CI 101: What is Cyberinfrastructure and Why It Matters

Jennifer Kim
CI Engineer
MS-CC

THE VISION

MS-CC envisions a transformational partnership to promote advanced cyberinfrastructure (CI) capabilities on HBCU, HSI, TCU, and MSI campuses. We are advancing connections across campuses around data, research computing, teaching, curriculum development, professional development, and capacity-building.

We will learn and grow as a consortium, lifting up all participating institutions by advancing cyberinfrastructure for research and education across diverse fields, disciplines, and communities in ways that reflect the unique voices and interests of our communities.

We will engage as full contributors to the global R&E community.

Photo Credit: North Carolina Central University

Photo Credit: Salish Kootenai College

Photo Credit: Jackson State University

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MS-CC: Coalescing HBCUs, TCUs, HSIs, and other entities

HBCUs (72)

Alabama A&M University
Alabama State University
Albany State University
Alcorn State University
American Baptist College
Benedict College
Bennett College
Bethune-Cookman University
Bishop State Community College
Bowie State University
Cheyney University
Claflin University
Clark Atlanta University
Coppin State University
Dillard University
Elizabeth City State University
Fayetteville State University
Fisk University
Florida A&M University
Florida Memorial University
Fort Valley State University
Grambling State University
Hampton University
Harris-Stowe State University
Howard University
Huston-Tillotson University
JF Drake State Community & Technical College
Jackson State University
Jarvis Christian University
Johnson C. Smith University
Kentucky State University
Knoxville College
Langston University
LeMoyne-Owen College
Livingstone College
Meharry Medical College

Miles College
Morehouse College
Morehouse School of Medicine
Morgan State University
Morris College
Norfolk State University
North Carolina A&T State University
North Carolina Central University
Oakwood University
Paul Quinn College
Prairie View A&M University
Savannah State University
Shaw University
South Carolina State University
Southern University - New Orleans
Southern University – Shreveport
Southern University and A&M College
Spelman College
St. Augustine's University
St. Philip's College
Stillman College
Tennessee State University
Texas College
Texas Southern University
Tougaloo College
Tuskegee University
University of Arkansas – Pine Bluff
University of Maryland Eastern Shore
University of the District of Columbia
University of the Virgin Islands
Virginia State University
Virginia Union University
Voorhees University
West Virginia State University
Winston-Salem State University
Xavier University

HSIs (27)

California State University – Dominguez Hills
California State University – Northridge
California State University – Sacramento State
Essex County College
Florida Atlantic University
Goshen College
Housatonic Community College
Houston Christian University
InterAmerican University of Puerto Rico
Los Angeles Harbor College
Mendocino College
Merced College
Northern Arizona University
Oxnard University
Taft College
Texas A&M University
Texas Tech University
The University of Arizona
University of California – Riverside
University of Illinois – Chicago
University of Nevada – Las Vegas
University of New Mexico
University of Redlands
University of Texas – El Paso
University of Texas Health Science Center – San Antonio
West Texas A&M University
William Paterson University

TCUs (16)

Aaniiih Nakoda College
Bay Mills Community College
Blackfeet Community College
Cankdeska Cikana Community College
College of the Menominee Nation
College of the Muscogee Nation
Diné College
Fond du Lac Tribal and Community College
Little Big Horn College
Little Priest Tribal College
Navajo Technical University
Nebraska Indian Community College
Salish Kootenai College
Sinte Gleska University
Turtle Mountain Community College
United Tribes Technical College

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MS-CC: Coalescing HBCUs, TCUs, HSIs, and other entities
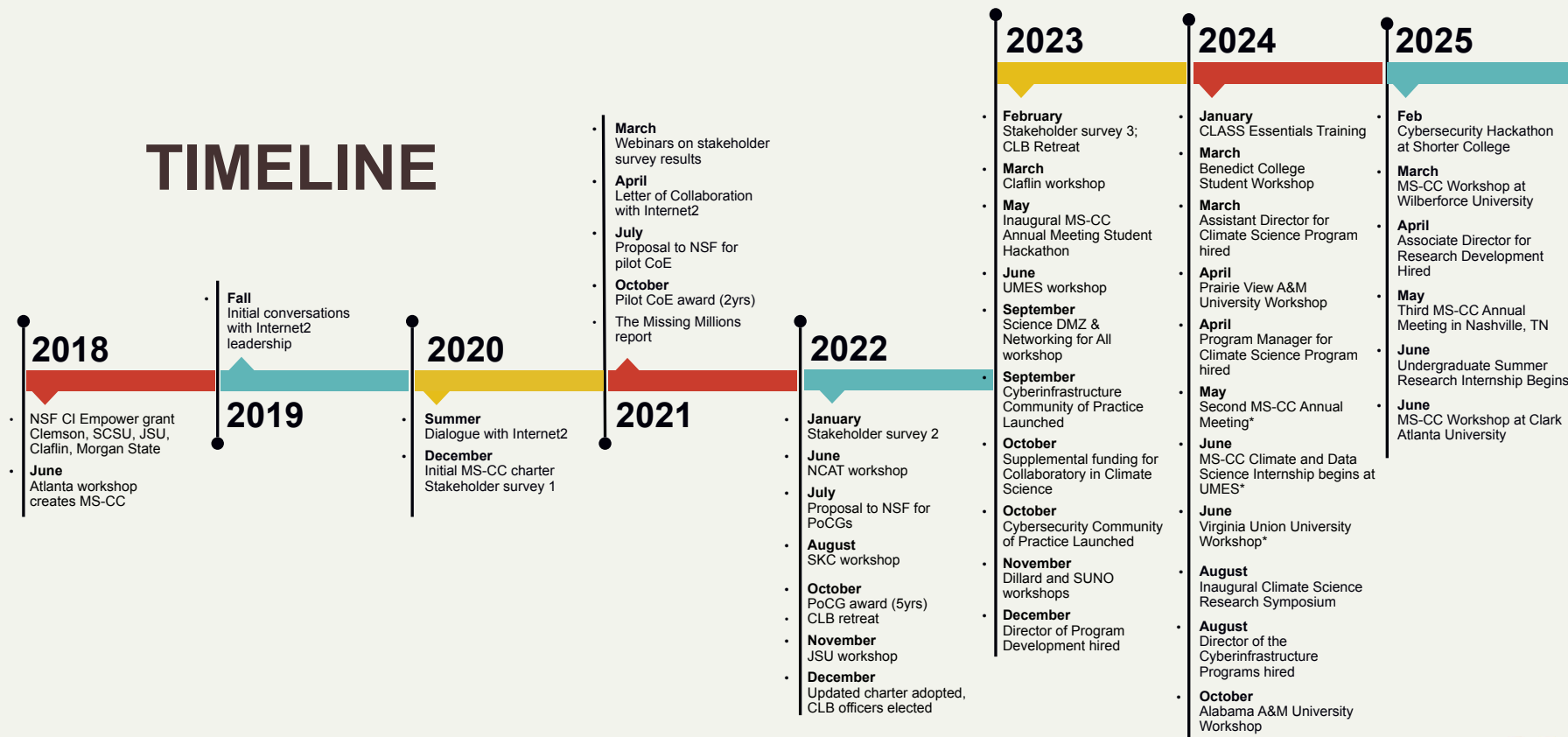
Affiliate – Institutional (52)

Arizona State University
Brandeis University
Chicago State University
Clayton State University
Clemson University
College of the Marshall Islands
Colorado State University
Cornell University
Fordham University
Fort Lewis College
George Washington University
Georgia State University
Georgia Tech
Harvard Medical School
Harvard University
Indiana University
Louisiana State University
Montana State University
New Jersey Institute of Technology
North Carolina State University
Penn State University
Purdue University
Thomas Edison State University
University of Alabama
University of Alberta
University of British Columbia
University of California – Berkeley
University of California – Davis
University of California – San Diego
University of Chicago
University of Colorado – Boulder
University of Delaware
University of Illinois – Urbana-Champaign
University of Maryland – Baltimore County
University of Maryland – College Park
University of Michigan

University of Minnesota – Twin Cities
University of Mississippi
University of Montana
University of North Carolina – Asheville
University of North Carolina – Greensboro
University of North Carolina – Pembroke
University of Oklahoma
University of Pennsylvania
University of South Carolina
University of Southern Mississippi
University of Tennessee – Knoxville
University of Utah
University of Virginia
University of Wisconsin – Madison
Villanova University
Virginia Commonwealth University

Affiliate – Not for Profit (30)

American Indian Higher Education Consortium
Air Force Office of Scientific Research
Arkansas Economic Development Commission
Bill & Melinda Gates Foundation
Campus Research Computing Consortium (CaRCC)
CI Compass
Coalition for Academic Scientific Computation
Edge, Inc.
HBCU Library Alliance
Internet2
Lawrence Berkeley National Lab
MARIA
MDREN
Network Startup Resource Center
NTIA
Ohio Supercomputer Center
Pacific Northwest Gigapop
Pittsburgh Supercomputer Center
Regulated Research Community of Practice
San Diego Supercomputer Center
Sicangu Lakota Treaty Council
South Carolina Commission for Minority Affairs
Southern Crossroads (SoX)
TACC
The Quilt
TrustedCI
University Corporation for Atmospheric Research (UCAR)
United Negro College Fund (UNCF)
United State Research Software Association
Waymark Analytics

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TIMELINE

2018
- NSF CI Empower grant Clemson, SCSU, JSU, Claflin, Morgan State
- **June**
  Atlanta workshop creates MS-CC

2019
- **Fall**
  Initial conversations with Internet2 leadership

2020
- **Summer**
  Dialogue with Internet2
- **December**
  Initial MS-CC charter Stakeholder survey 1

2021
- **March**
  Webinars on stakeholder survey results
- **April**
  Letter of Collaboration with Internet2
- **July**
  Proposal to NSF for pilot CoE
- **October**
  Pilot CoE award (2yrs)
- The Missing Millions report

2022
- **January**
  Stakeholder survey 2
- **June**
  NCAT workshop
- **July**
  Proposal to NSF for PoCGs
- **August**
  SKC workshop
- **October**
  PoCG award (5yrs) CLB retreat
- **November**
  JSU workshop
- **December**
  Updated charter adopted, CLB officers elected

2023
- **February**
  Stakeholder survey 3; CLB Retreat
- **March**
  Claflin workshop
- **May**
  Inaugural MS-CC Annual Meeting Student Hackathon
- **June**
  UMES workshop
- **September**
  Science DMZ & Networking for All workshop
- **September**
  Cyberinfrastructure Community of Practice Launched
- **October**
  Supplemental funding for Collaboratory in Climate Science
- **October**
  Cybersecurity Community of Practice Launched
- **November**
  Dillard and SUNO workshops
- **December**
  Director of Program Development hired

2024
- **January**
  CLASS Essentials Training
- **March**
  Benedict College Student Workshop
- **March**
  Assistant Director for Climate Science Program hired
- **April**
  Prairie View A&M University Workshop
- **April**
  Program Manager for Climate Science Program hired
- **May**
  Second MS-CC Annual Meeting*
- **June**
  MS-CC Climate and Data Science Internship begins at UMES*
- **June**
  Virginia Union University Workshop*
- **August**
  Inaugural Climate Science Research Symposium
- **August**
  Director of the Cyberinfrastructure Programs hired
- **October**
  Alabama A&M University Workshop

2025
- **Feb**
  Cybersecurity Hackathon at Shorter College
- **March**
  MS-CC Workshop at Wilberforce University
- **April**
  Associate Director for Research Development Hired
- **May**
  Third MS-CC Annual Meeting in Nashville, TN
- **June**
  Undergraduate Summer Research Internship Begins
- **June**
  MS-CC Workshop at Clark Atlanta University

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Issues include:

- The evaluation criteria of federal grant programs that prevent resource-strained HBCUs and TCUs from being competitive among larger, well-funded institutions

- MS-CC campuses not only need to advance their CI and research infrastructure; they also need to build expertise to deploy and use CI tools and implementations

- Competing priorities in supporting the campus infrastructure and limited resources and staffing needed to implement, maintain, troubleshoot, and just keep the lights on to support the campus operating.

- Assumptions that a campus has done work towards identifying STEM research and education drivers that require the use of computational and other CI resources provided by these efforts and where the training becomes necessary.

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MS-CC Guiding Principles

Inclusion | Innovation | Stakeholder Value

MS-CC Purpose

- Increase access to cyberinfrastructure (CI) capabilities across academic disciplines

- Enhance communication between researchers, IT professionals, campus leadership, and between institutional members

- Support IT for research-enabled professional and career development

- Collective advocacy and partnerships

MS-CC Stakeholders

- Researchers, educators, and students

- IT/CI professionals

- Campus leadership

- Industry partners

- Foundations and funding agencies

MS-CC Origins

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Strength in Numbers. Power of Community.

- Join a vibrant community where you can collaborate, receive support, and advocate for our collective needs.

- Participate in MS-CC governance and committees.

- MS-CC organizes workshops at HBCUs, TCUs, and Internet2 events, and provides funding support for MS-CC participants.

- MS-CC facilitates community-driven experience sharing to support and raise awareness around key topics of interest to MS-CC participants.

- Participate in regional workshops about the importance of IT for Research.

- Stay apprised of funding, collaborator and community offerings.

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CI Center of Excellence Demonstration Pilot

Award # OAC-2137123

21st Century Research-Cyberinfrastructure for MSIs through the Minority Serving - Cyberinfrastructure Consortium: A phased approach to engage the Missing Millions

Award # OAC-2234326

Collaboratory in Climate Science

Supplement to Award # OAC-2234326

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NSF

INTERNET2

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CI Center of Excellence Demonstration Pilot *(Award # OAC-2137123)* **and 21st Century Research-Cyberinfrastructure for MSIs through the MS-CC: A phased approach to engage the Missing Millions** *(Award # OAC-2234326)*

Key Objectives: CI CoE Pilot

- Create a **connective and collaborative organization** that serves as a centralized hub for HBCUs, TCUs, and other MSIs to utilize for CI expertise, experience-sharing, and advocacy.

- Increase awareness, availability, and financial support for **CI professional development** for faculty, staff, and students at HBCUs, TCUs, and other MSIs.

- **Enhance communication** among researchers, university leadership, and CI professionals.

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Engaging with the MS-CC Community

- **8 Workshops**

39 HBCUs (36%*) attended a workshop to date
9 TCUs (24%**) attended a workshop to date

- **2023 Inaugural Annual Meeting** and **2024 2nd Annual Meeting**

    41 HBCUs (38%*) attended an Annual Meeting
    5 TCUs (14%**) attended an Annual Meeting

- **Monthly All Hands Meetings**
    2024 YTD averaging 49 participants from 33 institutions

- **3 Communities of Practice Launched**
    - May 2023: CI Plan CoP
    - October 2023: Cybersecurity CoP
    - July 2024: IT Leaders CoP

Funded MS-CC Participant Travel, Attendance at Events

*Of all 108 HBCUs; **Of all 37 TCUs

NSF Award # 2137123 (pCoE) Accomplishments: October 2021 to October 2024

Engaging with Students
- May 2023: Student Hackathon @ Annual Meeting
- March 2024: Cyber-simulation at Benedict College
- March 2025: Cyber-simulation at Shorter College

Growing the MS-CC Community
500+ participants representing 200 organizations

Professional Development & Training Opportunities
- March 2023: ScienceDMZ, Network Testing, & Cybersecurity at Claflin
- September 2023: ScienceDMZ & Networking for All at TechEX23
- Winter 2023/2024: NSF CI Funding for HBCUs, TCUs, other MSIs
- January 2024: CLASS Essentials (AWS, Azure, GCP) for MS-CC
- May 2024: Network Technologies for Data Movement Supporting Research & Education on Campus Networks
- July-December 2024: Harvard Technology Enablement Program (pilot)
- August & September 2024: IAM Training with Cirrus Identity (pilot)
- December 2024: Network Technologies for Dta Movement Supporting R&E on Campus Networks at TechEx

MS-CC Community Surveys to Inform Activities
- 2022 & 2023: Stakeholder Pulse Surveys (Waymark Analytics)
- CI Facilitation Services (Summer 2023)
- Annual Meeting Surveys (May 2024)
- AI Survey (May 2024)

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CI Center of Excellence Demonstration Pilot *(Award # OAC-2137123)* **and 21st Century Research-Cyberinfrastructure for MSIs through the MS-CC: A phased approach to engage the Missing Millions** *(Award # OAC-2234326)*

Key Objectives: Phased Approach

- **Increase access to shared CI resources** for MS-CC organizations.

- **Increase and accelerate CI-enabled research and education capacity** at MS-CC campuses by piloting a model(s) for cyberinfrastructure development at HBCUs, TCUs, and other minority-serving institutions.

  - Initial allocation of **at least five (5) Proof of Concept Grant (PoCG) Awards** to select MS-CC institutions for funding and support for **CI strategic planning and capacity-building that advance CI-enabled education and research.**

NSF Award

Minority Serving Cyberinfrastructure Consortium (MS-CC)
Award # OAC-2234326
Start date: 10/1/2022   Projected end date: 9/30/2027

21st Century Research-Cyberinfrastructure for MSIs through the Minority Serving - Cyberinfrastructure Consortium (MS-CC): A phased approach to engage the Missing Millions

Principal Investigator:
Ana Hunsinger,
Internet2
ana@internet2.edu

Co-Principal Investigators:

Al Anderson,
Salish Kootenai College

James Brenn,
Claflin University

Dr. Deborah Dent,
Jackson State University

Objective

•Significantly *increase and accelerate cyberinfrastructure-centric research capacity* at MS-CC campuses through a set of new approaches from which we can then learn and potentially frame a repeatable, successful model for cyberinfrastructure implementations on the campuses of minority-serving institutions.

Approach

•Initial allocation of *at least five (5) Proof of Concept Grant (PoCG) Awards* to select MS-CC institutions that allows each to perform campus specific CI assessments that drive an overall CI strategic plan and a roadmap to pioneer new capabilities that advance CI-centric research, and empower scientific advancements.

•Establishing *teams of expert CI Professionals* that will provide support to the PoCGs through consultation, implementation of expanded CI capabilities, and leading efforts to ensure these institutions are participating and collaborating with the broader CI ecosystem.

•*MS-CC as a more robust effort* so that it can be able to support future PoCGs and to support a more directed approach to ensure these institutions are participating and collaborating with the broader CI ecosystem.

INTERNET2

JSU | JACKSON STATE UNIVERSITY

SALISH KOOTENAI COLLEGE

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NSF Award # 2234326 Ongoing Activities

All Proof-of-Concept Grant (PoCG) Activities
- Stakeholder Alignment toward formalized CI governance
- PoCG-funded CI Facilitator or CI Coordinator implementation

Claflin University
- R&E Facilitation informing HPC investment
- eduroam implementation

Jackson State University
- R&E Facilitation informing HPC investment
- Network Enhancement, with eduroam implementation

Salish Kootenai College
- R&E Facilitation informing conference participation, CI governance
- Virtual Lab and Network development, with eduroam implementation

Nashville HBCUs
- Chartered *Nashville HBCU CI Collaborative*
- Coordinated network development and campus CI Plans

CLAFLIN UNIVERSITY · FOUNDED 1869

JSU 1877 | JACKSON STATE UNIVERSITY®

SALISH KOOTENAI COLLEGE

Multi-Campus CI Collaboration
TENNESSEE STATE UNIVERSITY

ABC American Baptist College

MEHARRY MEDICAL COLLEGE

FISK UNIVERSITY · ESTABLISHED 1866

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NSF Award

Minority Serving - Cyberinfrastructure Consortium (MS-CC)
Supplement to Award # OAC-2234326
Projected Start date: 10/1/2023   Projected end date: 9/30/2025

MS-CC Collaboratory in Climate Science

Objective

- Develop a **Collaboratory in Climate Science** that **pairs cyberinfrastructure expertise and capabilities with ongoing climate science research initiatives**, strengthening the pipeline of faculty, staff, and students from HBCUs and TCUs with expertise in cyberinfrastructure-enabled climate science research and learning.
- Build **community-driven collaboration around climate science** across the MS-CC and key partners to develop long term education and research community efforts.

Approach

- The MS-CC Collaboratory in Climate Science will be a **campus-based effort** that focuses on local community or regional climate issues and concerns as well as workforce development.
- MS-CC will **partner with three anchor institutions**, including a climate-focused TCU and two HBCU National Oceanic and Atmospheric Administration (NOAA) Cooperative Science Centers (CSCs), to **develop campus-based events, collaboration opportunities, and summer internships** for participants from multiple HBCUs and TCUs.
- MS-CC will use its engagements to carry out **Communities of Practice to support informal collaboration in climate science and CI to identify shareable solutions in CI**, while serving as an opportunity for the broader community to communicate and share information with the MS-CC.

Principal Investigator:
Ana Hunsinger,
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ana@internet2.edu

Co-Principal Investigators:

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Join NOW: https://www.ms-cc.org/join

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Cyberinfrastructure (CI) = IT for scholarship

Data-dependent research and curricula increasingly require <u>beyond-the-desktop</u> IT resources.

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Cyberinfrastructure (CI) = IT for scholarship

Cyberinfrastructure (CI) = IT for scholarship

Data Lifecycle

Reuse
Plan
Share
Collect
Preserve
Process
Analyse

RDMkit
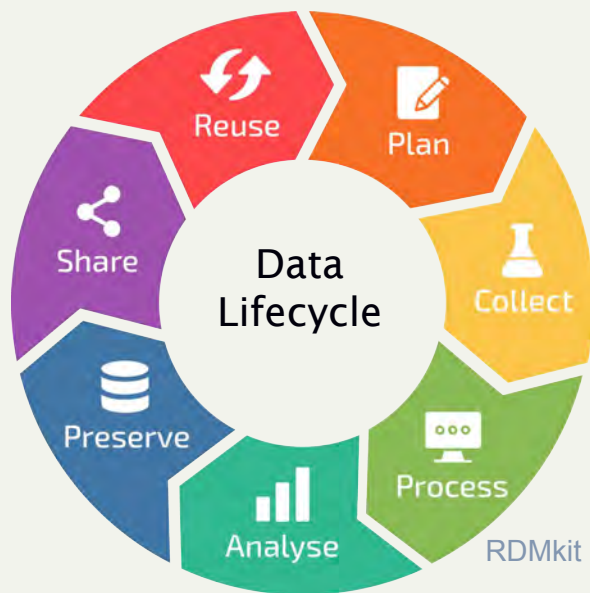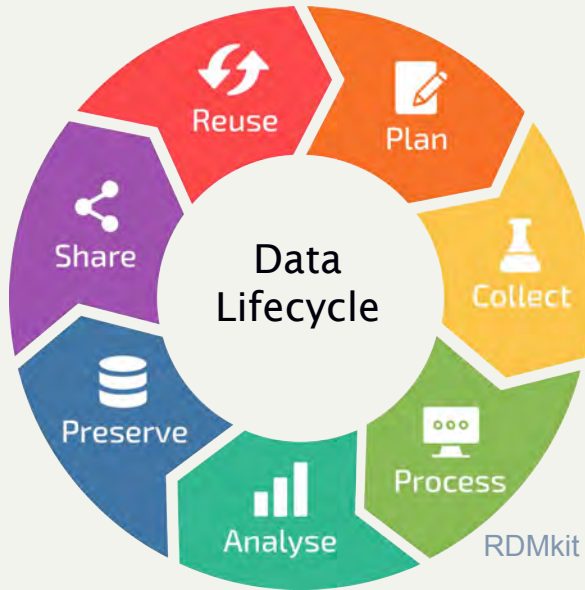
- network capacity

- data storage, access, security

- software, coding interfaces

- computing capacity

- data repositories, archives

- teaching environments using the above

- **People/Learning to Apply and Deliver the Above**

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Impacts to Data-Intensive Education

- Project-based learning
- Experience with real, full-scale datasets
- Modern tools for data science and collaboration
- Large-scale and cloud computing experience
- Increased enrollment, recognizing these strengths

Access to engaging research projects and experiences.

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Impacts to Research Programs

- Expanded project scale and scope
- Accelerated outcomes
- Enhanced collaboration capabilities
- New lines of inquiry
- Greater research impact

Transformative Research Outcomes and Impact

CI Funding Programs for Campuses

May include CI as

- <u>the primary focus </u>(CI-**centric**)

- <u>an expected **component**</u> of a research-/education-centric project

- <u>a **potential** component</u> of a research-/education-centric project

May Cover

- equipment (e.g. network, storage …)

- effort, travel, training, etc.

- external services/products

Federal Entities with Campus-Relevant CI Funding

- **National Science Foundation** (*all CI facets*; potential-centric)
- **National Telecommunications and Information Administration** (*networks,devices,workforce*; centric,component)
- **Department of Homeland Security** (*cybersecurity research+inf*; potential-centric)
- Other entities funding research/education programs: (component,potential)

  e.g. **NIH, DODefense**, **DOEducation, DOEnergy**, Title III, etc.

  (*software, compute, storage, facilities, incl. cloud*)

NSF Directorates

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NSF Directorates

Biological Sciences

Engineering

Mathematical & Physical Sciences

Computer & Information Science & Engineering

Geosciences (including Polar Programs)

Integrative Activities

STEM Education

Social, Behavioral & Economic Sciences

International Science & Engineering

Office of Advanced Cyberinfrastructure (OAC)

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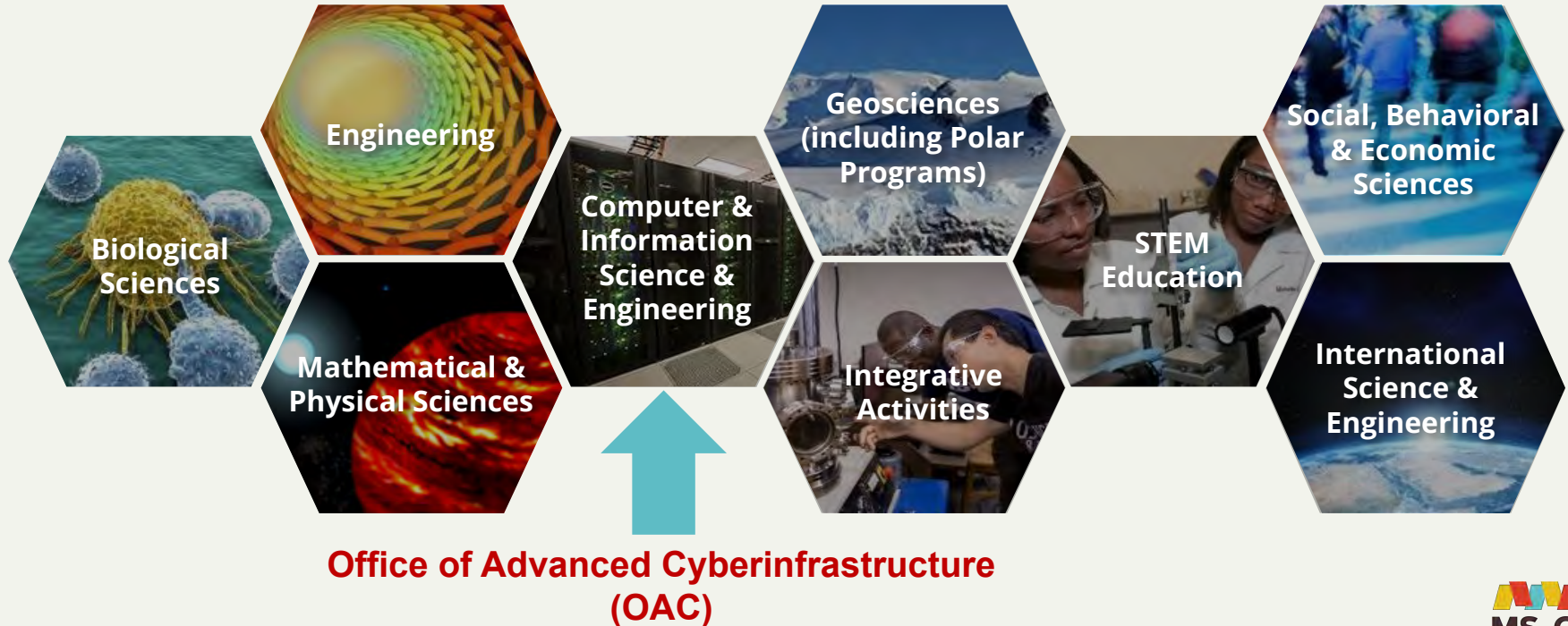
NSF Directorates

Engineering

Geosciences (including Polar Programs)

Social, Behavioral & Economic Sciences

Computer & Engineering

Mathematical & Physical Sciences

Integrative Activities

Education

International Science & Engineering

DIRECTORATE FOR TECHNOLOGY, INNOVATION AND PARTNERSHIPS (TIP)

TIP Webinar: https://www.youtube.com/watch?v=8CbogUbiTl8&list=PLGhBP1C7iCOkQIS4xGK8GCjnxx02oSZlZ

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NSF CI Funding for Campuses

- Research & Education grants across directorates   *potential-component*
- **CISE Office of Advanced Cyberinfrastructure** (OAC)   *centric*
  - **Campus Cyberinfrastructure (CC*) Program**
  - Others, e.g. Cybertraining, SCIPE (CI users and professionals)
- Multi-track MSI-specific funding programs   *potential*
  - HBCU-Undergraduates Program (EDU)   *potential*
  - TCUP (EDU)   *potential-centric*
- Office of Integrative Activities
  - Major Research Instrumentation (MRI)   *component*
  - Mid-scale Research Infrastructure (Mid-scale RI)   *component*

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CC* Example: Texas College, Planning

NSF Program Campus Cyberinfrastructure (CC or CICI): CC*

Program Area: Planning   Award Number: 2201474

PI: Dr. Sohel H. Quazi

Project Title: CC* Planning: RE-CONSTRUCTING THE CAMPUS CYBERINFRASTRUCTURE OF A SMALL, LIBERAL ARTS HBCU IN ORDER TO MAXIMIZE STEM INNOVATION AND INTEGRATION

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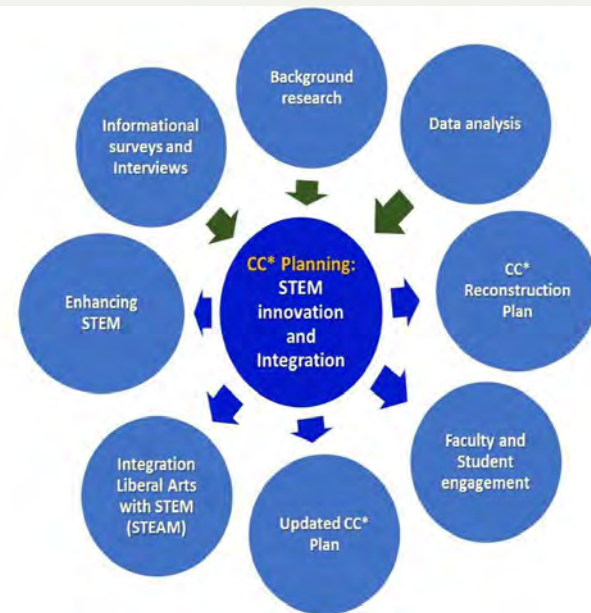
CC* Example: Langston University, Compute

NSF VIRTUAL CAMPUS CYBERINFRASTRUCTURE PI WORKSHOP
SEPTEMBER 19 – 21, 2022

NSF Program (CC): NSF 21-528 Campus Cyberinfrastructure

Program Area: CC* Compute

Award Number: 2201479

PI: Franklin Fondjo Fotou
co-PIs: Horst Severini, Abebaw Tadesse

Project Title: CC* Compute: Collaboration in Computing Infrastructure for Research and Education (CO-InResE)

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(prior Regional)

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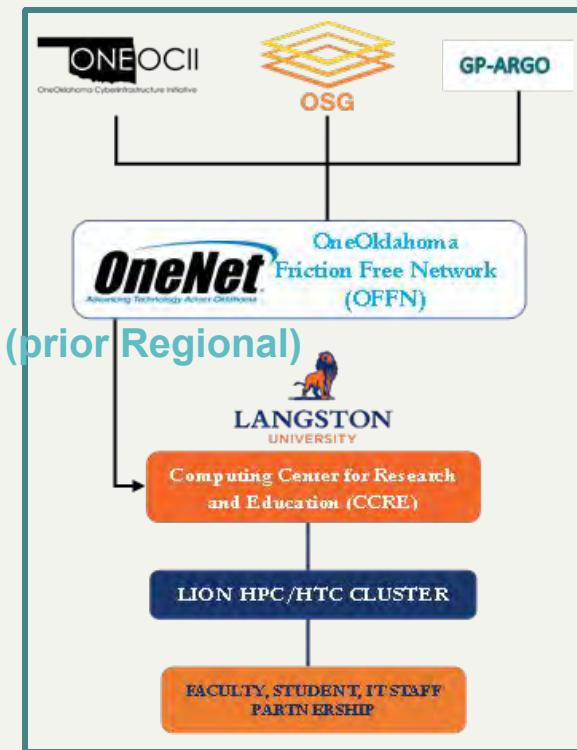
CC* Example: Navajo Tech, Network Design (campus) + Regional

2019 NSF Campus Cyberinfrastructure and Cybersecurity Innovation for Cyberinfrastructure PI Workshop

September 24 – 25, 2019; University of Minnesota, Minneapolis, MN

NSF Program (either CC or CICI): CC

Program Area: CC* network Design   **Award Number: 1827199**

PI: Jason Arviso   **Co-PIs:** John Hernandez, Marla Meehl, Jared Ribble

Project Title: "Nilch' bee naa alkaa go ohooa doo eidii t'jj. Translation: Using air (technology) to learn and understand new things.

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And later:

CC* Regional: Tribal Consortium Research Network
connecting multiple TCUs
(NSF# 1925689)

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CC* Major Proposal Components

- **<u>Science Drivers</u>** (education and research use cases)
- **<u>Campus CI Plan</u>** (document of existing CI and strategies)
  - not required for Planning or CIRA grants
- **Project Plan** that connects the above with technical resources and human effort.
  - **Budget** and **Justification**
  - **Letters of Collaboration** from stakeholders and partners.
- Standard for NSF proposals:
  - **Intellectual Merit** and **Broader Impacts** statements
  - **Data Management Plan** and **Facilities** docs
- See the CC* solicitation and NSF proposal guidance

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Example Science Drivers

- *Network upgrade needed to migrate dated Cybersecurity computer lab hardware/OS to the cloud.*

- *Class using large GIS datasets from external repositories requires network upgrade for timely download during class.*

- *Network (and/or local data storage) to support multiple research groups that regularly move large datasets to/from collaborating institutions and/or off-campus computing resources (e.g. bioinformatics, health, weather forecasting).*

Find abstracts via "Browse projects funded by this program" on the CC* web page.

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CC* Networking Infrastructure: Bulldog Connectivity and Research (1827127)

The **Bulldog Connectivity and Research Network (BCR net) project at South Carolina State University (SCSU)** creates a network infrastructure to accommodate **increasing research activities in STEM and non-traditional areas such as the library, visual arts, museum and the planetarium**. The campus enterprise network … supports only administrative and academic needs … Disparate silos of unconnected computing resources have supported research computing in research labs with little scalability to the evolution of research needs…

… Transfers of large datasets and instructions will be enabled under projects such as the Robotically Controlled Telescope Consortium, the NSF Partnership in Observational and Computational Astronomy (POCA), the NSF SCI-STEPS INCLUDES Project. Other areas affected include; the Physics and Chemistry computational labs for astrophysics and cancer research, the digital media lab, the historical collection and archiving Orangeburg massacre collection, applied radiation sciences lab, the Nuclear Engineering program reactor simulation lab, and the computer science security lab.
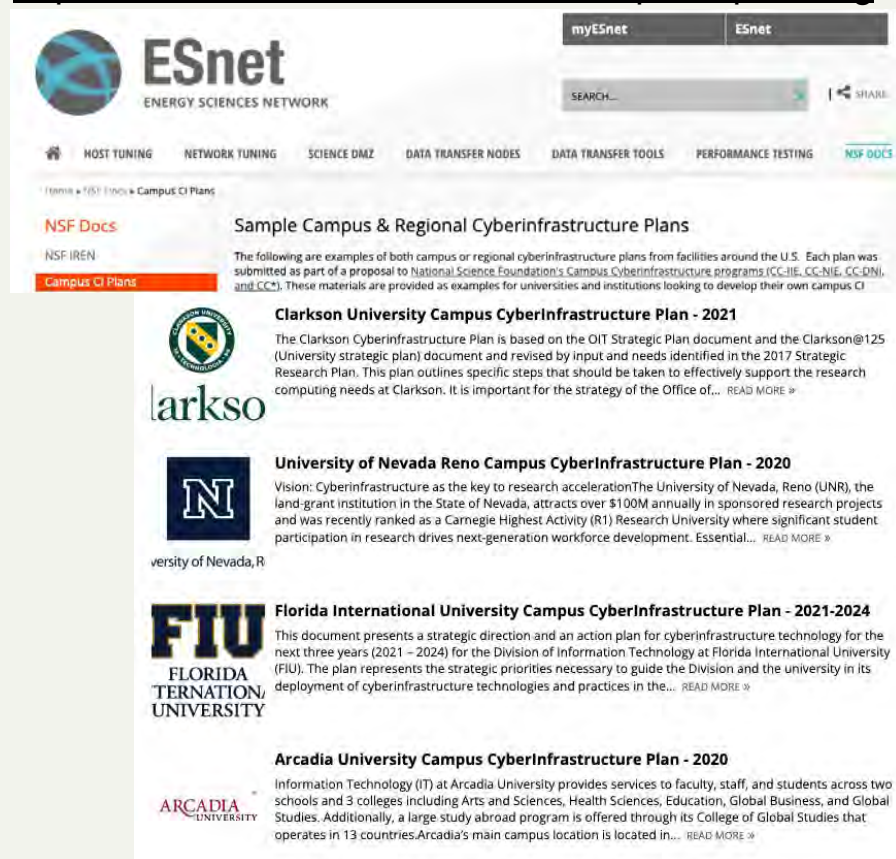
https://www.nsf.gov/awardsearch/showAward?AWD_ID=1827127

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CI Plans

captures current CI capabilities and outlook, needed only for non-planning NSF CC* proposals

- **Examples from other campuses** (Esnet)
  https://fasterdata.es.net/nsf-docs/campusCIplanning/
- **MS-CC CI Plan Template** (MS-CC, Google Doc)
- **MS-CC CI 101 Virtual Series introducing CI Plans**
  https://ms-cc.org/news/virtual-cyberinfrastructure-101-series/
- **MS-CC CI Planning Community of Practice**
  https://ms-cc.org/community-resources/ci-plan-of-practice/
  - 3rd Tuesdays (usually), Next: *March 18April18*
  - join the MS-CC email list for updates and invites:
    https://ms-cc.org/get-involved/participate-in-the-ms-cc

https://fasterdata.es.net/nsf-docs/campusCIplanning

80,000 jobs, 40 billion base pairs, and 20 bats –– all in 4 weeks

By: Josephine Watkins   October 26, 2021

An evolutionary biologist at the AMNH used HTC services provided by the OSG to unlock a genomic basis for convergent evolution in bats.

Ariadna Morales, a Gerstner postdoctoral fellow at the American Museum of Natural History (AMNH) from 2018 to 2020, used the fabric of services provided by the OSG consortium to single-handedly tackle her most computationally-intensive project yet. In only 4 weeks, she ran 80,000 jobs to analyze 20 bat genomes ––– a task that would have taken over 4 months to complete, even on the AMNH's significant local resources.

For more info:
https://osg-htc.org/spotlights/bat-genomics.html

Workforce Development for Today's and Tomorrow's IT Professionals

- Research & Education Facilitation
- Network configuration for open science (Science DMZ) and data security
- Linux systems administration
- Data storage and computing systems

❝ Access to technology is less [of] an issue compared to access to expertise."

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A National CI Ecosystem of Services to Support Researchers and Campuses
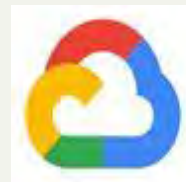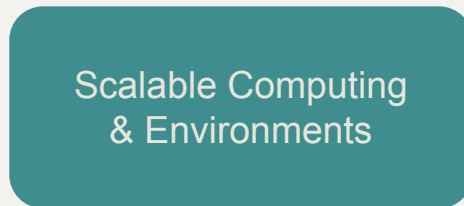
Domain-Specific Toolkits and Data Workflows

A National CI Ecosystem of Services to Support Researchers and Campuses

A National CI Ecosystem of Services to Support Researchers and Campuses

A National CI Ecosystem of Services to Support Researchers and Campuses

Networks, Data Transfer, & Security

globus

INTERNET2

TRUSTED CI
THE NSF CYBERSECURITY
CENTER OF EXCELLENCE

THE QUILT

InCommon

Domain-Specific Toolkits and Data Workflows

CYBER GIS.org

SGCI
Science Gateways
Community Institute

CYVERSE

NSG NEUROSCIENCE GATEWAY
A Portal for Computational Neuroscience

Training and CI Professional Communities

THE CARPENTRIES

MS-CC

CaRCC
Campus Research Computing Consortium

Red Hat Training

NCBI

United States Census Bureau

Pew Research Center

open storage network

Data Repositories & Storage

jupyterhub

NRP
NATIONAL RESEARCH PLATFORM

OSG

amazon webservices

ACCESS

Azure

Scalable Computing & Environments

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REGIONAL RESEARCH & EDUCATION NETWORKS IN THE UNITED STATES

The Strategic Value of CI in Education

- **Enabling Innovative Teaching**
  - Use of advanced technologies in classrooms (virtual labs, simulations, etc.)

- **Skill Development**
  - Preparing students for high-tech careers with hands-on CI experiences

- **Collaboration & Outreach**
  - Facilitating inter-institutional partnerships and global collaboration

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The Strategic Value of CI in Research

- **Accelerating Discovery**
  - How CI resources (e.g., HPC, cloud services) drive scientific breakthroughs

- **Collaborative Research Opportunities**
  - Integrating national CI resources with local research efforts

- **Resource Optimization**
  - Maximizing research efficiency and reducing costs through shared infrastructure
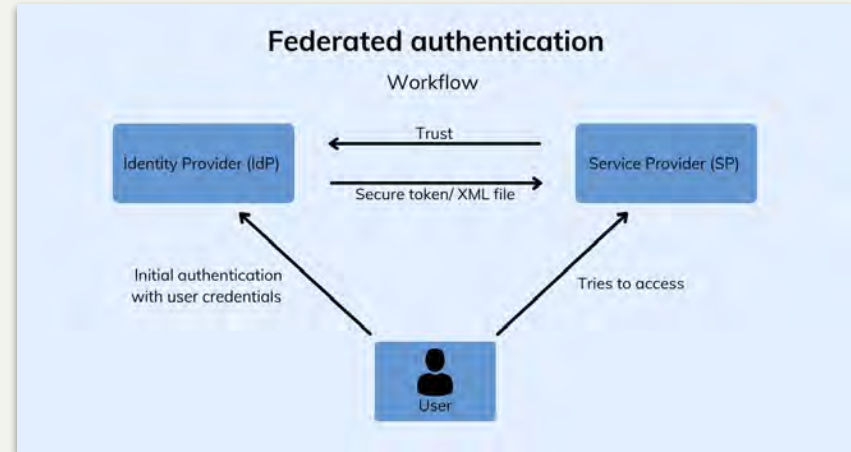
CI Value for HBCUs & other MS-CC Participants

- **Unique Opportunities for HBCUs**
  - Addressing historical resource disparities.
  - Enhancing institutional competitiveness.
- **Strategic Benefits for MS-CC**
  - Leveraging CI to boost collaborative research and educational initiatives.
- **Discussion Points**
  - How CI can help bridge the gap between high-caliber research and teaching at HBCUs.

Case Study 1 – IAM Federation

- **Overview of IAM Federation**
  - What it is and how it streamlines identity and access management.
- **Impact on Research & Collaboration**
  - How IAM Federation enhances secure access to CI resources.
- **Personal Experience**
  - Salish Kootenai College's Story

Federated authentication
Workflow

Identity Provider (IdP) — Trust — Service Provider (SP)

Secure token/ XML file

Initial authentication with user credentials

Tries to access

User

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Case Study 2 – Access to National CI Resources (HPC)

- **High Performance Computing (HPC) Resources**
  - Overview of national CI assets like HPC clusters.
- **Benefits to Research**
  - Accelerated computations, large-scale data analysis, simulation capabilities.
- **Personal Insights**
  - SKC's Story using JupyterHub at OSG

Additional PoCG Examples

- **Jackson State University - HTC 2-node cluster with UW**
  - Network Upgrades
  - IAM
  - Policy & Procedures
  - Research Data Storage
- **Claflin University**
  - CC* award to purchase HPC
  - Will be house and managed by Clemson
  - IAM
  - Policy & Procedures
  - Research Data Storage

Future Directions & Opportunities

- **NAIRR Pilot**
  - National AI Resources
  - GPUs
- **More training initiatives such as ACCESS or PaTH**

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Conclusion and Q & A

- **Recap of Key Points**
    - Improving campus CI allows for greater research and improved educational opportunities
    - MS-CC is here to help you do that via targeted CI facilitation, future funding opportunities
- **Final Thoughts**

Other Proposal-Development Resources from the MS-CC

CC* Proposal Consulting *no cost for HBCUs and TCUs*

- virtual meetings, proposal checklists, templates, review
- expanding into other CI-related (and non-NSF) proposal support in the future
- *email Jennifer Kim - jkim@internet2.edu*

Learn more about these and future opportunities:
https://ms-cc.org > Get Involved

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