HBCU Model Programs and Practices for Building a Competitive Cybersecurity Workforce

NTIA Webinar Series

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April 17, 2019

Participants

Presenters

- Karl Cureton, Executive Chairman, National Minority Technology Council and Executive Director, Minority Cyber Inclusion Council

- Dr. Kevin T. Kornegay, Professor and IoT Security Endowed Chair, Director of Cybersecurity Assurance and Policy (CAP) Center, and Director, Center for Reverse Engineering and Assured Microelectronics (CREAM), Morgan State University

- Dr. Aurelia T. Williams, Executive Director of the Cybersecurity Complex and Lead PI for the Consortium Enabling Cybersecurity Opportunities and Research (CECOR), Norfolk State University

Moderators

- Francine Alkisswani, Telecommunications Policy Analyst, NTIA, Department of Commerce
- Dr. Bruce Berger, JD, MBA, Lead, HBCU Cybersecurity Cluster & Director, Center for Innovation and Entrepreneurial Development, Clark Atlanta University

Helpful Information

Questions

- Please type questions and comments in the question box on the right hand side of the screen. Questions will be taken after the final presenter.
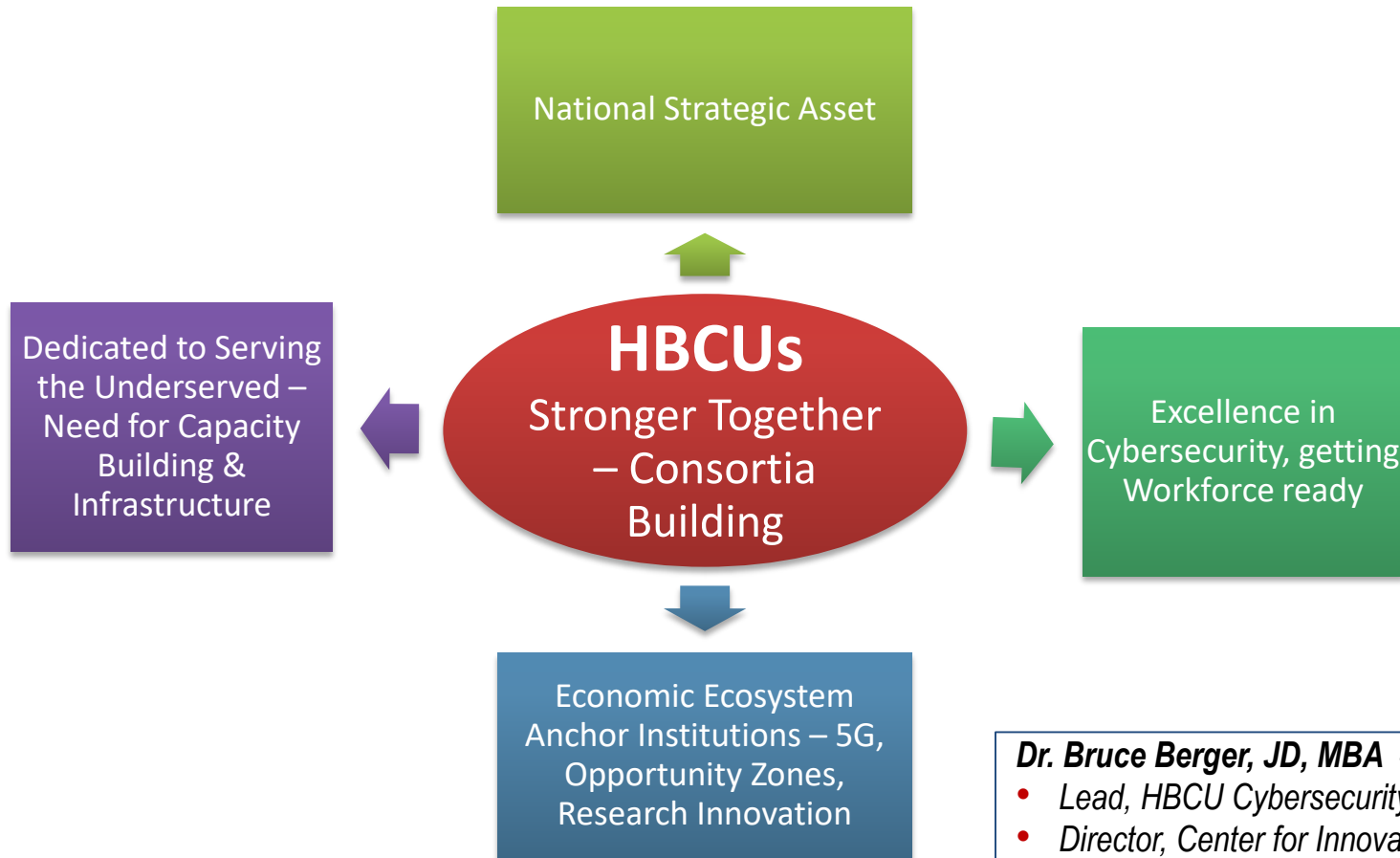
Presentation

- The presentation along with a transcript and an audio recording will be available on the BroadbandUSA website within 7 days of this webinar under Events/past events.
- https://broadbandusa.ntia.doc.gov/past-event

Technical Assistance

- Guides, products, publications, and other tools are available to assist you with the planning, funding and implementation of your broadband project.
- https://broadbandusa.ntia.doc.gov

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Historically Black Colleges and Universities

National Strategic Asset

Dedicated to Serving the Underserved – Need for Capacity Building & Infrastructure

HBCUs
Stronger Together – Consortia Building

Excellence in Cybersecurity, getting Workforce ready

Economic Ecosystem Anchor Institutions – 5G, Opportunity Zones, Research Innovation

Dr. Bruce Berger, JD, MBA - Moderator
- *Lead, HBCU Cybersecurity Cluster*
- *Director, Center for Innovation and Entrepreneurial Development, Clark Atlanta University*

Presentations

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Cybersecurity
Workforce

Industry Association Sponsored Research

HBCU Student/Faculty Engagement

Minority Cyber Inclusion Council
www.mcicouncil.org

Model Programs and Practices for Building a Competitive Cybersecurity Workforce

National Minority Technology Council
Looking Forward Research & Development

www.**MCI**council.org

MCI
Minority Cyber
Inclusion Council

nmtc
LOOKING FORWARD

BUILDING AN INCLUSIVE CYBERSECURITY WORKFORCE ™

Karl Cureton, Managing Director
Minority Cyber Inclusion Council

Chairman Emeritus
National Minority Technology Council

Co-Principal Investigator
Looking Forward Research & Development

20 Years of Service

COUNCIL.EXCHANGE

International Trade Association

Council Exchange Board of Trade
National Minority Technology Council

- 501c6 Business League

- 65,000 Minority Technology Employers

- Minority Tech Employer Firms Earn **$100 Billion** in Total Combined Annual Sales

- Minority Tech Employers provide over 500,000 Jobs worldwide

- One of our Nation's Fastest Growing Industries

- NMTC is a Federal Innovation Stakeholder Partner

- National Opportunity Fund Administrator, **Investing in Communities** and Qualified Opportunity Zone Businesses

MCI
Minority Cyber
Inclusion Council

Stakeholder Mission Alignment

- Increase Applied Research
- Increase Contract Funding
- Increase Interoperability
- Increase # Jobs & Salaries
- Increase Outcome Metrics

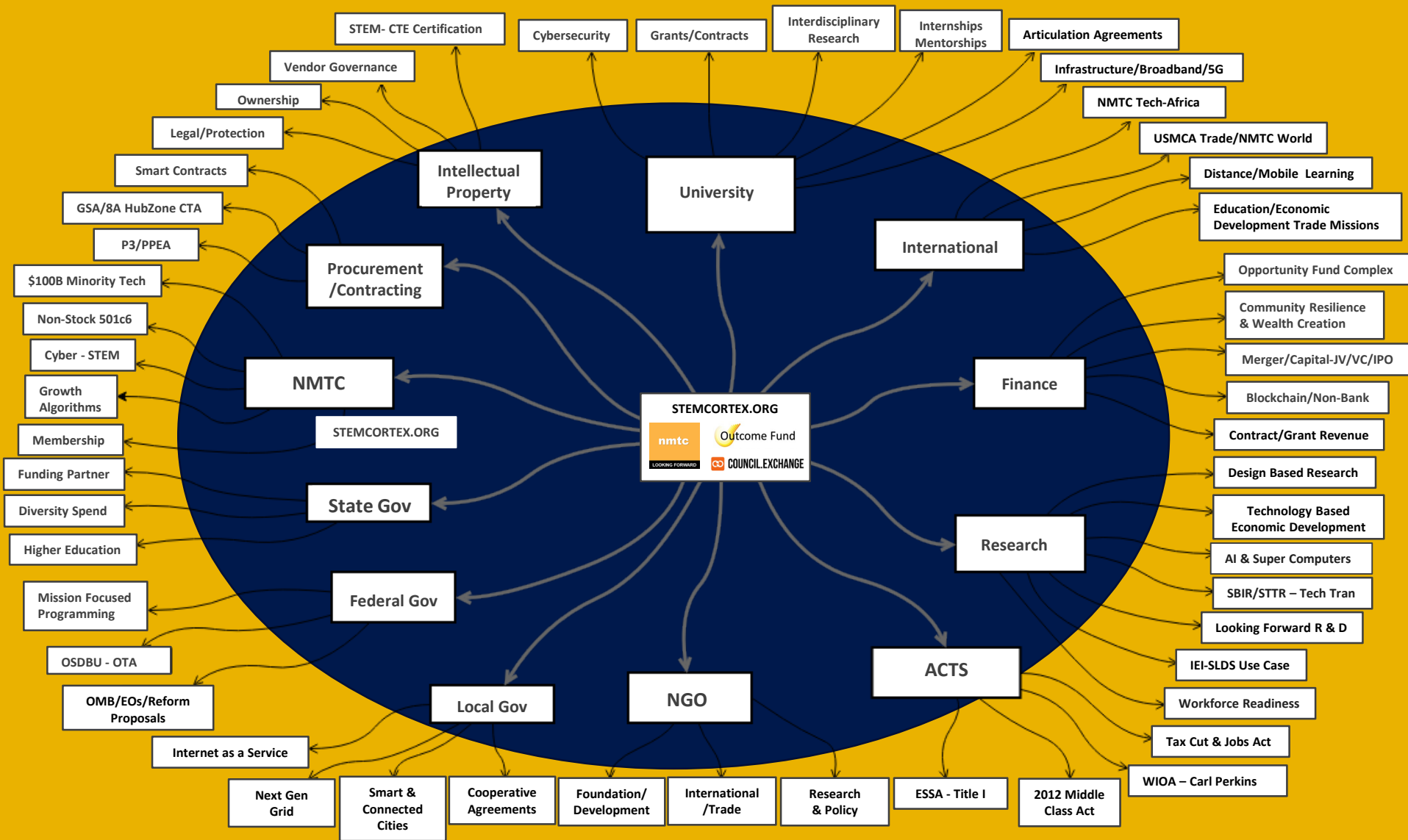**Understanding the Governance of Innovation and Community-Oriented Outcomes**

Creating Tech-Based Economic Development Ecosystems

nmtc
LOOKING FORWARD
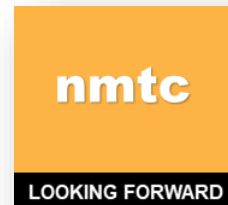
RESEARCH

Looking Forward Research & Development

20 Regions – 40 Districts

STEM Cortex Framework

Central hub: STEMCORTEX.ORG — nmtc LOOKING FORWARD, Outcome Fund, COUNCIL.EXCHANGE

Main nodes (inner circle):
- University
- Intellectual Property
- Procurement/Contracting
- NMTC
- STEMCORTEX.ORG
- State Gov
- Federal Gov
- Local Gov
- NGO
- ACTS
- Research
- Finance
- International

University — related:
- STEM- CTE Certification
- Cybersecurity
- Grants/Contracts
- Interdisciplinary Research
- Internships Mentorships
- Articulation Agreements

International — related:
- Infrastructure/Broadband/5G
- NMTC Tech-Africa
- USMCA Trade/NMTC World
- Distance/Mobile Learning
- Education/Economic Development Trade Missions

Finance — related:
- Opportunity Fund Complex
- Community Resilience & Wealth Creation
- Merger/Capital-JV/VC/IPO
- Blockchain/Non-Bank
- Contract/Grant Revenue

Research — related:
- Design Based Research
- Technology Based Economic Development
- AI & Super Computers
- SBIR/STTR – Tech Tran
- Looking Forward R & D

ACTS — related:
- IEI-SLDS Use Case
- Workforce Readiness
- Tax Cut & Jobs Act
- WIOA – Carl Perkins
- ESSA - Title I
- 2012 Middle Class Act

NGO — related:
- Foundation/Development
- International /Trade
- Research & Policy

Local Gov — related:
- Internet as a Service
- Next Gen Grid
- Smart & Connected Cities
- Cooperative Agreements

Federal Gov — related:
- Mission Focused Programming
- OSDBU - OTA
- OMB/EOs/Reform Proposals

State Gov — related:
- Higher Education
- Diversity Spend
- Funding Partner
- Membership

NMTC — related:
- Growth Algorithms
- Cyber - STEM
- Non-Stock 501c6
- $100B Minority Tech

Procurement/Contracting — related:
- P3/PPEA
- GSA/8A HubZone CTA
- Smart Contracts

Intellectual Property — related:
- Legal/Protection
- Ownership
- Vendor Governance

Industry Partnerships
= **University** Opportunities

HBCUs Compete
BUILDING TRUSTED NETWORKS™

HBCU Research & Innovation on convergence between 5G and Cybersecurity
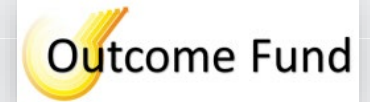

- University Led Broadband Investments bring Community Economic Development
- Both Faculty & Student Enrichment from Applied Research & Innovation
- Regional Alliance Partnerships with Industry Needed in HBCU community
- Interdisciplinary Cybersecurity Curriculum Development for Relevant Employer Career Paths

HBCU Consortia Building

Outcome Fund

www.outcomefund.us

- Industry Association focused on jobs and creating new learning opportunities – **research & building systems** to help get our communities workforce ready

- HBCUs are **Anchor Institutions for Economic Development** and are located in Opportunity Zones

- **HBCUs** serve a U.S. population prime for a historical increase in social economic empowerment and growth in wealth, ready in capability, resilience with **scalable human potential.**

PPP
Public-Private Partnership

American Innovation Ecosystem Framework

www.aieframe.org

Cybersecurity & the **Internet** Economy

- Promote Innovation and Emerging Technologies

- Advocate for Minority Inclusion in the Cybersecurity Workforce

- Research, Program & Deploy an Industry focused Cybersecurity Workforce Certification Program

- Strategically connect Minority Students to Employers and Industry Use Cases

MCI COUNCIL

Minority Cyber Inclusion Council
www.mcicouncil.org

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Minority Cyber
Inclusion Council

Cybersecurity
Workforce in Context

U.S. Public & Private Sector Crisis

- Federal Government Estimates **+300,000** active openings for U.S. Cybersecurity Related Jobs

- 2022 Cybersecurity Demand +1.8 Million Jobs

- Minorities and Women are Underrepresented in Cybersecurity Workforce

- **Pay for Cybersecurity Jobs are above average** (Public Sector Challenge – Reform Proposal CTMS)

- Employers Concerned with Cybersecurity Related Education – Teacher Shortage is a Challenge

- Adjudication for Security Clearance is a Challenge Orientation best started at Middle School

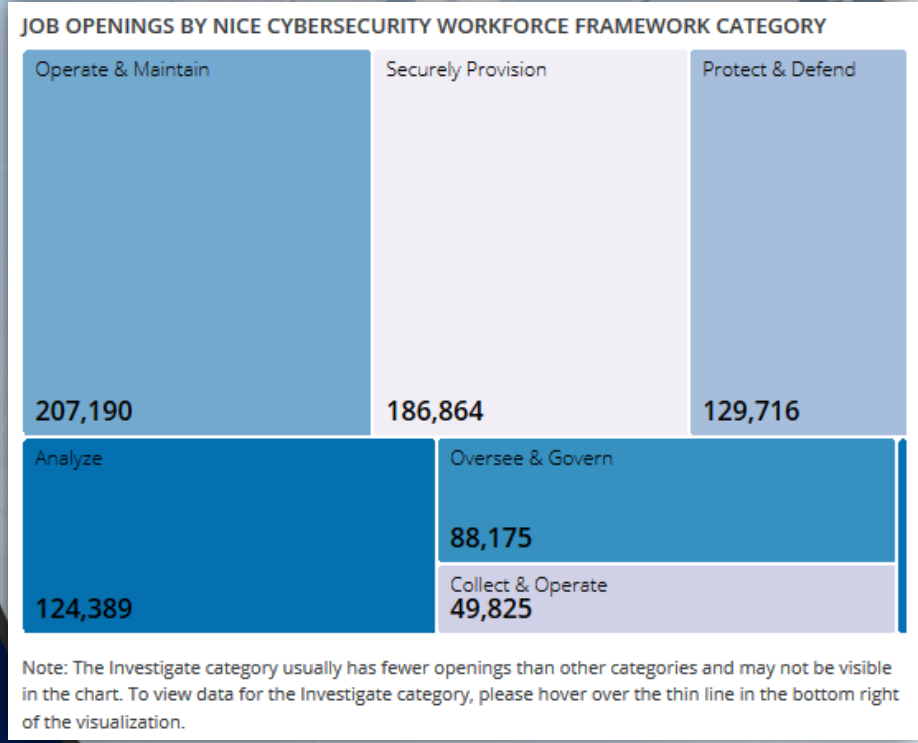THE NEXT BOOM!

MCI

Minority Cyber
Inclusion Council

A Publication of the
National Initiative for Cybersecurity Education Working Group
Subgroup on Workforce Management at the
National Institute of Standards and Technology

• Minority Cyber Inclusion Council (MCI Council), at http://www.mcicouncil.org
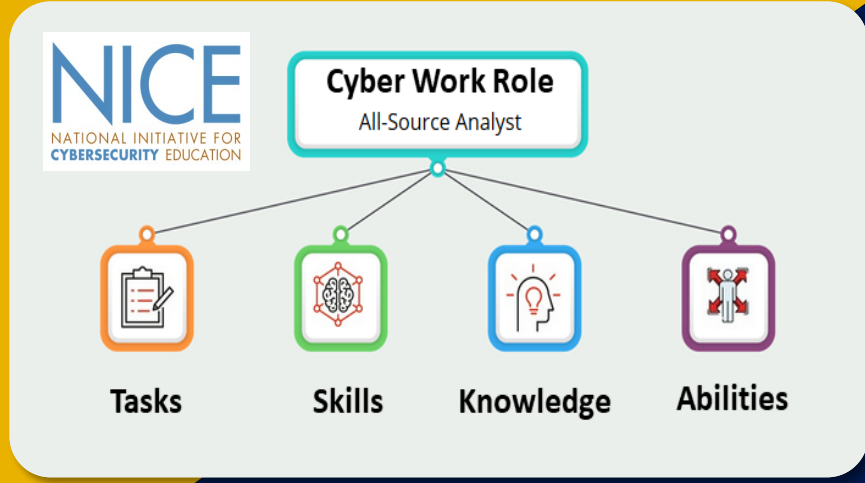
Cybersecurity is Everyone's Job

A Publication of the
National Initiative for Cybersecurity Education Working Group
Subgroup on Workforce Management at the
National Institute of Standards and Technology

NICE
NATIONAL INITIATIVE FOR
CYBERSECURITY EDUCATION

Cyber Work Role
All-Source Analyst

Tasks   **Skills**   **Knowledge**   **Abilities**

Private & Public Sectors need to align education and training with employers' cybersecurity workforce needs
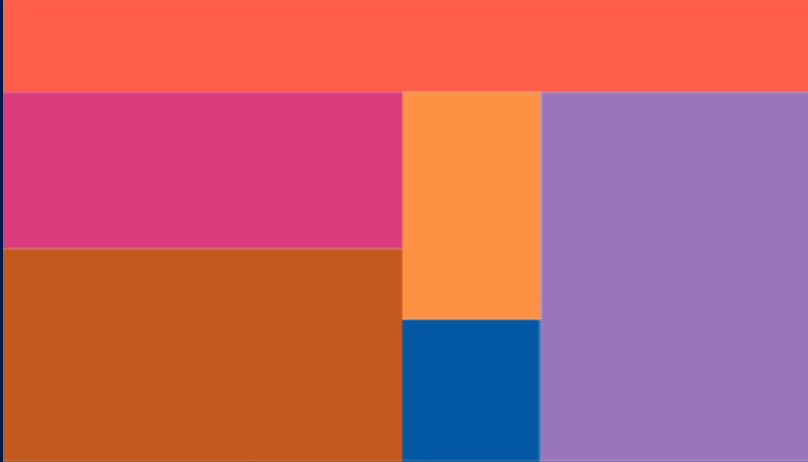
124,389 Analyze
+ 88,175 Oversight & Dev.
_____
212,564 MCI Council Focus

Cybersecurity Workforce Framework

JOB OPENINGS BY NICE CYBERSECURITY WORKFORCE FRAMEWORK CATEGORY

Operate & Maintain	Securely Provision	Protect & Defend
207,190	186,864	129,716

Analyze	Oversee & Govern
124,389	88,175
	Collect & Operate 49,825

Note: The Investigate category usually has fewer openings than other categories and may not be visible in the chart. To view data for the Investigate category, please hover over the thin line in the bottom right of the visualization.

Building on and strengthening hands-on, experiential and work-based learning approaches—including apprenticeships, research experiences, co-op programs and internships

Transform, Elevate, and Sustain the Learning Environment to grow a Dynamic and Diverse U.S. Cybersecurity Workforce

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HBCUs Compete
BUILDING TRUSTED NETWORKS™

UAS Navigator

Tech-Africa.US

www.hbcucompete.org

www.uasnavigator.org
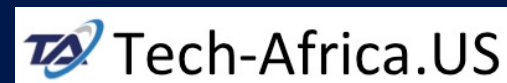
www.tech-africa.org

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Minority Cyber
Inclusion Council

Next Steps
&
Thank You

Council@NMTCImpact.org

www.nmtcimpact.org

www.mcicouncil.org

National Minority Technology Council

Presentations

- Karl Cureton, Executive Chairman, National Minority Technology Council and Executive Director, Minority Cyber Inclusion Council

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Cybersecurity Assurance and Policy Center
"The CAP Center"

Dr. Kevin Kornegay

IoT Security Chaired Professor & Director

(443) 885-4869

kevin.kornegay@morgan.edu

www.iotcream.com

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5G Technology
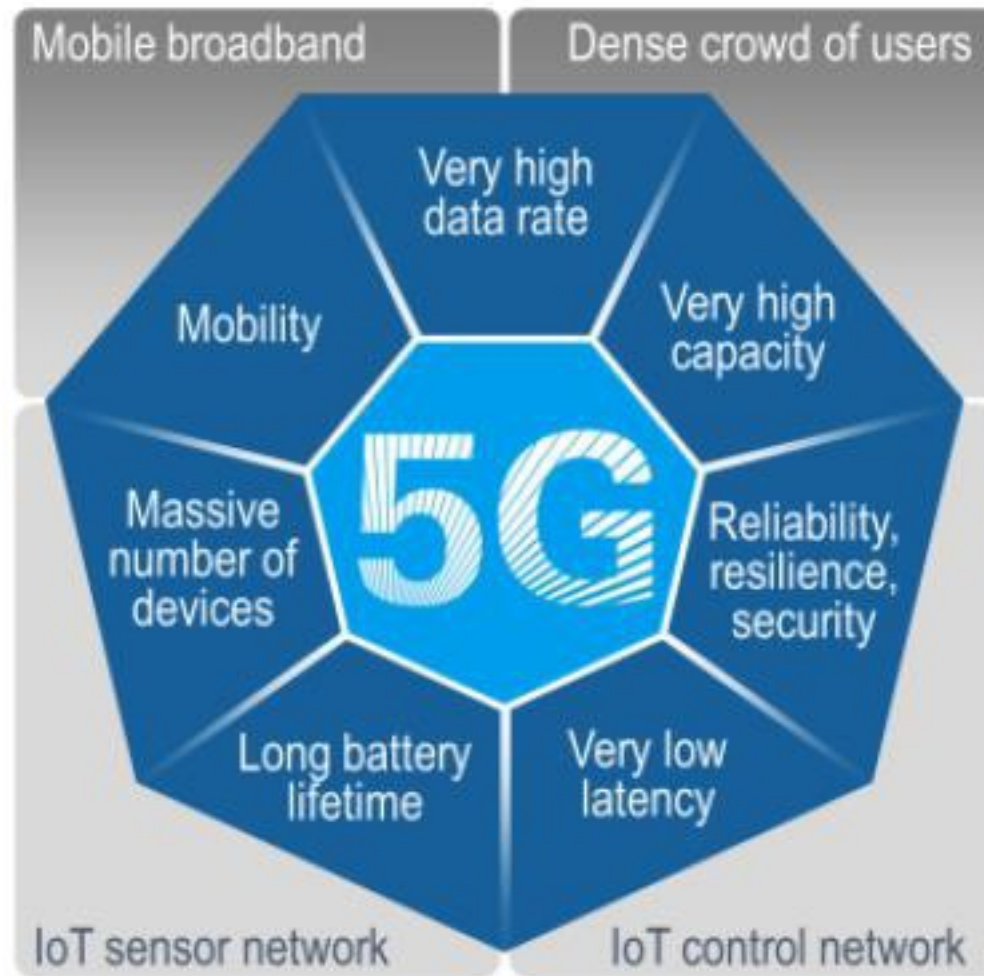
Are you ready?

Ubiquitous Connectivity Among People and Devices
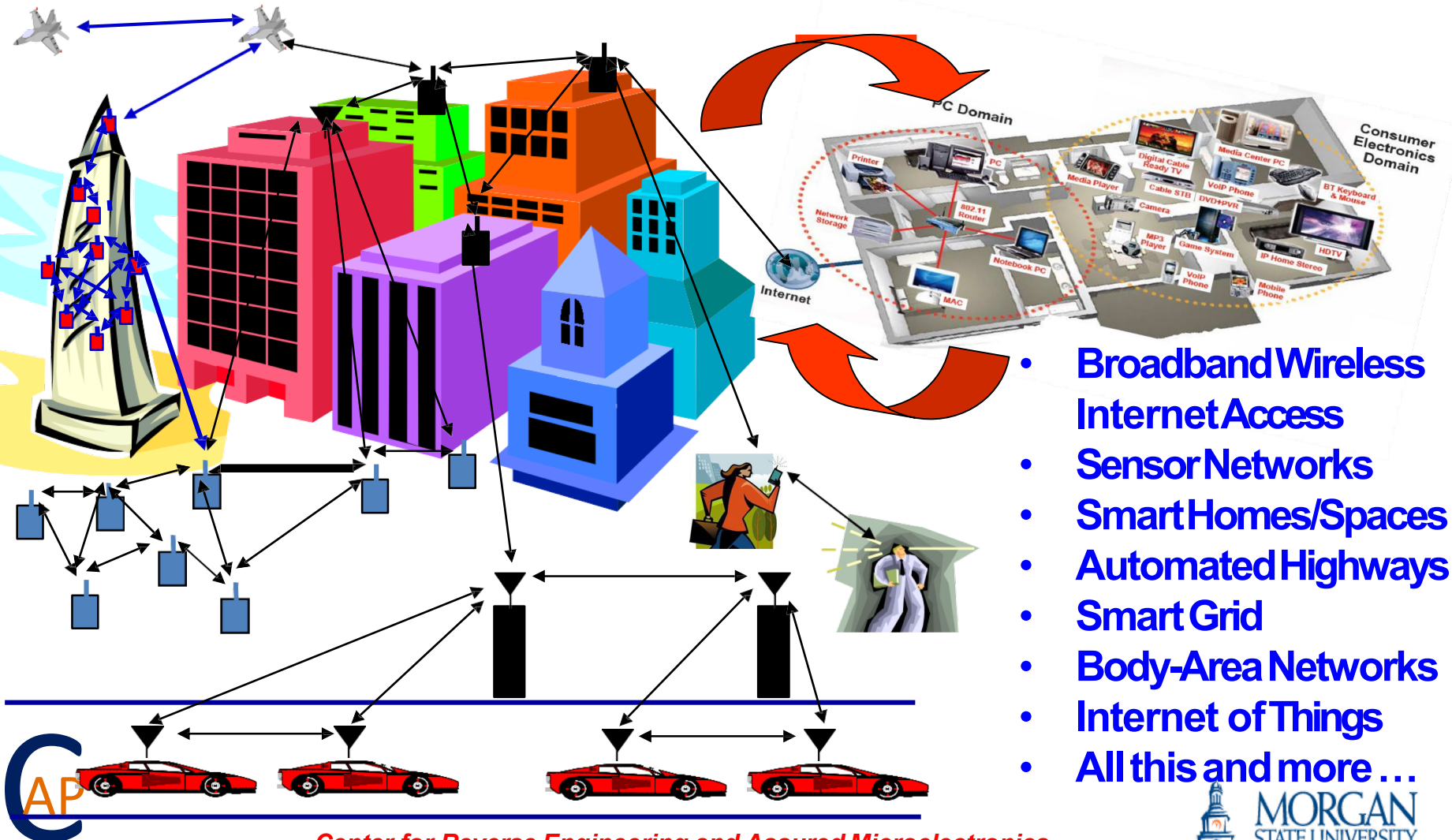
- **Broadband Wireless Internet Access**
- **Sensor Networks**
- **Smart Homes/Spaces**
- **Automated Highways**
- **Smart Grid**
- **Body-Area Networks**
- **Internet of Things**
- **All this and more …**

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CAP Center

- What is the CAP Center?

Education
NSA/DHS
CAE-CD

CAP

Research
NSA/DHS
CAE-R
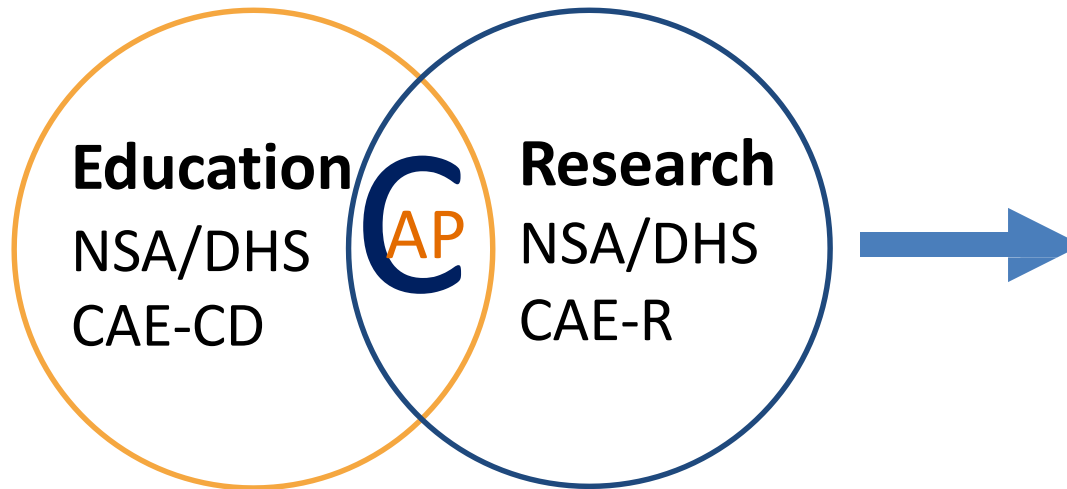
Impact
- SME's
- CD Education
- Economy
- Workforce
- Sustainable

CAP

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- Vision
  - To become the 1st HBCU CAE-R
- Mission:
  - Provide intelligence community with knowledge, methodology, solutions, and highly skilled cybersecurity professionals to prevent penetration and manipulation of our nation's cyber physical infrastructure.
- Research Objectives:
  - Conduct physical layer cybersecurity research using invasive and noninvasive hardware/software reverse engineering techniques to assess the assurance of IoT systems.
  - Conduct Security and privacy policy research

Research: IoT Device Hardware Assurance

No. of IoT Devices
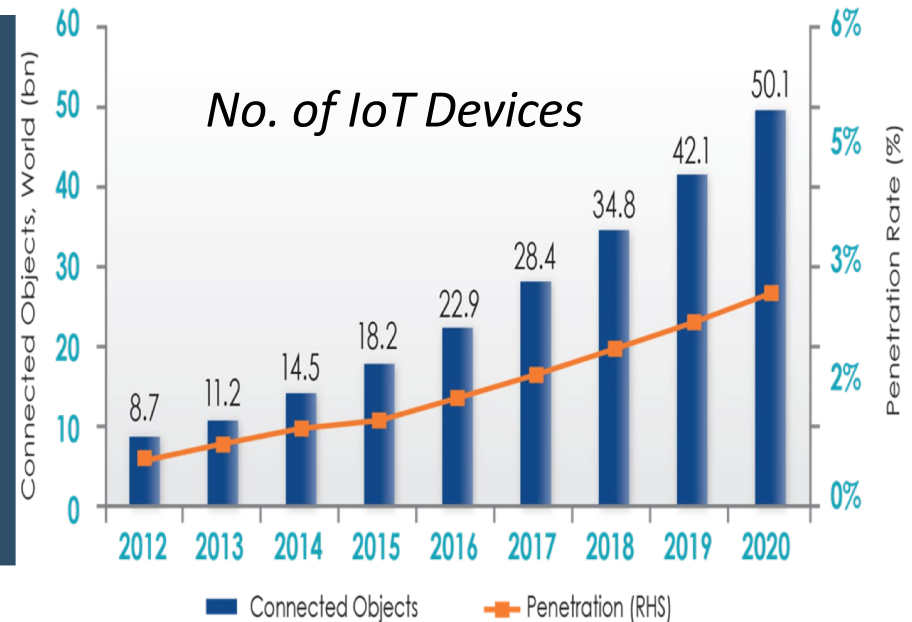
CNN MoneyTech – Feb. 2012

SENSE + PROCESS + TRANSMIT = IoT Device

IoT Device Vulnerabilities

An **unintended** channel for monitoring or operating a device resulting from its physical interface.

Intended

Keypad
Screen
Card Reader
Speaker
USB
Bluetooth/WiFi
Power

Unintended

Power Consumption
EM Radiation
Sound
Temperature
Time
Light

In relation to a security operation, a side channel can lead to a compromised system!

IoT Testbeds

Smart Grid IoT Testbed

Home/Office Automation IoT Testbed

Metering SoC

Malicious SDR IoT Device

Xilinx Zynq SoC

Drone with SDR and Rasberry Pi Payload
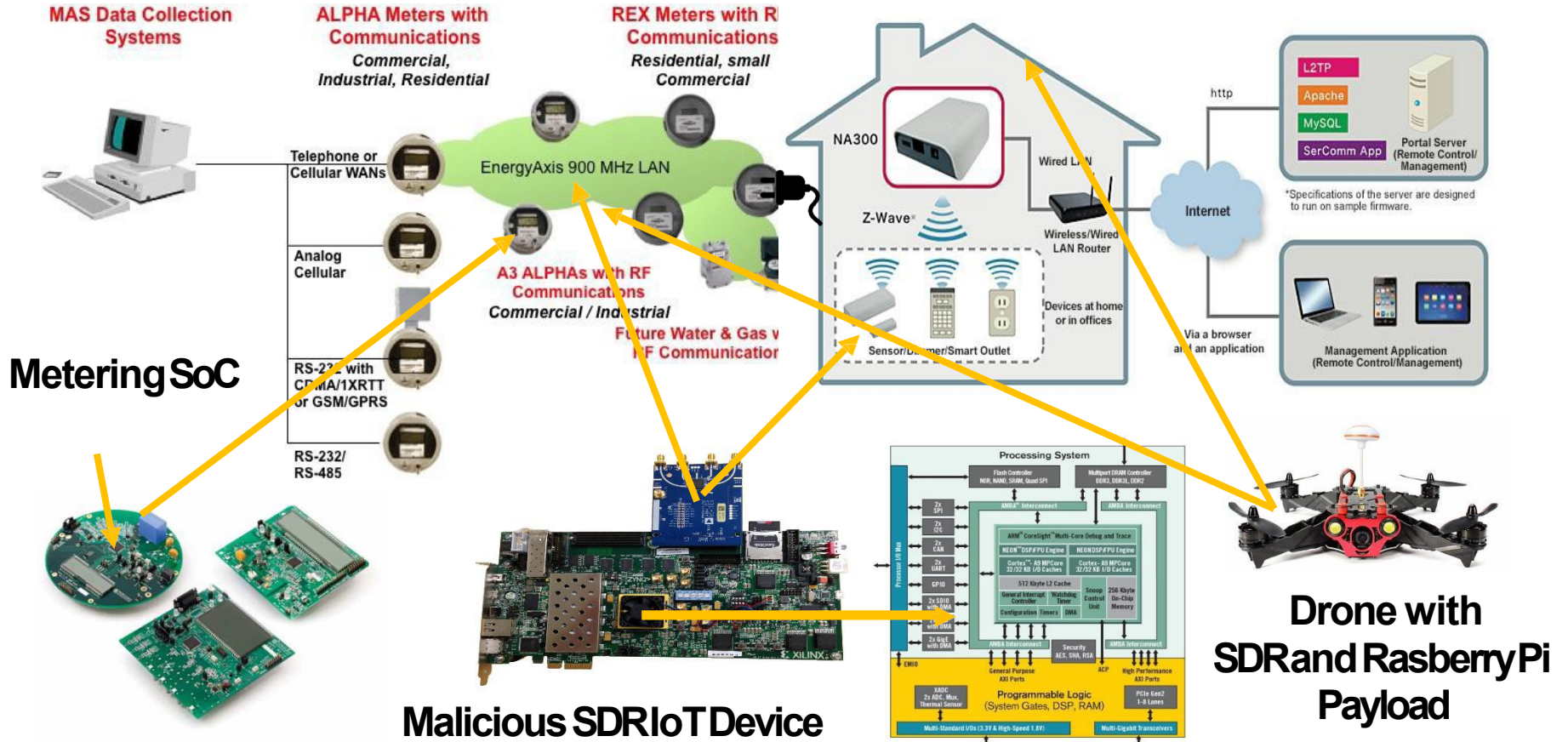
CAP Faculty

Dr. Kevin Kornegay
HW Assurance

Dr. Michel Reece
Wireless Authentication

Dr. Willie Thompson
Software Defined Radio

Dr. Kofi Nyarko
Data Analytics

Dr. Kemi Ladeji-Osias
Engineering Education/Outreach

CAP

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Partners and Sponsors

Education: Secure Embedded Systems Graduate Curriculum

Design

- Secure Embedded System Design
- Advanced Digital System Design
- Embedded Software Design
- System -on-a-Chip FPGA Design
- Machine Learning
- Operating Systems
- Programming Languages
- AI/Machine Learning

Communications

- RF Communication Systems
- Digital Communications
- Communication Networks
- Protocol Design
- Microwave Systems and Components
- Active Microwave Circuit Design
- Intro to Microwaves

Embedded Systems

Hardware Assurance

- Cryptography
- Intro to Network Security
- Hardware Reverse Engineering
- Advanced Secure Embedded Systems
- Cyber Physical System Security
- Digital Forensics Technologies and Techniques

Note: Some courses are offered by JHU via MSU/JHU Memo of understanding

CAP

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CREAM Cyber Scholar Skills Profile

CREAM Cyber Scholar

Cryptography
- Asymmetric Encryption
- Symmetric Encryption
- Message Authentication Codes

Software
- Operating Systems
- Virtual Machines
- Programming Languages
- AI/Machine Learning
- Reverse Engineering

Communications
- Wireless/wired networks
- Protocols and standards

Hardware Assurance
- System-on-Chip (SoC)
- Trusted Platform Modules
- Software Defined Radio
- Software Defined Networks
- Reverse Engineering

CAP

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CAP Scholars

- 13 DEN Students
  - 5 Women (**40%**)
  - 8 African American (**70%**)
  - 1st DEN graduated in Dec 2018, currently CAP Postdoc
  - Most of the students are at least in their 3rd year of study
- Prestigious Graduate Fellowships
  - 2 DoD/NSA CySP Scholarship Recipients
  - 5 GEM Doctoral Fellowships (3 Full, 2 Associate)
- 25+ Undergraduate Student Researchers

Degree Programs & Certifications

- Bachelor of Science in Electrical Engineering with Cybersecurity Track
- Master of Engineering in Cyber Engineering (Professional)
- Doctor of Engineering in Embedded Systems
- Future
- Bachelor of Science in Computer Science Cybersecurity Track
- Bachelor of Science in Information Systems Cybersecurity Track
- Master of Science in Cyber Security
- Master of Science in Information Systems Cybersecurity
- Doctorate of Engineering in Hardware Security (Proposed New Program)

Thank You &
Contact Information

Dr. Kevin Kornegay
IoT Security Chaired Professor & Director
(443) 885-4869
kevin.kornegay@morgan.edu
www.iotcream.com

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NSU Cybersecurity History

- Cybersecurity Educational Pathways
- Capabilities
    - Partnerships and Collaborations
    - Awarded Grants and Contracts
    - Facilities: Laboratories, Hardware, and Software
- Outreach

NSU Cybersecurity Capabilities

Partnerships and Collaborations

- NSA/DHS Center of Academic Excellence in Cyber Defense Education
- DOD Center of Excellence in Cybersecurity (Research)
- DOE Cybersecurity Consortium Leader for Workforce Development

Awarded Grants and Contracts

- Since 2010, NSU has won 18 major cybersecurity grants and contracts totaling $43M
- Most awards are from the Department of Energy, including the prestigious $25M "Consortium Enabling Cybersecurity Opportunities and Research" and $5M "Center of Excellence in Cybersecurity (Research)" from DoD.

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We see the future in you.

Consortium Enabling
Cybersecurity Opportunities and Research

Consortium Partners

- Allen University
- Benedict College
- Bowie State University
- Claflin University
- Clark Atlanta University
- Denmark Technical College
- Lawrence Livermore National Laboratory
- Morris College
- *Norfolk State University – Lead University*
- North Carolina A&T State University

- Paine College
- Sandia National Laboratories
- South Carolina State University
- University of the Virgin Islands
- Voorhees College

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Consortium Enabling Cybersecurity Opportunities and Research

Vision

To become recognized as a leader in developing highly-qualified cyber security researchers and practitioners reflective of the US population demographics.

Mission

Establish a consortium of educators, students, and professionals to provide STEM opportunities to underrepresented students to enhance the cyber security workforce.

Goals

- Build consortium and institutional capacity in cybersecurity
- Develop and implement education and training programs for K-20
- Conduct cybersecurity related research
- Sponsor workforce development initiatives
- Establish government, corporate, and educational partnerships
- Develop the CECOR Scholar Certificate Program to be recognized by the industry as providing qualified cybersecurity workforce.

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Consortium Activities

Cybersecurity Capacity Building	Education and Training	Research	Workforce Development	Partnerships
Equipment acquisitions and upgrades	Middle and high school cybersecurity summer camps	Academic year research	Summer teacher training in cybersecurity for middle and high school teachers	DOE laboratories provide guidance in curriculum development
Software acquisitions and upgrades	MOU and articulation agreements between CAE[1] institutions and consortium members	Student research experiences at CAE Institutions	Faculty development hosted by CAE universities	CAE universities provide guidance in curriculum development
Infrastructure enhancements to include the establishment of a teaching lab in SC	Tracer Fire cybersecurity Boot Camps for consortium students	Student internships with industry partners	Faculty research externships at DOE laboratories	Industry partners host students for summer experiences
Scholarship support for undergraduate students enrolled in cybersecurity concentrations	Pre-college institute for incoming freshmen	Faculty research externships at DOE laboratories	Academic year training in computer science for middle and high school teachers	Development of federal and corporate K-20 partnerships
Scholarship support for graduate students enrolled in cybersecurity concentrations	Cybersecurity course and curriculum design, development, deployment and enhancement	Faculty research at local campuses and mentoring students in cybersecurity related areas	Student internships at DOE laboratories and SPAWAR	
New faculty and staff hires	Boot Camp for LLNL bound students	Mobile applications development with high school students in CCSD	K-12 outreach and pipeline development	
Resource and information sharing across the consortium	Boot Camp for SNL bound students		Development and implementation of training programs	
Faculty lab start-up packages	STEM curriculum development at CCSD		Advice on K-12 STEM development and activities	
DOE labs provide technical guidance to the consortium and its governing board	Implementation of 3D programming to CCSD students		Outreach and awareness to CCSD and 2-year colleges from consortium members	
	Development of K-12 cybersecurity modules		Academic year internships	

K-12 Summer Camps

STEM Girls Rock! & My Brother's Keeper

In partnership with SPAWAR,
- ✓ 100 rising 8th and 9th grade female students and a parent were exposed to Science, Technology, Engineering and Math (STEM) related degrees and career opportunities in a fun and interactive way.

In partnership with LLNL,
- ✓ Bay Area students were exposed to the "My Brother's Keeper" initiative launched by President Obama

CECOR

K-12 Summer Camps

Cyber Security Summer Academy

- High School Students learn the basics of computer forensics, cyber security and solve a case using forensics techniques learned during the camp

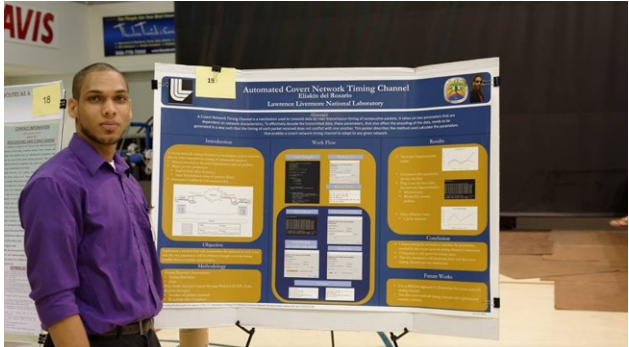# Research Experiences for Undergraduates

NSU Summer Internships

Fig. 1: Eliakin DelRosario and Gabriel Ramos presented their summer research completed at NSU during the Fall Undergraduate Research Symposium. UVI
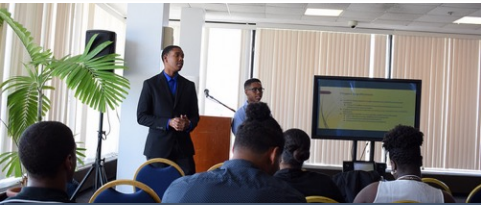
Camps, Competitions, Conferences

CECOR

Python Bootcamp, NSU

Undergraduate Research Symposium, UVI

Presentations to Businesses, UVI

FRONT PAGE   ALL VI NEWS   LEGAL NOTICES   POLITICS   OPINION   BUSINESS   GROCERY STORE DEALS   CLASSIFIEDS
VIRGIN ISLANDS FEMALE STUDENTS MAKE SEMIFINALS IN INTERNATIONAL CYBER SECURITY COMPETITION
Featured / News / Technology / Top Stories / Virgin Islands / February 1, 2016

Debate legal, policy and technical topics

LEGO® Pi – build it and program it

Claflin Faculty, Deidra Morrison at LLNL for 12 weeks

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CECOR Consortium Success

- Build consortium and institutional capacity in cybersecurity.
  - 10 new labs @ 8 Schools
  - 61 faculty trained in Cybersecurity
- Develop and implement education and training programs for K13-20.
  - 8 new programs @ 6 schools;
  - 88 new/improved courses @ 11 schools
  - 237 BS, 91 MS, and 4 PhD degrees
- Conduct cybersecurity related research.
  - 35 publications @ 7 partners;
  - 251 students participated in active research
- Sponsor workforce development initiative.
  - 2417 students participated in Cybersecurity Summer Camps
  - 224 graduated entered the workforce; 32 with cybersecurity-related titles
- Establish government, corporate, and educational partnerships.
  - Numerous partnerships have been established due to this important work

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NSU Cybersecurity Complex

Dr. Aurelia T. Williams, Executive Director

NSU Cybersecurity Complex

- **Total Investment: $4M – With $1M from DOD HBCU/MI Program**

- **Secure: Isolated from NSU network**

- **Offices, conferencing area, office equipment**

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Complex Centers and Laboratories

Information Assurance Research, Education, and Development Institute (IA-REDI)

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Complex Centers and Laboratories

- Digital and Mobile Forensics Laboratory
- Capture the Flag and Networking Teaching Environment
- Malware Reverse Engineering Laboratory
- Cybersecurity Training

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Center Of Excellence Cybersecurity Research

Cooperative Agreement Funded by Department of Defense

- Lead Institution: Norfolk State University (Computer Science; IA-REDI)
- Collaborator: Old Dominion University (VMASC)

Objectives

- Conduct basic research
  - To develop a cloud-enabled, big-data-analytics-capable Cyber Analysis, Simulation and Experimentation Environment (CASE-V)
  - For enhancing situational awareness and decision support for cyber defense and cyber training
  - Focusing on advanced persistent threat (APT)
- Perform research-related education and outreach activities
- Be a valued resource
  - For the Nation, Commonwealth of Virginia, Hampton Roads Region, and HBCU/MI Community
  - In cybersecurity research, education, outreach, and workforce development
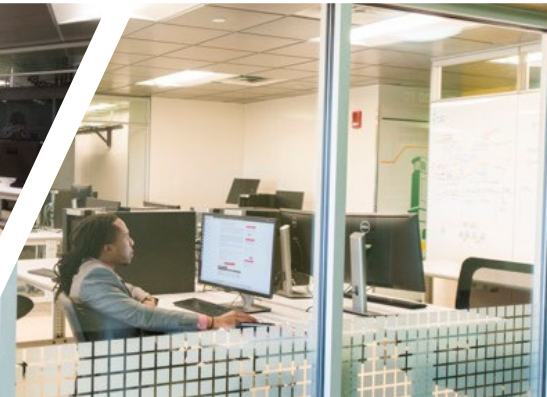
COE Research Infrastructure & Datacenter

- Direct optic fiber link between NSU and ODU (new): City of Norfolk
- ODU Cloud Research and Cybersecurity Research Labs (new)
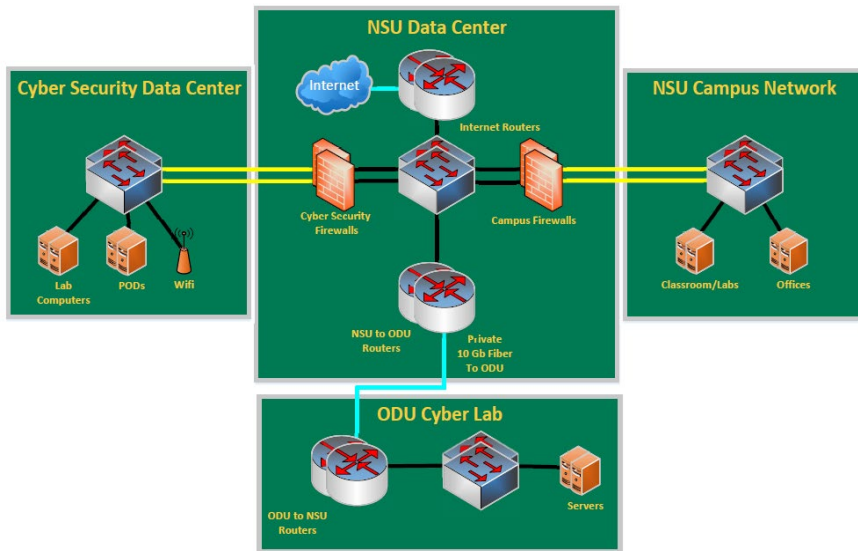
- State-of-the-art enterprise-grade equipment
- Multi-functional & modular architecture
- Substantial capacity
  - Hard disk storage: ~820 Terabytes
  - Server-grade CPU cores: ~1,700
  - Main memory: ~7.5 Terabytes
  - 10/40 Gbps LAN connectivity

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We see the future in you.
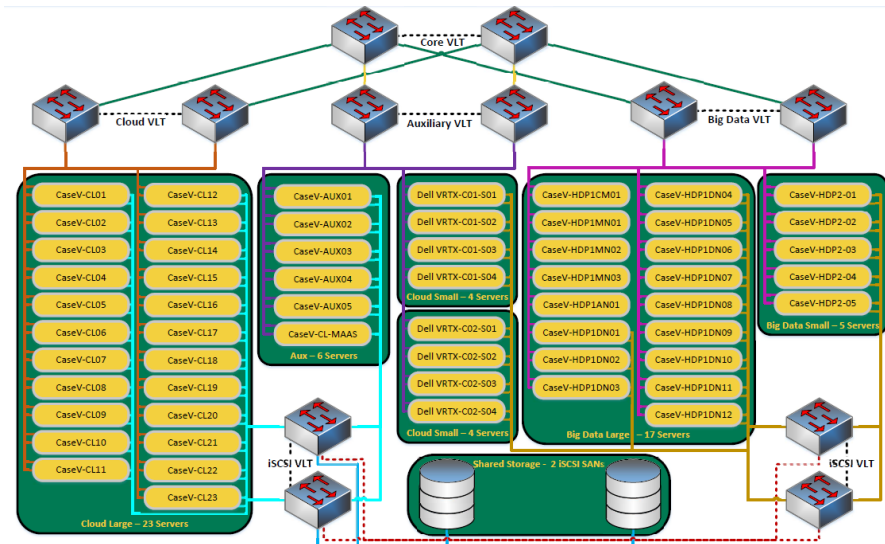
Cybersecurity Complex

New Activities

- Infrastructure acquisition to offer a research environment for students to engage in policy, risk, and audit management research on production grade equipment.
- Launch a professional development office to offer certifications in enterprise governance, risk and compliance (eGRC).
- Investigate the design of a framework to leverage existing infrastructure into the development of a Cybersecurity contracting hub

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NSU Cybersecurity Educational Strengths Summary

- Designated **NSA/DHS Center of Academic Excellence in Cyber Defense Education** through 2020
- Extensive online cybersecurity laboratories and facilities and the capability of delivering programs worldwide
- Collaborations with national laboratories and other government agencies
- Well-qualified faculty
- Significant external funding
- Innovative ideas to lead the HBCU community

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Additional Information

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HBCU Model Programs and Practices for Building a Competitive Cybersecurity Workforce

Questions and Comments

- Please type your questions in the question box.

- The slides, transcript, and an audio recording will be posted on the BroadbandUSA website within 7 days of the webinar.

  https://broadbandusa.ntia.doc.gov/past-event

BroadbandUSA

Thank you for attending.

Tune in for the next Practical Conversations Webinar

Infrastructure Week: Leveraging Public Assets to Accelerate Broadband Deployment

May 15, 2019
2:00 pm EST

Registration is required for each webinar:

https://broadbandusa.ntia.doc.gov/event

BroadbandUSA is available to help communities with their broadband access and digital inclusion efforts

For General Information:

202-482-2048

broadbandusa@ntia.gov

https:broadbandusa.ntia.doc.gov/resources

To Request Technical Assistance (TA):

Broadband TA Request Form -
https://broadbandusa.ntia.doc.gov/ntia-common-content/how-we-can-help

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BBUSA Resources

- Implementing a Broadband Network Vision: A Toolkit for Local and Tribal Governments

- Community Broadband Roadmap Toolkit

- Guide to Federal Funding of Broadband Projects

- Using Partnerships to Power Smart Cities