



[www.chameleoncloud.org](http://www.chameleoncloud.org)

## INTRODUCTION TO CHI@EDGE

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*September 9, 2021*

*CHI@Edge Community Workshop*



# CHAMELEON IN A NUTSHELL

- ▶ We like to change: a testbed that adapts itself to your experimental needs
  - ▶ Deep reconfigurability (bare metal) and isolation – but also a small KVM cloud
  - ▶ power on/off, reboot, custom kernel, serial console access, etc.
- ▶ Balance: large-scale versus diverse hardware
  - ▶ Large-scale: ~large homogenous partition (~15,000 cores), ~6 PB of storage originally distributed over 2 sites (UC, TACC) connected with 100G network
  - ▶ Diverse: ARMs, Atoms, FPGAs, GPUs, Corsa switches, etc.
  - ▶ CHI-in-a-Box sites at Northwestern, coming soon: IIT, UIC, and other places
- ▶ Cloud++: CHameleon Infrastructure (CHI) via mainstream cloud tech 
  - ▶ Powered by OpenStack with bare metal reconfiguration (Ironic) + “special sauce”
  - ▶ Blazar contribution recognized as official OpenStack component
- ▶ Standing on the shoulders of giants: packaging for repeatability and sharing
  - ▶ Packaging, sharing, discovering, and publishing experiments

## OPEN TESTBED – BY THE NUMBERS

300+

Papers  
published

45

Countries

700+

Projects

5,900+

Users

160+

Institutions

6+

Years Old

and 3 more  
years to grow!

# WHAT DOES AN EDGE TESTBED LOOK LIKE?



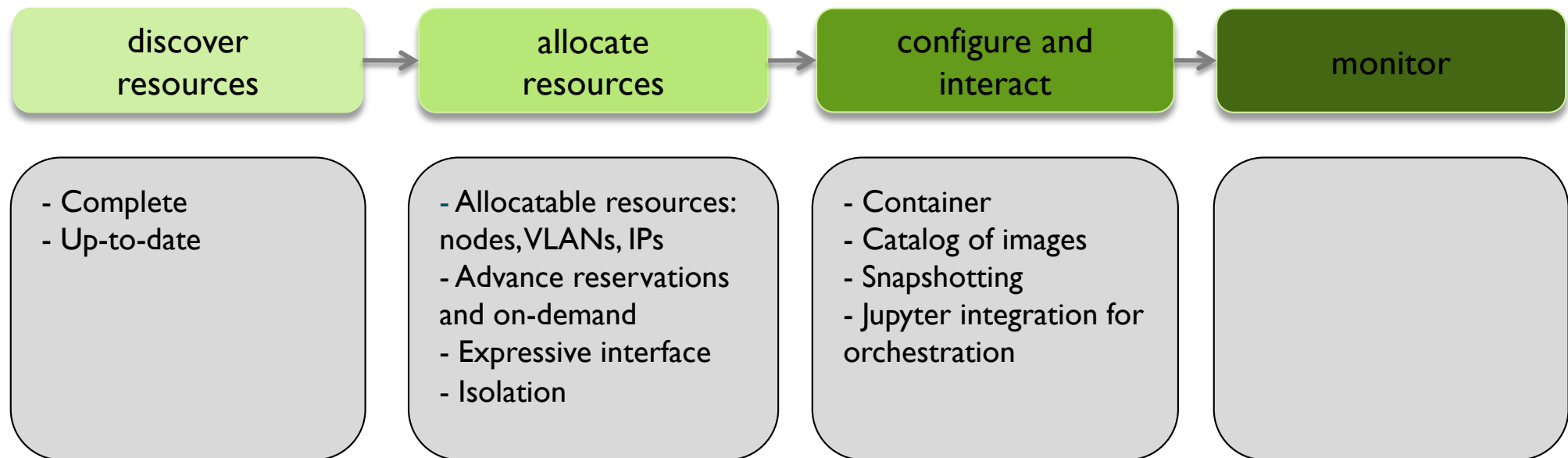
A lot like a cloud just for edge devices!  
All the features we know and love!

Not at all like a cloud!  
Not server-class!  
IoT: cameras, actuators, SDRs!  
Location, location, location!  
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 available through a virtual site(s)
  - ▶ Still working on defining the capabilities: join the mailing list  
<https://groups.google.com/g/chameleon-edge-users>

# CHI@EDGE EXPERIMENTAL WORKFLOW (PREVIEW)

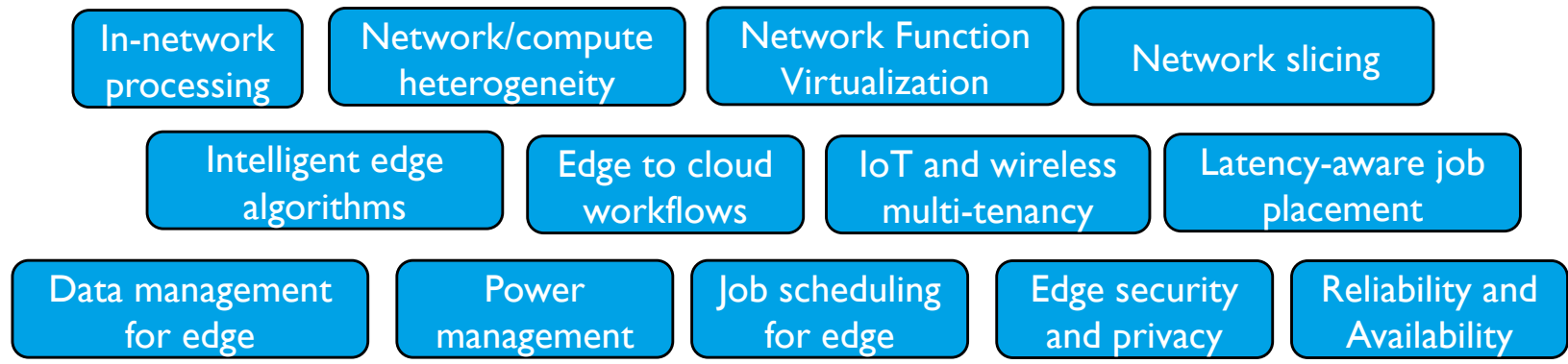


*Authentication via federated identity, accessed via GUI, CLI and python/Jupyter*

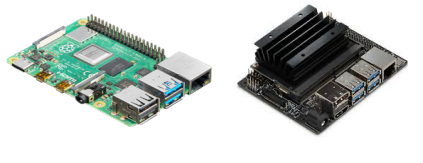
# SHARING DEVICES THROUGH CHI@EDGE

- ▶ CHI@Edge SDK: fully automate the process of enrolling a device into CHI@Edge
- ▶ Support for **restricted leases**
  - ▶ You operate your device for your community and leverage our expertise on sharing
  - ▶ Your users get seamless access to the devices you operate for them + Chameleon + partnerships
- ▶ Access reasonable hardware properties e.g., GPUs
- ▶ Peripheral devices
  - ▶ Standard camera modules, GPIO, SDR
  - ▶ Extensible framework for integrating new devices
- ▶ Temporarily suspended: in the process of refactoring, hoping to bring it back by end of Q1/Q2 of 2022
- ▶ Alternative: adding your device to Chameleon network (available in Q4)

# WHAT DOES AN EDGE TESTBED LOOK LIKE?



CHI@Edge



*chameleon-owned devices*



*user-owned devices*

# BUILDING CHI@EDGE





# CHI AND CHI@EDGE SIDE BY SIDE

## Chameleon for bare metal

Advanced reservations for **bare metal machines**

**Bare metal reconfigurability**

Single-tenant isolation

Heterogeneous collection of interesting hardware

Isolated networking, public IP capability, **OpenFlow SDN**

Composable cloud APIs (GUI, CLI, Python+Jupyter)

**Owned and operated by Chameleon**

## Chameleon for edge

Advanced reservations for **IoT/edge devices**

**Container deployment**

Single-tenant isolation

Heterogeneous collection of interesting hardware **and peripherals/locations!**

Isolated networking, public IP capability

Composable cloud APIs (GUI, CLI, Python+Jupyter)

**Mixed ownership model via restricted sharing**

# CHI@EDGE STATUS

- ▶ CHI@Edge is in **preview!**
  - ▶ Reasonably featureful and reliable core based on mainstream open source adaptation
  - ▶ More thinking: networking, different security/availability scenarios, centralized/decentralized, containers vs other modes of reconfiguration, and many others
  - ▶ More interesting hardware/peripherals via extensible framework
  - ▶ Implementation refactor
  - ▶ Scaling operationally
- ▶ General availability of CHI@Edge SDK is temporarily suspended
  - ▶ Focus on work with current partners
  - ▶ Hoping to restore it around Q1/Q2 of 2022
- ▶ CHI@Edge-in-a-Box in restricted availability, under evaluation
- ▶ Roadmap and technical partnerships



*We're here to change*

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