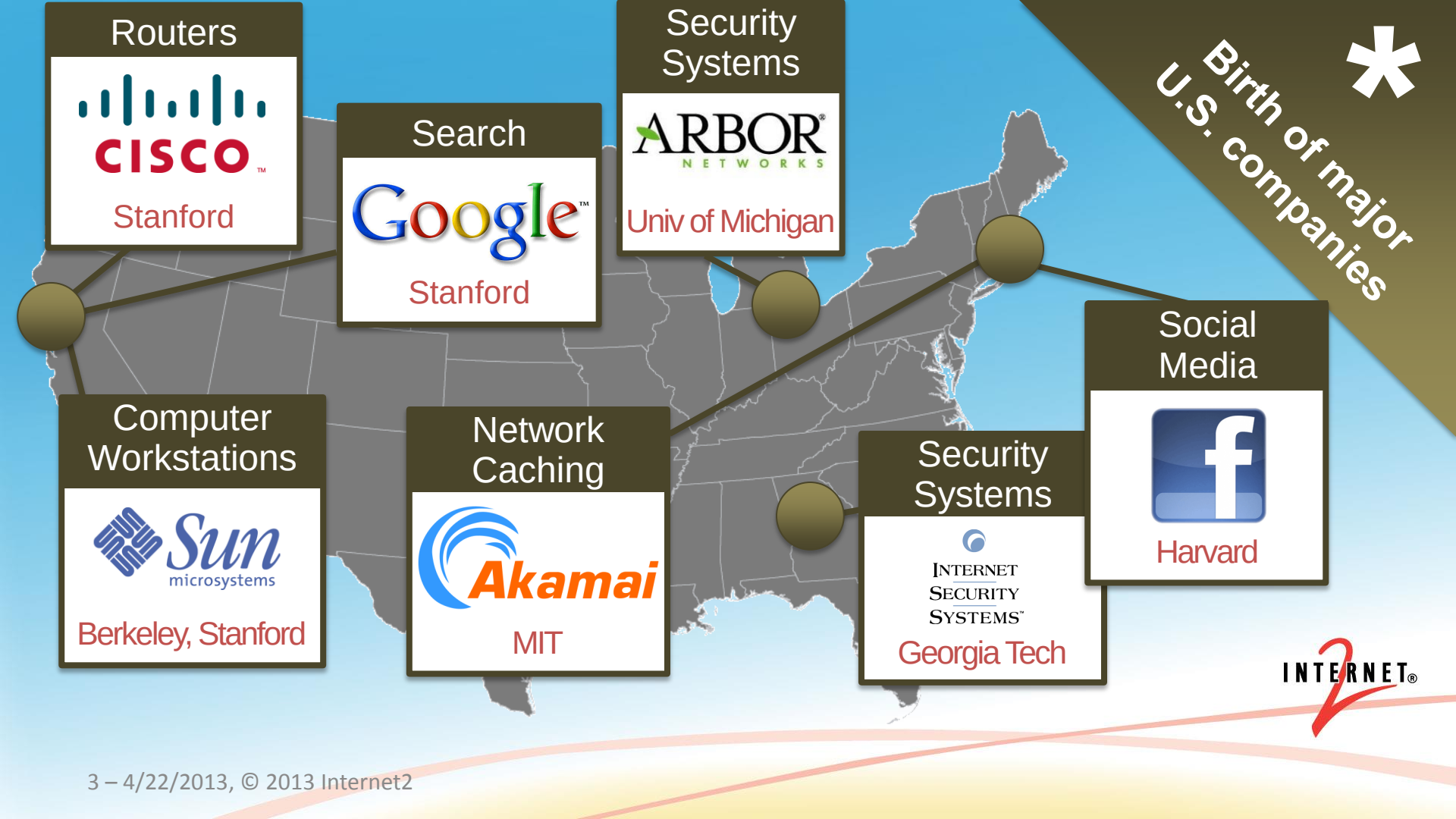
Routers
CISCO
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Stanford
Security Systems
ARBOR NETWORKS
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Birth of major U.S. companies
Social Media
Harvard
Computer Workstations
Sun microsystems
Berkeley, Stanford
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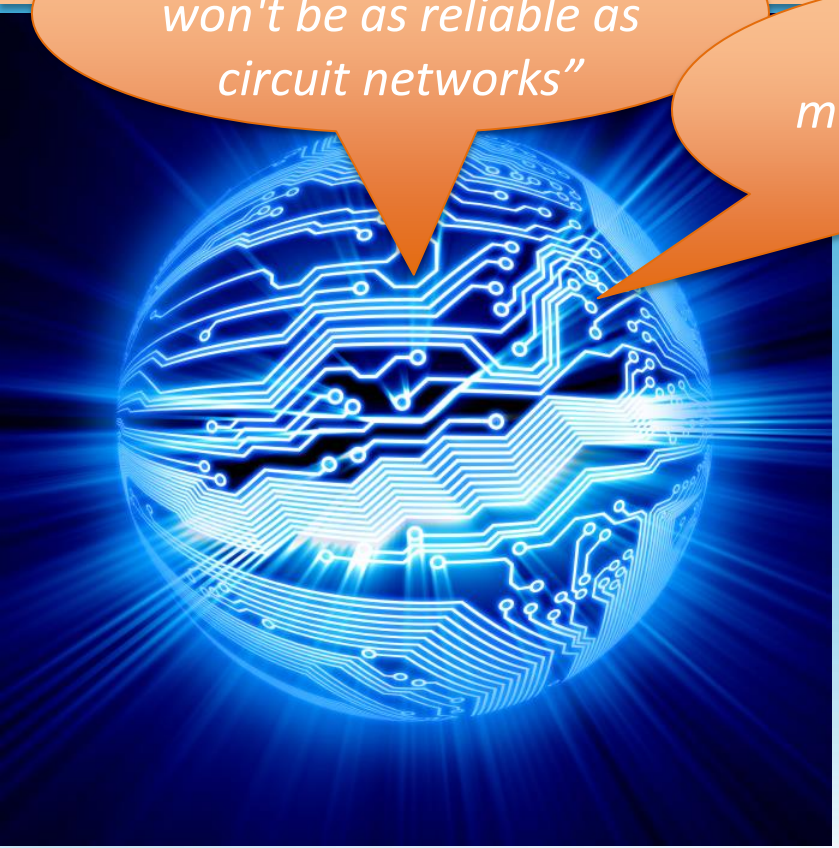


"packet networks won't be as reliable as circuit networks"

"this decentralized model can't scale or be manageable"

Ethernet and IP emerged as defacto standards in spite of all arguments to the contrary.

Will we fight re-centralization of an open control plane and hybridization to a potentially post-IP SDN-based packet environment?

How do we create an at-scale Innovation Platform for the next era?

Innovation Platform vision:

Abundant bandwidth

Innovation roadblocks

- Limited capacity a major barrier—*need more than incremental boosts*
- Too expensive and risky to try totally new approaches
- Closed approaches limit applications or use cases

Innovation route

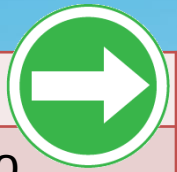
- Raw capacity now available on Internet2 Network a key imagination enabler
- Incent disruptive use of new, advanced capabilities
- Promote “open” and creative freedom of use

Innovation Platform vision:

Software-defined networking (SDN)

Innovation roadblocks

- Proprietary software in routers and switches
- Communications with hardware limited by actual, physical, proprietary components
- Application developers have to use the network as prescribed



Innovation route

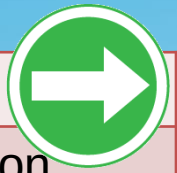
- Open up network layer to innovation
- Let innovators communicate with and program *the network itself*
- Allow developers to optimize the network for specific apps

Innovation Platform vision:

Support for data-intensive science

Innovation roadblocks

- One-size-fits-all approach to network data flows
- Lack of transparent performance monitoring solution
- No way to customize and optimize the network via SDN



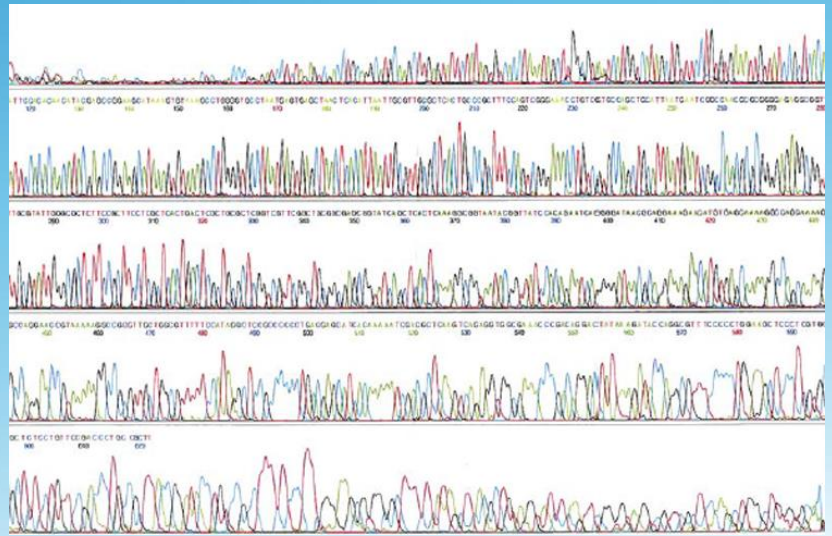
Innovation route

- Architect a special solution to allow higher-performance data flows
- Include end-to-end performance monitoring
- Include SDN server to support programmability

Innovation Platform Program Pilot Sites

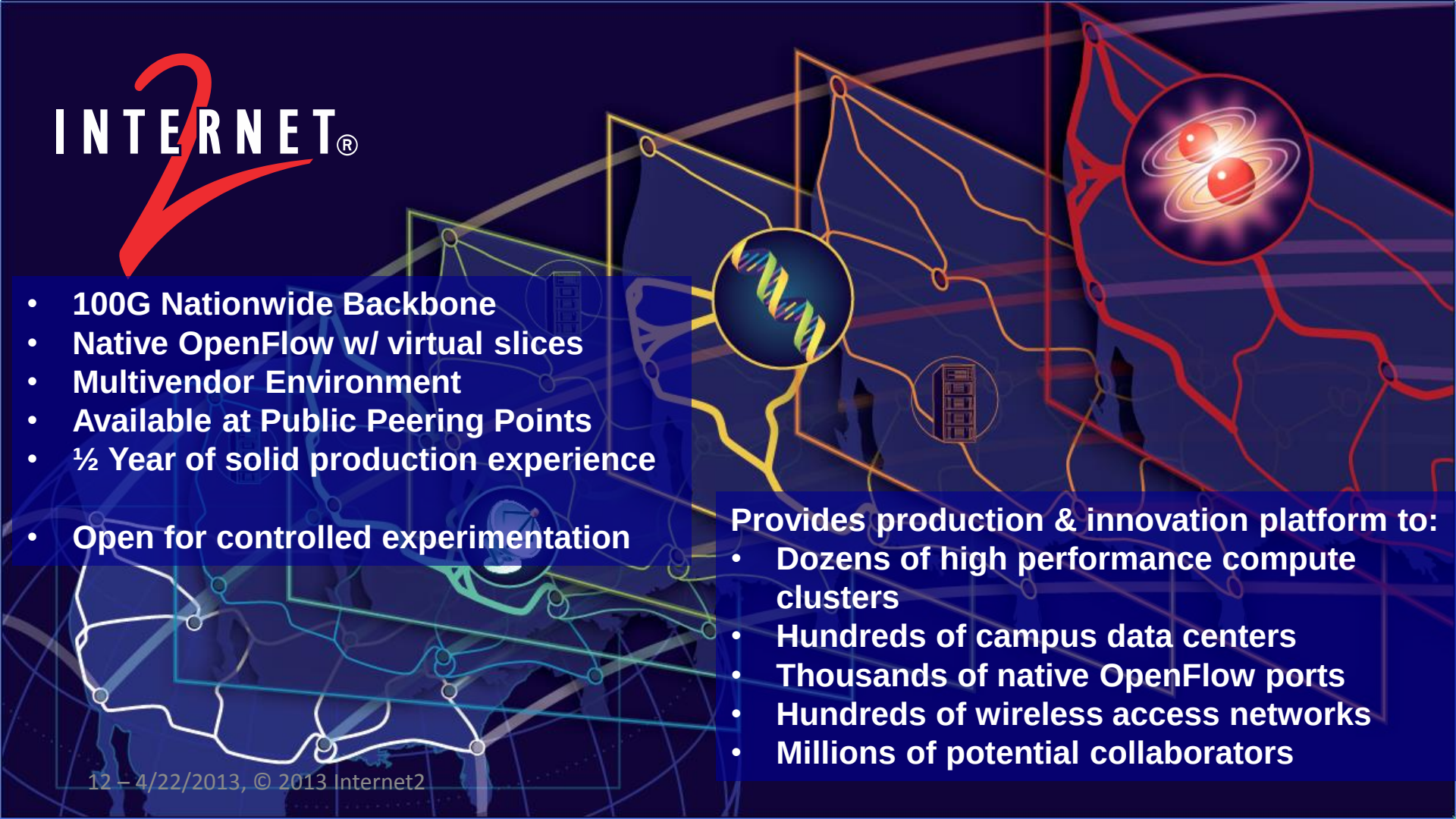
Innovation Use Case: Genomics Analysis

How do we bring petabytes of distributed data to and from compute resources and correlate gene sequences to accelerate cures for disease?



- Accelerated Bulk File Transfer of Massive File sets
- Content Distribution Caching / Distribution
- Clear Authorities & Health Security compliance
- High Performance Compute, Storage, Visualization

The 100G SDN/OpenFlow Internet2 Network



- 100G Nationwide Backbone
- Native OpenFlow w/ virtual slices
- Multivendor Environment
- Available at Public Peering Points
- ½ Year of solid production experience

- Open for controlled experimentation

Provides production & innovation platform to:

- Dozens of high performance compute clusters
- Hundreds of campus data centers
- Thousands of native OpenFlow ports
- Hundreds of wireless access networks
- Millions of potential collaborators

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