

Midscale infrastructure investments  
to support computing research:  
CCC white paper process  
to gather community input

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# Background:

- ❖ *goal*: solicit community input on midscale infrastructure requirements
  - options discussed, not taken: CISE-AC only, decadal studies (e.g., Astronomy), NAS study, NSF-sponsored workshop
- ❖ white paper process
  - solicited through CCC, advertised via CCC blog, mailing lists

“The Computing Community Consortium is seeking community input to better understand the potential needs and payoff for additional investments in mid-scale infrastructure for computing research ... “

    - <http://www.cccb.org/2013/03/20/call-for-white-papers-on-mid-scale-infrastructure-investments-for-computing-research>
  - 10 white papers, including inputs from many impactful MI activities (Emulab, FutureGrid, GENI, Openflow, Planetlab), experimental systems researchers

# A common vision:

Is there a need for midscale infrastructure? *Yes!!*

*“A nationwide, multi-tiered system (national/regional R&E backbones, data centers, campuses) that is sliced, deeply programmable, virtualized, and federated so that research experiments can run ‘end to end’ across the full suite of infrastructure.”*

- ❖ *multi-tiered system (national/regional R&E backbones, data centers, campuses):* core/edge networking, computation, clouds
- ❖ *sliced, virtualized:* one (logically shared) physical infrastructure
- ❖ *programmable:* platform for innovation
- ❖ *federated:* organic growth, skin-in-the-game business model

# Observations (1):

- ❖ accessible to different researcher communities at different levels in architecture
  - *IaaS*: infrastructure as a service, down to bare machine
  - *PaaS*: experimental platforms (e.g., end-end networked cloud platform) as a service
  - *SaaS*: application software (SaaS)
- ❖ building bottom up vs. top-down: *converging* to similar place
  - architectural, control differences
- ❖ importance of clear, consistent architecture of testbed design, control, management
- ❖ open software: OpenFlow, OpenStack

# Observations (2):

- ❖ edge networks:
  - WiMax, mostly via existing GENI sites (wireless ubiquity a challenge)
  - measurement of wireless, cable access nets
- ❖ limited input from:
  - cyberphysical systems: one paper only
  - security
  - optical (some)
- ❖ sustainable business models often addressed:
  - NSF, campus co-investment, working with industry
  - investment timescales
  - interaction with industry

# Observations (3): other visions

- ❖ education value noted in several white papers
- ❖ a couple of other, more tightly focused whitepapers:
  - edge network: measurement observatory
  - BGP routing

# Summary:

- ❖ valuable, thoughtful input reflecting deep experience, articulating midscale infrastructure value
- ❖ multiply-articulated MI vision: *nationwide, multi-tiered system .. sliced, deeply programmable, virtualized, and federated*
  - many common views on how to get there, but some differences as well (architecture, control, management)
- ❖ next steps: what's valuable to NSF?
  - broadening community input (CPS, security)
  - sustainability, review & evaluation processes
  - control/architecture/management approaches
  - whitepapers ideas out to broad audience?