

PEERING: An AS for Us

Giving researchers control over *real* BGP routing

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with:

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How to study Internet routing?

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- Traditional approaches are limited
 - Measurements: *realism* without *control*
 - Simulation/emulation: *control* without *realism*

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- We find it useful
 - **LIFEGUARD: route around failures** (bold=us / normal=others) [SIGCOMM 2012]
 - **PoiRoot: locate root cause of path changes** [SIGCOMM 2013]
 - **Measuring Internet routing policies** [IMC 2015]

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 - PECAN: joint content & network routing [SIGMETRICS 2013]
 - **PoiRoot: locate root cause of path changes** [SIGCOMM 2013]
 - ARROW: deployable fix to routing problems [SIGCOMM 2014]
 - SDX: software-defined Internet exchange [SIGCOMM 2014]
 - **Measuring Internet routing policies** [IMC 2015]
 - Sprite: SDN-based inbound traffic engineering [SOSR 2015]
 - RAPTOR: Routing attacks on TOR [USENIX Security 2015]

Pairing Emulated Experiments with Real Interdomain Network Gateways

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PEERING is AS47065

With PEERING, a researcher:

- **Emulates** an ISP or runs a BGP router
- **Connects** the emulated ISP to *real* ISPs on the Internet via BGP
- **Controls** the ISP, including exchanging traffic & routes with *real* ISPs

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Peering points around world

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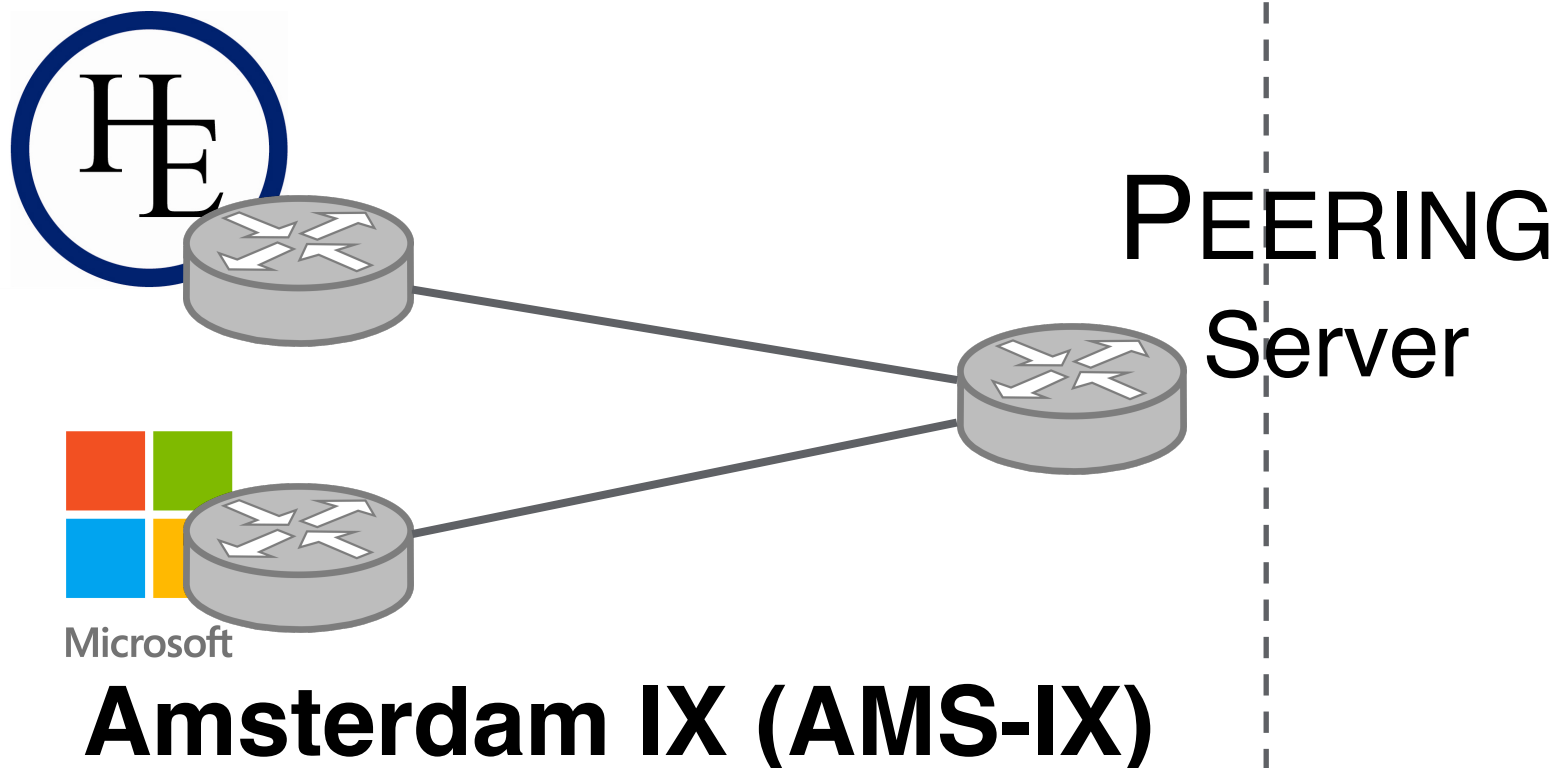
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Rich connectivity via IXPs

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 - 500+ peers: Akamai, Google, Hurricane Electric, Terremark, TransTeleCom,...

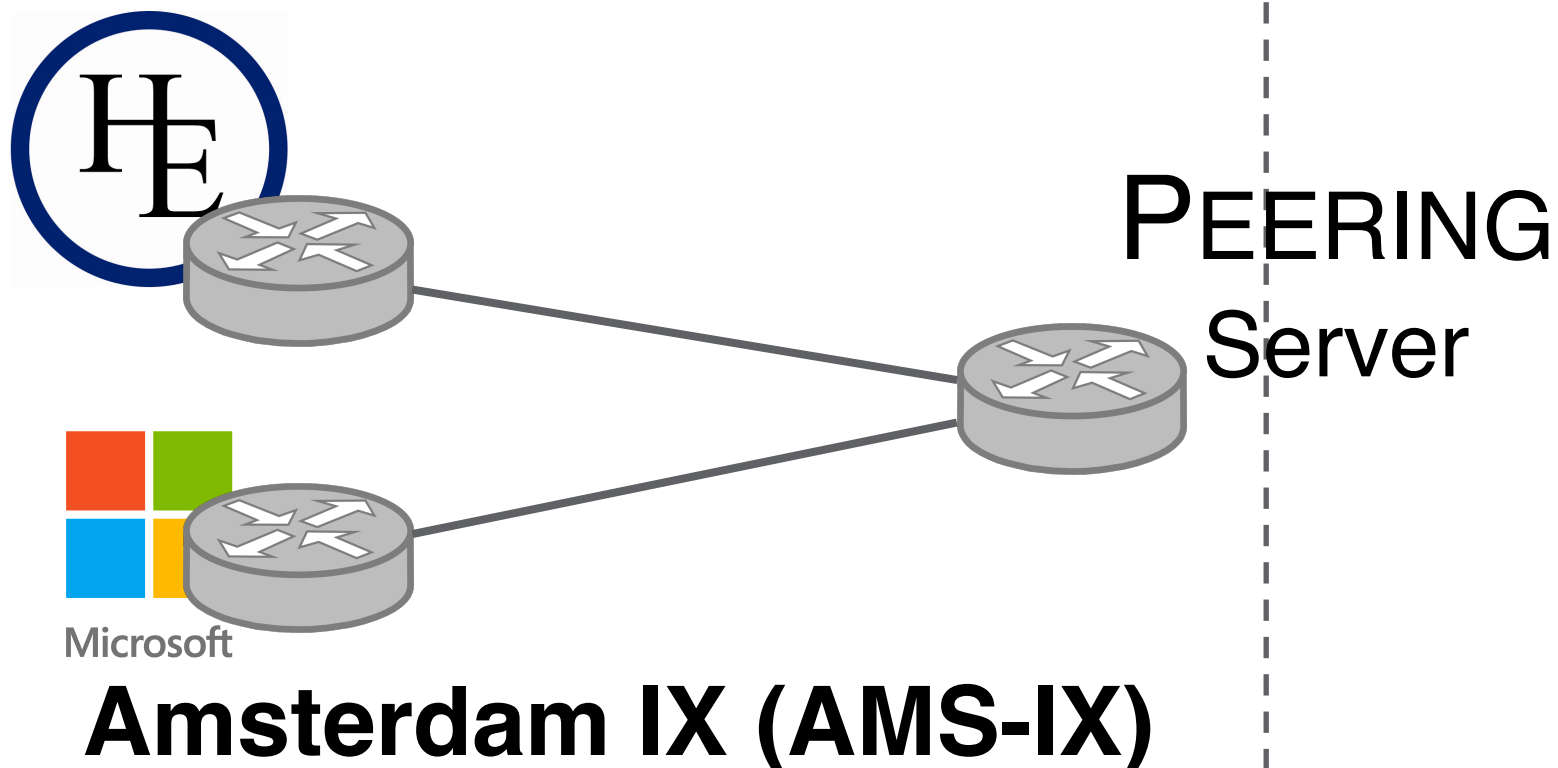


Researchers control routes and traffic

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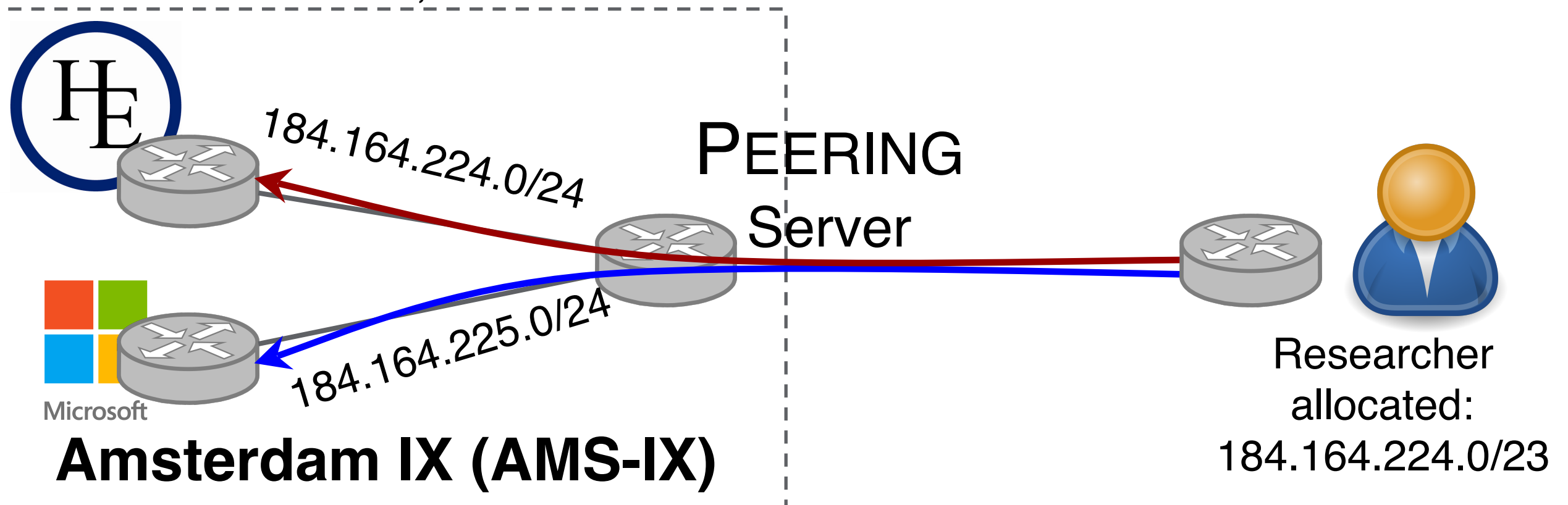


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What's new? What's next?

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→ Supporting experiments

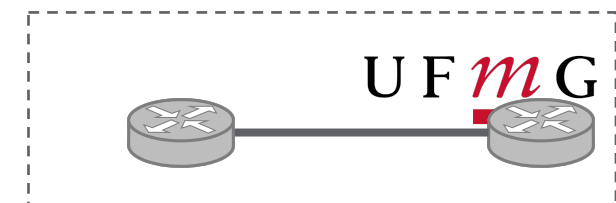
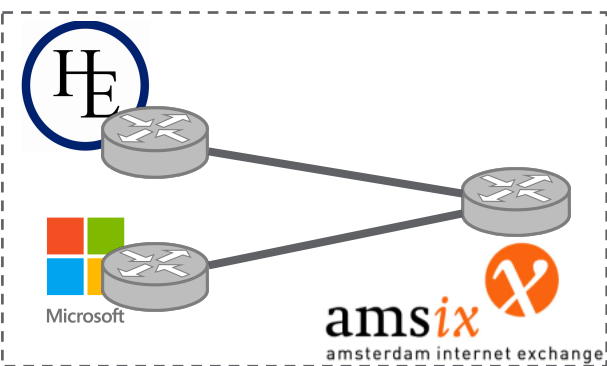
- *New*: Rebuilt entire platform this year
 - Essentially push button to deploy new experiment, new site, new peer
 - Give experiments independent control over route selection and announcements at IXPs
 - Etc.
- *Next*: API for easy deployment of simple experiments (in testing)

→ Expansion

- *New*: More transit providers at IXPs
- *Next*: Remote peering
- *Next*: Emulate a cloud provider
 - Federating with CloudLab's cloud data centers
 - Wide-area network interconnecting sites (using Internet2's AL2S)

Forthcoming: Emulate a cloud provider

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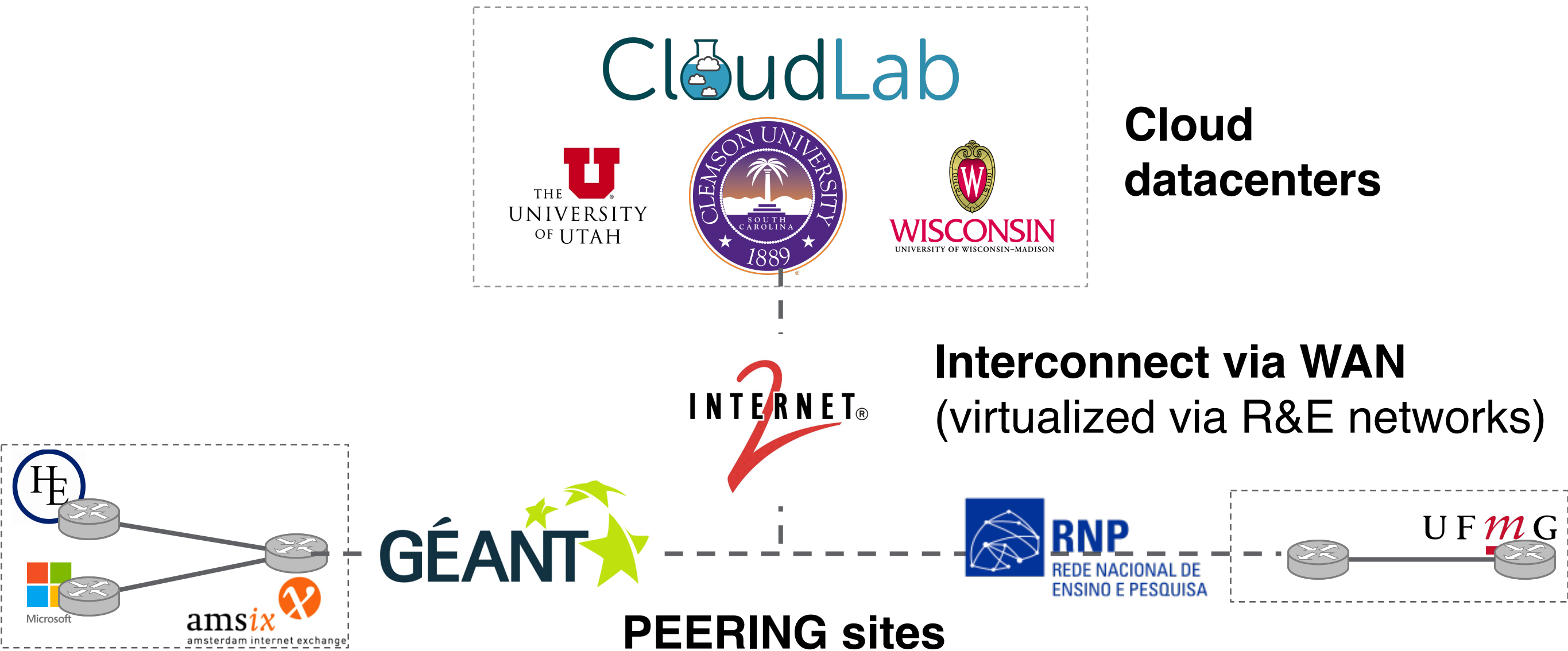
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Conclusion

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Little innovation in interdomain routing in 20 years

- Yet BGP is at the root of fundamental Internet problems
- Researchers have limited visibility or tools to run experiments

PEERING provides a new approach to Internet research

- Connects emulated ISPs with real ISPs on the Internet
- Vision is to let researchers run the ISP of their choice

A community testbed

- Contact us if you want to use or contribute!
- <http://peering.usc.edu>