www. chameleoncloud.org

CHAMELEON

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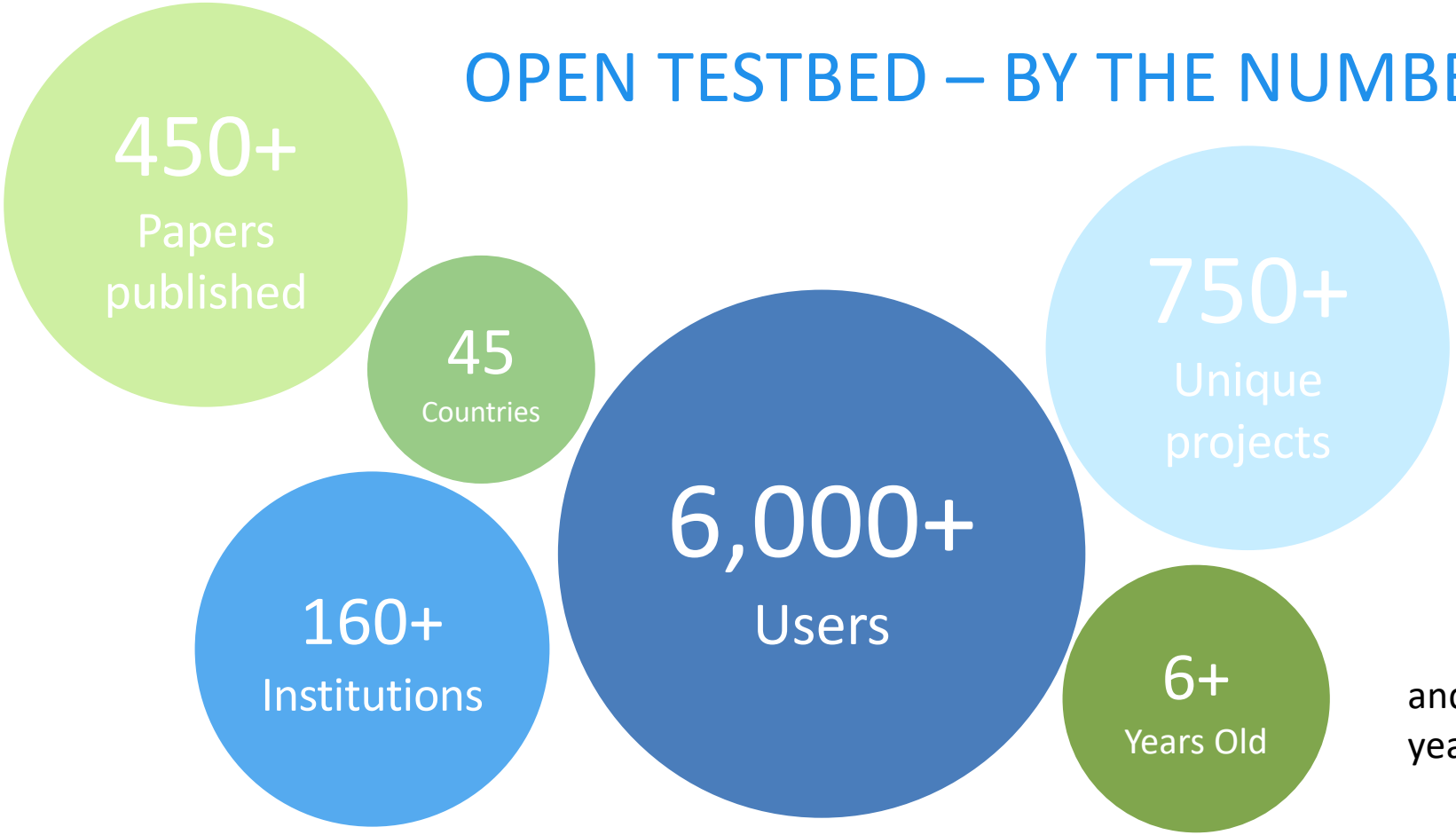
CHAMELEON IN A NUTSHELL

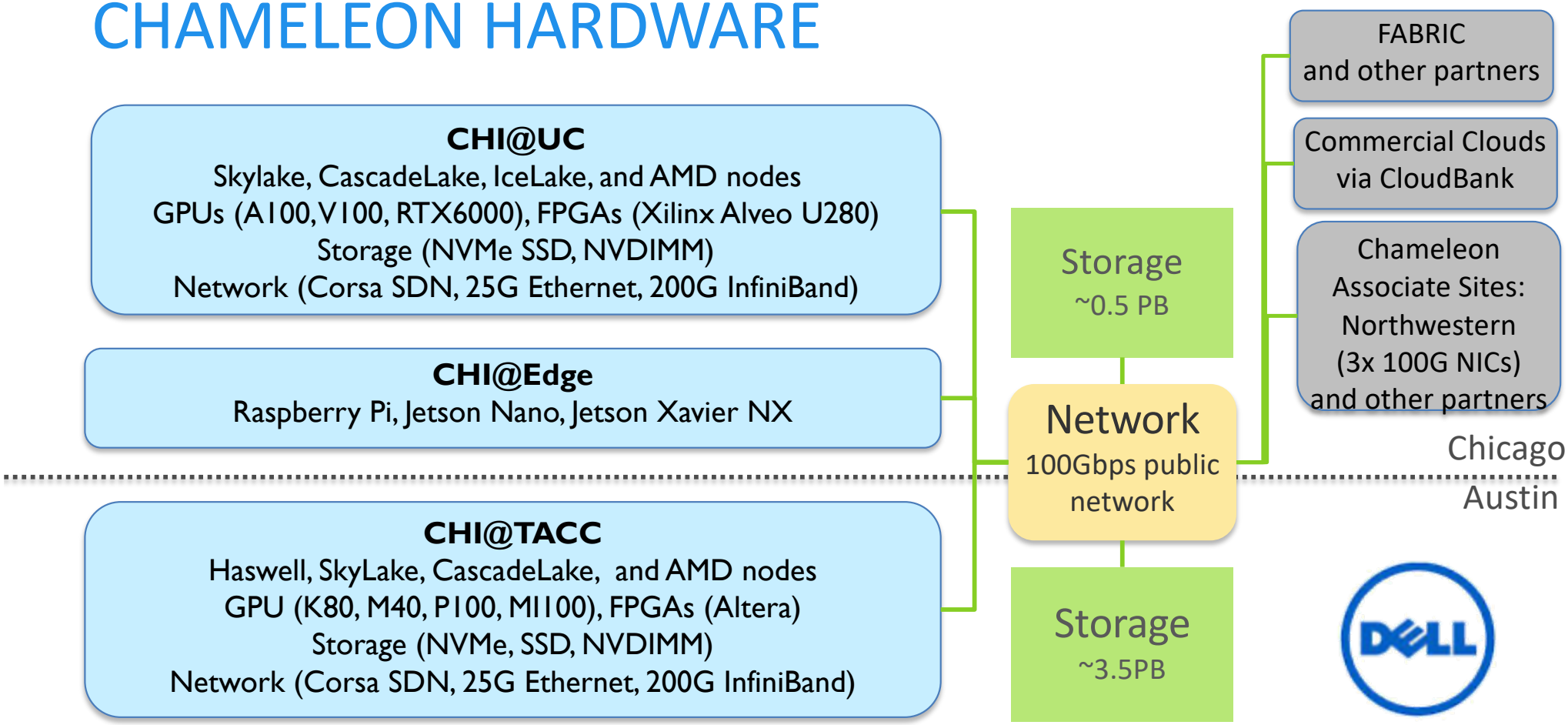
- Chameleons like to change: a testbed that adapts itself to your experimental needs
  - **Deep reconfigurability** (bare metal) and isolation + KVM cloud (different cost/isolation trade-off)
  - Capabilities: power on/off, reboot, custom kernel, serial console access, etc.
- Balance: diversity and scale – from large to small
  - Large to small: from 2 supercomputing sites (**UC, TACC**) connected with 100G network to **edge devices**
  - Diverse: FPGAs, GPUs, NVMe, NVDIMMs, Corsa switches, edge devices via CHI@Edge etc.
  - **CHI-in-a-Box** sites at Northwestern, in preparation: NCAR, IIT, and other places
- Cloud++: CHameleon Infrastructure (CHI) via mainstream cloud tech
  - Powered by **OpenStack** with bare metal reconfiguration (Ironic) + "special sauce" (50/50 split)
  - Blazar contribution recognized as official OpenStack component
- Reproducibility, repeatability, and sharing
  - **Jupyter integration** for imperative and non-transactional experiment packaging, **Chameleon daypass** for easy access, **Trovi** for sharing and finding experiments, integration with **Zenodo** for publishing

OPEN TESTBED – BY THE NUMBERS

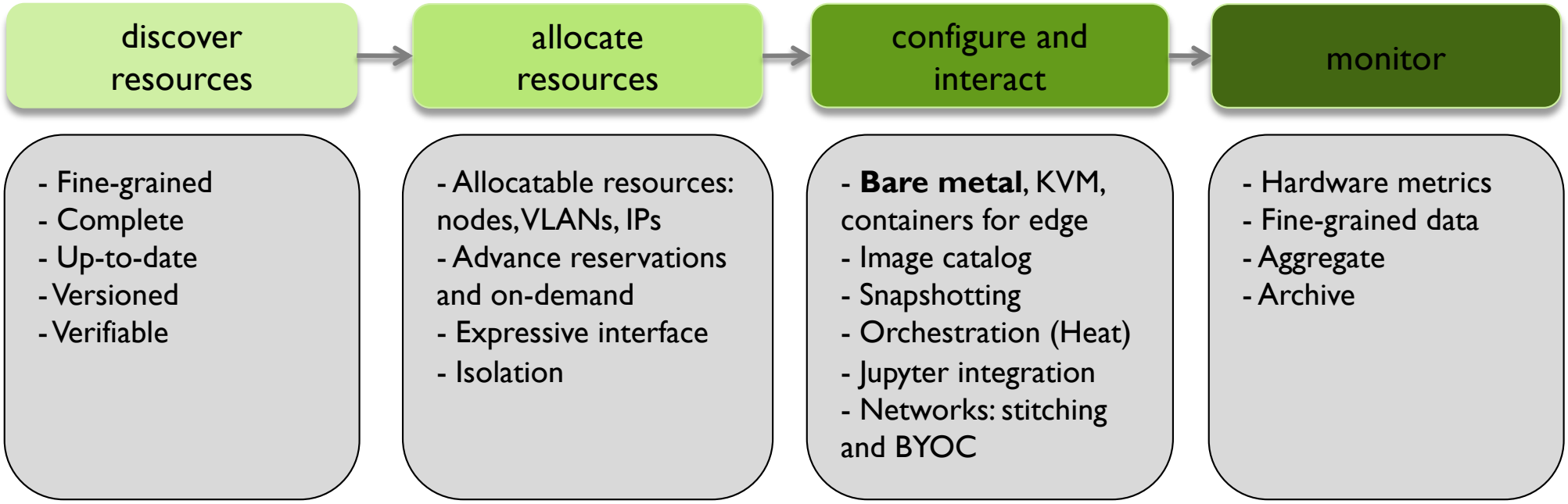


and 3 more years to grow!

CHAMELEON HARDWARE



CHI EXPERIMENTAL WORKFLOW



Authentication via federated identity, accessed via GUI, CLI and python/Jupyter

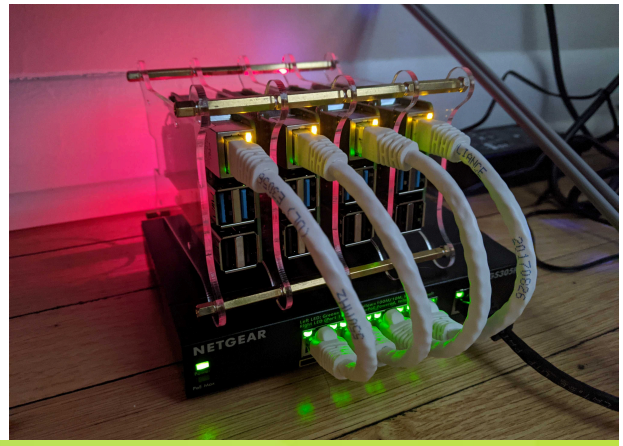
Paper: "Lessons Learned from the Chameleon Testbed", USENIX ATC 2020

NEW IN P3: CHI@EDGE (PREVIEW)

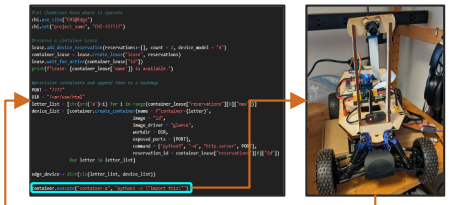
A lot like a cloud!
All the features we know
and love but for edge!

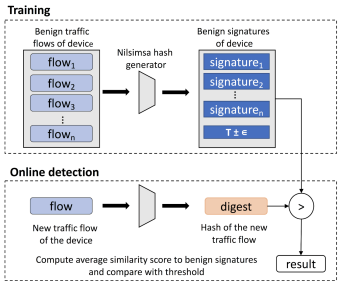
Not at all like a cloud!
Location, location, location!
Not server-class!
IoT: cameras, actuators, SDRs!
And many other challenges!

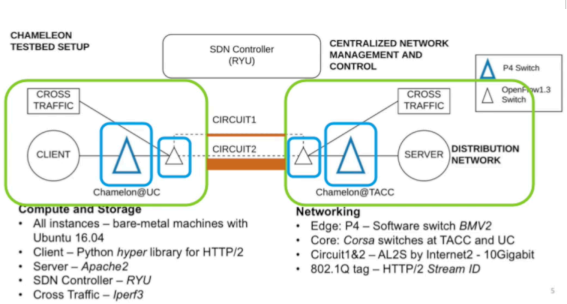
- CHI@Edge: all the features you know and love plus
  - Reconfiguration via container deployment
  - Support for peripherals based on an extensible plug-in model
  - **Mixed ownership** model via an SDK with devices, virtual site, and **restricted sharing**
  - And more… Chameleon@Edge Community Workshop in September 2021 https://chameleoncloud.org/chiedge-community-workshop/

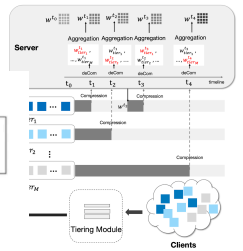


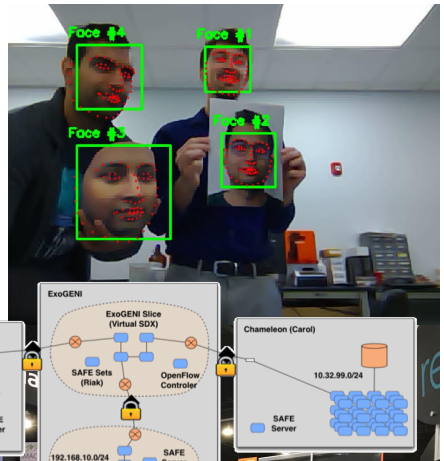
LEAVING NO EXPERIMENT BEHIND!

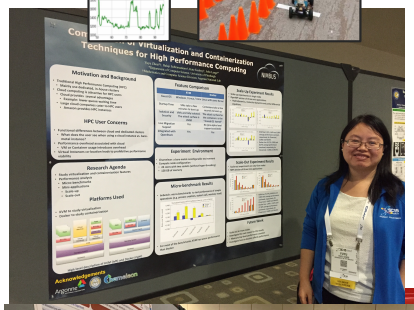




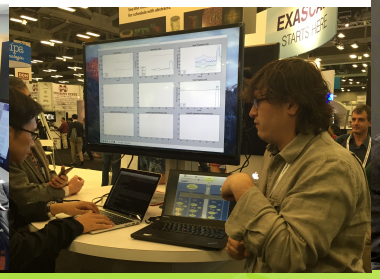


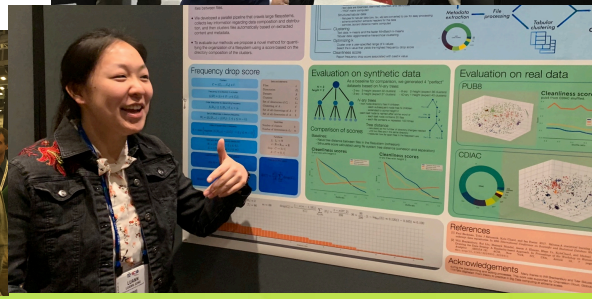






Supporting research projects in architecture, operating systems design, virtualization, power management, real-time analysis, security, storage systems, databases, networking, machine learning, neural networks, data science, and many others.





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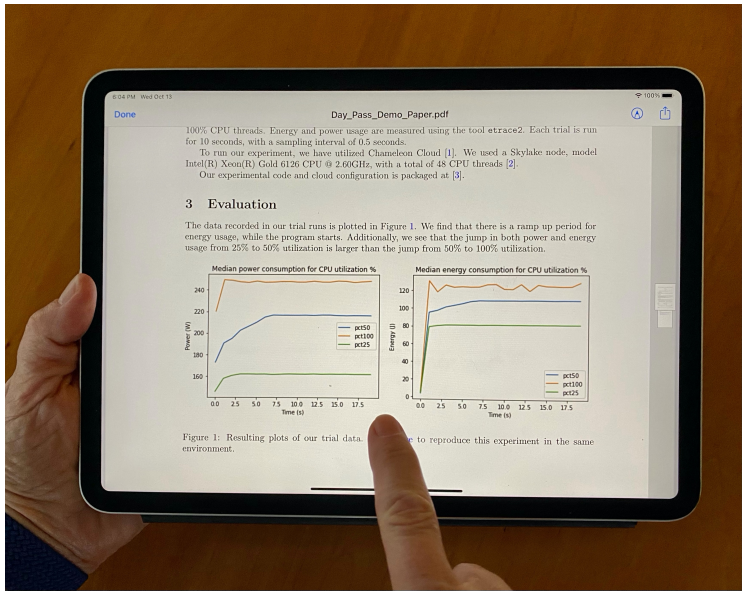
Check out user experiment stories on our blog:
https://www.chameleoncloud.org/blog/category/user-experiments/

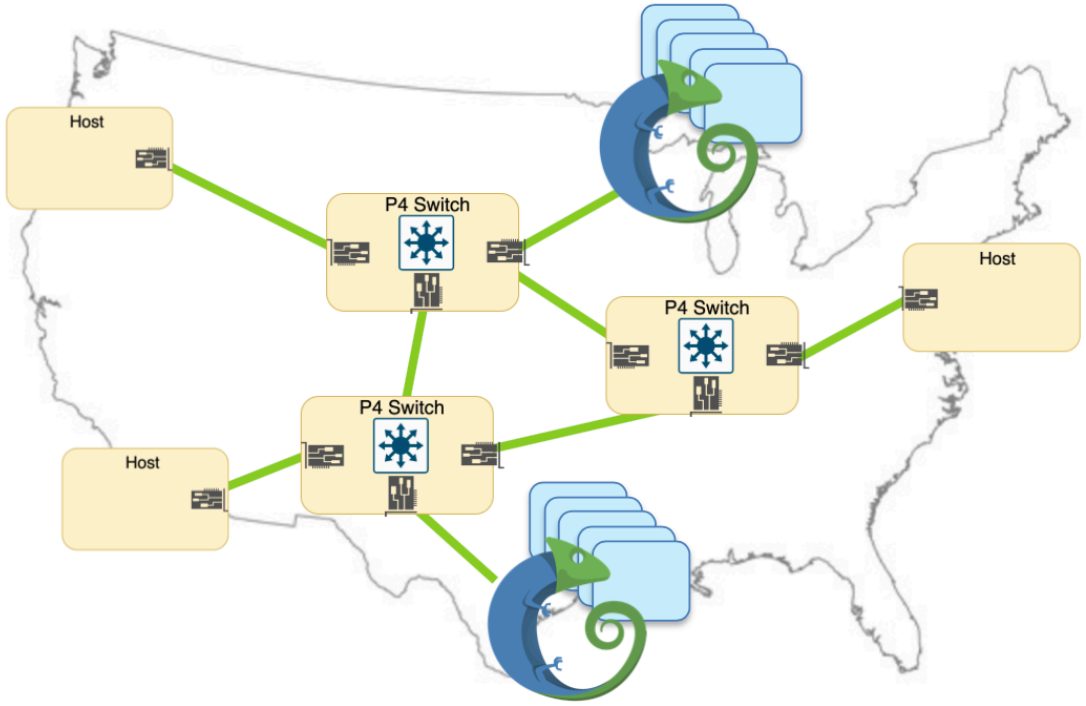
SUPPORT FOR PRACTICAL REPRODUCIBILITY

- Can experiments be as sharable as papers are today?
- Baseline: public, versioned testbed infrastructure
- Environment repeatability as side effect
  - Image snapshotting and orchestration: thousands of artifacts already created
- Missing link
  - Non-transactional and easy to replay **packaging via Jupyter**
  - Access to experiments via **Chameleon daypass**
  - Sharing experiments via **Trovi**
  - Publishing through integration with **Zenodo**



CHAMELEON AND FABRIC

- Powerful edge for FABRIC experiments
- Deep reconfigurability and large variety of hardware
- Extends to CHI in a Box sites
- Edge experimentation with CHI@Edge
- Similar Jupyter-based interface



PARTING THOUGHTS

- Powerful deeply reconfigurable testbed with resources covering experimentation from edge to cloud
- Chameleon is FABRIC facility partner, supports similar Jupyter-based interface, is also based on OpenStack, and will deploy similar patch panel design
- Mechanisms for practical reproducibility: packaging, accessing, and sharing your experiments
- Scientific instrument: continually adapting to your experimental needs!

Think Big!

(with the help of a small reptile)

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