CENTER FOR ADVANCED RESEARCH COMPUTING

Internal Advisory Board Meeting
October 28, 2021

Minutes

Present: **Karl Benedict**, Associate Professor & Director of Research Data Services, College of University Libraries and Learning Sciences; **Patrick Bridges** - Director of CARC; **Mary Jo Daniel** – Interim Associate Vice President of Research; **Jane Lehr** – Professor, Electrical and Computer Engineering; **Keith Lidke**- Associate Professor, Physics & Astronomy; **Christopher Lippitt** - Associate Dean for Research, Arts & Sciences, Associate Professor, Geography and Environmental Studies; **Marek Osinski** - Professor, Electrical & Computer Engineering; Center for High Technology Materials; **Brian Pietrewicz** - Interim Deputy CIO, Information Technologies; **Ylva Pihlstrom** – Associate Director of CARC; **Andrea Polli** - Mesa Del Sol Endowed Chair of Digital Media Professor, Fine Arts and Engineering University of New Mexico Department of Art and Art History; **Edl Schamiloglu** - Distinguished Professor, Electrical and Computer Engineering; Associate Dean for Research and Innovation, School of Engineering; **Gregory Taylor, Ph.D.** - Director, Long Wavelength Array; Director, Center for Astrophysical Research and Technology, Professor, Department of Physics and Astronomy; **Lee Taylor, Ph.D.** - Associate Professor, Biology; **Tracy Wenzl** - CARC Business Manager

1. CARC Annual Report 2020
    - Slides presented (attached)
    - Impact of CARC – how complete is the process of gathering this information? -Google alerts, email submission. Challenge = getting people to use CARC acknowledgement
    - Use of Orchids?
2. Discussion:
    - Spring user meeting (Friday, April 8)
        - Goal: connect with users (current and potential), discover specific needs
        - Provide info to users, but also gather information from them
        - Have users present on research and HOW they used CARC systems
        - Feedback – one full day is long, consider paring down to most important goals, leverage team research symposium for some of the presentations
        - Make the day modular, so that people can drop in/out for specific segments – new users, desired use for experienced users, advanced user topics

        - Could be useful to record (research talks, tutorials)
- Use of cloud in research (discipline-specific)
        - Demand for petabyte-scale archival?

Center for Advanced Research Computing

Patrick Bridges
Director

2021 IAB Meeting | October 28, 2021

Agenda for today

- Introduce new CARC Associate Director
- Review 2020 Accomplishments/Annual Report - Patrick
- CARC User Meeting – Ylva
- Cloud and distributed systems strategy discussion

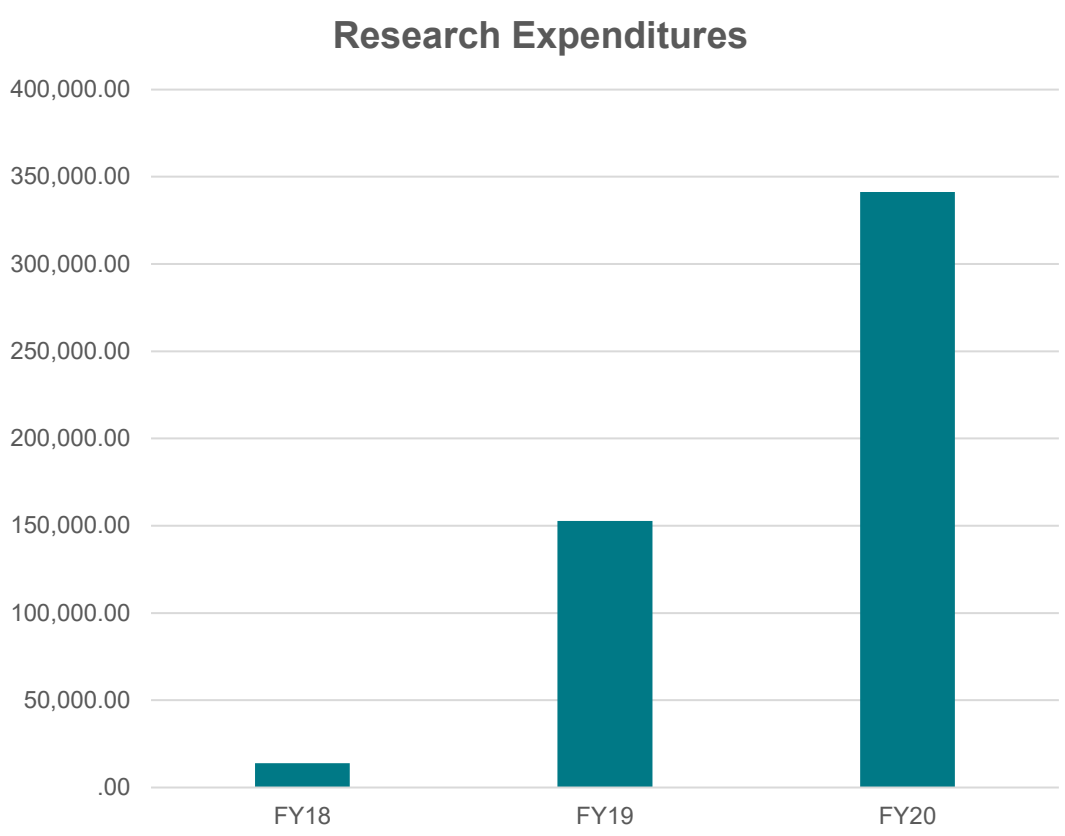
CY 2020 Goals and Status

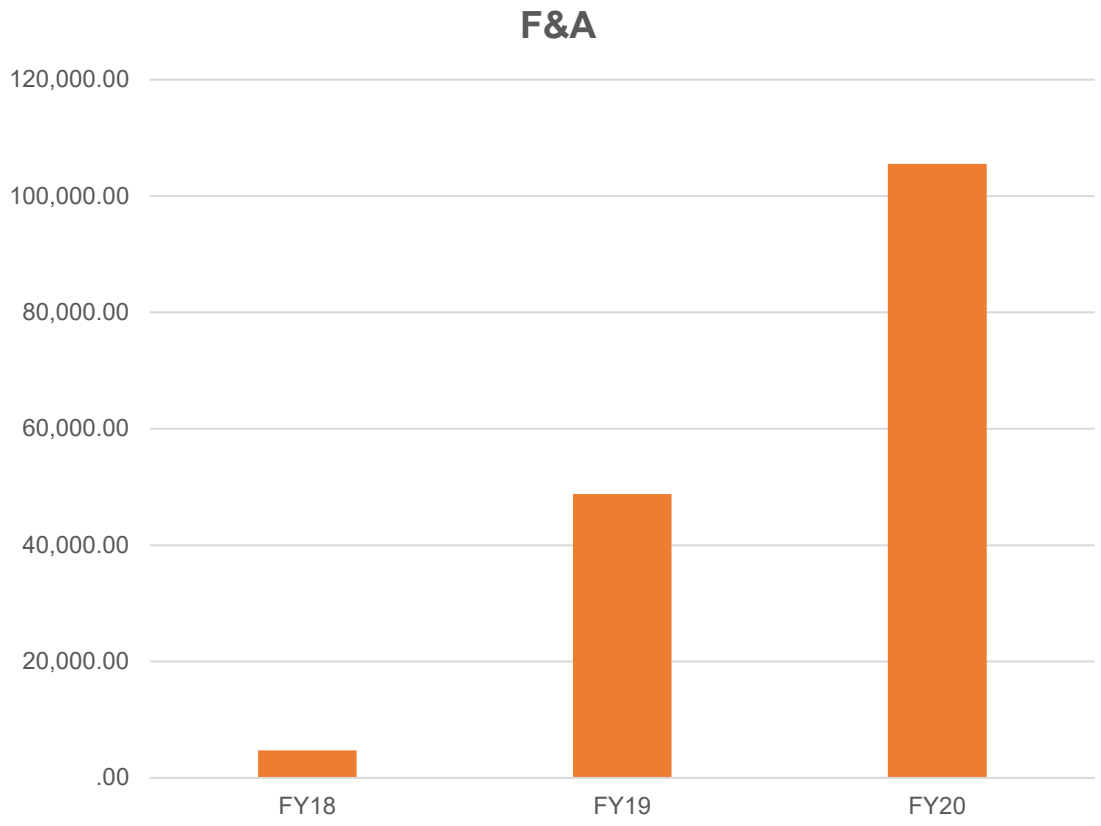
- $4 million, 5-year DOE NNSA award to create the Center for Understandable, Performant Exascale Communication Systems (CUP-ECS) was awarded September 30, 2020.
- Computational Science and Engineering graduate certificate application moved into UNM's ApplyYourself system, admissions committee established, data science specialization roadmap published to CARC website
- Goal of becoming an NSF XSEDE basic service provider (SP) and assessing requirements/benefits of further integration with NSF XSEDE services deferred to 2021 or later
- Plan to develop and submit of an NSF MRI proposal for a new HPC CARC-hosted capacity HPC system deferred pending identifying sufficient cost share funds and cyberinfrastructure plan

CY 2020 Highlights

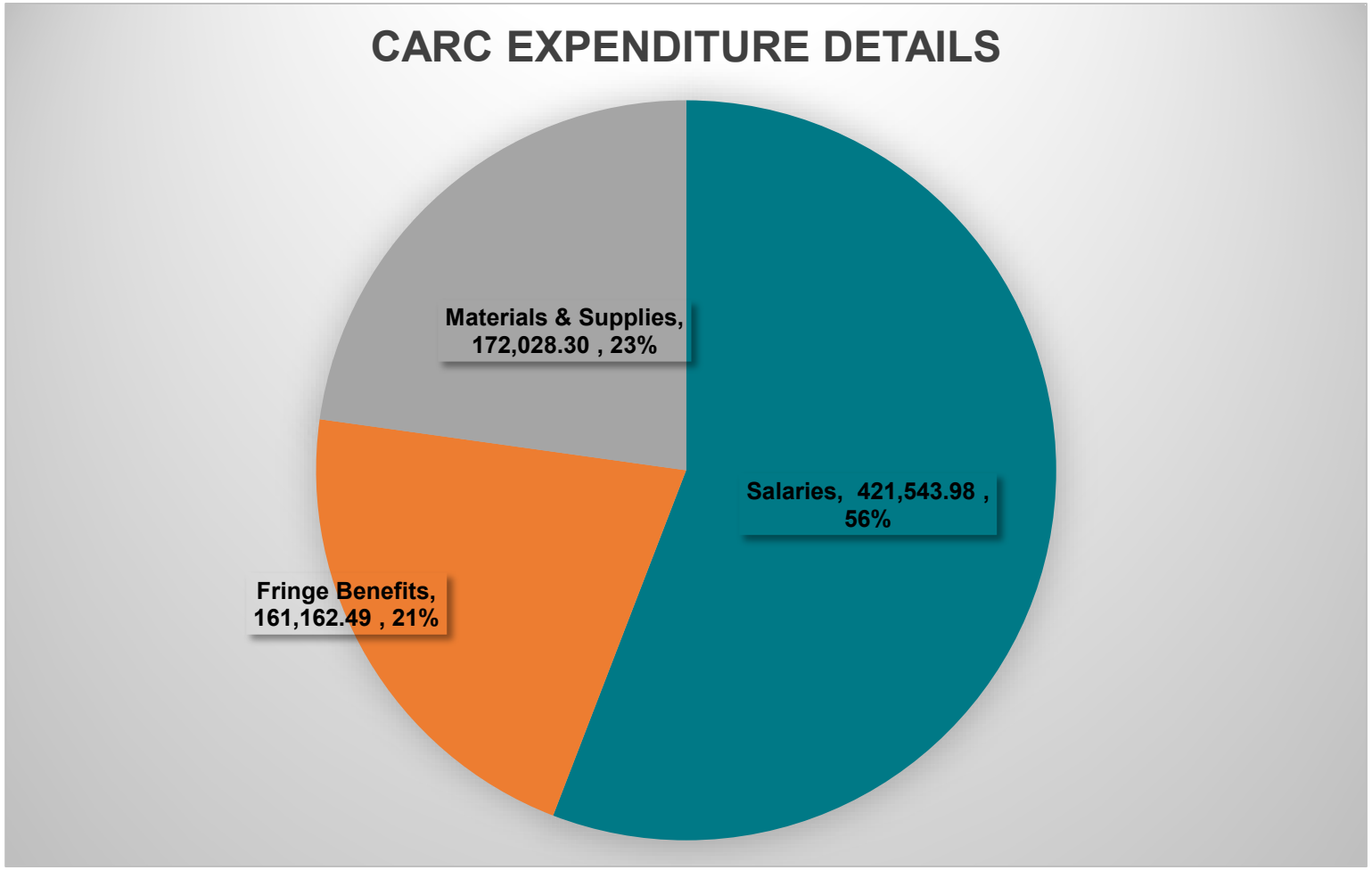
- Systems Expansion
  - Taos cluster expansion using funds from PIs and their sponsored research projects
  - Prototyping and deployment of center-wide parallel filesystem
- CARC support for UNM COVID-19 research efforts
  - Analysis of COVID gene sequences collected in New Mexico and Wyoming
  - Deidentifying CT scans of pneumonia and COVID victims for pathology research
  - Simulation of COVID-19 spread in human lung tissue
  - https://carc.unm.edu/news--events/News/researchers-study-covid-19.html
- Awarded $4 million DOE NNSA PSAAP III research center
- Introduction to Computing at CARC goes online (Youtube, Learn)

Research Expenditures and F&A





FY20 Sources of Revenue	
F&A Return	36,946
VPR Allocation	680,000
Service Center	36,292
Other	4,500
FY19 to FY20 Reserves	98,102
Total	855,840



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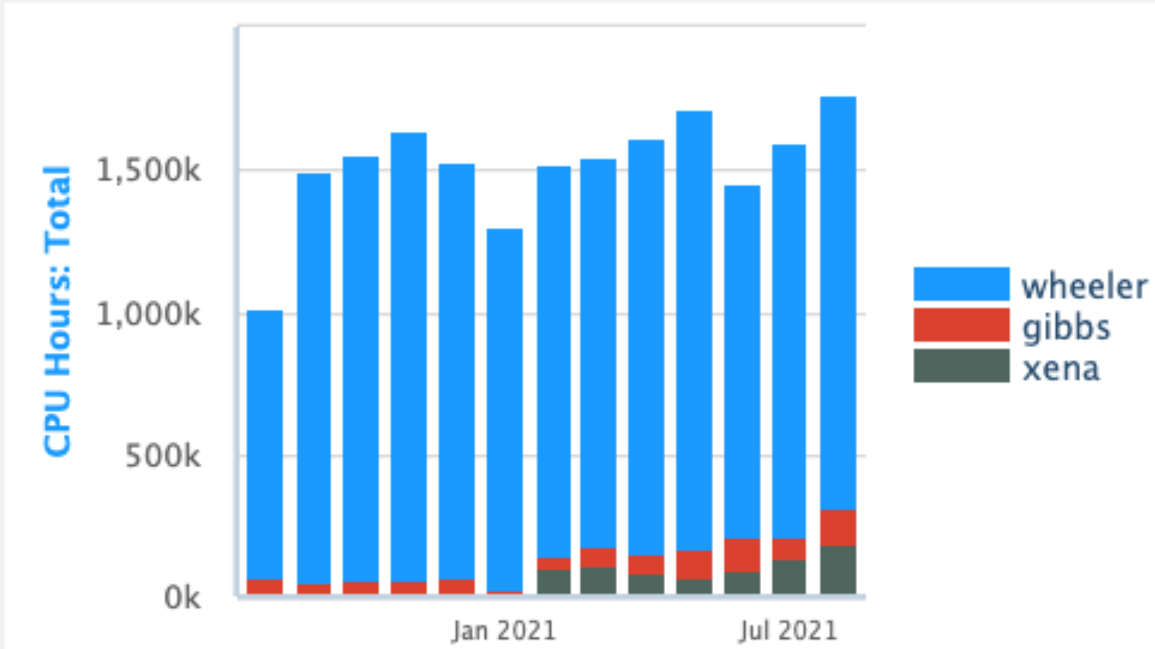
Summary | Usage | About

Duration: User Defined Start: 2020-08-01 End: 2021-08-30 Refresh

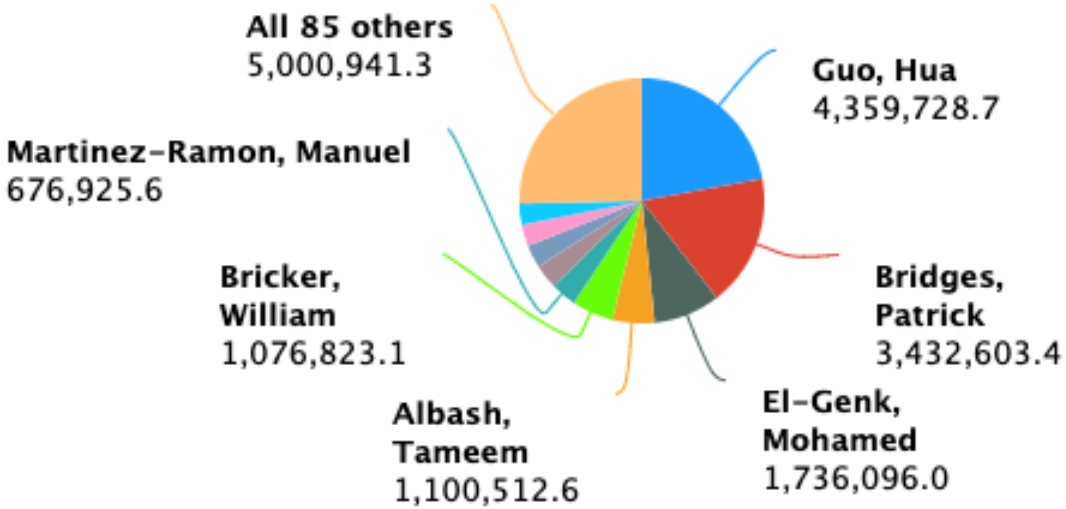
Quick Filters

Activity		Jobs	CPU Time (h)		Wait Time (h)	Wall Time (h)		Processors	
Users:	PIs:	Total:	Total:	Avg (Per Job):	Avg (Per Job):	Total:	Avg (Per Job):	Max:	Avg (Per Job):
256	95	856,067	19,713,737.4	23.02	3.59	1,806,988.1	2.11	400	4

Total CPU Hours By Resource (Top 10)



Total CPU Hours by PI



Avg Job Size (Core Count)

Total CPU Hours by Job Size

Research Center Impacts

- Trained 32 students in-person in Spring 2020 on using CARC systems
- 832 views of QuickBytes YouTube series that replaced in-person training this summer; Dr. Fricke estimates he's oriented 40-70 new users online since March
- NSF-funded research projects supported multiple graduate students, publication of papers, and design/prototyping of platform for handling controlled unclassified research information SAMPRA impact
- CARC-trained graduate student ambassadors completing research, actively training lab members, and being placed in jobs
- The number of users, projects, jobs finished, and CPU hours provided to UNM continues to grow
  - 2018: 217,427 jobs finished; 15.4M CPU hours provided
  - 2019: 411,125 jobs finished; 17M CPU hours provided
  - 2020: 545,309 jobs finished; 16.9M CPU hours provided
- Collaborating with NMSU via EPSCoR award to improve UNM and state computational research capabilities related to smart energy grids, including new storage at CARC

Return on Investment

- CARC supported 408 users and 104 PIs, with 545,309 jobs finished
- 53 publications in journals such as *Nature; Chemical Science; Journal of Volcanology and Geothermal Research; The Journal of Chemical Physics; Journal of Applied Physics; Journal of Chemical Theory and Computation; Applied Materials Today; Current Robotics Reports; Journal of the American Chemical Society; ACS Nano; Journal of Geophysical Research: Space Physics; G3: Genes, Genomes, Genetics; NeuroImage; Proceedings of the National Academy of Sciences of the United States of America*
- Awards resulting in publications using CARC resources included funding from the National Science Foundation, Department of Energy, Defense Advance Research Projects Agency, Air Force Office of Scientific Research, and Army Research Office among others.

STRENGTHS

- Support a broad range of computational research activities by the UNM community
- Provide substantial computational resources to researchers free of charge
- Expert user support staff
- Graduate student ambassador training program

WEAKNESSES

- Aging systems and facilities
- Understaffed to meet campus demand
- Building with significant security, maintenance, and utilization challenges
- Lack of support for research with specialized needs or that handle sensitive data

OPPORTUNITIES

- Utilize CSE program to expand research computing expertise on campus
- Computational science workforce demand
- Research and Education Funding opportunities within NSF Harnessing the Data Revolution Big Idea calls
- Increase collaboration with other computational units on campus (Libraries, IT)
- External collaboration with Labs (SNL, LANL) and industry

THREATS

- Staff loss to retirement, external competition
- Major system or facilities failure
- Unnecessary use of expensive cloud computing systems by UNM researchers
- Pandemic could push already short staffing into a bigger problem

Looking Ahead to 2021/2022

- Acquiring new condo cluster base system from Dell
  - Half off system paid for by PIs, half by OVPR
  - Includes 14 32-core general purpose compute nodes for community use
  - 700TB of research storage to be shared across center
- Put together two requests for large-scale computing systems
  - Federal earmark request - didn't make final budget, changing to special legislative request
  - GO Bond request also in progress
- Starting work on research cyberinfrastructure plan, plan on working with PIs to architect support for data/instrumentation systems
- Hiring Linux research facilitation specialists to support researchers in A&S on desktop, VM, and CARC systems