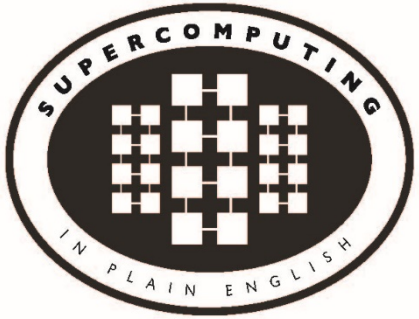
OneOklahoma Cyberinfrastructure Initiative (OneOCII)

Henry Neeman, University of Oklahoma
Dana Brunson, Oklahoma State University

OK EPSCoR, Thu Dec 3 2015



OCII vs OneOCII

- OCII: Oklahoma Cyberinfrastructure Initiative
  - Established under Oklahoma's 2008-13 NSF EPSCoR Research Infrastructure Improvement (RII) Track-1 grant.
- OneOCII: OneOklahoma Cyberinfrastructure Initiative
  - Became OneOCII under Oklahoma's 2013-18 RII Track-1.
    - State Science & Technology plan, a required proposal component for RII Track-1, was the OneOklahoma Science & Technology Plan.

OK Cyberinfrastructure Initiative

- All academic institutions in Oklahoma are eligible to sign up for free use of OU's and OSU's centrally-owned Cyberinfrastructure resources.
- Other kinds of institutions (government, non-governmental) are eligible to use, though not necessarily for free.
- Everyone can participate in our CI education initiative.
- The Oklahoma Supercomputing Symposium, our annual conference, continues to be offered to all.
- Triggered by OK's NSF EPSCoR Research Infrastructure Improvement Track-1 2008-13, then expanded under OK's RII Track-1 2013-18.

OCII/OneOCII Goals

- **Reach** institutions outside the mainstream of advanced computing.
- **Serve** every higher education institution in Oklahoma that has relevant curricula.
- **Educate** Oklahomans about advanced computing.
- **Attract** underrepresented populations and institution types into advanced computing.

OneOCII Service Methodologies Part 1

- **Access**: to supercomputers and related technologies (20 OK academic institutions to date).
- **Dissemination**: Oklahoma Supercomputing Symposium – annual advanced computing conference has reached 112 academic institutions, 143 commercial, 36 government, 20 nongovernmental (25 OK academic institutions to date).
- **Education**: "Supercomputing in Plain English" (SiPE) workshop series: 11 talks about advanced computing, taught with stories, analogies and play rather than deep technical jargon. Have reached 362 institutions (academic, government, industry, nonprofit) in 51 US states and territories and 17 other countries (16 OK academic institutions to date).

OneOCII Service Methodologies Part 2

- **Faculty/Staff Development**: Workshops held at OU and OSU on advanced computing and computational science topics, sponsored by the National Computational Science Institute, the SC supercomputing conference series, the Linux Clusters Institute, the Virtual School for Computational Science & Engineering. Oklahoma is the only state to have hosted multiple events sponsored by each of these (18 OK academic to date).
- **Informatics**: research facilitators embedded in specific research projects (and largely funded by them)
- **Outreach**: "Supercomputing in Plain English" (SiPE) overview talk (25 OK academic to date).

OneOCII Service Methodologies Part 3

- **Proposal Support**: Letters of commitment for access to OneOCII resources; collaborations with OneOCII lead institutions (4 OK academic, 1 nongovernmental).
- **Stewardship**: Research data stewardship initiative, led by Libraries.
- **Technology**: Got or helped get technology (e.g., network upgrade, mini-supercomputer, hi def video camera for telepresence) for that institution (14 OK academic to date).

OneOCII Service Methodologies Part 4

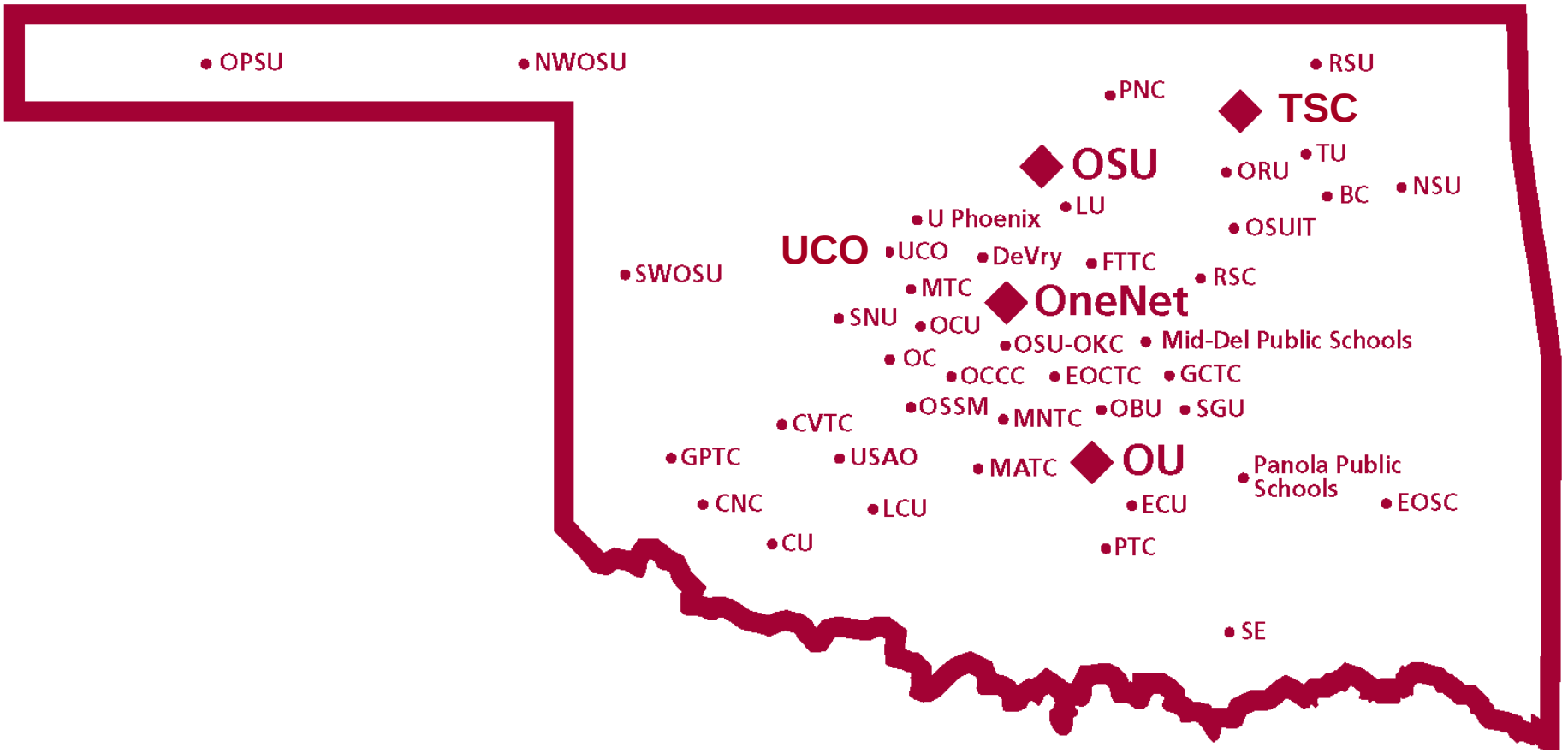
- **Workforce Development** – (39 OK academic)
  - Oklahoma Information Technology Mentorship Program (OITMP)
  - "A Day in the Life of an IT Professional" presentations to courses across the full spectrum of higher education.
  - Job shadowing opportunities and direct mentoring of individual students.
  - Institution Types: high schools, career techs, community colleges, regional universities, PhD-granting universities.
- Special effort to reach underrepresented populations: underrepresented minorities, non-PhD-granting, rural

OneOCII Institution Profile

To date, OneOCII has served 103 Oklahoma institutions, agencies and organizations:

- 55 OK academic
- 48 OK non-academic

OneOklahoma Cyberinfrastructure Initiative



OneOCII Outcomes: Research

- External research funding to OK institutions facilitated by OneOCII lead institutions (Fall 2001- Summer 2013): **$200M+**
- Funded projects facilitated: **300+**
- OK faculty and staff: **200+** in **20+** academic disciplines
- Specifically needed OneOCII just to be funded: **~$44M** (necessary but far from sufficient)
  - NSF EPSCoR RII Track-1 (2008-13, OU+OSU): $15M
  - NSF EPSCoR RII Track-1 (2013-18, OU+OSU+Noble)): $20M
  - NSF EPSCoR RII Track-2 (OU+OSU+KU+KSU): $6M ($3M to OU+OSU)
  - NSF EPSCoR RII C2 (OU+OSU+TU+LU+Noble+OneNet): $1.17M
  - NSF CC-NIE (OU+OSU+LU+OII+UCO+OneNet): $500K
  - NSF CC*IIE (OU): $400K
  - NSF CC*IIE (OneNet+GPN): $350K
  - NSF MRI (OU): $793K
  - NSF MRI (OSU): $908K
  - NSF MRI (OSU): $950K
  - NSF MRI (Langston U): $250K
  - NSF MRI (UCO): $304K
  - NSF MRI (TU): $180K
  - DOD DURIP (TU): $200K
- Publications facilitated: **over 1500**

OCII/OneOCII CI Grants

COMPLETED

1. Grant No. EPS-0919466, "A cyberCommons for Ecological Forecasting," OU+OSU+KU+KSU, $6M, **COMPLETED**
2. Grant No. EPS-1006919, "Oklahoma Optical Initiative," OU+OSU+Noble+TU+LU+OneNet, $1.17M, **COMPLETED**
3. Grant No. OCI-10310029, "MRI: Acquisition of Extensible Petascale Storage for Data Intensive Research," OU, $793K
4. Grant No. OCI-1126330, "Acquisition of a High Performance Compute Cluster for Multidisciplinary Research," OSU, $908K
5. Grant No. ACI- 1229107, "Acquisition of a High Performance Computing Cluster for Research and Education," LU, $250

ONGOING

1. Grant No. ACI-1341028, "OneOklahoma Friction Free Network," OU+OSU+LU+OII+UCO+OneNet, $500K
2. Grant No. ACI-1440783, "A Model for Advanced Cyberinfrastructure Research and Education Facilitators," OU, $400K
3. Grant No. ACI-1440774, "ENCITE: ENabling CyberInfrastructure via Training and Engagement," OneNet+GPN, $130K
4. Grant No. ACI-1429702, "MRI: Acquisition of a High Performance Computing Cluster for Research at a Predominantly Undergraduate Institution," UCO, $304K -- **RECENT RIBBON CUTTING**
5. Grant No. ACI-1531128, "MRI: Acquisition of Shared High Performance Compute Cluster for Multidisciplinary Computational and Data-Intensive Research," OSU, $950K
6. Grant No. ?, "DURIP-ARO: Heterogeneous Cluster for Cyber-Physical System Security Analytics," TU, $200K
7. Grant No. CNS-1531270, "MRI: Development of Heterogeneous Cluster for Cyber-Physical System Hybrid Analytics," TU, $180K

<u>TOTAL under OCII/OneOCII</u>: Since Sep 2008, $8.8M in 12 CI grants to 8 OK institutions (OU, OSU, TU, LU, UCO, OII, Noble, OneNet) (average of $1.25M per year in new CI grants to OK institutions)

Comparison: 2001-2008: $722K (3 grants) TOTAL (1/12 as much)

Grants That Needed OCII/OneOCII

COMPLETED

- Grant No. EPS-0814361, “"Building Oklahoma's Leadership Role in Cellulosic Bioenergy,” OU+OSU, $15M

ONGOING

- Grant No. EPS-1301789, “Adapting Socio-ecological Systems to Increased Climate Variability,” OU+OSU+TU+Noble, $20M

<u>TOTAL under OCII/OneOCII</u>: $35M in 2 grants that needed OCII/OneOCII to be fundable, to 4 OK institutions since Sep 2008

Papers About Pieces of OneOCII

- H. Neeman, K. Adams, J. Alexander, D. Brunson, S. P. Calhoun, J. Deaton, F. Fondjo Fotou, K. Frinkle, Z. Gray, E. Lemley, G. Louthan, G. Monaco, M. Morris, J. Snow and B. Zimmerman, 2015: "On Fostering a Culture of Research Cyberinfrastructure Grant Proposals within a Community of Service Providers in an EPSCoR State." *Proc. XSEDE'15*, article 19. DOI: 10.1145/2792745.2792764.
- H. Neeman, D. Akin, J. Alexander, D. Brunson, S. P. Calhoun, J. Deaton, F. Fondjo Fotou, B. George, D. Gentis, Z. Gray, E. Huebsch, G. Louthan, M. Runion, J. Snow and B. Zimmerman, 2014: "The OneOklahoma Friction Free Network: Towards a Multi-Institutional Science DMZ in an EPSCoR State." *Proc. XSEDE'14*, article 49. DOI: 10.1145/2616498.2616542.
- S. P. Calhoun, D. Akin, J. Alexander, B. Zimmerman, F. Keller, B. George and H. Neeman, 2014: "The Oklahoma PetaStore: A Business Model for Big Data on a Small Budget." *Proc. XSEDE'14*, article 48. DOI: 10.1145/2616498.2616548.
- C. Carley, B. McKinney, L. Sells, C. Zhao and H. Neeman, 2013: "Using a Shared, Remote Cluster for Teaching HPC." *Proc. IEEE CLUSTER 2013*. DOI: 10.1109/CLUSTER.2013.6702630.
- H. Neeman, D. Brunson, J. Deaton, Z. Gray, E. Huebsch, D. Gentis and D. Horton, 2013: "The Oklahoma Cyberinfrastructure Initiative." *Proc. XSEDE'13*, article 70. DOI: 10.1145/2484762.2484793.

National Leadership Part 1

- Workforce Development
  - OU CI lead Henry Neeman's NSF CC*IIE Campus CI Engineer grant is doing a "Virtual Residency" to teach people how to help researchers use advanced computing in their research.
    - Summer 2015 workshop: 50 participants from 39 institutions in 26 states and territories (28 onsite and 22 offsite via videoconferencing)
- NSF MRI grants
  - OSU CI lead Dana Brunson's most recent MRI has been plugged at multiple national meetings by the Division Director of the NSF Advanced Cyberinfrastructure division as exactly what the NSF wants to see from MRIs for CI.

National Leadership Part 2

- XSEDE (NSF-funded national supercomputing center program)
  - Campus Engagement: OU CI lead Henry Neeman and OSU CI lead Dana Brunson have been appointed XSEDE Campus Engagement Co-managers starting July 1 2016.
    - Campus Champions
    - Intra-state collaboration (next slide)
  - XSEDE Level 3 Service Providers: OSU CI lead Brunson is chair.

More States Should Do This

- More states should do intra-state collaboration for Cyberinfrastructure.
- Some states already do similar things, for example:
  - Sunshine State Educational &Research Computing Alliance (Florida)*
  - Louisiana Optical Networking Initiative*
  - Massachusetts Green HPC Center*
  - New York State HPC Consortium*
  - Ohio Supercomputer Center

  * Limited subset of research-intensive institutions
- We want institutions with CI to share with others in their states.
- We want to help other states develop their own approaches.
  - We're already scheduled to work with three other states on this in the coming 6 months and are now scheduling a fourth.
- Ultimately, this should be normal, and expected.

Acknowledgements

- Portions of this material are based upon work supported by the National Science Foundation and the Department of Defense under the following grants:
  - Grant No. EPS-0814361, “Building Oklahoma's Leadership Role in Cellulosic Bioenergy”
  - Grant No. EPS-0919466, “A cyberCommons for Ecological Forecasting”
  - Grant No. EPS-1006919, “Oklahoma Optical Initiative”
  - Grant No. OCI-10310029, “MRI: Acquisition of Extensible Petascale Storage for Data Intensive Research”
  - Grant No. OCI-1126330, “Acquisition of a High Performance Compute Cluster for Multidisciplinary Research”
  - Grant No. ACI- 1229107, “Acquisition of a High Performance Computing Cluster for Research and Education”
  - Grant No. EPS-1301789, “Adapting Socio-ecological Systems to Increased Climate Variability”
  - Grant No. ACI-1341028, “OneOklahoma Friction Free Network”
  - Grant No. ACI-1440783, “A Model for Advanced Cyberinfrastructure Research and Education Facilitators”
  - Grant No. ACI-1440774, “ENabling CyberInfrastructure via Training and Engagement”
  - Grant No. ACI-1531128, “MRI: Acquisition of Shared High Performance Compute Cluster for Multidisciplinary Computational and Data-Intensive Research,” OSU, $950K
  - Grant No. ?, “DURIP-ARO: Heterogeneous Cluster for Cyber-Physical System Security Analytics,” TU, $200K
  - Grant No. CNS-1531270, “MRI: Development of Heterogeneous Cluster for Cyber-Physical System Hybrid Analytics,” TU, $180K
- Dell provided seed systems for the OU Research Cloud (“OURcloud”) and the OU Science DMZ.

Thanks for your attention!

QUESTIONS?