HELLO!

My name is Mohammed Tanash
I am here because I am going to present at the ACI-REF.
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ACI-REF
Advanced CyberInfrastructure
Research & Education Facilitators

Cyberinfrastructure (CI) User Support

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“I do not fear computers. I fear lack of them.”

— *Isaac Asimov*

Agenda Layout

- CI user expectations, categorization and commonalities
- Policies, Politics, Conflicts and Personality Management
- Outreach and Education
- some Results
- Lessons learned

These slides are based on material from Mehmet (Memo) Belgin (GA Tech), modified by Henry Neeman (OU), Andrew S herman (Yale), Dirk Colbry (MSU), and are used with permission. Numerous edits have been made.

Agenda Layout

- **CI user expectations, Categorization and Commonalities**
- Policies, Scheduled Maintenance, and Personality Management
- Outreach and Education
- Some Results
- Lessons Learned

Who am I

- BSC in Computer Science (2005), MSC in Information Technology (2008), MSC in Computer Science (2014).
- Ph.D. Student at Kansas State University
  - Research Area: High Performance Computing (Improving the Performance of the Slurm Workload Manager)
- Instructor (2008 – 2012), TA & RA
- A Cyberinfrastructure team member at New Mexico State University (Jan 2017 – Jan 2019)
  - Role: Cyberinfrastructure User Support
- XSEDE Student Campus Champion (2017 – Current) & XSEDE Fellow (2018 – 2019)

XSEDE
Extreme Science and Engineering Discovery Environment

CAMPUS CHAMPIONS

What is CI

Technology

- Computing systems
- Data storage systems
- Advanced instruments data repositories
- Visualization environments

Linked

Linked

Software & High Performance Networks

People

Managed

Managed

People

Purpose

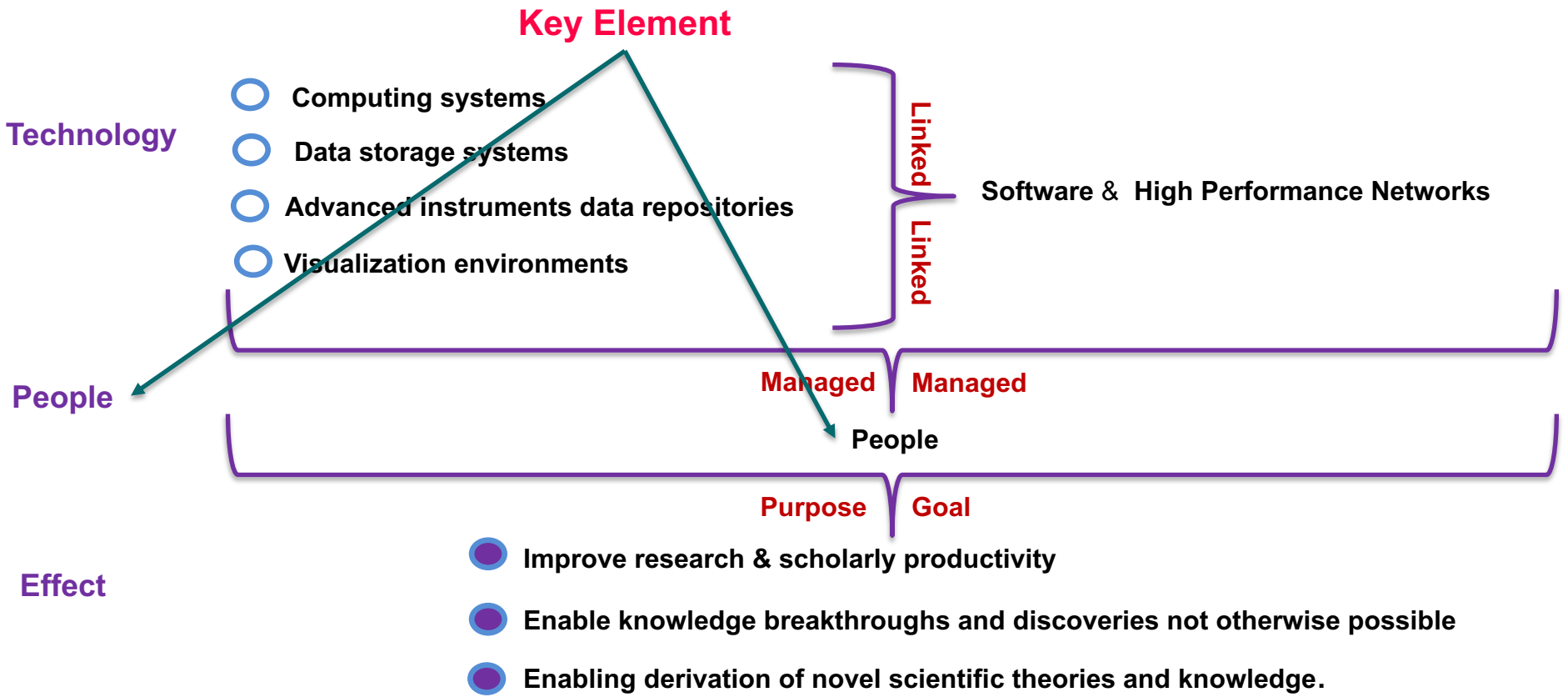
Goal

Effect

- Improve research & scholarly productivity
- Enable knowledge breakthroughs and discoveries not otherwise possible
- Enabling derivation of novel scientific theories.

Stewart, C.A. 2010. What is Cyberinfrastructure? Presentation. ACM SIGUCCS 2010 Annual Meeting, 24-27 October, Norfolk, VA. http://hdl.handle.net/2022/13987

What is CI User Support



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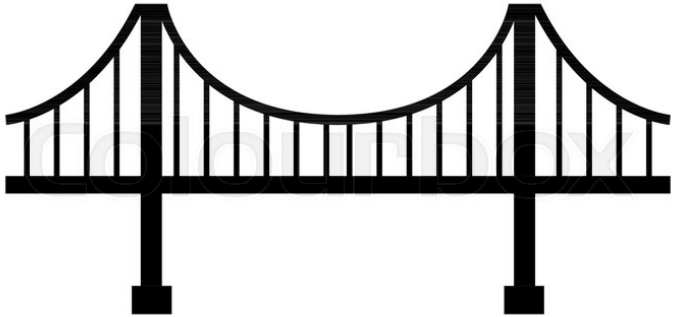
What is CI User Support



Successful User Support

- CI User Support Equation:

Help & Support Users

+

Solve Problems

+

Build Relationships

= **Successful User Support**

Differences between CI and conventional IT

- Primary target is Application **performance**
- Usually relies on conventional IT services (by a separate team)
- More focus on supporting end-users than services
- Uses common IT technologies in uncommon ways
- May mix shared and dedicated resources in one entity
- Requires specific middleware and software layers
- Requires code compilations using complicated mechanisms
- May require specific knowledge about the application/science
- Has irregular usage patterns, which may become obvious and troubling to users

CI Hardware Resources

- Local/Internal Resources
  - Your Own or Departmental Resources (Usually low capabilities)
  - Your Institutional Resources (Low to high Capabilities (depends))
- External Resources
  - NSF (XSEDE Resources, Blue Waters) (High Capabilities)
  - DOE (High Capabilities)
  - …… Many Others
- Commercial Resources (cloud computing)
  - Amazon
  - Azure
  - Liquid Web
  - ……Others

Liquid Web™

Microsoft Azure

aws

XSEDE

Extreme Science and Engineering Discovery Environment

Why CI Resources?

- Computations takes too long to run (Days, months, maybe more)
  - Needs more CPU's

- Computation runs out of memory
  - Needs more RAM's

- Need licensed software

- Need advanced interface (visualization/database)

- Need more storage

Who are CI users?

- Institutional Administrators
- Faculty (Principal Investigators) Faculty (a.k.a PI) (owner of research and maybe of resources, but not active users):
- Users (Students, Post-Docs, Collaborators, computationally active PIs)

Institution Administration Roles

- Funder and Supporter
- Does not use the HPC
- Doesn't know how to use the HPC

Faculty Rules

- Researcher, entrepreneur, teacher
- Manager and funder of CI users
  - Often knowledgeable about CI
  - Often does not use CI directly (that pleasure is reserved for students & postdocs!)
  - May own or pay for resources and services (but shared resources may be free at some institutions)

Faculty Expectations

- CI resources are reliably up and running on 7x24 basis
- Students and collaborators have fair (?) access to CI resources needed to meet deadlines and get the work done (on time).
- Assistance available as and when needed
- Maximum availability of resources
- Minimum communication with CI support staff
- Regular usage and expense reports (especially for storage)

Actual CI User Roles

- Some “hands on” faculty
- Usually students, postdocs, or others who are not permanent
- Permanent research staff or research faculty
- External collaborators

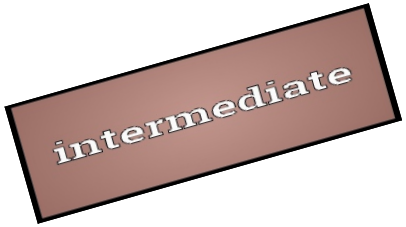
Actual CI User Expectations

- 24x7 access to CI resources (and short job wait times, of course)
- “Insider” relationship to CI staff for advanced users
- Ultra-fast learning curve
- Simple and instant solutions to complex problems
- Applications, computation, and simulation run much faster than on desktops (not always possible!)
- Help diagnosing/fixing problems that may be externally controlled
- Answers that match their level of knowledge

CI Users Categories

- **Novice**

- **Intermediate**



- **Advanced**

- Difficult to identify a user's category without prior interaction
- The language used in requests is a good indicator
- Replies to follow-up questions also decide their level of proficiency
- In case of uncertainty, assume “novice”

Novice Users

- **Common Points**

- **Characteristics**
  - Little experience with Linux or command-line environments
  - May use Matlab, Mathematica, and sometimes R (or even Excel)
  - May have limited knowledge of a scripting language like Python
  - Rarely any inkling about parallelism

Novice Users

- **Common Points**

- Generate the most of support requests. Common examples:
  - Desktop setup (especially for Linux)
  - Login procedures (ssh keys, two-factor authentication, etc.)
  - Finding software on the cluster(s)
  - Finding help and documentation
- Most requests are straightforward, but some “simple-sounding” ones may take a lot of work (or be impossible)

Novice Users

- **Common Points Cont.**

Get's better and better over time

- No/little Linux skills
- No/little experience with running the domain specific packages
- No/little understanding of the scientific fundamentals behind the packages
- Mostly identical or similar requests with straightforward solutions
- Usually not aware of the standard help channels
- May feel insecure or apologetic when seeking for help

Novice Users

- **Common Needs**

Get's better and better over the time

- Cluster orientation and structure
- Linux basic commands (Introduction to Linux)
- E-mail list
- Text editors (nano, vi, vim, emacs, etc.)
- Load/unload modules
- Request software installation
- Help with tools to move data in/out
- Help with the job submission script (specify # of nodes, CPUs, time, etc.)

Novice Users

- **Common approaches for effective support**

BE FRIENDLY!

BE PATIENT
and
PATIENT!

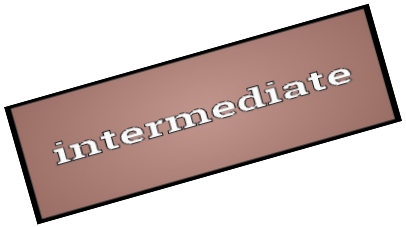
MORE TRAINING
and
WORKSHOPS!

- Do everything to build mutual trust
- Provide regular orientations and help opportunities.
- Maintain up-to-date web documentation
- Provide links to existing help locations
- Suggest proper web search terms (How to google)
- Make them feel better about their simple (or sometimes stupid) questions
- Explain all the steps for resolution in simple, replicable terms
- Prefer exact list of commands to general/conceptual answers

Smile ☺

Intermediate Users

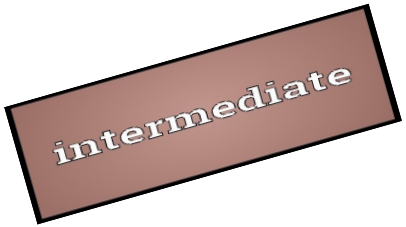
- **Intermediate**



- **Characteristics**
  - Have prior Linux cluster experience; can create job scripts, but may not understand system-wide impact of their actions
  - Varying degrees of proficiency in Python, C, Fortran, R, etc.
  - Use workflows involving multiple domain-specific packages
  - Often notice and report HW or system problems
  - May use web search to try to overcome difficulties

Intermediate Users

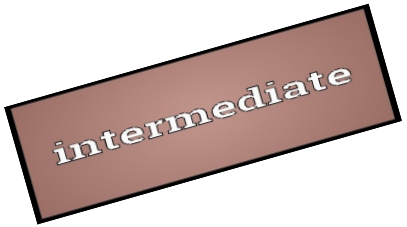
- **Common Points**



- Generate less than half of support requests.
- Largest portion of the compute activity on the cluster
- Experience with Linux, and clusters in the same or other institutions
- First to notice and report system problems
- Hybrid mix of straightforward and complex questions
- Aware of the standard help channels
- Suggest solutions to their own problems and may not like what you did
- Act as the local technical expert and often train novice users in their group

Intermediate Users

- **Common Needs**



SOMETIMES NOT POSSIBLE
OR MAYBE THERE IS SOME
CONSTRAINTS!

- Advanced (and group-specific) information sessions
- Well-explained effective solutions
- More performance/efficiency from already running codes
- Specific modules/patches/versions for existing software
- Higher level of control on their jobs (e.g. higher queue priority)
- Access to specialized computational resources
- Configurations that may conflict with system defaults
- Code development/debugging/profiling support

Intermediate Users

- **Common approaches for effective support**

BE FRIENDLY!

BE PATIENT
and
PATIENT!

- Do everything to build mutual trust
- Hold advanced classes to “teach how to fish.”
- Schedule one-on-one meetings
- Add exceptional/advanced cases to existing help pages
- Present solid data/evidence instead of speculation
- Show complete transparency: they can separate excuses from facts
- Get help from vendor support and user forums, keeping users CC'ed

Smile ☺

Advanced Users

- **Advanced**

- **Characteristics**
  - May be hands-on faculty, research staff, or advanced students
  - Experience with and access to multiple clusters (including XSEDE, etc.)
  - Technically proficient in scripting or programming languages
  - Develop and/or use parallel applications
  - Develop complex workflows and job scripts
  - Always trying new things; willing to experiment with new software

Advanced Users

- **Common Points**

- Generate a small fraction of support requests
- Installation of complex software & tools
- Open to experimentation with new systems and software
- Too busy or advanced to act as the local expert for their group
- Help with special hardware (e.g., GPUs, FPGAs)
- Bugs found in hardware, 3rd party applications, or libraries
- Try to fix problems themselves, and see CI support as a last resort
- Inclination for bypassing the ticket system

Advanced Users

- **Common Needs**

- VIP treatment
- Direct and open communication channels
- Acknowledgement of their level of knowledge and intelligence
- High-level and direct vendor/developer support
- Lots of exceptions, even though they require violation of existing policies
- Almost everything else listed under “common intermediate users needs”
- Root password (the answer is still NO!)

Advanced Users

- **Common approaches for effective support**

BE FRIENDLY!

BE PATIENT
and
PATIENT!

- Do everything to build mutual trust
- Schedule one-on-one meetings
- Try to learn more about their research, deadlines and aspirations
- Be very careful saying that something is impossible
- Make small exceptions as long as it does not impact other users
- Avoid speculation as much as possible (as with all users)
- Be completely transparent: they can easily separate excuses from facts
- Encourage them to contact vendor support or user forums

Smile ☺

Agenda Layout

- CI user expectations, Categorization and Commonalities
- **Policies, Scheduled Maintenance, and Personality Management**
- Outreach and Education
- Some Results
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Policies

- Clear policies help keep user demands under control
- Publish policies in places easy to find (online)
- Be prepared to explain the reasoning behind each policy item
- Make policies as strict as possible, be open to exceptions when necessary
- Encourage users to openly discuss and criticize the policies
- Don’t hesitate updating policies frequently to stay relevant
- Build trust and effective communication with decision makers
- Seek delegation privileges to speed things up
- Don’t make policies for resources you don’t own, but influence them

Scheduled Maintenance

- Set regular schedule, with multiple advance announcements
- Provide a report after maintenance
- Prepare for potential problems during/after maintenance days
- Show best effort for minimal impact
  - Configure the scheduler to have no running jobs
  - Disable user access to resources during the maintenance activities
  - Assist users in moving work to alternative clusters when possible
- **Test**, **Test**, and do more **Testing** before turn back the resources

Personality Management

- Some users are difficult than others; why they behave that way is irrelevant
- Do not take anything personally; report any harassment you may receive and do not retaliate
- In most cases users do not mean bad, but they are extremely frustrated
- If you make a mistake, take responsibility and offer an apology
- Acknowledge that:
  - You understand the problem
  - You are aware of its particular impact on the user
- Be aware of, and show tolerance for cultural differences and language difficulties
- Humor is powerful only when used appropriately, avoid being awkward or insulting
- Communicate frequently while working on any issue

CI Users Support

HELPING

VS

DOING THEIR WORK

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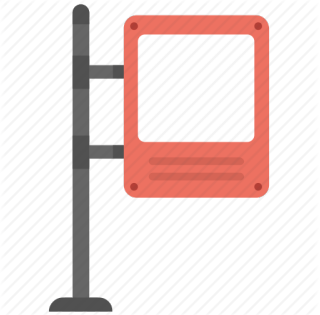
Outreach

- Spread email frequently (e.g. monthly bases)
- Advertisement brochures
- Digital signage
- Events announcements
- Orientations announcements



Education

- **Training and Tutorials**
  - Workshops
    - Introduction to Super Computing
    - Introduction to Linux
    - Intermediate Linux
    - How to Write Scripts
    - Introduction to Python
  - webinars
  - Online videos
  - Online Courses
  - Onboarding Training
  - Customized Classes
    - Parallel Programming
    - System architecture

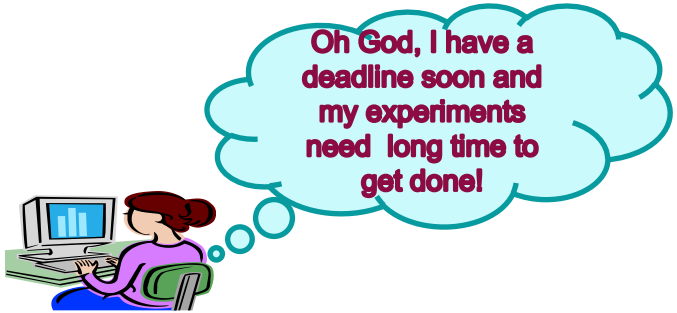
Deal With Users Issues

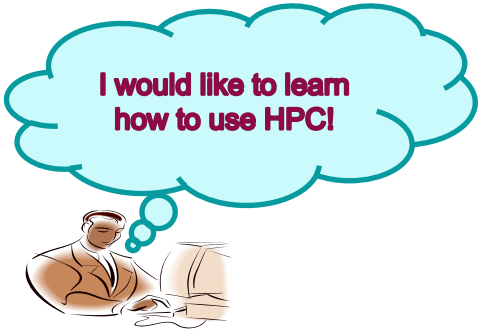
- Emails
- Ticket systems
- Office hours
- Onsite visit
- Personalized Meeting
  - One-to-one Meetings
  - Group meetings

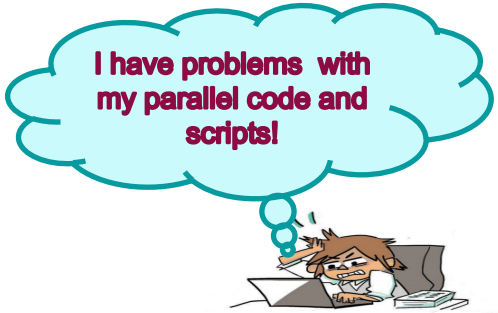
Skills Needed

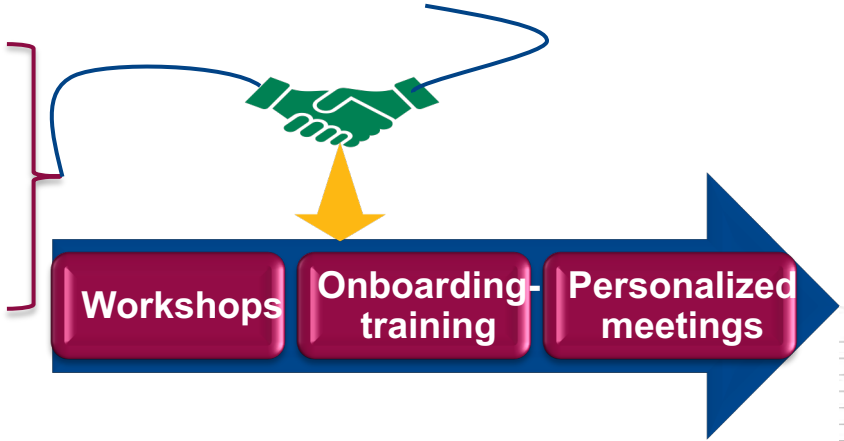
- Technical Skills
  - Advanced Linux
  - Advance HPC knowledge
  - Parallel programming
  - Script programming
  - Interested in new technologies (FPGA, GPUs, etc.)
  - ??
- Personal Skills
  - Responsible
  - Communication skills
  - Sense of humor
  - ??

CI User Support Process









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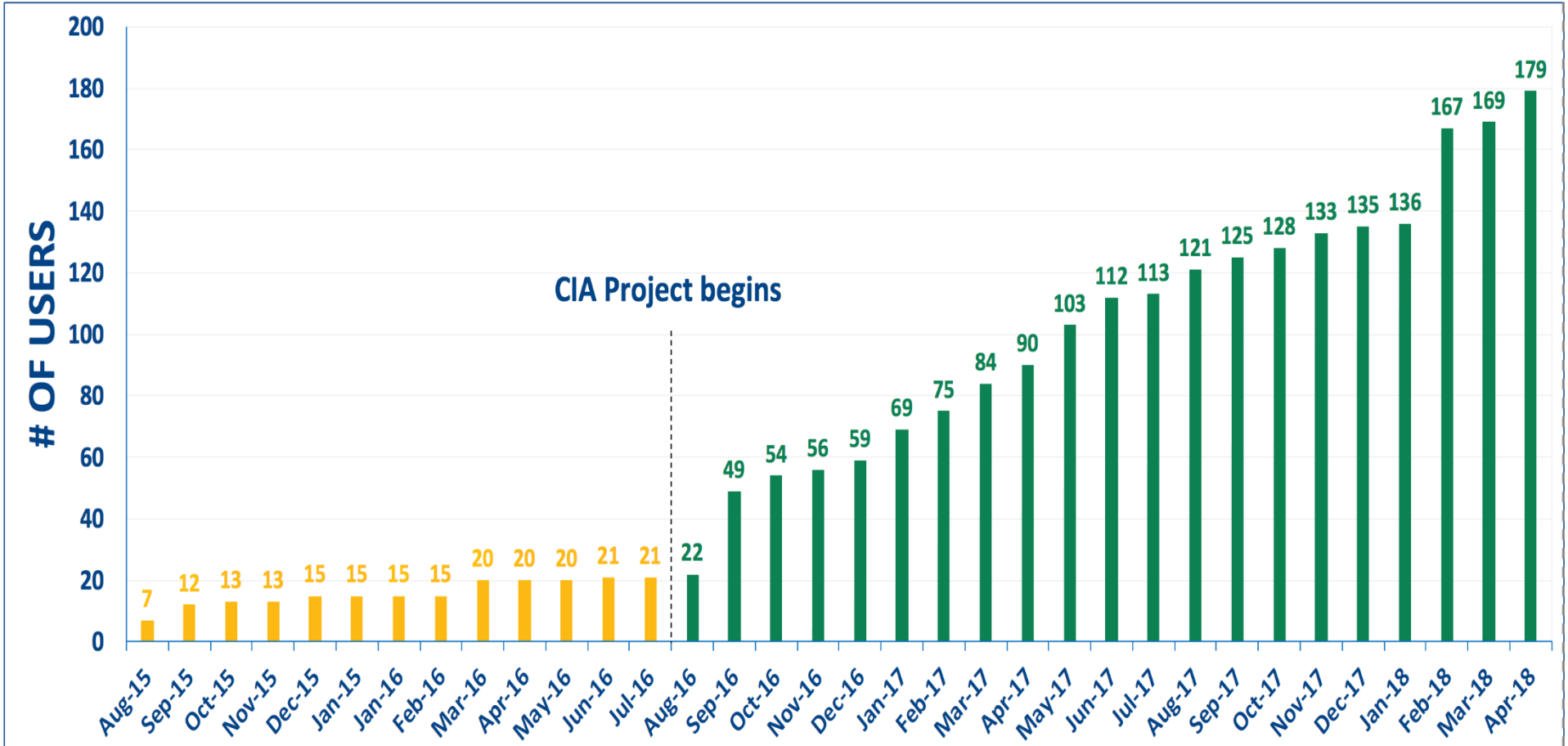
Some Results (NMSU)



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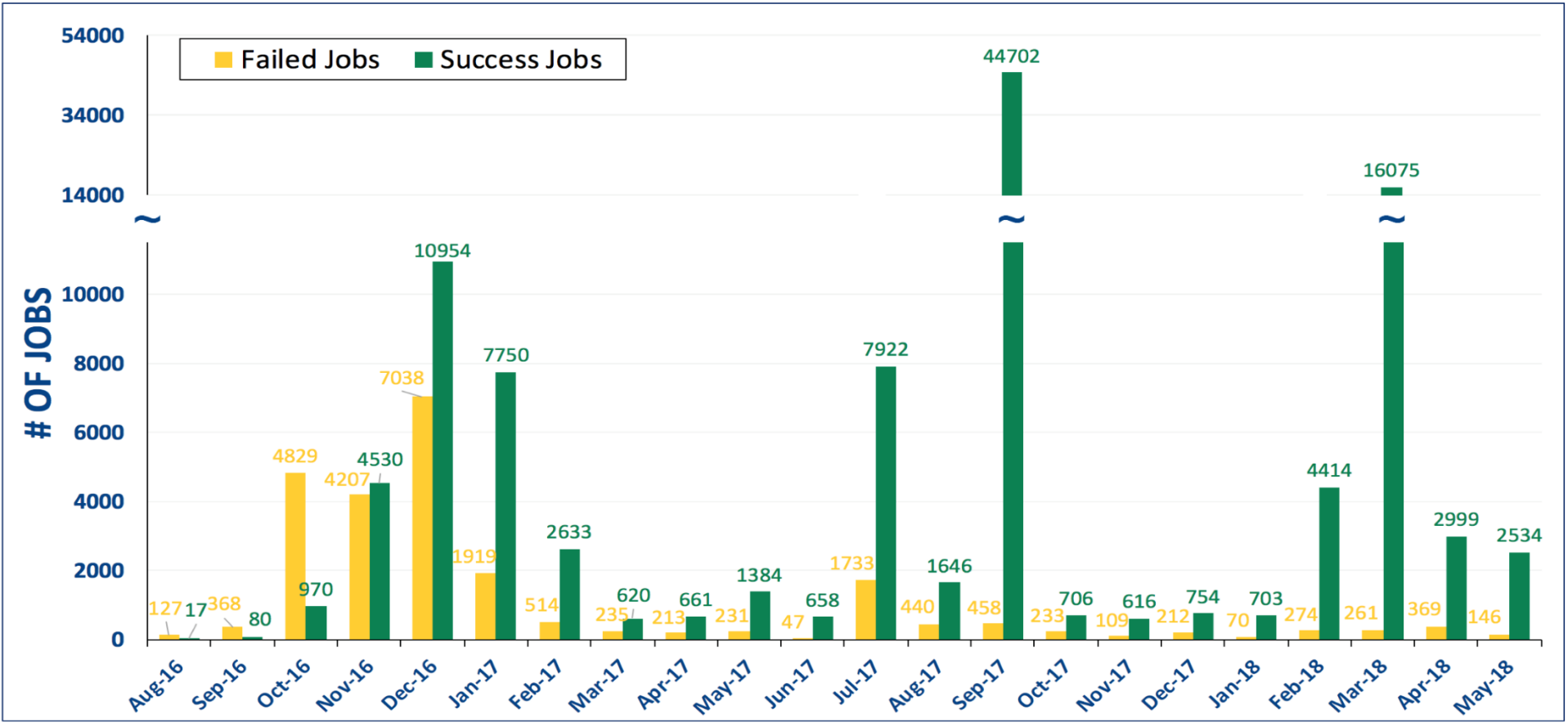

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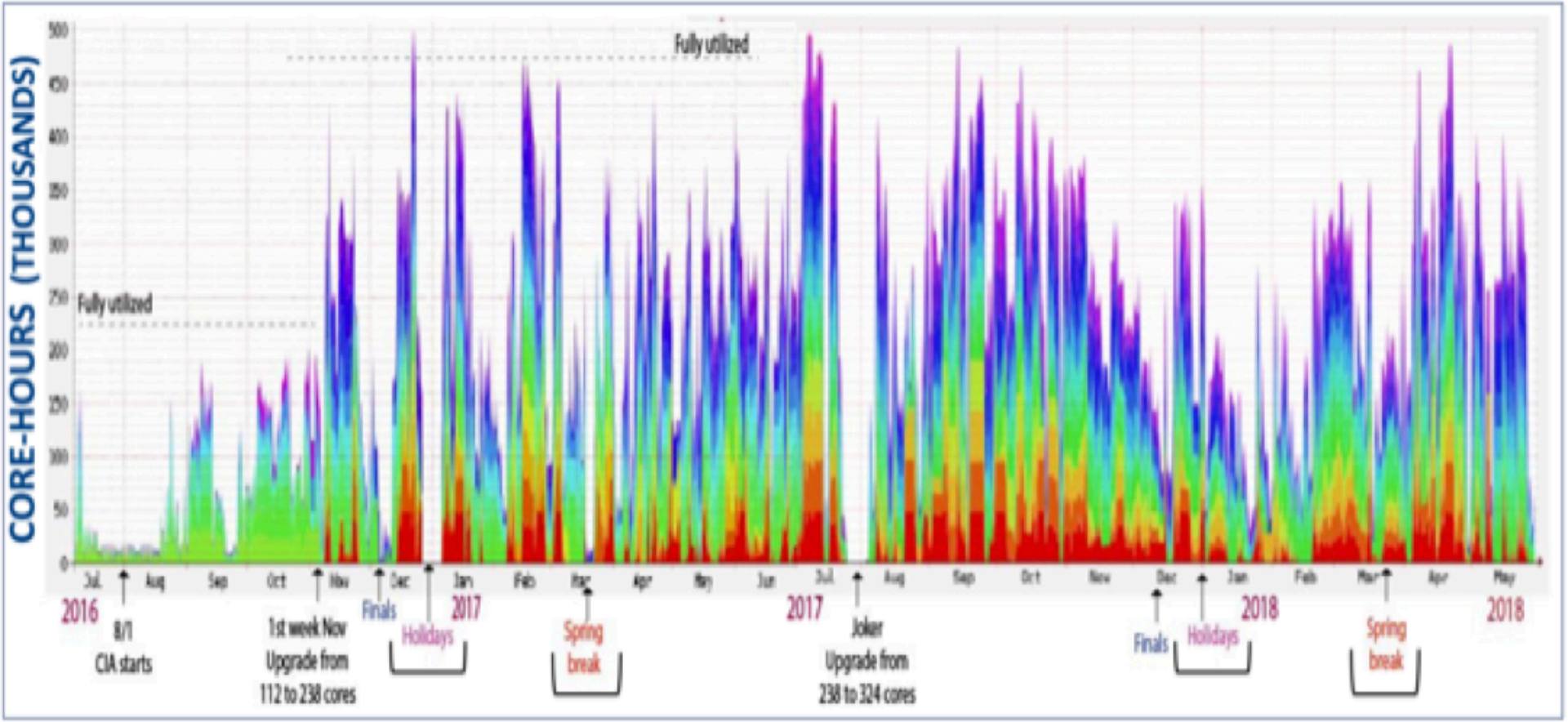

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“Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution.”

— Albert Einstein

Thank you!