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INL/State of Idaho Collaborations:

Center for Advanced Energy Studies, Cybercore
Integration Center, Collaborative Computing Center

Presentation to the LINE Commission, Boise, ID

Battelle Energy Alliance manages INL for the
U.S. Department of Energy's Office of Nuclear Energy



Idaho National Laboratory

Leveraging INL Collaborations with the State of Idaho: *CAES, C3, and Cybercore*



University of Idaho



BOISE STATE UNIVERSITY





Established 2006
Building Constructed 2009

Center for Advanced Energy Studies

Philip M. Reppert

Director, Center for Advanced Energy
Studies & Idaho University Collaborations

What is CAES?

- A collaboration between INL, Boise State University, Idaho State University, University of Idaho
- CAES main laboratory is located in Idaho Falls adjacent to INL and University Place
- CAES provides opportunities for students to experience experiential learning in a real-world national laboratory setting.
- CAES touch communities across the state of Idaho.



CAES Mission & Vision

Mission

Create new knowledge and the next generation of technology leaders through research and education with academic-industry-government collaborations.



Vision

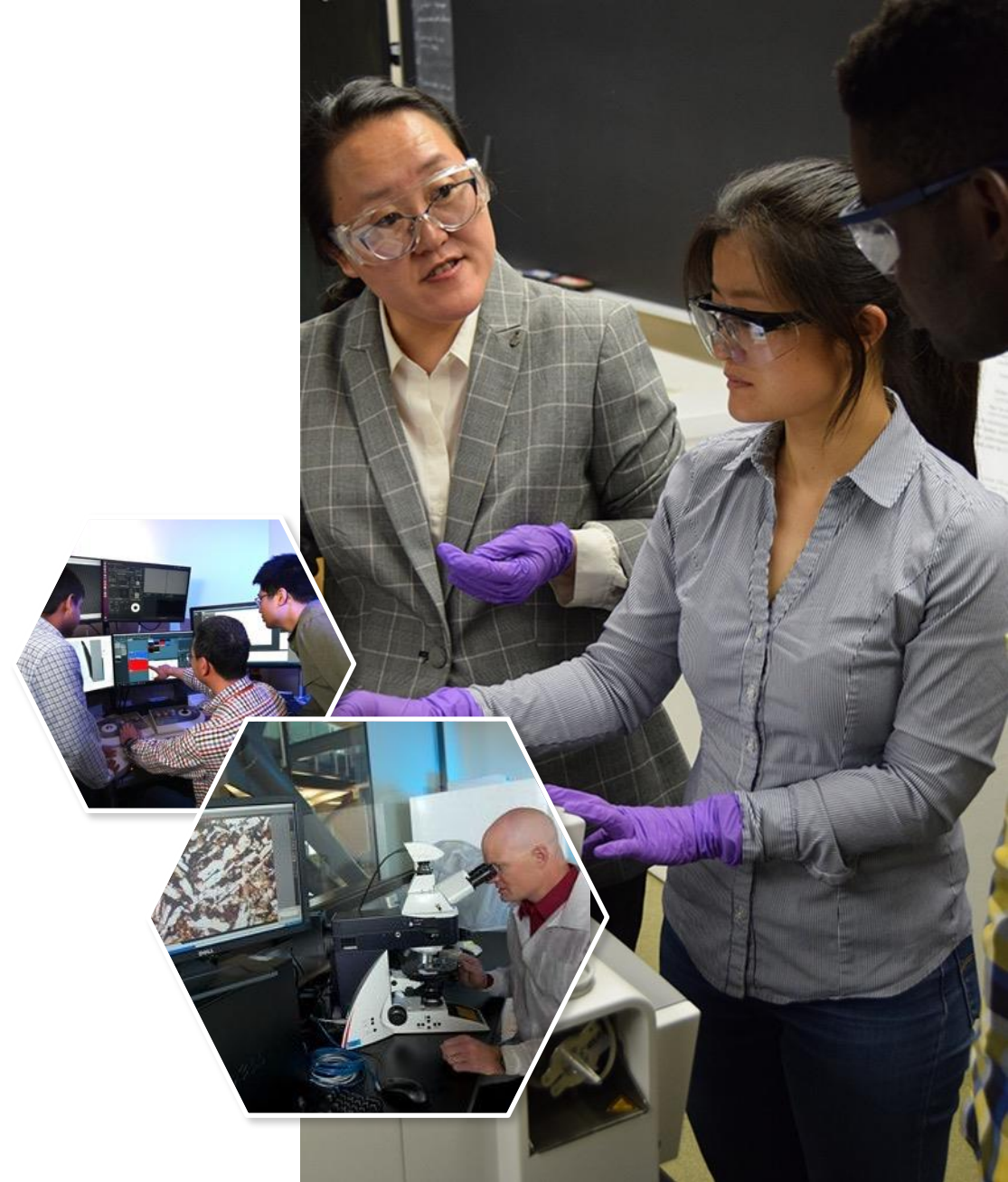
Through world-class collaborative research, CAES innovates to secure the nation's energy future.

Three Primary Focus Areas

The three focus areas at CAES are related to the broad interdisciplinary field of nuclear engineering. They also support aspects of clean-energy development.

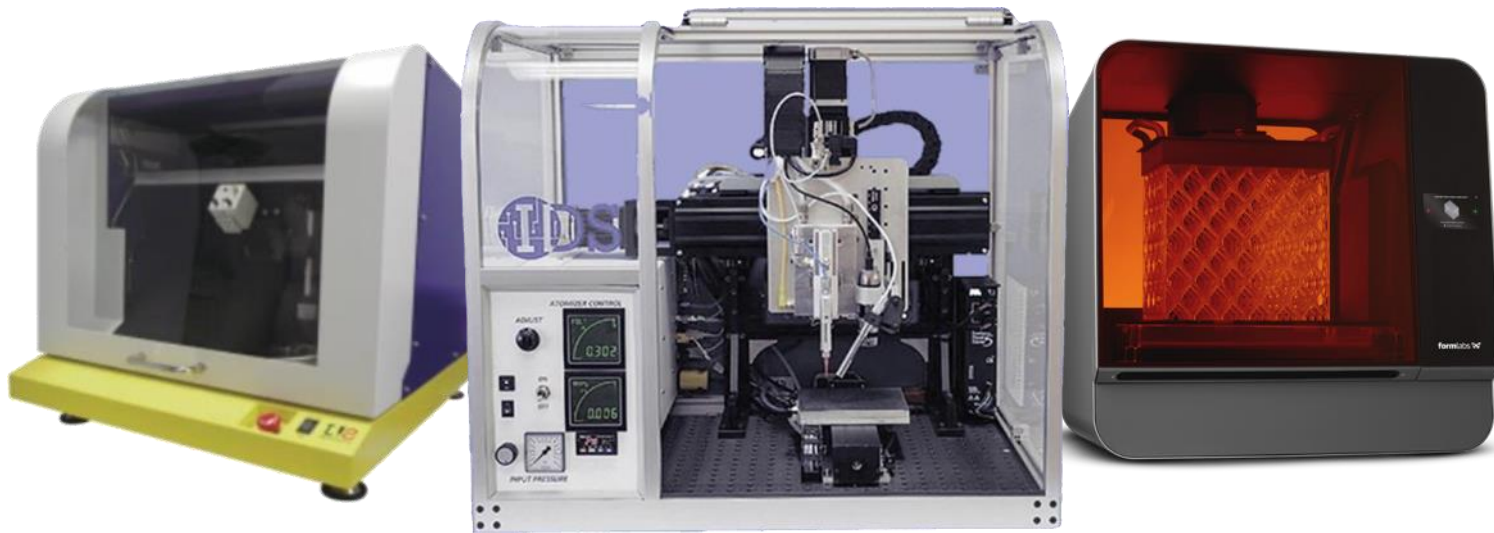
- Advanced Manufacturing
- Potential area: Critical Minerals/Geothermal
- Potential area: Energy Storage/Transfer

Two previous CAES focus areas, Cybersecurity and Computing, Data, and Visualization, have enabled the formation of C3 and Cybercore.



Advanced Manufacturing Highlights

- New Scanning-Transmission Electron Microscope (S-TEM)
- New 3-D powder bed metal printer
- New nano printers



CAES Highlights

- National Science Foundation Scholarships in STEM program award of \$5M to Boise State University
- Higher Education Research Council-Idaho Global Entrepreneurial Mission: \$2.1M award to team led by University of Idaho's Michael Haney
- Idaho Global Entrepreneurial Mission award (\$348K) to University of Idaho's Amin Mirkouei to research and develop a new technique for drilling and extracting rare earth elements.
- \$450K NRC grant for Idaho State University's Amir Ali to create a program enabling thermal hydraulic research in ISU's Nuclear Engineering department.
- BSU, ISU receive DOE EPSCoR grants for projects involving INL
- Research Experience for Undergraduates: Advanced Manufacturing for a Sustainable Energy Future Program



Future Goal – *More Industry Involvement in CAES*

Benefits of Industry Involvement

- Additional sources of funding to support students
- Keep Idaho companies on the forefront of new technology development
- Pipeline of Idaho students to Idaho industry
- Develop internships for Idaho students
- Growing collaborations with industry





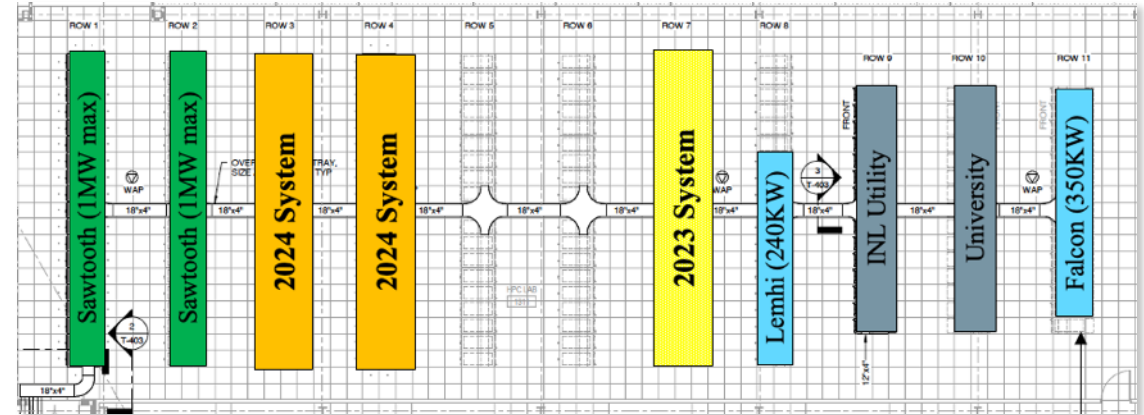
Collaborative Computing Center (C3)

Eric T. Whiting

Division Director Advanced
Scientific Computing

Collaborative Computing Center (C3)

- Financed by the State of Idaho – Leased by INL
 - Constructed 2018-2019
 - By 2020 more than \$40M of computers installed
- 196 maximum occupancy
 - 157 staff assigned to C3
 - 75 interns Summer 2022, including 18 from Idaho Schools
- Data center -- 4 MW with the ability to expand to 8 MW
- Centralized location for computational staff and visitors



Transformers, cooling towers, pumps, power will be required for future systems

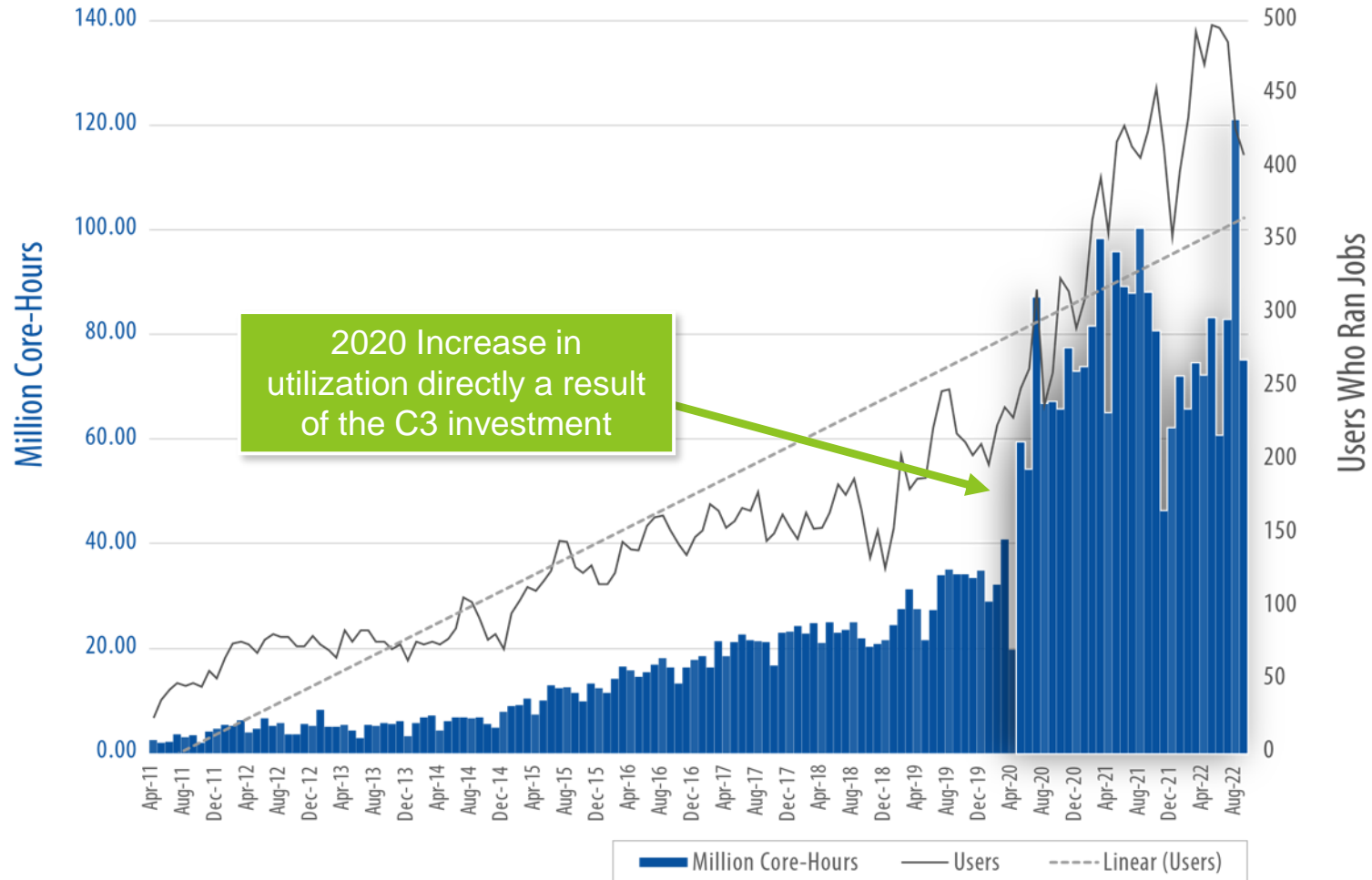
High Performance Computing rows 1-8
1.0 MW per row, 19 racks per row UPS/Utility selectable

Rows 9-10
1.0 MW per row, 19 racks per row UPS/Utility selectable



HPC Growth and Engagement

HPC Usage by Month (April 2011 - September 2022)



User Count	Affiliation
694	Idaho National Laboratory
116	Naval Nuclear Laboratory
64	Argonne National Laboratory
53	TerraPower
43	MPR Associates
42	Oak Ridge National Laboratory
33	Framatome
32	North Carolina State University
30	Idaho State University
28	University of Tennessee Knoxville
27	Westinghouse Electric Company
26	University of Idaho
24	Boise State University
24	Nuclear Regulatory Commission
22	BWX Technologies, Inc
21	University of Wisconsin-Madison
19	Texas A&M University
18	Pennsylvania State University
17	Los Alamos National Laboratory
17	Oregon State University
14	Holtec International
14	Massachusetts Institute of Technology
13	Oklo Inc
12	Radiant Industries Incorporated
12	University of Michigan
10	Missouri University of Science and Technology
10	Purdue University
9	Georgia Institute of Technology
9	University of South Carolina

Table: Top 35 institutions with largest user count utilizing INL HPC systems as of September 30, 2022

Falcon – for Idaho

- INL's Falcon Supercomputer is now managed and operated by the CAES universities
- System provides 34,992 compute cores to Idaho Universities and ranks in the top 25 of university computing systems in the US
- Falcon timeline:
 - 2014 installed
 - 2017 upgraded
 - 2020 moved to C3
 - 2022 transferred to CAES management
- \$10M total INL investment





Cybercore Integration Center

Eleanor J. Taylor
Program Manager, National &
Homeland Security Workforce
Development Program Office

80,000
SQUARE FEET

TWENTY
LABORATORIES
AND TEST BAYS

**SPACE
FOR 200**
Employees/Collaborators

**DEDICATED
UNIVERSITY**
Collaboration Space

**SECURE CONFERENCE
ROOMS &
Auditorium**

INL National & Homeland Security Directorate Workforce Development Program Office

Address the most critical control systems challenges that require a national collaborative, inter-disciplinary environment



Drive a culture change in engineering

Increase cybersecurity of systems
deployed and under development



Enhanced partnerships

Advance control systems
cybersecurity gaps



Accelerate workforce development

Support demand for control
system cybersecurity talent

Cybercore University Collaboration Laboratory

- **Partner** to advance control systems cybersecurity
- **Deliver** on MOU commitments with the state of Idaho and strengthen education ecosystem
- **Access** to collective resources and equipment
- **Exchange** of scientific and engineering information and collaboration
- **Align** interdisciplinary programs to address national challenges



Cybercore Summer Camp

Started as an Intro Camp reaching a handful of students and has continued to grow with offerings now available across the state....

- Intro and Advanced Camps
- More offerings across the state
- Teaming across institutions

Future focus.....

- Teachers
- Adult learners
- Additional locations and partners



CYBERCORE SUMMER CAMP

Now enrolling in **IDAHO FALLS**

INTRO CAMP
July 18-22, 2022

ADVANCED CAMP
August 1-5, 2022
\$125/week

The Cybercore Summer Camps introduce high school students to the world of cybersecurity and information technology. Participants will be introduced to:

INTRO CAMP

- Computing basics, using Windows & Linux
- Programming with python
- Circuit design
- Binary, hex, encoding, and cryptography & more
- Raspberry Pi for each student

ADVANCED CAMP

- Automation with python
- Circuit design, soldering & embedded system construction
- Safe & secure online behavior, including email and web security skills
- Cybersecurity "red versus blue" attack & defend games
- Raspberry Pi accessory kit for each student

INL Idaho National Laboratory | CYBERCORE | I University of Idaho

Limited Space Register Early
frankie.adams@cci.edu | 200.555.3345 | cci.edu/ntcc/



CYBER SUMMER CAMP

Now enrolling in **BOISE**

July 18-22, 2022
9 a.m. to 3 p.m.
\$150
Lunch provided

The Cyber Operations and Resilience Program (COPe) is hosting the Cyber Summer Camp for junior high and high school students (7th-12th grade) to provide students with a hands-on experience to the world of information technology and cybersecurity. Students will learn the basics of information technology and security, as well as cybersecurity basics.

- Learn what's in a computer
- Build a network
- Install an operating system
- Learn what a cyber blue team does

INL Idaho National Laboratory | CYBERCORE | CWI | DEC | B

Register by June 3rd!
boisestate.edu/coper/outreach/cyber-summer-camp/



CYBERCORE SUMMER CAMP

Now enrolling in **NORTH IDAHO**

July 18-21, 2022
9 a.m. to 2 p.m.
\$150

Includes a Raspberry Pi Kit and lunch!

The Cybercore Summer Camp is a summer program designed to introduce high school students and local teachers to cybersecurity and related topics. Students, grades 9-12, with an interest in computer programming, networking, and cybersecurity will participate in hands-on learning activities, gain access to industry mentors through demonstrations and lectures, and experience real world exposure through facilities tours coordinated by local industry partners.

LC State Security Operations Center
Thomas Jefferson Hall Room 17
www.lcsc.edu/business/cybercore-summer-camp

INL | CYBERCORE | LEWIS & CLARK



CYBERCORE SUMMER CAMP

Now enrolling in **TWIN FALLS**

July 18-22, 2022
9 a.m. to 3 p.m.
\$125

T-shirt & Raspberry Pi provided!

The Cybercore Summer Camp is an IN-PERSON EVENT held on the College of Southern Idaho campus that introduces high school students to the world of cybersecurity and information technology. Participants learn how to:

- Computing basics, using Windows & Linux
- Safe & secure online behavior
- Programming with python
- Cybersecurity "capture the flag" event
- Circuit design
- Binary, hex, encoding, and cryptography

Registration
workforce.csi.edu/events/youth-career-camps/cybercore-summer-camp.aspx

INL | CSI

Cybercore Research and Education Partnerships

Industrial Cybersecurity Community of Practice (ICSCOP)

- Consists of over 300 participants nationwide and 12 countries from industry, academia, and government with bi-annual public workshops
- Opportunity to demonstrate capability and expertise at national scale

National Research Model – Idaho Cyber Research Project (ICRP)

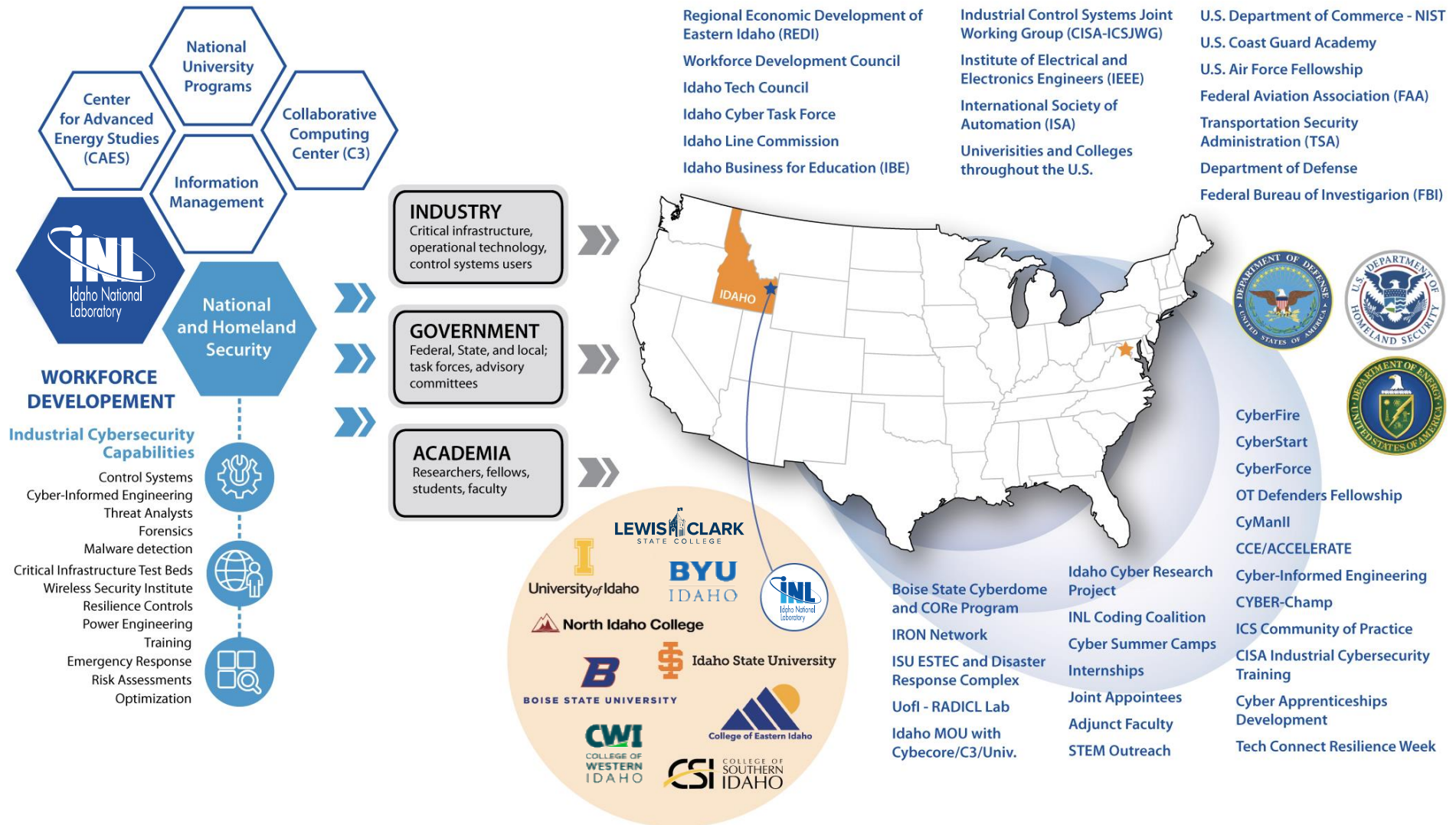
- Provide student and faculty development opportunities
- Maximize and leverage existing programs and resources

Idaho Engagements & Research Projects

- Cyber Informed Engineering (CIE)
- Consequence driven Cyber informed Engineering (CCE)
- Curriculum Development and Hands-On Training
- Laboratory Directed Research and Development (LDRD)
- Cyber CHAMP Assessments
- Community Cyber Guidebooks
- Community College Pilots
- STEM Outreach

Idaho Interns Lab Wide	2018	2019	2020	2021
Total	97	111	118	159
Cyber Focused	22	45	52	54

National Industrial Cybersecurity Workforce Impact





Idaho National Laboratory