MASSACHUSETTS CYBERSECURITY

Global Leadership Through Talent, Resources, and Investment
The Cybersecurity Opportunity

Cybersecurity is the Fastest Growing Tech Sector Worldwide

The worldwide cybersecurity market will reach $248 Billion by 2023; Overall security market will grow at a 10% CAGR from 2018-2023¹

$655 Billion will be spent on cybersecurity initiatives to protect PCs, mobile devices, and IoT devices from 2015-2020²

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 program³

Cloud security market to be worth $12 billion by 2022⁴

¹ Markets and Markets: Cybersecurity Market to 2023-Global Forecast
² BI Intelligence: Cybersecurity Threats and Opportunities
³ Jones, Lang, Lasalle, IP
Massachusetts Global Innovation Leadership Drives the Cybersecurity Ecosystem

Massachusetts provides innovative, collaborative support of cybersecurity initiatives to businesses and their customers:

- **Unparalleled concentration** of talent, workforce, R&D centers, universities, industry

- A cybersecurity ecosystem with **global sector leadership** in healthcare, financial services, defense, manufacturing, life sciences.

- **Informed State governance** supporting cybersecurity policy and programs.
Cybersecurity Leadership

**Talent**
- 21,000+ STEM grads in 2016, #1 nationally per capita (NSF)
- 55,000 strong cybersecurity workforce as of 2018*
  - 9,000 job openings (Cyberseek)

**Investment**
- $4.7B raised by Cybersecurity firms in MA (Crunchbase, as of March 2018)
- In 2016, VC investment in MA was 3rd largest in US, including $2.0 B in Software & IT Services (pwc Moneytree)

**Industry Cluster**
- A vibrant industry cluster with 29 of the top 500 Innovative Global Cybersecurity Firms; (Cyber Ventures 500, 2018)
- 140+ cybersecurity-related companies with operations in Massachusetts

**R&D**
- 15 Dedicated Security Research Centers at top 5 Universities
- 13 Leading University/Non Profit Research Centers in Massachusetts

**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 cybersecurity at 18 universities, colleges and community colleges
- 4 NSA Centers of Academic Excellence

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* According to research commissioned by MasTech, includes jobs at cybersecurity companies and cybersecurity jobs at non-cybersecurity companies
TALENT

A smart and ready workforce, top colleges and universities
Ten Mass. Schools in the Top 100 National University Rankings:

- #1 Ranked School for Engineering (MIT)
- #1 (Babson) and #2 (MIT) in the Undergrad Entrepreneurship Program Rankings
- #1 (Harvard) and #5 (MIT) Ranked Business Schools; and
- #1 Ranked School for Best Internship/Career Services (Northeastern).

Seven Mass. Schools in the Top 100 Liberal Arts Colleges:

- Williams
- Amherst College
- Wellesley
- Smith College
- College of the Holy Cross
- Mount Holyoke
- Wheaton College
Top Talent Pipeline

There are **117 colleges and universities in Massachusetts that enroll over 500,000 students**

- Massachusetts is #2 in awarding new college degrees per capita, inclusive of community college, 4-year, & advanced degrees

- **120,813 higher education graduates in 2016.** This includes more than 70,000 graduates inside Route 128 alone.

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

Massachusetts confers the **most STEM Degrees in the U.S. per million residents.**
(source: Massachusetts Innovation Index)

Massachusetts has the **Highest Percentage** (48.7 %) of Adults in US with a Bachelor’s Degree or Higher.
(source: Massachusetts Innovation Index)

Source: National Center for Education Statistics, 2016
STEM Graduates

STEM (Science, Technology, Engineering & Math)

- MA is **#1 nationally** in STEM graduate & 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 list of the Best Schools for Computer Science: MIT (#1), Harvard (#18), and UMass Amherst (#25).

Engineering

- MA **ranked #5 in U.S.** in engineering graduate & professional degrees granted
- Four Massachusetts universities rank in the top 50 engineering schools in the U.S.: MIT (#1), Harvard (#20), Boston University (#37), and Northeastern (#43).

Degrees Granted in Computer and Information Sciences and Support Services per 1 Million Residents
Massachusetts, 2014-2015

Degrees Granted in STEM Fields All Degree Levels per 1 Million Residents
Massachusetts & LTS, 2014-2015

Source: The Index of the Massachusetts Innovation Economy 2017, MassTech Collaborative
# Cybersecurity Degree Programs

## Current Colleges, Universities with Named Security Degree Programs

### Private Colleges, Universities
- Assumption College
- Bay Path University
- Boston College
- Boston University (NSA CAE)
- Brandeis University
- Clark University
- Harvard University
- Northeastern University (NSA CAE)
- Worcester Polytechnic Institute (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 Community College
- Quinsigamond Community College
- Springfield Technical Community College
Cybersecurity Degree Programs

Current Colleges, Universities with Named Security Degree Programs

Sample Degree Programs

Boston College:  
**Master of Science in Cybersecurity 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 – Cybersecurity Focus

UMass Amherst: NSA CAE  
BS in Computer Science with Security & Privacy Track  
MS in Computer Science with Concentration in Security  
Graduate-Level Information Security Certificate Program

UMass Boston  
BS in Information Technology – Computer Forensics

UMass Lowell:  
Graduate Certificate in Network Security  
Online Master of Science in Security Studies: Cybersecurity 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 Cybersecurity program development efforts across campuses.

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

- Program development includes cybersecurity industry partners Raytheon, MITRE, and MIT Lincoln Labs.

- Program Deliverables:
  - Cybersecurity 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 & over 70 startups
  - Many Innovation Programs and Accelerators
  - Highly Collaborative Community
#1 Innovation State

*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.

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

<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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<td>1</td>
<td>Massachusetts</td>
<td>94.82</td>
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<td>12</td>
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<td>13</td>
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<td>Oregon</td>
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<td>78.17</td>
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<td>Minnesota</td>
<td>75.00</td>
<td>15</td>
<td>19</td>
<td>10</td>
<td>8</td>
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<td>New Hampshire</td>
<td>74.75</td>
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<td>Virginia</td>
<td>73.23</td>
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<td>4</td>
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<td>12</td>
<td>Delaware</td>
<td>69.80</td>
<td>7</td>
<td>3</td>
<td>34</td>
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<td>17</td>
<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>6</td>
<td>18</td>
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<td>14</td>
<td>Utah</td>
<td>63.50</td>
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<td>34</td>
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<td>Arizona</td>
<td>62.80</td>
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<td>Rhode Island</td>
<td>62.55</td>
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<td>26</td>
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<td>25</td>
<td>21</td>
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<td>17</td>
<td>North Carolina</td>
<td>62.37</td>
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<td>24</td>
<td>13</td>
<td>23</td>
<td>19</td>
<td>20</td>
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</tbody>
</table>
Massachusetts is home to 29 of the 500 most innovative security companies in the world, according to Cybersecurity Ventures.*
# Full Spectrum of 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>
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<tbody>
<tr>
<td><strong>Startups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<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>GreatHorn</td>
<td>Belmont</td>
<td>2015</td>
<td>Cloud communication security software.</td>
<td>1-10</td>
<td>Techstars NYC alumnus</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>251-500</td>
<td>Acquired in 2017 by Vista Partners</td>
</tr>
<tr>
<td>Cybric</td>
<td>Boston</td>
<td>2015</td>
<td>Vulnerability assessment and remediation</td>
<td>11-50</td>
<td></td>
</tr>
<tr>
<td>Threat Stack</td>
<td>Boston</td>
<td>2012</td>
<td>Cloud security, infrastructure monitoring, and compliance</td>
<td>251-500</td>
<td>TechStars cloud alumnus</td>
</tr>
<tr>
<td>Cybereason</td>
<td>Boston</td>
<td>2012</td>
<td>Threat detection and response</td>
<td>251-500</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>251-500</td>
<td></td>
</tr>
<tr>
<td>BAE Systems Applied Intelligence</td>
<td>Boston</td>
<td>1999</td>
<td>Cyber arm of global defense, aerospace and security company</td>
<td>5001-10000</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Crunchbase.com*
Robust Start Up Ecosystem

Accelerators
- techstars
- BOLT
- MASSCHALLENGE
- For All

Incubators
- TechSpring
- GREENTOWN LABS
- UMass Lowell Innovation Hub
- Raizlabs
- Venture Development Center
- hack/secure

Support
- FinTech Sandbox
- Founders Workbench
- The Venture Cafe
- MassCyberCenter
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


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Growth in Key Customer Industry Sectors Drives Security Demand in Massachusetts

Output in Key Sectors
Massachusetts, 2012-2017

Software & Communication Services
Financial Services
Healthcare Delivery
Biopharmaceuticals, Medical Devices & Hardware
Scientific, Technical & Management Services
Computer and Communication Hardware
Defense Manufacturing & Instrumentation

Millions $

2012
2017

Source: The Index of the Massachusetts Innovation Economy 2017, MassTech Collaborative
Spotlight: MassMutual

“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

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.

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

2016 World’s Most Ethical Companies

(all data are for 2016)
INVESTMENT

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

Recent Security Acquisitions in Massachusetts:

- **aws** → **sqrrl** 2018
- **synopsys** → **duck** 2017
- **gemalto** → **3M** 2017
  
  *Identity Management business*
- **ca technologies** → **veracode** 2017
- **carbon black** → **confer** 2016
  
  *strength in numbers*
- **ibm** → **resilient systems** 2016
State’s Cybersecurity Investments (1)

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.

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.

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.
Data Science/Cybersecurity Collaborative Research and Education Center at UMass Amherst
Target industry clusters: Insurance Services, Financial Technology and Digital Health. The Commonwealth 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

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.
RESEARCH & DEVELOPMENT (R&D)

An unparalleled concentration of research centers and universities supporting the cybersecurity and technology enterprise
Leadership in University R&D

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

- **Cybersecurity@CSAIL, The Computer Science and Artificial Intelligence Laboratory**
- The MIT Cybersecurity and Internet Policy Research Initiative
- MIT Sloan’s Interdisciplinary Consortium for Improving Critical Infrastructure Cybersecurity (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**
- **Cybersecurity 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, Cybersecurity, 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 Cybersecurity Collaboration & Growth

- Cybersecurity 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:

MassCyberCenter
Engage@masstech.org
(508) 870-0312
@Mass_Tech