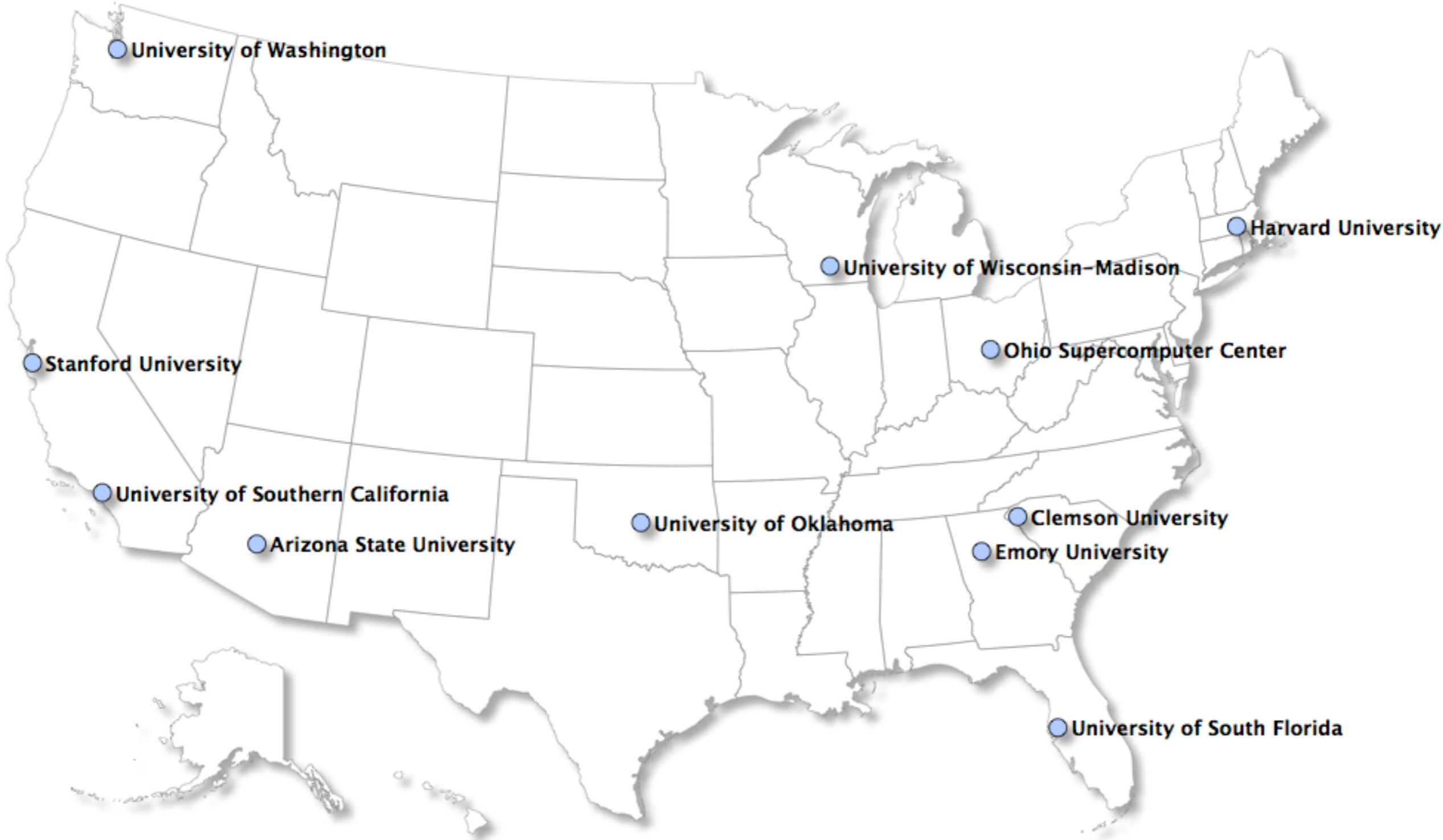# The Condo of Condos

GENI CC-NIE Meeting

Washington, DC

January 7, 2013

Condo Consortium Members

Vision

Transform American universities' computational capacity and advance the nation's research capabilities

Strategy

- Partner with academic computing organizations to re-engage and bring them back into the forefront of providing research computing resources and support.

- Organize & deploy an inter-institutional team of campus IT professionals dedicated to:

  - Connect advanced computing resources among the sites.
  - Develop unified and balanced support teams that include technical- and discipline-oriented staff to advance science and scholarship.
  - Drive end-to-end applications that optimize "friction free" science.
  - Build upon and leverage existing academic and federal investments in high end infrastructure (OSG, XSEDE, resource providers, research faculty)

Understandings

- 1/2 of the proposing team are CC-NIE funded.

- All members of the proposing team are Internet2 Innovation Platform adopters.

- Consortium will partner with, leverage, and transfer knowledge from national initiatives:
  - XSEDE
  - Open Science Grid
  - Internet2
  - ESnet
  - EPSCoR
  - GENI

Understandings

- **Implementation of the I2 Innovation Platform:**
  - Minimum of 10 GB/s connectivity
  - Science DMZ
  - Software Defined Networking (SDN)
- **Dedicate at Least 1FTE at each site to:**
  - Support local campus researchers
  - Bridge condo of condos participants
- **Sustainability:**
  - Expect that over the course of the award new funding streams will develop from faculty partnerships

Outcomes

- Create a community of practitioners that:
  - Shares knowledge, experience, and expertise
  - Bridges research communities
  - Form extended local and national collaborations
- Be a model for "team science" that can be extended and replicated nationwide for both IT staff and science users

Value Proposition *temporary investment to create a strategically balanced support team allowing each campus to transform its research support and outreach capabilities (case study next) and in leveraging the strengths of all sites creates a national resource and coalition that does exist today*

Brief History of HPC Provisioning in Higher Education

- **1960s:** University computing centers provided research computing access (federal funds often supported)

- **1970s:** "Supercomputing famine" begins
  - Federal funds dry up
  - Campus fund time-sharing systems (Dec-10s, Sigmas, Multics, Univac)
  - Research problem size shrink; science "constrained"
  - To gain access to "supercomputers" (CDC series…) researchers either get security clearances to work at weapons labs or go to Europe

History continued

- **1980s:** Researchers shift to departmental computing (Dec-Vax, Sun, Server & workstations, PCs, Unix)
  - Series of reports (Lax, Press, Bardon-Curtis)
    - Led to establishment of NSF supercomputing centers
    - Generally available to academic community (v. mission oriented)

- **1990s:** Centers considered successful
  - 1996 – NSF cancels centers program
    - Mission creep; computing pervasive
  - 1997 announces PACI which includes:
    - Resource providers
    - Interdisciplinary teams to build "advanced computational infrastructure"
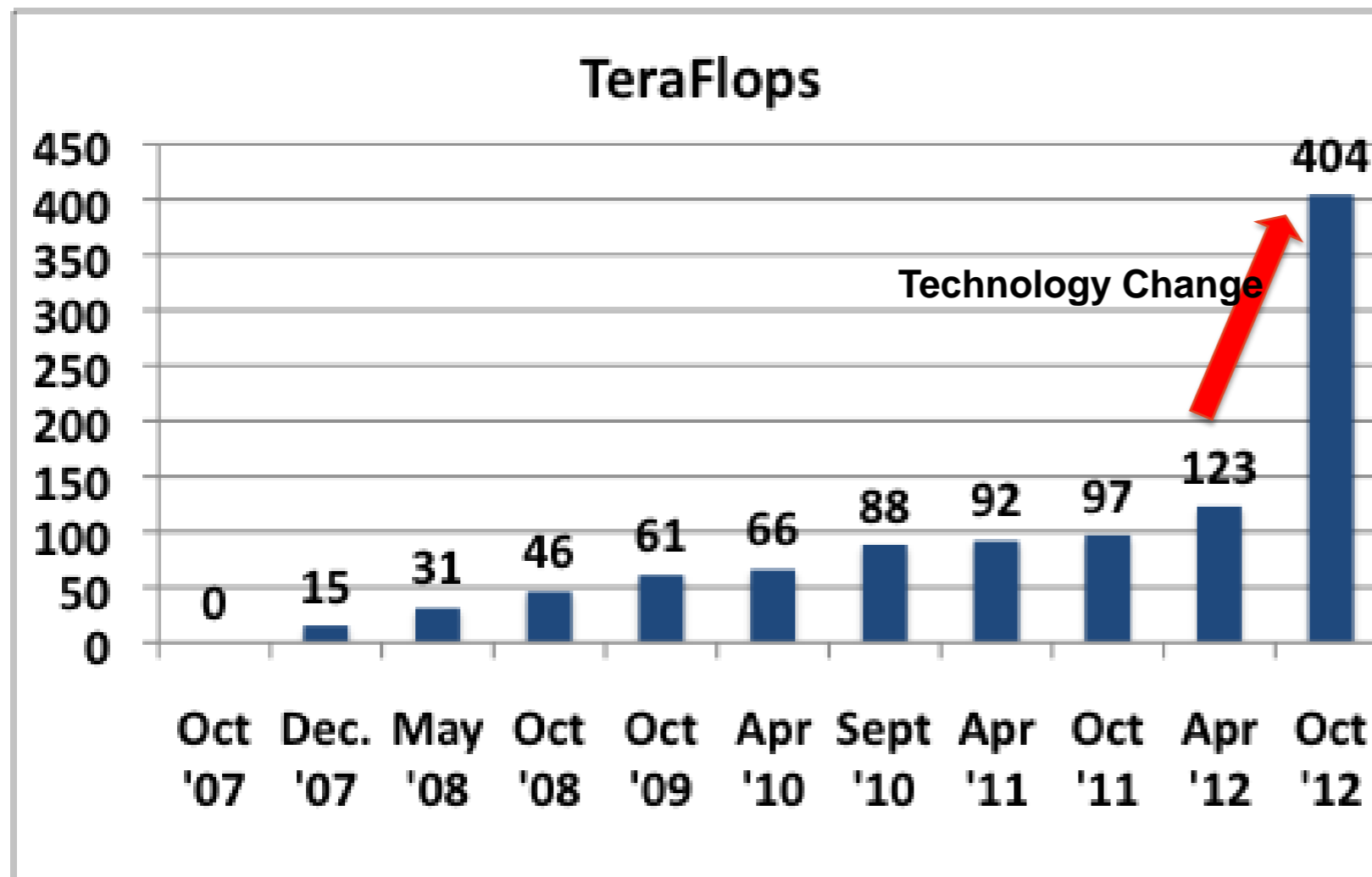
History continued

- **2000s:** TeraGrid
  - Modification of PACI (fewer partners)

  - New trends → Driven by utilities, security, support availability researchers
    - Commoditization of HPC architectures
    - NETWORKS – Cloud Architectures – Google/Amazon/Ebay….
    - Grant and start-up funded clusters
    - Begin migration back to campus data centers …. But also out to external "aaS" entities
    - Big Data – the emerging academic "missing middle"

  - Most universities had largely divested of research computing and are under-resourced for research support.
    - Networks part of IT, but not necessarily advanced networking.
    - Profile for research computing = 1-5% of overall central IT budget

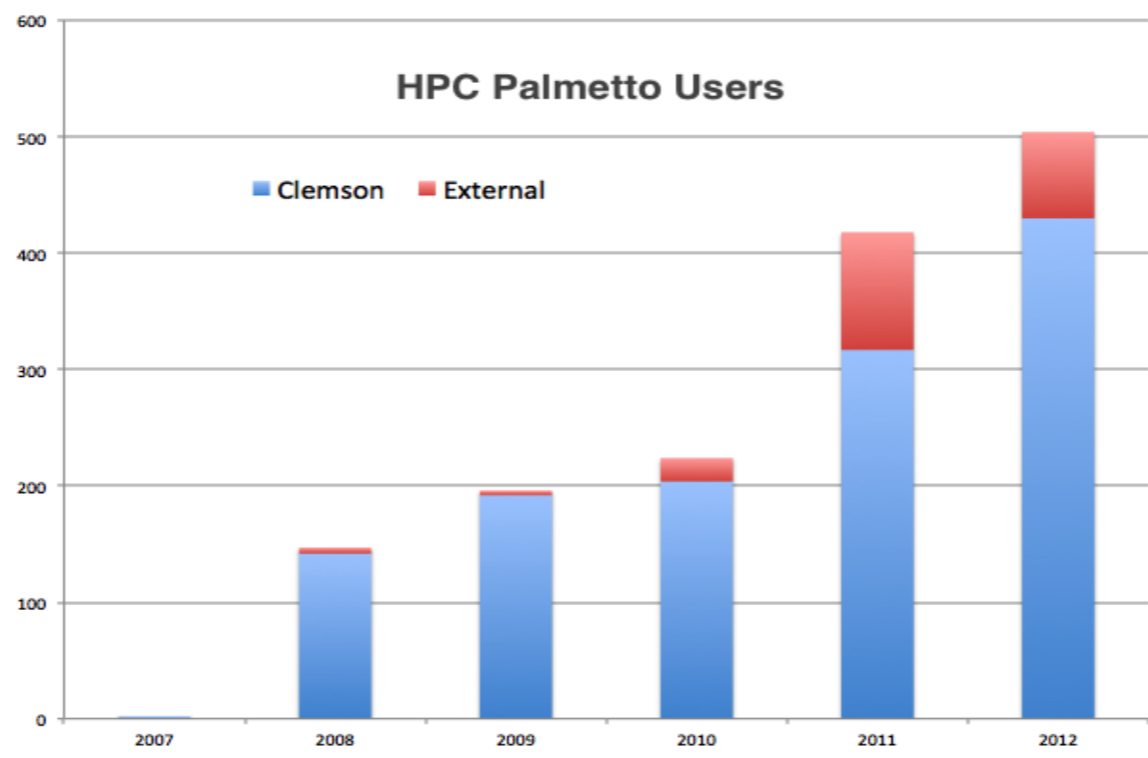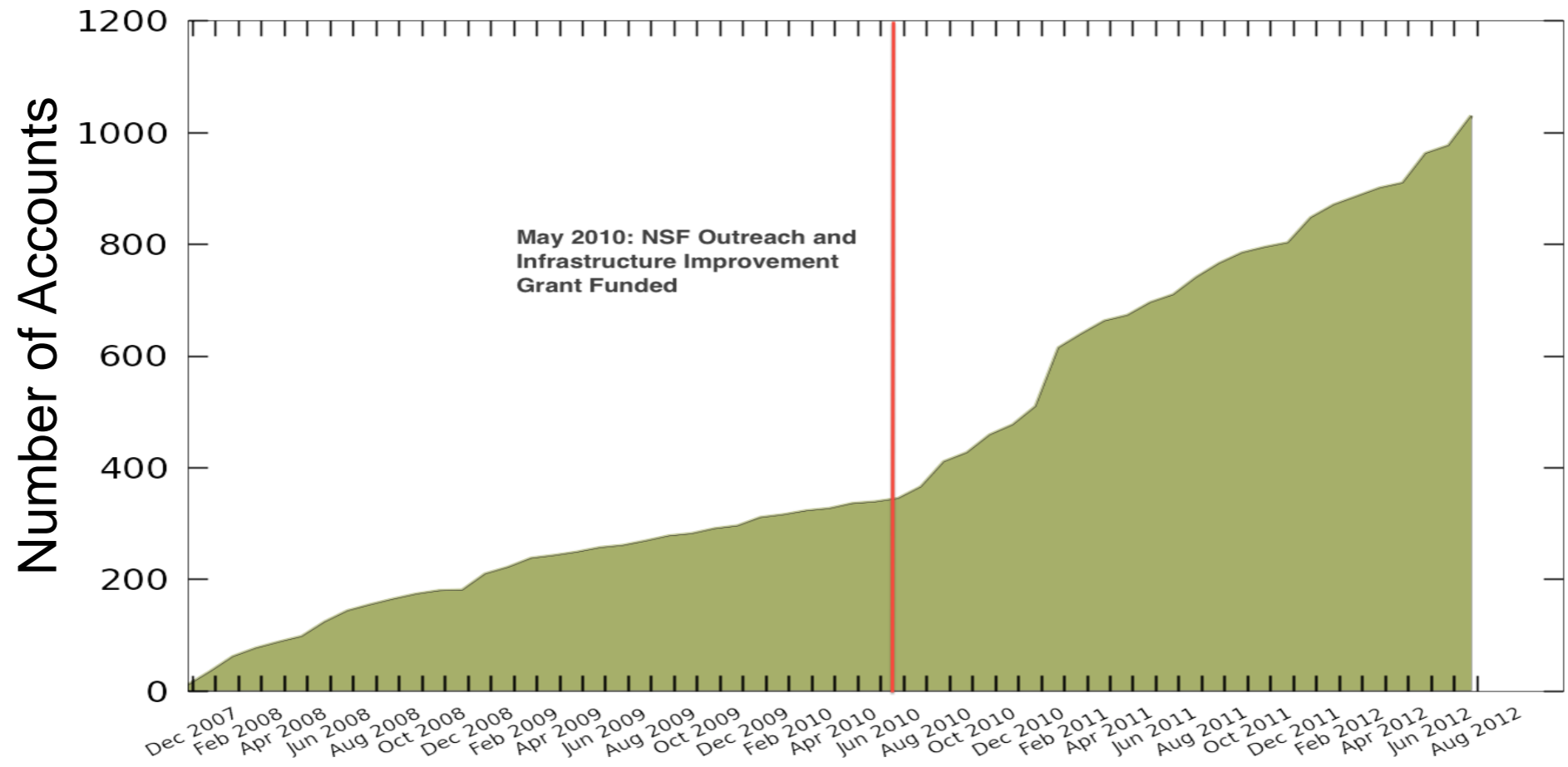# A Case Study or Model to Substantiate "Transformative" Hypothesis

Clemson University

Computing Infrastructure

⑩ Community HPC Clusters – Shared Investments

⑩ Highly leveraged instrument for research
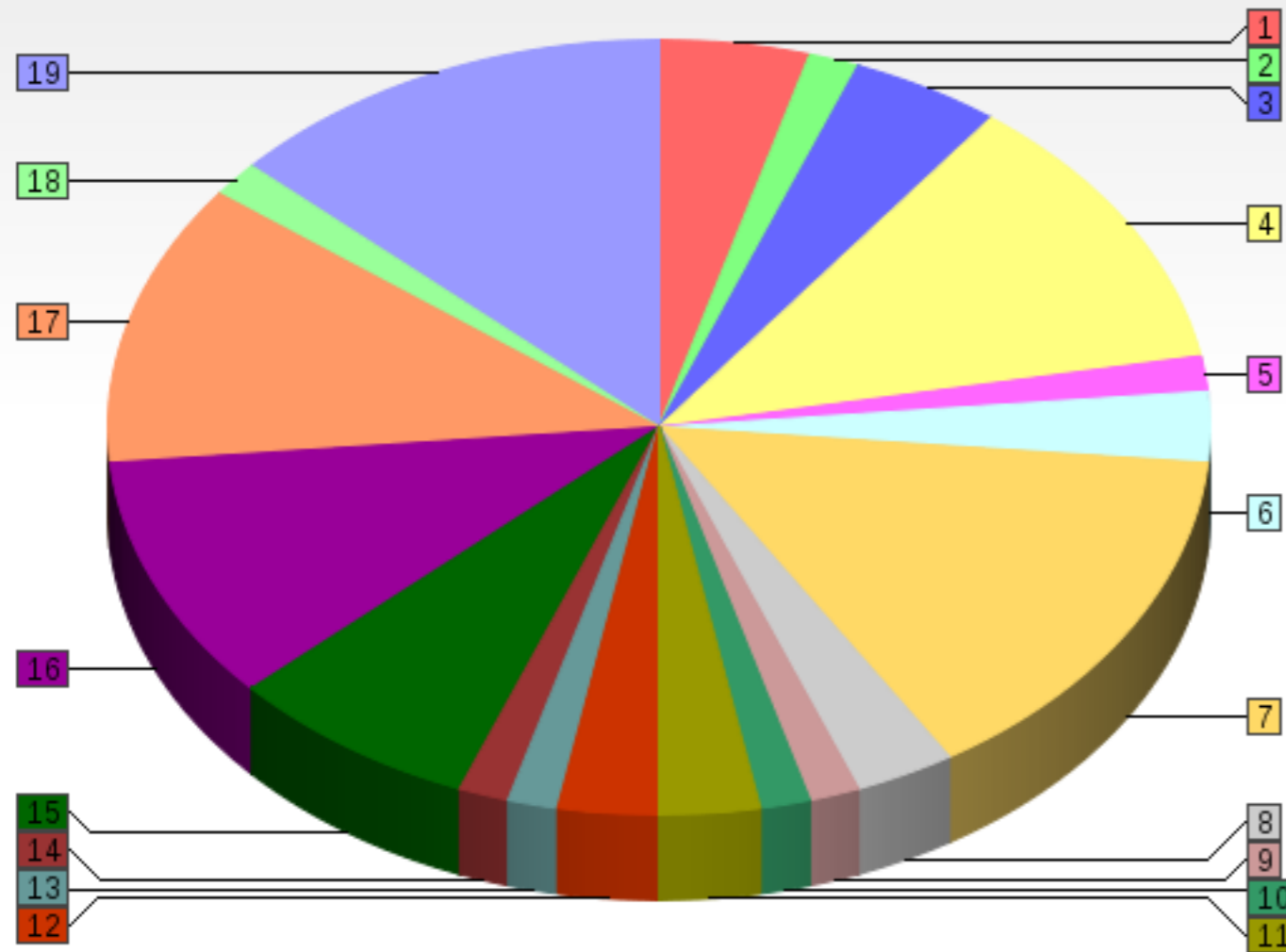
⑩ #4 among public academic institutions

TeraFlops

Technology Change

Data values by date:
- Oct '07: 0
- Dec. '07: 15
- May '08: 31
- Oct '08: 46
- Oct '09: 61
- Apr '10: 66
- Sept '10: 88
- Apr '11: 92
- Oct '11: 97
- Apr '12: 123
- Oct '12: 404

Impacts: Community Growth

May 2010: NSF Outreach and Infrastructure Improvement Grant Funded


HPC Palmetto Users

HPC Users – FY08
Total Depts. = 19

Departments using HPC

1. BIOENGINEERING 4.41%
2. CAMPBELL GRAD ENGR. 1.47%
3. CHEMICAL ENGR. 4.41%
4. CHEMISTRY 11.76%
5. CTR ADVNCD ENGR. FILM 1.47%
6. ECONOMICS 2.94%
7. ELEC. & COMPUTER ENGR. 14.71%
8. ENV. ENGR & ES 2.94%
9. FAMILY OUTREACH 1.47%
10. GENERAL ENGR. 1.47%
11. GENETICS & BIOCHEM. 2.94%
12. HEHD COLLEGE SUP. 2.94%
13. HORTICULTURE 1.47%
14. INDUSTRIAL ENGR. 1.47%
15. MATHEMATICAL SCI. 7.35%
16. MECHANICAL ENGR. 10.29%
17. PHYS. AND ASTRONOMY 11.76%
18. SCHOOL OF ARCH. 1.47%
19. SCHOOL OF COMPUTING 13.24%

HPC Users – FY13
Total Depts. = 36
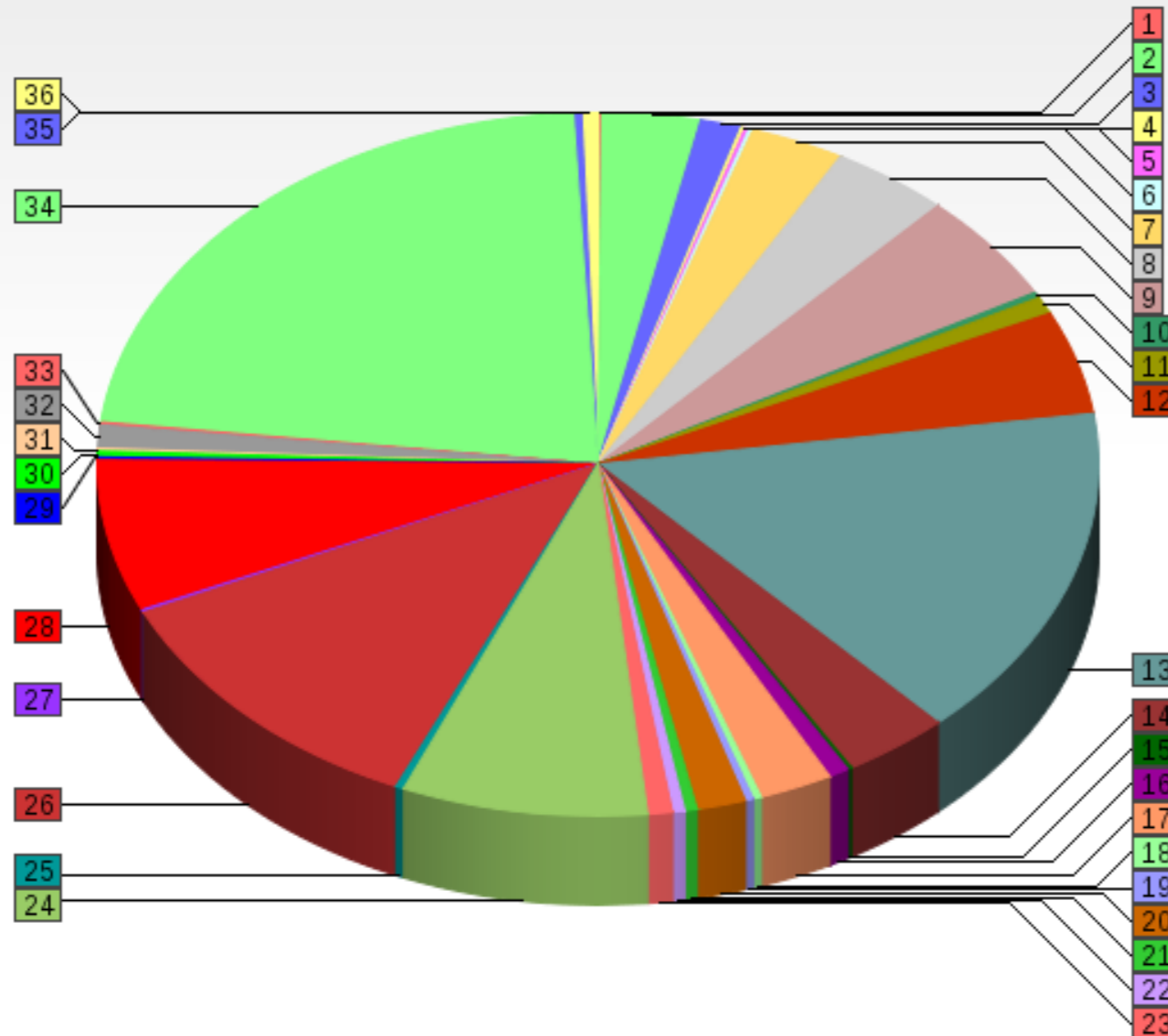
1. ART 0.13%
2. BIOENGINEERING 3.17%
3. BIOLOGICAL SCIENCES 1.32%
4. CAMPBELL GRAD ENGR. 0.13%
5. OPTICAL MATERIALS SCI. 0.13%
6. HOUSTON CENTER 0.13%
7. CHEMICAL ENGR. 3.03%
8. CHEMISTRY 3.83%
9. CIVIL ENGINEERING 5.01%
10. CTR ADVNCD ENGR. FILM 0.26%
11. CU GENOMICS INSTITUTE 0.79%
12. ECONOMICS 4.75%
13. ELEC. & COMPUTER ENGR. 15.44%
14. ENV. ENGR & ES 3.43%
15. FAMILY OUTREACH 0.13%
16. GENERAL ENGR. 0.66%
17. GENETICS & BIOCHEM. 2.37%
18. HEHD COLLEGE SUPPORT 0.26%
19. HORTICULTURE 0.26%
20. INDUSTRIAL ENGR. 1.58%
21. INT'L VISITORS 0.40%
22. MANAGEMENT 0.40%
23. MATERIALS SCI. & ENGR. 0.79%
24. MATHEMATICAL SCI. 7.92%
25. MBA PROGRAM 0.26%
26. MECHANICAL ENGR. 11.48%
27. PARKS REC & TOURISM MGT 0.13%
28. PHYS. AND ASTRONOMY 6.99%
29. PSYCHOLOGY 0.13%
30. PUBLIC HEALTH SCIENCES 0.26%
31. ACCOUNTANCY&FINANCE 0.13%
32. AG, FOR, ENV SCIENCE 1.06%
33. SCHOOL OF ARCH. 0.13%
34. SCHOOL OF COMPUTING 22.30%
35. SCHOOL OF PDPLA 0.26%
36. SOCIOLOGY AND ANTHRO. 0.53%

Clemson HPC Users in the State of South Carolina
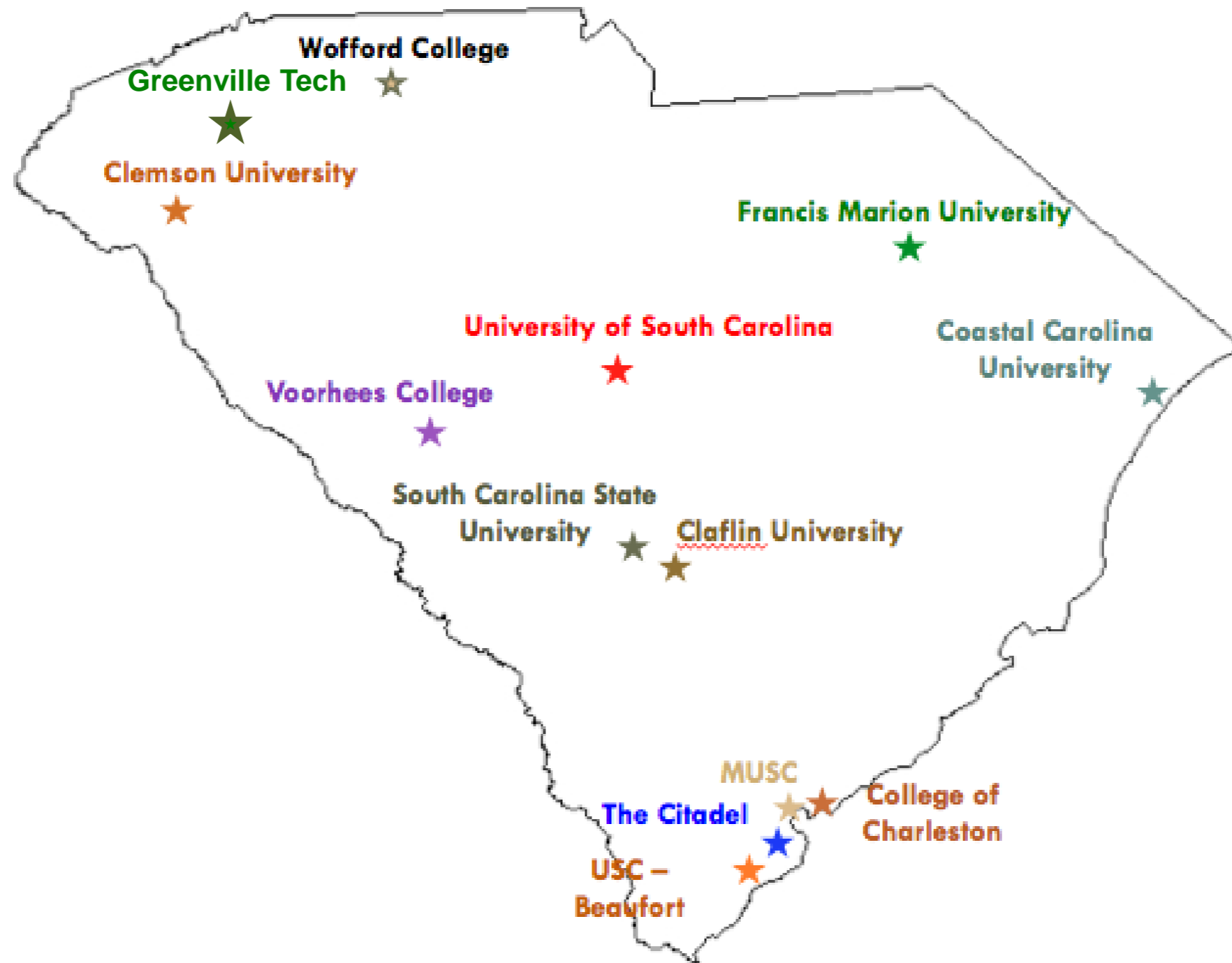
Approximately 80 faculty user groups of Clemson Palmetto HPC cluster in State of SC

DISCUSSION