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CENTER FOR

**ADVANCED RESEARCH COMPUTING**

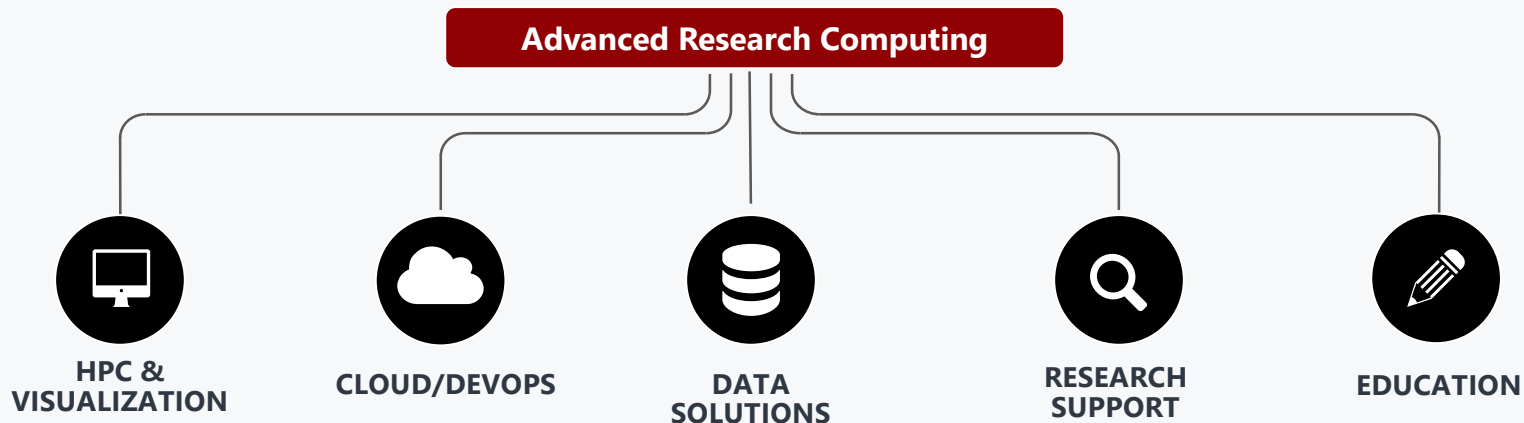
Viterbi New Faculty Orientation August 18 2022

BD Kim, PhD  
Associate Chief Research Information Officer

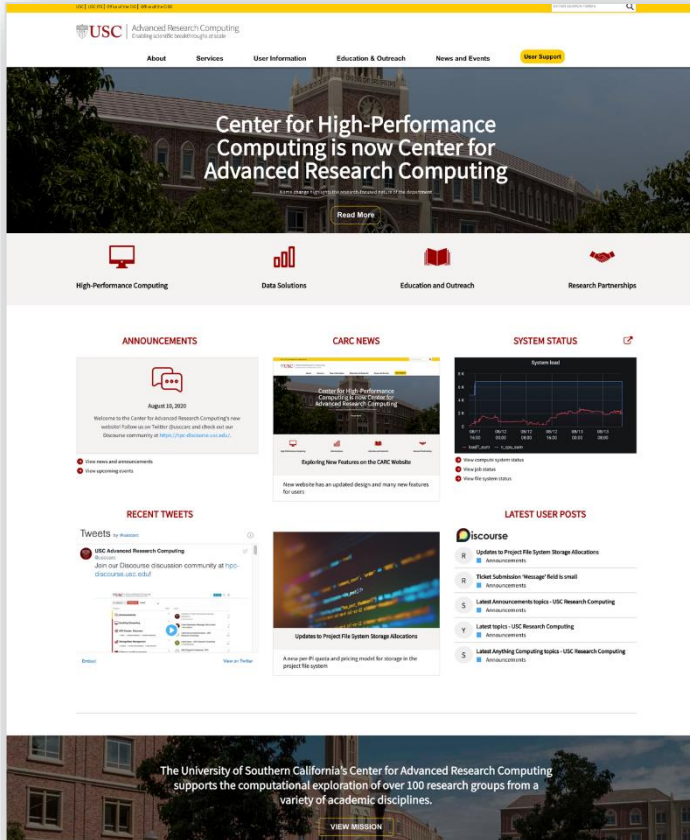


# ADVANCED RESEARCH COMPUTING: MISSION & VISION

- USC Center for Advanced Research Computing (CARC) aims to provide advanced computational research support to USC faculty and students.
- CARC aims to be an institutional resource and a long-term research partner of USC research community



# REBUILT IN 2020: ADVANCED RESEARCH COMPUTING



The screenshot shows the USC Advanced Research Computing website homepage. At the top, there is a navigation menu with links for About, Services, User Information, Education & Outreach, News and Events, and User Support. The main header features a large image of a USC building with the text: "Center for High-Performance Computing is now Center for Advanced Research Computing" and a "Read More" button. Below the header are four service area icons: High-Performance Computing, Data Solutions, Education and Outreach, and Research Partnerships. The main content area is divided into several sections: "ANNOUNCEMENTS" with a date of August 18, 2020; "CARC NEWS" with a sub-header "Exploring New Features on the CARC Website"; "SYSTEM STATUS" with a "System Health" graph; "RECENT TWEETS" from the USC Advanced Research Computing account; and "LATEST USER POSTS" from a Discourse forum. At the bottom, a banner reads: "The University of Southern California's Center for Advanced Research Computing supports the computational exploration of over 100 research groups from a variety of academic disciplines." with a "VIEW MISSION" button.

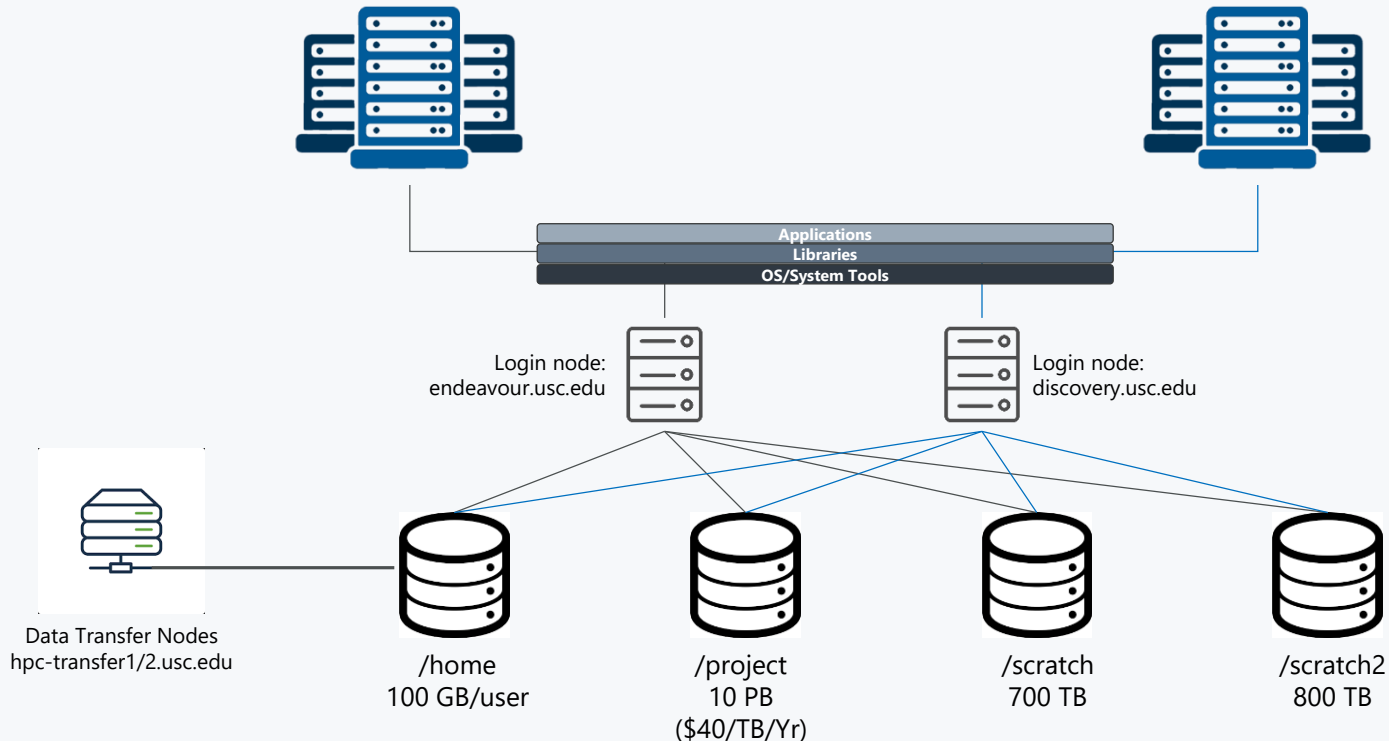
- **Center for High-Performance Computing is now Center for Advanced Research Computing (CARC)**  
The new name captures the research-focused direction of the new program.
- **4 major service areas:**
  - High-Performance Computing
  - Data Solutions
  - Education and Outreach
  - Research Partnership
- **New Systems**
  - Discovery & Endeavour HPC Cluster
  - 10PB Project file system
  - Hybrid Cloud Computing system (Artemis)
- **New Website ([carc.usc.edu](http://carc.usc.edu))**  
CARC website provides intuitive user guides, system specifications, service descriptions, news, workshop information and other comprehensive, user-support resources.

# CARC SYSTEMS OVERVIEW

CARC systems include the Endeavour condo cluster as well as the Discovery shared cluster

Endeavour (Condo Cluster)

Discovery (Shared Cluster)



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# CARC SYSTEM USAGE STATUS

Discovery HPC cluster usage status in a quick glance

# OF PROJECTS

**768**

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## On Discovery

- 873 PI's
- 4,000 users
- 250M SU's have been allocated since inception
- 130M active SU's used on the system

# OF NODES ON DISCOVERY

**518**

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## System Specs

- Total 15.4K cores
- 300+ applications
- 300 GPUs
  - 24 x A100
  - 24 x A40
  - 58 x V100
  - 78 x P100
  - 116 x K40

FY22 PURCHASE

**\$1M**

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## New System Purchase

- 70 new compute nodes (4480 cores)
- 30 GPU nodes
  - 24 x A100
  - 36 x A40
- HIPAA cluster

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# CCP: CONDO CLUSTER PROGRAM

The Center for Advanced Research Computing (CARC) launched the Condo Cluster Program (CCP) in December 2020 to allow researchers a flexible way to purchase computing resources for their own dedicated use.

**The CCP has two pricing models:**

## **Annual Subscription Model**

- Allows research groups to subscribe to their selected number of compute and storage resources on a yearly basis
- Compute resources can be requested via CARC User Portal
- Allocated nodes get provisioned automatically within a week

## **Traditional 5-year System Purchase Model**

- A useful option when research groups need to make a bulk purchase using a research grant or departmental budget
- Compute/GPU system configurations by CARC
- System purchases can be requested via CARC User Portal



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# STATE OF THE NEW CONDO CLUSTER PROGRAM

Current usage for CARC's Endeavour condo cluster

# OF PROJECTS:

**61**

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**Contributions:**

- Viterbi: 11 PI's, 389 nodes
- Dornsife: 12PI's, 223 nodes
- Keck: 7 PI's, 156 nodes
- Others: 15 PI's, 183 nodes

- Not including subscription nodes

# OF NODES IN USE:

**868**

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**System utilization:**

- 20K cores
- 36/50 subscription nodes
- More than 1,000 old compute nodes have been decommissioned

FY22 PURCHASE:

**\$1.2M**

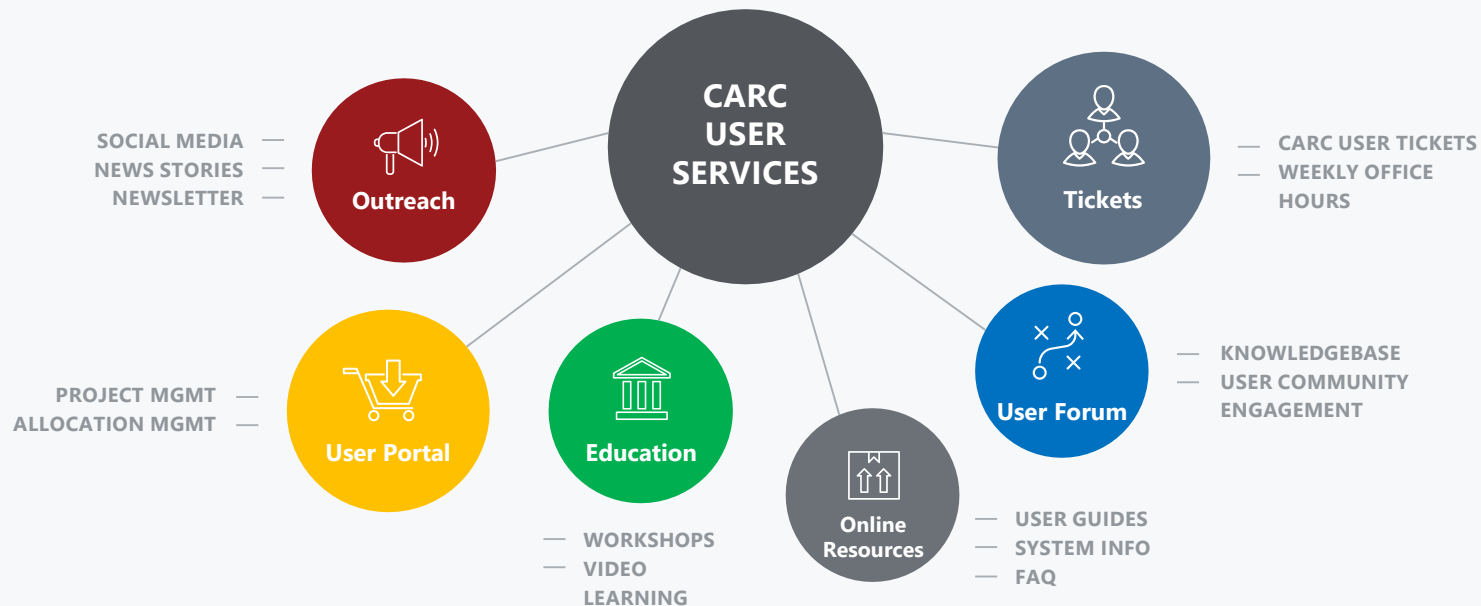
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**New nodes purchased:**

- 60 CPU nodes
- 2 GPU nodes (A40)
- DURIP award cluster (24-node)
- DOE cluster (36-node)

# ADVANCED RESEARCH COMPUTING **USER SERVICES**

The Center for Advanced Research Computing (CARC) offers comprehensive user support services





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# GOVERNANCE MODEL

The USC Center for Advanced Research Computing (CARC) established a program governance model that is structured to engage USC faculty, IT professionals, and senior leadership of the university with respect to the direction of the CARC.

01

## ADVANCED RESEARCH COMPUTING - PROGRAM ADVISORY COMMITTEE (ARC-PAC)

A faculty-led governance structure that coordinates with stakeholders (faculty, students, IT professionals, and university leadership) for discussions concerning research cyberinfrastructure, facilities, and services.

- Vice President of Research (or a designated representative)
- Chief Information Officer (or a designated representative)
- Vice/Associate/Divisional Deans for Research from USC Schools
- Representatives of USC Research Centers and Institutes
- Associate Chief Research Information Officer/Director of the CARC (ex officio)

02

## CONDO CLUSTER PROGRAM – EXECUTIVE STEERING COMMITTEE (CCP-ESC)

Current HPC infrastructure at USC needs continuous upgrades, including data center power and cooling, storage and network, GPU resources and the scale of HPC systems, etc.

- Vice President of Research (or a designated representative)
- Chief Information Officer (or a designated representative)
- Faculty investors of the Condo Cluster Program
- Associate Chief Research Information Officer/Director of the CARC (ex officio)

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# BUILDING PARTNERSHIP

CARC aims to be an institutional resource and a long-term research partner of USC research community

01

## **\$400K NSF CC\* AWARD: COLLABORATION WITH INFORMATION SCIENCE INSTITUTE (ISI)**

CARC and Information Science Institute (ISI) have been collaborated on multiple NSF proposal developments. The collaborative effort resulted in multiple NSF CC\* awards. This is the first one we received in 2020 for the development of Hybrid Cloud Computing system.

02

## **\$1M NSF CC\* AWARD: COLLABORATION WITH ISI & LOS NETTOS**

Working with Los Nettos R&E Network Consortium and ISI, another CC\* proposal has been awarded (\$1MM) in 2021, aiming to build a regional Science DMZ network for local institutions.

03

## **CRYO-EM PROJECT: SUPPORTING DONRSIFE/AMGEN/ITS**

CARC is developing a full research ecosystem including user interface, data and computational workflow management platform, with special GPU cluster deployment.

04

## **NSF CC\* REGIONAL COMPUTING (\$1M)**

CARC is working with ISI for planning and building computational infrastructure for local institutions in SoCal region

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# FUTURE PLAN

CARC aims to become a regional leadership computing facility in SoCal

01

## IMPROVING RESEARCH CYBERINFRASTRUCTURE AT USC

Current HPC infrastructure at USC needs continuous upgrades, including data center power and cooling, storage and network, GPU resources and the scale of HPC systems, etc.

02

## DEVELOPING ADVANCED RESEARCH SUPPORT CAPACITY

In addition to the system infrastructure improvement, developing advanced computational and data expertise is critical to provide adequate support the research community and enable scientific breakthroughs at scale.

03

## BECOMING REGIONAL LEADERSHIP COMPUTING FACILITY

We aim to become a regional leadership research computing facility, supporting and promoting multi-disciplinary, multi-institutional research collaborations.

04

## STRATEGIC PLAN DEVELOPMENT

CARC is currently developing long-term strategic plan. This involves with multiple surveys and interviews with peer research computing programs at R1 universities and Sr Leadership at USC.

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**THANK YOU  
& FIGHT ON!**

