MASSACHUSETTS

Cyber Security

Global Leadership Through Talent, Resources, Investment
The Cyber Security Opportunity

Cyber Security is the Fastest Growing Tech Sector Worldwide

The worldwide cyber security market will reach $170 Billion by 2020; Overall security market will grow at a 7.8% CAGR from Q4 2015-2019*

$655 Billion will be spent on cyber security initiatives to protect PCs, mobile devices, and IoT devices from 2015-2020.**

Government spending on cybersecurity has increased at an average annual rate of 14.5% between FY 2006 and FY 2017, outpacing procurement in every other type of major government program.***

Cloud security market to be worth $12 billion by 2022****

**BI Intelligence: Cybersecurity Threats and Opportunities
***Jones, Lang, Lasalle, IP
Massachusetts provides innovative, collaborative support of cyber security initiatives to businesses and their customers:

- **Unparalleled concentration** of talent, workforce, R&D centers, universities, industry
- **A cyber security ecosystem** with **global sector leadership** in healthcare, financial services, defense, manufacturing, life sciences.
- **Informed State governance** supporting cyber security policy and programs.
Cyber Security Leadership

**Talent**
- 15,000+ STEM grads in 2014
  - #1 nationally
- In 2015, Massachusetts was 4th among all states for the number of new patents issued; 6th among nations. (*UMass Donahue Institute*)

**Industry Cluster**
- A vibrant industry cluster with 37 of the top 500 Innovative Global Cyber Security Firms; #2 globally following only California (*Cyber Ventures 500, Q1 2017*)
- 70 Massachusetts Startups focused on security products and services

**Investment**
- $1.5B raised by 29 of the Cybersecurity500 firms in MA (*Crunchbase*)
- In 2015, **VC Investment in MA is 3rd largest in US** including $1.8B in Software & IT Services

**Customers**
- 10 of US largest Retail companies HQ’d in MA
- 13 Massachusetts companies in the Fortune 500; **Large Concentration of Healthcare, Financial Services sector leaders**

**Universities**
- 30 degree programs in Cyber Security at 18 universities, colleges and community colleges
- 4 NSA Centers of Academic Excellence

**R&D**
- 15 Dedicated Security Research Centers at top 5 Universities
- 13 Leading University/ Non Profit Research Centers in Massachusetts
TALENT:
A smart and ready workforce,
Top colleges and universities
Ten Schools in the Top 100 National University Rankings:

- Harvard University
- MIT
- Tufts University
- Boston College
- Brandeis University
- Northeastern University
- Clark University
- UMass Amherst
- WPI
- College of the Holy Cross

Seven Schools in the Top 100 Liberal Arts College Rankings:

- Williams College
- Amherst College
- Wellesley College
- Smith College
- Mount Holyoke College

• Home to #1 Ranked School for Engineering (MIT)
• Home to #1 (Babson) and #2 (MIT) in the Undergrad Entrepreneurship Program Rankings
• Home to #1 Ranked Business School (Harvard)
• Home to #1 Ranked School for Best Internship/Career Services (Northeastern)
Over 114 Colleges and Universities; with over 400,000 students enrolled

There are 114 colleges and universities in Massachusetts enrolling over 400,000 students seeking bachelor's or associate degrees (Based on National Center for Education Statistics, 2014).

- Massachusetts is #1 in awarding new college degrees per capita, with over 117,000 higher education graduates in 2014, inclusive of community college, four year degrees, and advanced degrees.

- 50 of these colleges and universities are in the greater Boston metropolitan area, which is home to more than 250,000 students.

 Massachusetts is home to the most STEM Degrees in the U.S. per million residents. (source: Massachusetts Innovation Index)

Massachusetts has the Highest Percentage (46.1%) of Adults in US with a Bachelor’s Degree or Higher. (source: Massachusetts Innovation Index)
STEM Grads

STEM (Science, Technology, Engineering & Math)

- MA is **#1 nationally** in STEM graduate and professional degrees granted per capita
- Two Massachusetts universities rank in the top five best graduate schools for math: *Massachusetts Institute of Technology* (#1) and *Harvard University* (#3)

Science

- MA is **#4 nationally** in number of Science graduate and professional degrees granted
- Three Massachusetts universities rank in the top 25 of the best schools for computer science: *Massachusetts Institute of Technology* (#1), *Harvard University* (#18) and *University of Massachusetts Amherst* #25).

Engineering

- MA is **#5 nationally** in number of Engineering graduate and professional degrees granted
- Four Massachusetts universities rank in the top 50 engineering schools: *Massachusetts Institute of Technology* (#1), *Harvard University* (#20), *Boston University* (#37) and *Northeastern* (#43).
STEM Talent Density

Degrees Granted in Computer and Information Sciences and Support Services
per 1 Million Residents
Massachusetts, 2013-2014

Degrees Granted in STEM Fields
per 1 Million Residents
Massachusetts, 2013-2014

Source: The Index of the Massachusetts Innovation Economy 2015/16, MassTech Collaborative
Talent Pipeline

Talent Pipeline: Computer Science and Engineering

- **MA produces Masters degrees at about the same rate the US produces bachelors, and more than double the rate that the US produces masters degrees.**
- **MA produces 56% more bachelors degrees per capita than the US.**

![Bar chart](image)

**Bachelors and Masters Degrees Conferred in Computer Science & Engineering**

Per 100,000 residents

Massachusetts & U.S., 2000-2014

- **Massachusetts Bachelors**
- **Massachusetts Masters**
- **U.S. Bachelors**
- **U.S. Masters**

Colors:
- Blue: 2008-2009
- Orange: 2009-2010
- Yellow: 2011-2012
- Green: 2012-2013
- Grey: 2013-2014
Cyber Security Degree Programs

Current Colleges, Universities with Named Security Degree Programs

**Private Colleges, Universities:**
- Bay Path University
- Boston College
- Boston University (NSA CAE)
- Brandeis University
- Clark University
- Harvard University
- Northeastern (NSA CAE)
- WPI (NSA CAE)

**Public Universities**
- UMass Amherst (NSA CAE)
- UMass Boston
- UMass Lowell

**Community Colleges**
- Bristol Community College
- Bunker Hill Community College
- MassBay Community College
- Middlesex Community College
- Mt. Wachusett
- Quinsigamond Community College
- Springfield Technical Community College

**Sample Degree Programs:**

**Boston College:**
- Master of Science in Cyber Security Policy and Governance

**Boston University: NSA CAE**
- Graduate Certificate in Information Security
- MS in Computer Information Systems with Concentration in Security

**Northeastern: NSA CAE**
- Graduate Certificate in Information Security Management
- M.S. in Information Assurance; PhD in Information Assurance

**WPI: NSA CAE**
- MS in Computer Science – Specialization in Security
- PhD in Electrical and Computer Engineering – Cyber Security Focus

**UMass Amherst: NSA CAE**
- BS in Computer Science with Security & Privacy Track

**UMass Boston**
- BS in Information Technology – Computer Forensics

**UMass Lowell:**
- Graduate Certificate in Network Security
- Online Master of Science in Security Studies: Cyber Security Concentration

**Bunker Hill Community College:**
- Associate in IT Security Option; Certificate in Technology Security

**Springfield Technical Community College**
- Associate Degree in Computer & IT Security
Building Pathways

Mass. Department of Higher ED (DHE) is linking Cyber Security program development efforts across campuses.

- DHE is working with Broadening Advanced Technological Education Connections (BATEC) in the development and implementation of Cyber Security Academic Pathways on (5) public campuses.

- Program development includes Cyber Security industry partners, Raytheon, Mitre, and MIT Lincoln Labs.

- Program Deliverables:
  - Cyber Security Workforce Research Study;
  - Establish (1) Bachelor of Science Degree at UMass Boston;
  - Establish (5) Associate in Science Degrees
  - Establish (7) Stackable Certificates; Faculty Professional Development
INDUSTRY:

A World-Leading Startup Ecosystem
Strong & Established Anchor Companies and over 70 startups
Many Innovation Programs and Accelerators
Highly Collaborative Community
Bloomberg’s 2016 U.S. Innovation Index ranks Massachusetts as the “Most Innovative State.”

The Index factors R&D intensity, productivity, high-tech density, concentration of STEM employment, science and engineering degrees, and patent activity.

Bloomberg 2016 U.S. State Innovation Index

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Total Score</th>
<th>R&amp;D Intensity</th>
<th>Productivity</th>
<th>Tech Company Density</th>
<th>STEM Concentration</th>
<th>Science &amp; Engineering Degree Holders</th>
<th>Patent Activity</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Massachusetts</td>
<td>94.82</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
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<td>California</td>
<td>93.80</td>
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<td>3</td>
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<td>Washington</td>
<td>92.73</td>
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<td>8</td>
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<td>3</td>
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<td>4</td>
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<td>5</td>
<td>15</td>
<td>10</td>
<td>12</td>
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<td>5</td>
<td>Maryland</td>
<td>78.95</td>
<td>3</td>
<td>13</td>
<td>19</td>
<td>2</td>
<td>4</td>
<td>26</td>
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<tr>
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<td>Oregon</td>
<td>78.22</td>
<td>8</td>
<td>15</td>
<td>22</td>
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<td>6</td>
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<td>7</td>
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<td>78.17</td>
<td>8</td>
<td>4</td>
<td>24</td>
<td>12</td>
<td>12</td>
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<td>17</td>
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<td>Minnesota</td>
<td>75.00</td>
<td>15</td>
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<td>8</td>
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<td>New Hampshire</td>
<td>74.75</td>
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<td>39</td>
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<td>14</td>
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<td>Virginia</td>
<td>73.33</td>
<td>20</td>
<td>16</td>
<td>14</td>
<td>4</td>
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<td>Delaware</td>
<td>69.80</td>
<td>7</td>
<td>3</td>
<td>34</td>
<td>11</td>
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<td>16</td>
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<td>13</td>
<td>New Mexico</td>
<td>68.90</td>
<td>1</td>
<td>23</td>
<td>8</td>
<td>18</td>
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<td>14</td>
<td>Utah</td>
<td>63.50</td>
<td>14</td>
<td>34</td>
<td>12</td>
<td>13</td>
<td>28</td>
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<td>15</td>
<td>Arizona</td>
<td>62.80</td>
<td>16</td>
<td>42</td>
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<td>Rhode Island</td>
<td>62.55</td>
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<td>25</td>
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<td>24</td>
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<td>17</td>
<td>North Carolina</td>
<td>62.37</td>
<td>17</td>
<td>24</td>
<td>13</td>
<td>23</td>
<td>19</td>
<td>20</td>
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</tbody>
</table>

Massachusetts has been #1 in the Milken Institute’s State Technology and Science Index in every report since 2002.
Most Innovative Security Companies in US

Massachusetts is home to 37 of the most innovative security companies based on a 15-pt selection criteria by Cybersecurity Ventures.*

*Cybersecurity Ventures Cybersecurity 500 Q1 2017
# Successfully Scaling Companies

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Founded</th>
<th>Subsector and Applications</th>
<th>Employees</th>
<th>Accelerator or Other History</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Startups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PiraShield</td>
<td>Wellesley</td>
<td>2016</td>
<td>Anti-piracy application and monitoring.</td>
<td>1-10</td>
<td>MassChallenge alumnus</td>
</tr>
<tr>
<td>Lexumo</td>
<td>Cambridge</td>
<td>2015</td>
<td>Remediate software security vulnerabilities in embedded, enterprise, and cloud products.</td>
<td>11-50</td>
<td>MIT STEX25 Accelerator 2016</td>
</tr>
<tr>
<td>mZeal</td>
<td>Littleton</td>
<td>2000</td>
<td>Cyber/Network Security and analytics for Enterprise, Mobile, Healthcare, and Financial environments.</td>
<td>11-50</td>
<td>MassVentures funding</td>
</tr>
<tr>
<td><strong>Scaling Companies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applause</td>
<td>Framingham</td>
<td>2007</td>
<td>In-the-wild testing services, software tools, and mobile sentiment analysis.</td>
<td>201-500</td>
<td></td>
</tr>
<tr>
<td>Cybric</td>
<td>Boston</td>
<td>2015</td>
<td>Vulnerability assessment and remediation</td>
<td>11-50</td>
<td>TechStars cloud alumnus</td>
</tr>
<tr>
<td>Threat Stack</td>
<td>Boston</td>
<td>2012</td>
<td>Cloud security, infrastructure monitoring, and compliance</td>
<td>51-200</td>
<td></td>
</tr>
<tr>
<td>Cybereason</td>
<td>Boston</td>
<td>2012</td>
<td>Threat detection and response</td>
<td>51-200</td>
<td></td>
</tr>
<tr>
<td><strong>Large Companies and Company Divisions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CyberArk</td>
<td>Newton</td>
<td>1999</td>
<td>Privileged account security</td>
<td>500-1000</td>
<td></td>
</tr>
<tr>
<td>IBM Security</td>
<td>Cambridge</td>
<td>2011</td>
<td>Threat protection and incident response</td>
<td>201-500</td>
<td></td>
</tr>
<tr>
<td>BAE Systems</td>
<td>Boston</td>
<td>1999</td>
<td>Cyber arm of global defense, aerospace and security company</td>
<td>1001-5000</td>
<td></td>
</tr>
</tbody>
</table>
Robust Start Up Ecosystem

Accelerators
- techstars
- BOLT
- MASSCHALLENGE
- HACK/SVIOUS
- Idea (Northeastern University's Venture Accelerator)

Incubators
- TechSpring
- GREENTOWN LABS
- UMass Lowell Innovation Hub
- Venture Development Center
- hack/secure
- Hi (Harvard innovation lab)

Support
- FinTech Sandbox
- founders workbench
- The Venture Cafe
IBM Security, headquartered in Cambridge, Mass. is home to the X-Force Command Center, which brings breakthrough technology and expertise to help clients mature their security operations at the first-ever Commercial Cyber Range.

The X-Force Command Center immerses security professionals in a simulated experience designed to test response readiness and leadership skills in crisis.

Offers actionable insights from some of the best incident responders in the world.

IBM X-Force Command Center Features:
- 24/7 Global Watch Floor
- Global incident response capabilities
- Seats for 36 Operators
- Data Center with a Petabyte of Data
- Simulates an actual cyber crisis featuring audio, video, and typical Fortune 500 company operations
Massachusetts has a strong network of industry and civic associations partnering with companies and the state to support innovation and growth.
CUSTOMERS:

Global Industry Leaders in Healthcare, Financial Services, Life Sciences
Currently there are 16 U.S. Industry Sectors defined as critical infrastructure.

- 85% of critical infrastructure is in the private sector
- Trends exposing critical infrastructure to increased risk:
  - Interconnectedness of sectors
  - Proliferation of exposure points
  - Concentration of Assets

Critical Infrastructure Sectors

Growth in Key Sectors

Growth in Key Customer Industry Sectors Drives Security Demand in Massachusetts

Growth in Key Sectors
Massachusetts, 2009 & 2015

Source: The Index of the Massachusetts Innovation Economy 2015/16, MassTech Collaborative
“MassMutual takes cyber security seriously, continuously investing in tools, resources and personnel that help us keep that commitment.”

Protecting Life Insurance Policy Holders:
- Restricting Information Access
- Information Security Platform & Infrastructure
- Testing and Assessing Risk
- Regular Monitoring, Evaluation, Adjustment
- Protecting MassMutual Systems
- Cybersecurity Awareness

2016:
#76 FORTUNE 500
REVENUE ($M)$38,243
EMPLOYEES 11,593
SPRINGFIELD, MASS
FOUNDED 1851

2016 World’s Most Ethical Companies

Strong Public/Private Partnership in Cyber Security

- MassMutual Foundation is providing UMass Amherst $15M over 10 years to further strengthen its world-class data science and cybersecurity research and education programs in Western Massachusetts; State match investment of $5M.

- Private-public collaboration that will uniquely benefit the State, expand knowledge of data science and its uses and develop new cybersecurity systems to protect information networks.

- Supports new research and education activities at UMass Cybersecurity Institute and the new Trust Assurance Cybersecurity certificate offered at the MassMutual Foundation/UMass Springfield Center for Training in Cybersecurity.

- Provides significant economic development benefit to downtown Springfield, drawing professionals from the Springfield-Hartford, Conn., area.
INVESTMENT: 

Competitive Venture Capital Environment 
Strong R&D Investments
Favorable M&A Environment

Recent Security Acquisitions in Massachusetts:

- Carbon Black → Confer (2016)
- IBM → Resilient Systems (2016)
- Cisco → CloudLock (2016)
- NetScout → Arbor Networks (2015)
- Dell → EMC² (2015)
State’s Cyber Security Investments

George J. Kostas Institute for Homeland Security at Northeastern University
The Institute fosters a collaborative environment where multidisciplinary teams of academic and industry researchers interact closely with private and public sector practitioners to develop practical and scalable tools and applications to enable the capacity of communities, critical systems, and infrastructure to withstand, respond to, recover from, and adapt to disruptive events.

Hanscom Air Force Base and Massachusetts Open Cloud (MOC) Security Test Environment
The hardware as a Service (HaaS) technology with contributions by the Air Force and MIT Lincoln Labs provides a test bed for security in a public cloud. $3M Investment in Mass Open Cloud.

The Commonwealth Fusion Center (CFC)
The Fusion Center provides 24 hours a day statewide information sharing among local, state and federal public safety agencies and private sector organizations in order to facilitate the collection, analysis and dissemination of intelligence relevant to terrorism and public safety. Managed by Executive Office of Public Safety and Security.

Hanscom Collaboration and Innovation Center (HCIC)
The HCIC is a Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Cyber collaborative environment to support: Research and Development, Test and Evaluation, modeling and simulation, acquisition program/project development and direct warfighter support for Air Force programs.

MassVentures
Formed as a quasi-public corporation by the Commonwealth of Massachusetts to address the capital gap for start-up companies and to encourage the growth of early-stage technology firms, MassVentures is a venture capital firm focused on fueling the Massachusetts innovation economy by funding early-stage, high-growth Massachusetts startups as they move from concept to commercialization.

Data Science/Cybersecurity Collaborative Research and Education Center at UMass Amherst
Target industry clusters: Insurance Services, Financial Technology and Digital Health. The State investment in this project is $5 million with $15 million in matching funds from MassMutual Foundation.

PracticePoint at WPI
Membership-based research, development, and commercialization alliance built to advance healthcare technologies and launch new medical cyber-physical systems. Located at WPI’s Gateway Park, the facility will replicate point-of-practice environments that are integrated with advanced manufacturing and testing equipment. The aim is to accelerate translation of new discoveries from prototype to product. $5M Investment
R&D:
An unparalleled concentration of research centers and universities supporting the cyber security and technology enterprise.
Leadership in University R&D

- Hariri Institute for Computing and Computational Science & Engineering
- Center for Reliable Information Systems and Cyber Security – multidisciplinary research across BU Schools
- BU Security Group – cryptographic and network security research

- Cyber Security@CSAIL, The Computer Science and Artificial Intelligence Laboratory
- The MIT Cyber Security and Internet Policy Research Initiative
- MIT Sloan’s Interdisciplinary Consortium for Improving Critical Infrastructure Cyber Security (IC³)

- George J Kostas Research Institute for Homeland Security
- ALERT program – Awareness and Localization of Explosives-related Threats
- Bernard M Gordon Center for Subsurface Sensing and Image Systems
- Institute for Information Assurance

- Center for Data Science
- Cyber Security Institute – multidisciplinary education & research across UMass Amherst schools

- Vernam Group – Encryption and data security research
- Applied Logic and Security Group
- Computer Science Department Research Facilities

- Federally Funded R&D Center (FFRDC)

- Lincoln Laboratory
  - Administrator: Massachusetts Institute of Technology
  - Location: Lexington, MA
  - Sponsor: Department of Defense, Office of the Under Secretary of Defense for Acquisitions, Technology and Logistics

- National Security Engineering Center
  - Administrator: MITRE Corp.
  - Location: Bedford, MA, and McLean, VA
  - Sponsor: Department of Defense, Office of the Under Secretary of Defense for Acquisitions, Technology and Logistics
High Performance Computing

The MGHPCC (Mass Green High Performance Computing Center) is jointly operated by Boston University, Harvard, MIT, Northeastern, and UMass

Regional HPC data center for research
- Open to any research organization in the region
- Industry leading energy efficiency; tailored for high performance computing
- 90% carbon-free energy supply; LEED Platinum certification

Collaborative, computationally intensive research
- Ranging from theoretical physics to analysis of MBTA performance metrics
- Millions of virtual scientific experiments per month
- Complex simulations and analysis of massive data sets

Regional Economic Development
- Anchor tenant for Holyoke Innovation District ($90M development project)
- More than $200M private investment has followed

Stimulating Local Education partnerships
- Middle School High School, Community College
The MOC is a state, academic and industry partnership that connects providers, innovators, and consumers of cloud computing, security and Big Data solutions.

- Preparing 100s of students for careers in cloud computing through internships and courses
- Resulted in federal research grants in cloud cybersecurity, monitoring, and infrastructure
- Forging new industry/research/government collaborations in Big Data, Cyber Security, and cloud computing

MOC Vision: Create a self-sustaining at-scale public cloud based on the Open Cloud eXchange model
- Enabling a marketplace for industry
- Enabling a place for researchers and industry to innovate and expose innovation to real users

http://info.massopencloud.org
A non-profit consortium the Advanced Cyber Security Center (ACSC) brings together industry, university, and government organizations to address the most advanced cyber threats, with a focus on sharing cyber threat information, engaging in next-generation cybersecurity research and development, and creating education programs that will address the shortfall in cyber talent.

- Research & Education
- Threat Evaluation/Information Sharing
- Policy
Why Massachusetts for Cyber Security Collaboration & Growth

Cyber Security Global Leadership fueled by extensive ecosystem

Unparalleled concentration of the world's leading universities and research centers

Engaged customer base in critical industry sectors

VC and Investment activity among top in U.S.

Skilled and ready security workforce

Robust, Start Up Environment with Strong support

The Place to Be for Security M&A

#1 in U.S: STEM Graduates and Professional Degrees per Capita
Massachusetts is a top global destination for cyber security growth, expansion, or strategic partnerships. We want to work with you.

Connect with Us:

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Executive Director/CEO,
Massachusetts Technology Collaborative
Connelly@masstech.org
(617) 371-3999
@Mass_Tech