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Cybersecurity Education at UMBC: Preparing the Workforce of Today and the Future

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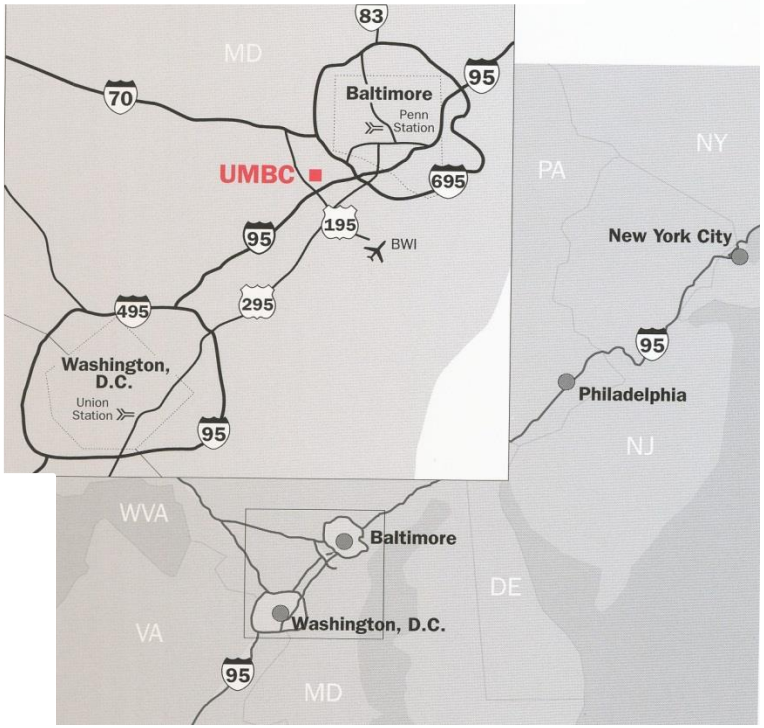
Outline

- Cybersecurity curriculum characteristics
- Education and Training Programs at UMBC
- Partnerships
- Final thoughts



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UMBC – Institutional Overview

- **Founded in 1966**
- **44 Major, 41 Minors and 20 Certificate Programs**
  - Physical and biological sciences, social & behavioral sciences, engineering, mathematics, information technology, humanities, visual & performing arts
- **24 PhD, 38 Master's and 21 Graduate Certificate Programs**
  - Natural and social sciences, engineering, information technology, public policy, arts and humanities, education, human services and others.
- **Student Enrollment, Fall 2014 – 13,979**
  - 11,379 Undergraduates, 2,600 Graduate Students
  - Average Freshman GPA: 3.76
  - Average SAT Score: 1216
  - Minority Enrollment : 42%
- **657 Full-time Faculty**
- **Research Expenditures FY'14 – $74 M**
  - **Total Institutional Budget FY'15 – $405 M**

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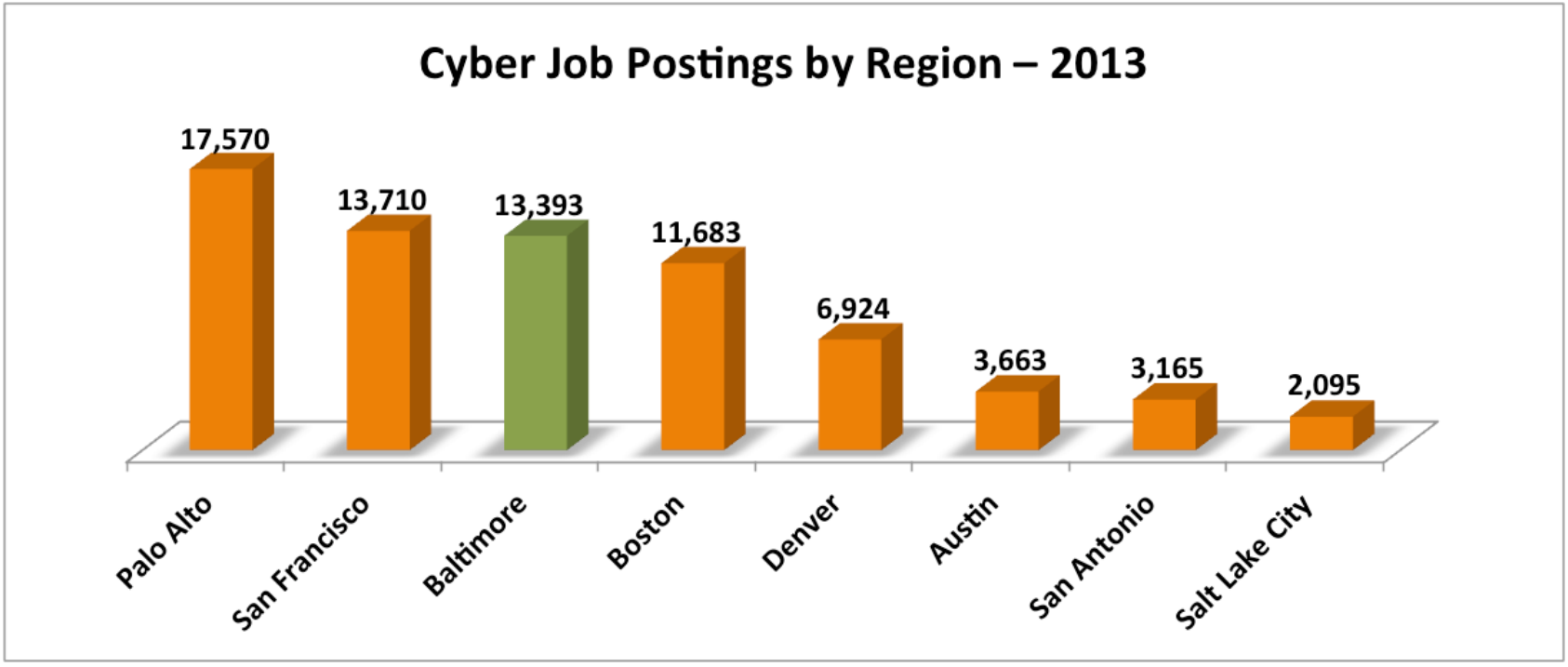
Cyber Jobs Demand

- **13,400 Cybersecurity Jobs posted in Baltimore in 2013**



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Cybersecurity Curriculum

- A competent practitioner needs basic computer science and information systems practices.
  - There are varied expectations about what constitutes a “technical course” and (professional) student qualifications for them.
  - Practical and theoretical preparations needed.
- Programs should focus on context, practice, community, and professionalism to further one’s cybersecurity “career” – not just impart “skills” for a series of “jobs”.
- Curriculum needs to consider technical, social, policy and business components representing the challenges facing cybersecurity professionals.

Education & Training

- **Traditional degree programs** (bachelor's, master's, doctorate) in computer science, computer engineering, electrical engineering, and information systems with security-related concentrations. A large number of electives in security offered across these fields of study.

- **Professional Degree** (MPS) and academic certificates in cybersecurity across two campuses.

- **Non-credit technical training** courses offered by UMBC Training Centers for IT and cyber-professionals.

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Undergraduate Cybersecurity (BS)

- Traditional CS/CE/IS degree
- Students can elect an Information Assurance concentration of four (4) security courses to gain cybersecurity exposure.
- Students may apply for a combined BS/MS or BS/MPS program to continue their studies in cybersecurity via continuous enrollment.
- Exploring: Introductory First Year Elective Course and a course in the Social Sciences tailored to cybersecurity students.

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Graduate Programs

- *Graduate Studies at the MS/PhD Level: graduate courses in computer security, network security, cryptology, coding theory, analytics, privacy, wireless, voting, e-commerce, etc.. Multiple Ph.D. and MS students complete dissertations in the security area every year.*
- *Graduate Certificate in Cybersecurity Strategy and Policy :* non-technical graduate certificate that provides students the essential domain knowledge required to serve in decision-making roles throughout the cybersecurity industry.
- *Masters in Professional Studies: Cybersecurity* –prepares computer science, information systems, and other technical professionals to fill management and leadership roles in cybersecurity-related companies or agencies.
- Courses offered via traditional classroom instruction and via hybrid courses that replace 50% or more of class sessions with asynchronous on-line activities.

Professional Degree (MPS)

- Target audience: current IT/cyber professionals
- Curriculum mixes cybersecurity & professional skills development, technical & non-technical

- **Six Core Courses** (18 credits)
  - Introduction to Cybersecurity
  - Cybersecurity Law and Policy
  - Cybersecurity Project
  - Managing Cyber Operations
  - Risk Analysis & Compliance
  - Management, Leadership, Communication

- **Four Electives** (12 credits) among
  - Software Security
  - Cyber Warfare
  - Mobile Device Security
  - Global Cyber Capabilities & Trends
  - Practitioner Development Lab
  - Malware Analysis (CMSC)
  - Reverse Engineering (CYBR/CMSC)

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Increasing Enrollment Trends

UMBC's Graduate Cybersecurity Program (MPS)												
	<Sp 11>	<Sum 11>	<Fall 11>	<Sp 12>	<Sum 12>	<Fall 12>	<Sp 13>	<Sum 13>	<Fall 13>	<Sp 14>	<Sum 14>	<Fall 14>
Total Unduplicated Head Count	35	21	87	123	48	148	150	60	174	147	57	161

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Cybersecurity Student Experience

- UMBC Cyber Scholars

  Undergraduate students receive financial assistance and inclusion in an exclusive scholarship community that includes special on-campus housing, unique courses, mentoring, networking, and the chance to take part in cybersecurity research and internships early in their academic careers.

- Cyber Defense Competition Team
- hackUMBC innovative “hackerspace”

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Cyber Scholars and Affiliates

- Fall 2014
  - 93 students total
  - 23 Cyber Scholars
    - 52% women
    - 17% underrepresented minorities
  - 70 Cyber Affiliates
    - 39% women
    - 46% underrepresented minorities

UMBC Training Centers

- The Center for Cybersecurity Training at UMBC Training Centers.
- Variety of programs ranging from entry-level cybersecurity foundations to advanced cyber warrior programs for the military, intelligence and contractors communities.
- Professional certification preparation to meet DoD Directive 8570 (CompTIA Security+, CISSP, etc.).
- Training delivered at UMBC, or at satellite locations in Northeast, MD, Rockville, MD or Tyson's Corner, VA.
- Mobile Cybersecurity Lab available for onsite training.
- UMBC Training Centers has been granted facility security clearance to be eligible for a broad range of training engagements.

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Faculty Expertise

- Over 100 security-related research papers published since 2009.
- Over $12M USD in external research funding.
- MPS adjunct faculty are recognized senior leaders & technical experts in the field.
- Faculty cybersecurity interests are interdisciplinary and found across UMBC's campus/programs.

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Industry and Government Partnerships

- Recent cooperative agreements include:
  - NSA, ARL, USA RDECOM
- Recent research grants from:
  - NSF, NIST, DARPA, NSA, ONR and AFOSR.
- Strong corporate support from:
  - Northrop Grumman, SAIC
- Entepreneurship @ BWTech
- UMBC co-directing research @ NCCoE FFRDC

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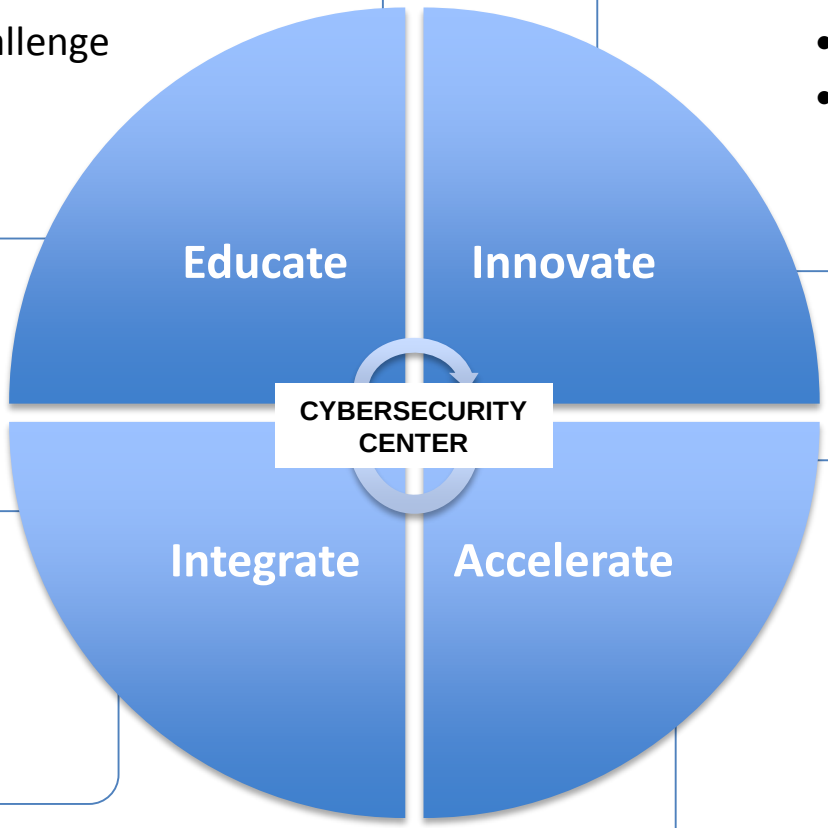
UMBC Cybersecurity Overview

- **BA/MS/MPS/PhD**
- Maryland Cyber Challenge
- Training Centers
- SFS / CyberScholars

- Cync
- Faculty Research
- DPS Innovation



- Networking
- CyberHive
- Career Services

- Incubator
- TargetGov
- Growth Programs
- Tech Transfer Support

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Final Thoughts

- Cyber landscape and cyber threat approaches evolve constantly
- Increased connectivity → Increased access to knowledge → Increased Global Innovation
- Cybersecurity is a highly innovative area → what will the jobs of the future look like?
- Need for information security as a national/international priority

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Thank You

Any Questions?

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