

NSF 2017 PI Workshop
CI Engineer Breakout
Survey
Monday, October 2, 2017

Survey Respondents = 20

University of Missouri – Columbia

University of Wyoming

Massachusetts Green High Performance Computing Center

UC Santa Cruz

University of Utah

Northern New Mexico College

Colby College

George Washington University

DePauw University

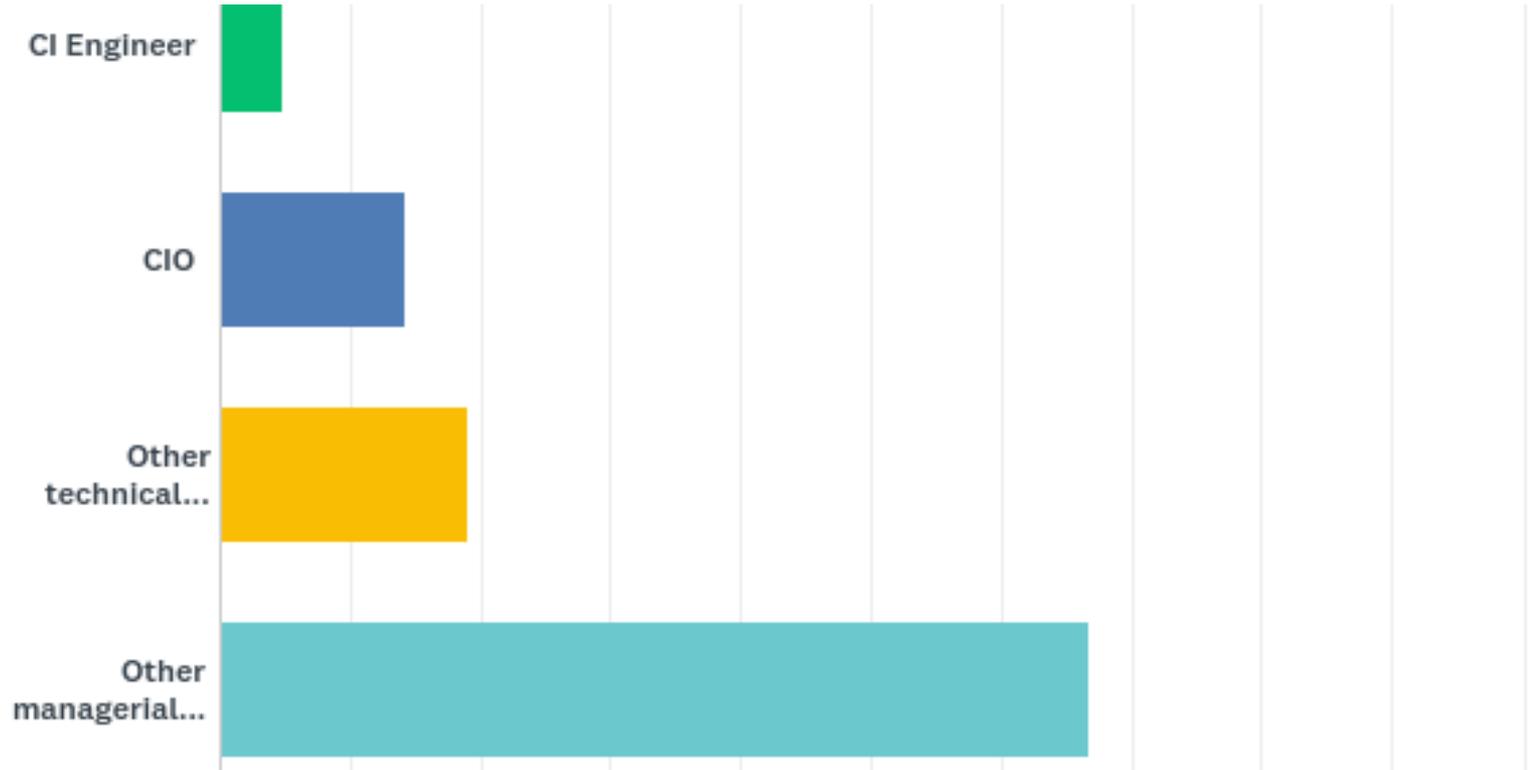
Rice University

UC Berkeley

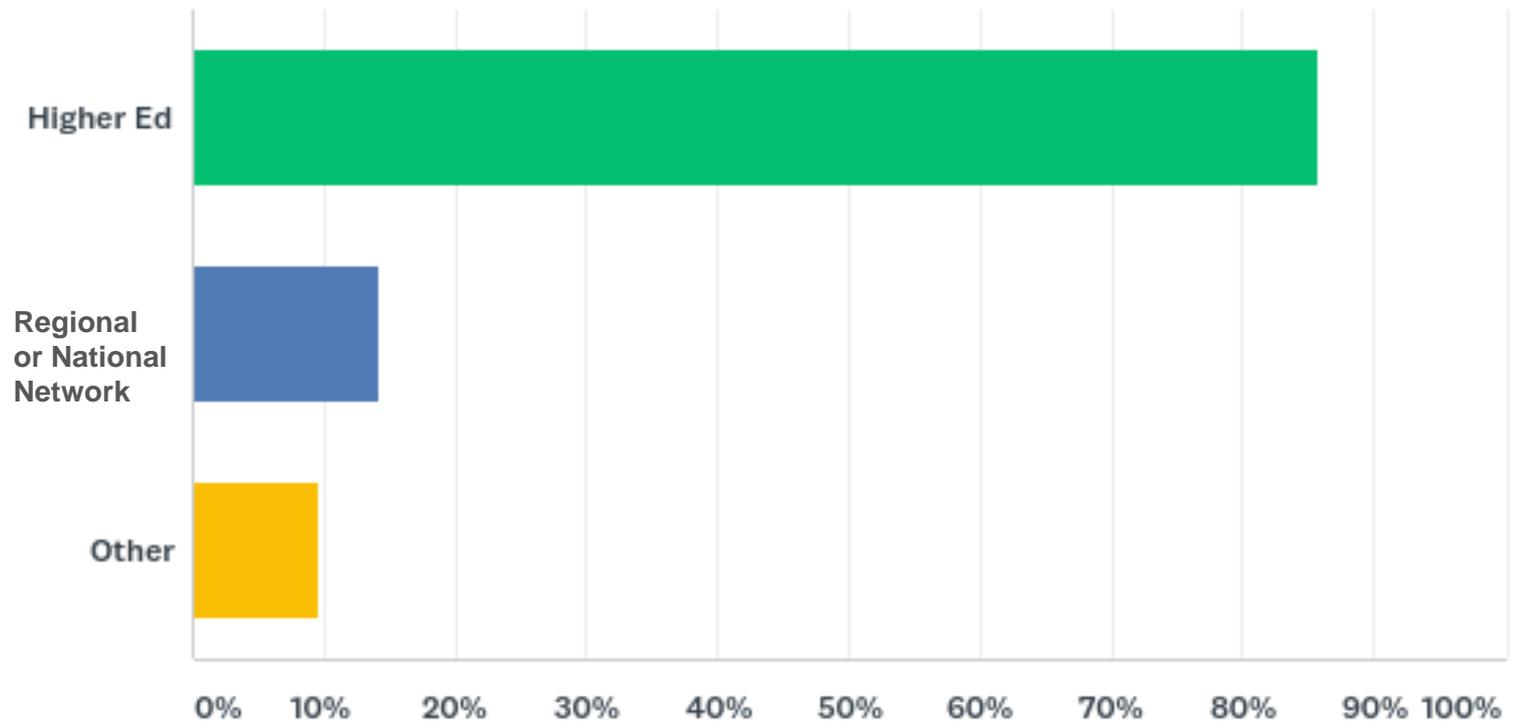
University Center for Atmospheric Research

Case Western Reserve University

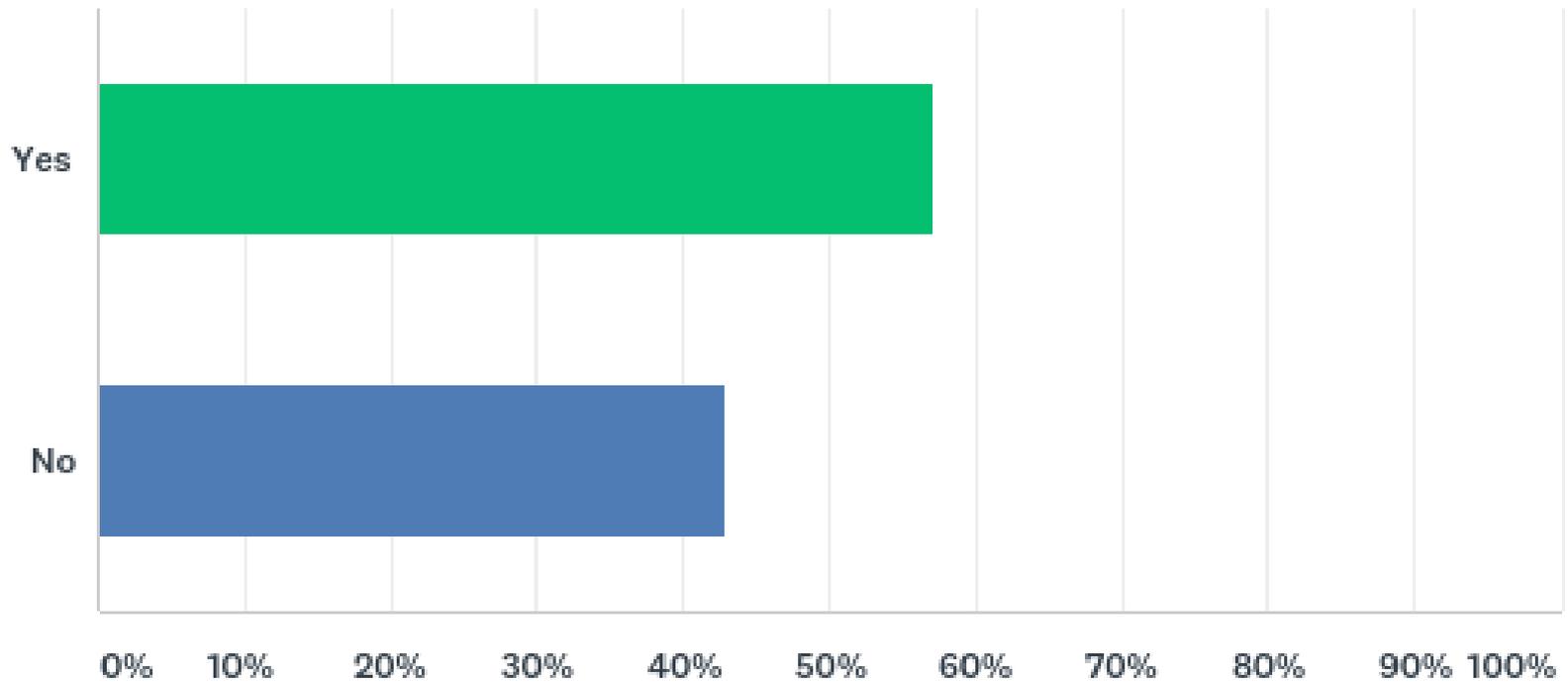
Role of Survey Respondent



Institutional Type of Survey Respondent



Breakout Participant Organizations With a Formal CI Engineer Position



Summary

CI Engineer Basic Educational Requirements

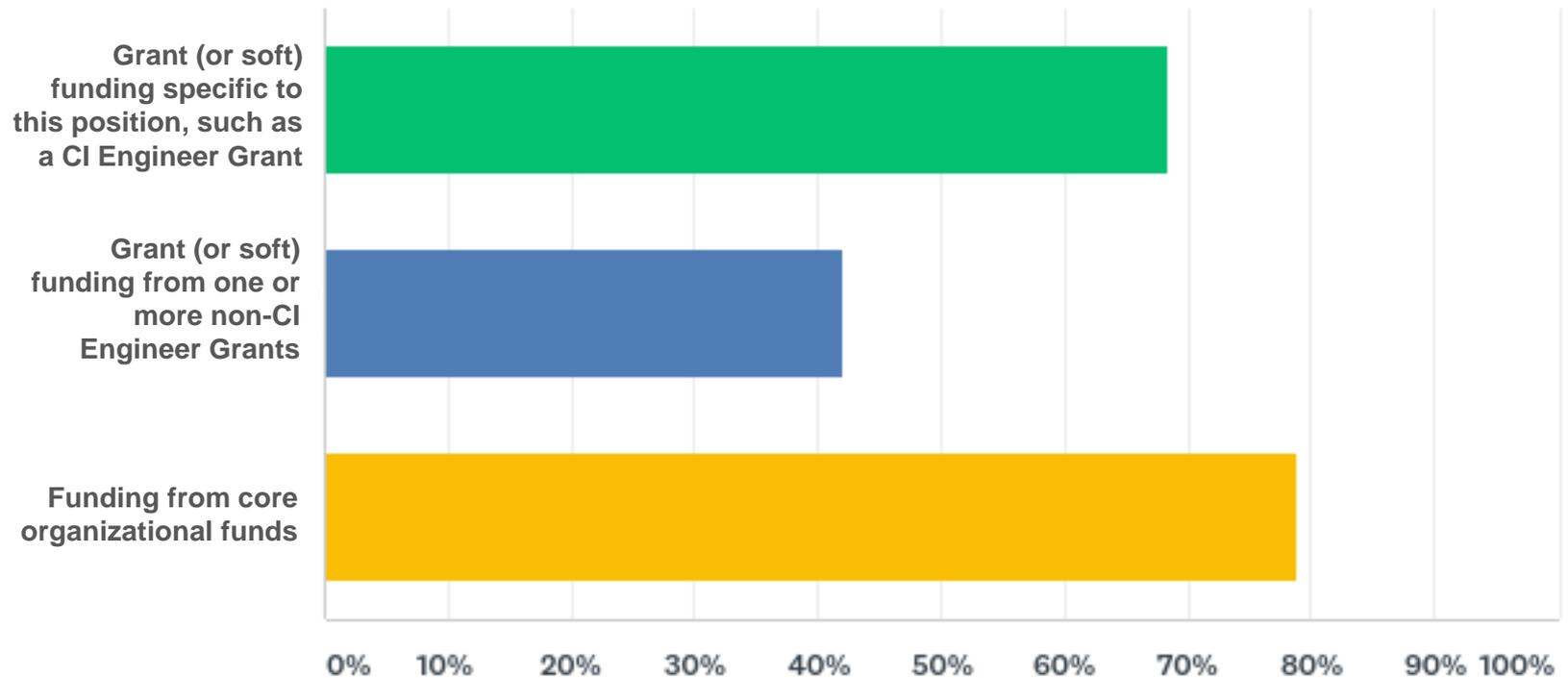
- Bachelors Degree (11)
 - With advanced degree (4)
 - Preference with CS or closely related field
 - Hands-on industry credentials (e.g., Cisco, Juniper, Palo Alto certificates or good knowledge of it)
- MS or PhD (4)
 - Computer science, computer engineering or related field
- IT degree
 - some science/research knowledge or vice versa

Summary:

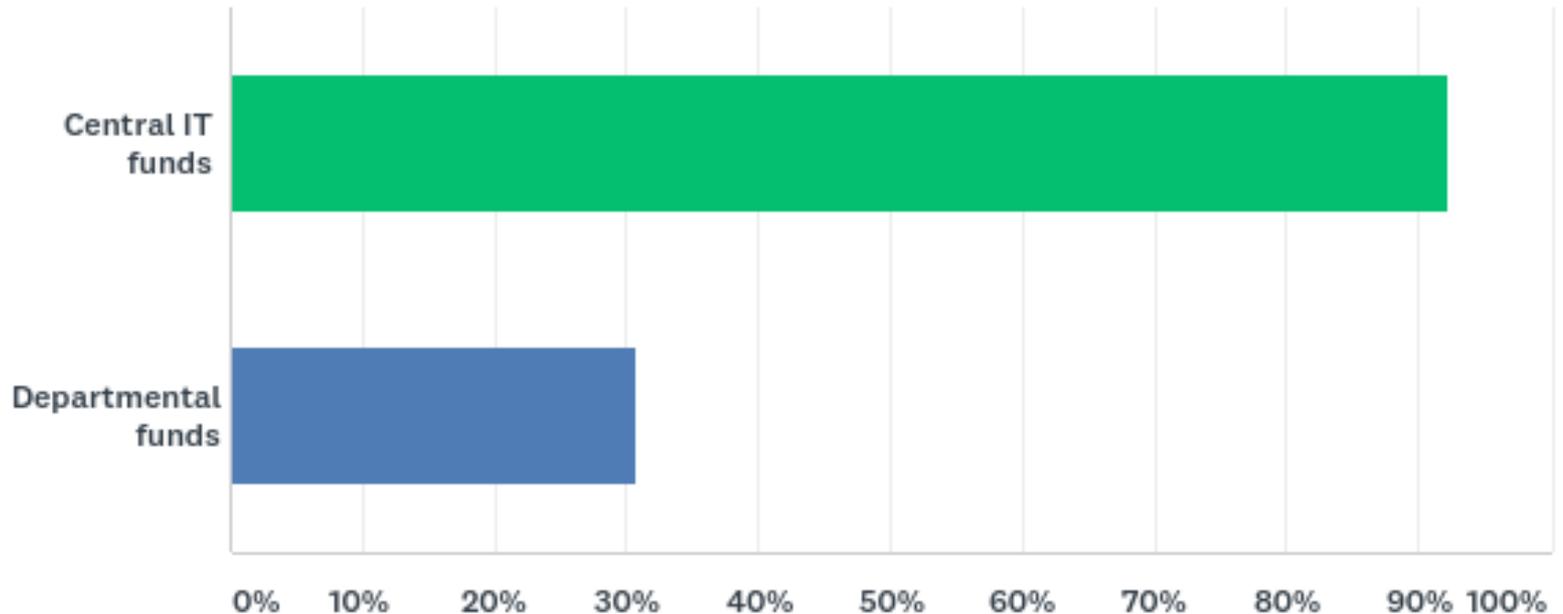
CI Engineer Major Job Responsibilities

- Interface with Researchers – Provide Technical Support and Problem Solving (11)
- Help researchers to scale data movement, computation, and other aspects of their workflows. This includes HPC, cloud computing, data management, container support, and some network diagnostics.
- Stay abreast of technological tools/solutions for research/science
- Design and implement network changes to facilitate research use of the campus network (3)
- Engineer, operate and manage: systems, networks and security
 - Production responsibilities at a smaller institution

Mechanisms for Funding a CI Engineer Position



Funding for the position that comes from core organizational funds, indicate the major source of funding



Summary: Challenges Encountered During the Hiring Process

- Time to Hire
 - Often multiple offers before filling the position
 - Internal hiring processes, including hiring freeze
 - Attracting qualified internal candidates
- Finding Qualified Job Candidates
 - Competition for qualified candidates
- Location
 - Relocation for qualified candidates

Detailed Comments from the Survey

Details: CI Engineer Basic Educational Requirements

- MS in Computer Science, Certifications in Networking and Security
- Background in computer science or any other computational sciences will be a plus - Expertise in one or more of the following languages: C, C++, Java, Fortran, R, Python, Perl, and MATLAB, etc.
- Depends on where they are on the CI spectrum. E.g we get great mileage out of community college student interns for tasks at the system / network admin end of the spectrum (esp those who are getting to higher ed late due to military service or financial constraints). At the other end of the spectrum a PhD in a science domain might be the minimum. Important, I think to have a spectrum of education levels, and people who like to learn new stuff as they go.

Details: CI Engineer Basic Educational Requirements

- First, I'm not calling them CI Engineers because nobody outside our community knows what that means. The title I have converged on is Research Computing Analyst which is in parallel to a Business Analyst and that seems to make HR understand it. Minimum requirements: Bachelor's degree from an accredited institution in the computer sciences or related fields with experience with science groups OR a Bachelor's degree from an accredited institution in the physical sciences or related fields with strong quantitative background in analysis, statistics, and programming OR a Master of Library and Information Science. A combination of education and experience may be substituted for the degree on a year-for-year basis Preferred qualifications - 2 years of advanced academic work at the level of a M.Sc. or equivalent

Summary

CI Engineer: Minimum Work or Training Experiences

- Years of Experience
 - Minimum 3 years experience, prefer 5+, occasionally 10.
- Skills
 - Hands on experience in one or more technical area – network engineering, high performance computing, etc.
 - Programming experience – scientific programming, software development, network programming, etc.
 - Ability to manage technical services and resources (network, manage data, system administration, server support)
- User Support and Communication
 - Written and presentation skills
 - Successful experience working with users

Details: CI Engineer Minimum Work or Training

- Hands-on system/network administration, scripting experiences, database management, knowledge of legacy/state-of-the-art technologies and their limitations, ability to work with user requirements and managed technical services, data analysis/statistics familiarity, policy compliance
- Must know how to manage data, networks, and system administration. High performance computing experience considered a plus.
- At least one tour of duty as an intern or apprentice.
- System and network engineering, user support experience, good communication (written and presentation), project management, STEM teaching.

Details: CI Engineer Minimum Work or Training

- Experience desirable in their area (networking, systems, storage)
- Training in routing and switching (e.g., Cisco, Juniper), a minimal knowledge and/or training experience in security (e.g., Palo Alto or similar), cabling
- 3 to 5 years experience in higher education IT environment
- At least 3 years of hands on experience
- Experience working in science/research with a technical relationship or vice versa
- Minimum 5 years of network engineering experience.
- judged individually
- 10 Years of experience
- We required real world software engineering experience, and experience working with researchers on projects with a significant CI aspect

Details: CI Engineer Minimum Work or Training

- 2-3 years working in a cyberinfrastructure related organization; experience with cyberinfrastructure technologies - networking, computing or storage.
- Working knowledge of theory and practice underlying VLAN/LAN/WAN network operations Analyzing network characteristics (e.g. traffic time, connect time, transmission speeds, utilization, packet size, and throughput) and recommending modifications to network components Working with server hardware in a data center including managing power, space, and cooling configurations Ability to provide basic explanation of technical procedures and processes clearly and accurately to both technical and non-technical audiences Installing, testing, implementing and maintaining complex communication networks using and implementing network standards Configuring and trouble-shooting both MS Windows and UNIX/LINUX based system connectivity

Details: CI Engineer Minimum Work or Training

- Min 5 years experience in support of technical environment, or in one or more of following areas: data networking, storage architectures, data structures, or data management; Demonstrated collaborative approach to learning / sharing knowledge in STEM-related disciplines and research
- Minimum 3 years of experience working with scientific programming - Certifications/courses in programming languages - Prior experience in working stakeholders from diverse backgrounds Experience in information technology consulting, facilitation, customer engagement - customer facing responsibilities
- 2 years of user support experience - Expertise in high performance computing systems or applications and workflows or networking

Details: CI Engineer Minimum Work or Training

- Required Qualifications: M.S. in Computer Engineering, Computer Science, or related discipline, or equivalent combination of education and experience is required, Excellent verbal and written communication skills, In-depth knowledge and experience with Linux system administration, Ability to write, compile, and run code for an HPC environment, Ability to administer and use a batch execution environment, Ability to create, configure, and use virtual machine images for cloud systems, Ability to work with other professionals and students in a team environment, Ability to work closely understand the needs and motivations of university researchers, Ability to travel (mostly in-state), generally requiring a valid driver's license; Minimum three years experience required in each of the following: Linux system administration; Writing/compiling/modifying/running common scientific codes on HPC equipment; Programming in languages such as FORTRAN, C, C++, BASH, Perl, and Python, Hardware/software debugging, and deployment, Systems integration

Details: CI Engineer Major Job Responsibilities

- Contributes to scientific research and software development efforts in accordance with university policies, goals, and objectives; investigates and develops technical solutions to meet the objectives for researchers and educators; derives technical solutions that are tested and integrated within cyberinfrastructures locally and nationally; assists in technical report writing, and serves as a mentor to student team members of researcher/educator groups.
- Teach researchers how to use high speed networks to move data to or from campus and how to store it effectively in a high performance data farm.

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Details: CI Engineer Major Job Responsibilities

- Generically, removing barriers to efficient use of available compute, storage, and networking resources. Somewhat less generically, a mix of rapid response to immediate needs and steady progress on planned improvements that simplify access. In detail, building out / maintaining / refreshing network/storage/compute infrastructure; direct assistance to infrastructure users + build/install tools that reduce the need for direct assistance; installation/debugging/tuning/simplifying applications and workflows; developing working relationships with researchers and research groups that make it possible to anticipate needs vs reacting; engaging with people in similar positions at other institutions both to avoid reinvention and to contribute so that others can avoid reinvention.
- Researcher training and consulting, CI community collaboration, CI strategic planning, CI lessons-learned dissemination.

Details: CI Engineer Major Job Responsibilities

- Working with researchers to identify areas where their research can benefit from high-end technologies such as HPC, Science DMZ, DTN, Big Data and/or GPU platforms. - Facilitate transition from desktop computation to campus and national computation facilities. Train researchers and students to not be limited by the lack of computational power immediately available to them or by continuing the use of archaic and inefficient software methods. - Document and share best application practices with community and provide training as appropriate - Collaborate on grants and assist researchers with their proposals

Details: CI Engineer Major Job Responsibilities

- User Training - 30% Participate in and lead teaching efforts, including training workshops or formal CU courses
- Consulting - 40% Consult with and advise scientific researchers at the University of Colorado Boulder on efficient, appropriate, and powerful computational and informatics approaches for advancing scientific investigations in languages they use and understand Build relationships with departments across campus to better coordinate individual researcher's data efforts into larger, combined efforts

Minor / Additional Job Responsibilities for a CI Engineer

- Travel, networking with other CI Engineers outside/inside organization - II
- Conduct training workshops – III
- Maintain documentation that may be useful to researcher/educator groups - III
- Track user requirements continually and match with system/network usage reports
- Mentoring junior staff, students
- Proposal writing – II
- New service development
- Code development

Minor / Additional Job Responsibilities for a CI Engineer

- Collaborate with research computing staff in designing and modifying network infrastructure.
- Additional technical capability (software development, router configuration, etc), depending on area of technical expertise; ability to write short technical reports.
- Speaking engagements.
- Backup for the system administrators of the cloud and high performance computer.
- Provide virtual 'office hours' and virtual user forums so that people throughout the system can interact on a regular basis

Details: Hiring Challenges

- Position approval process was easy; had to do 3 or more on-site interviews and offer letters to find candidate; easier to get teaching support funding if hiring postdoc level but harder to find IT research support; had to assume some technical skills and service skills will be acquired on the job; suitable candidates found other jobs easily and had to be proactive in the hiring process
- We had a hiring freeze in place. A new position had to be approved and it took time to find someone with enough guts to sign off. Then we had to find someone willing to move to a town that is remote, can have snow storms in July, and temperature lows of -51 F
- Largest challenge was in the area of time to hire... ended up taking 10 months
- We have recently hired systems administrators with security experience (2) and we received sufficiently strong applications to hire two people with necessary experience and drive

Details: Hiring Challenges

- Lack of funding; the college does not have a position for a network engineer at this moment. The network is overseen by the IT director, with the help of faculty and engineering students
- Announced the position, identified an internal candidate that could be trained up into the role
- Despite having the JD already vetted through HR when the NSF award was made, we had to navigate through newly-implemented HR rules. That took several weeks. It took a total of six months between the award and the hiring of the CIE. Finding a person with the right mix of technical and interpersonal skills was a challenge
- very difficult to find, or nonexistent - difficult to retain

Details: Hiring Challenges

- The grant funds were not sufficient to make a competitive hire, and we had to supplement them with other funds. Hiring is extremely competitive, and finding someone who has both computational, data management, and network experience was nigh impossible. We backed off on the network side, and have had to do some training to fill this gap. Human resources typically doesn't have appropriate job class/types to match the type of skill sets necessary. - Have developed good relationship with HR. - No difficulty with the internal processes - Finding a diverse pool of applicants was the major challenge - Applicant pool was small but we found high quality applicants by recruiting scientists that have experience in CI and want to do a career change. Finding suitable candidates is difficult. It took a year

Example of CI Engineer Job Description

- This position helps develop and support the University of Maine System's research cyberinfrastructure including large cluster computers used for parallel processing and cloud based computing and storage. The Cyberinfrastructure Engineer (CI Engineer) provides advanced support to researchers and educators in the University of Maine System in three major areas: high performance computing (HPC), cloud computing, and data management. This support will include items such as: optimizing cloud based virtual machines for research and education, help optimizing user code for a parallel environment, and help determining data management strategies

Example of CI Engineer Job Description

- Assist researchers in leveraging existing cyber-infrastructure; Engage with researchers to guide institution in acquisition of additional resources required to facilitate and extend research, and assisting in design, architecture, and implementation of those resources; Perform outreach in the form of seminars, workshops, collaborative visioning and design sessions that further research mission; Provide second-level support for researchers in their use of campus cyber-infrastructure; collaborate with external research partners, Internet2, and regional collaborative consortiums; Participate in development of the CIE profession through active collaboration with CI community