

An Update on the Administration's Advanced Manufacturing Initiatives

NDIA Manufacturing Division Meeting

19 October 2016

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Take-Aways

- Why Manufacturing R&D Matters (*a review*)
 - *Manufacturing punches above its weight*
 - *There's innovation in manufacturing*
 - Manufacturing USA: the National Network for manufacturing Innovation
 - A snapshot of Federal priority technology areas
 - Manufacturing Day: inspiring the next generation of manufacturers
 - Some manufacturing mega-trends
- Cybersecurity for Manufacturing (*a review*)
 - *Motivations*
 - Key resources for manufacturers

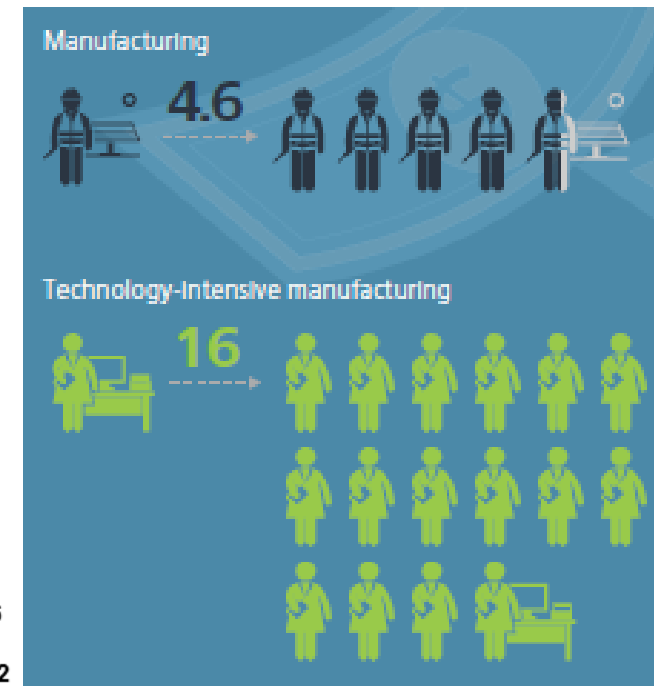
Manufacturing Punches Above Its Weight

- **Manufacturing:** making something that can be “dropped on your foot”
- **Advanced Manufacturing:** when technology gives competitive advantage
- Manufacturing has the **greatest multiplier effect:** every \$1 in manufacturing value added, \$1.40 in additional value is created in other sectors
- Manufacturing has **one of the highest job multiplier effects**



Economic Activity Generated by \$1 of Sector GDP, 2012

Bureau of Economic Analysis

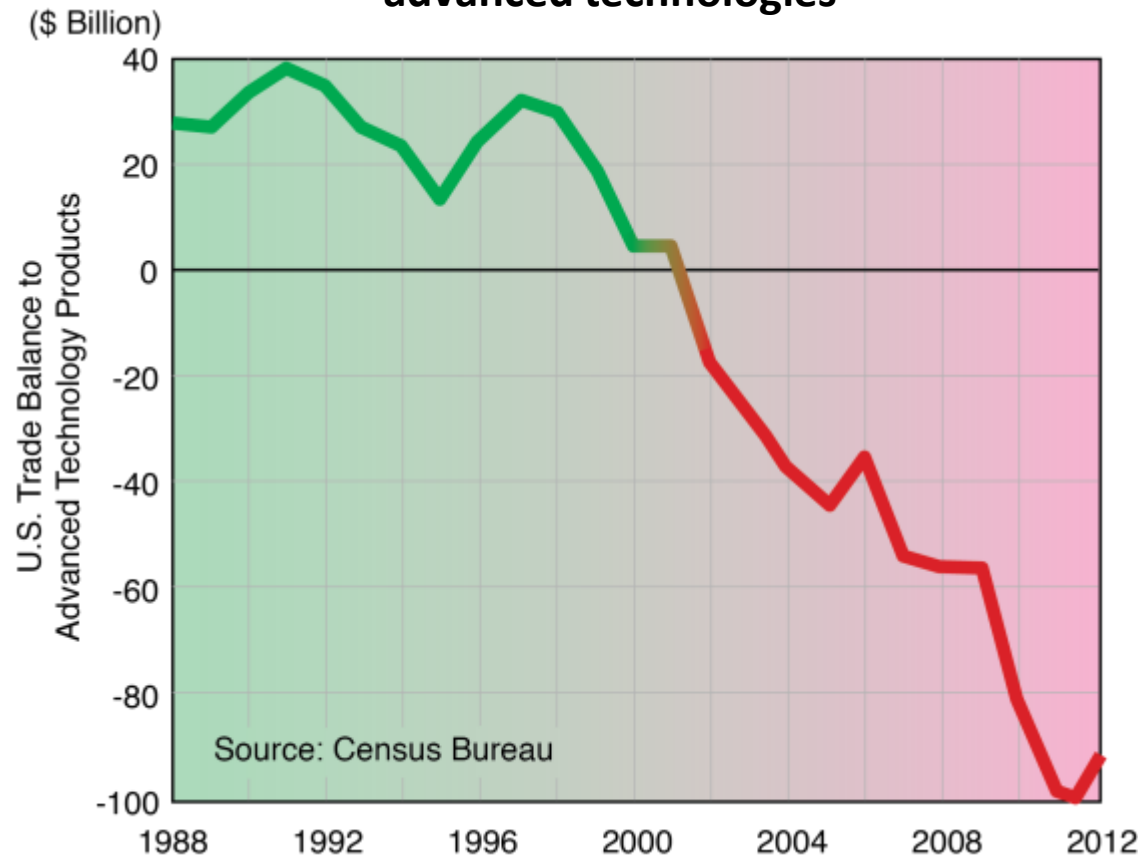


Deloitte/Council on Competitiveness

There's Innovation In Manufacturing

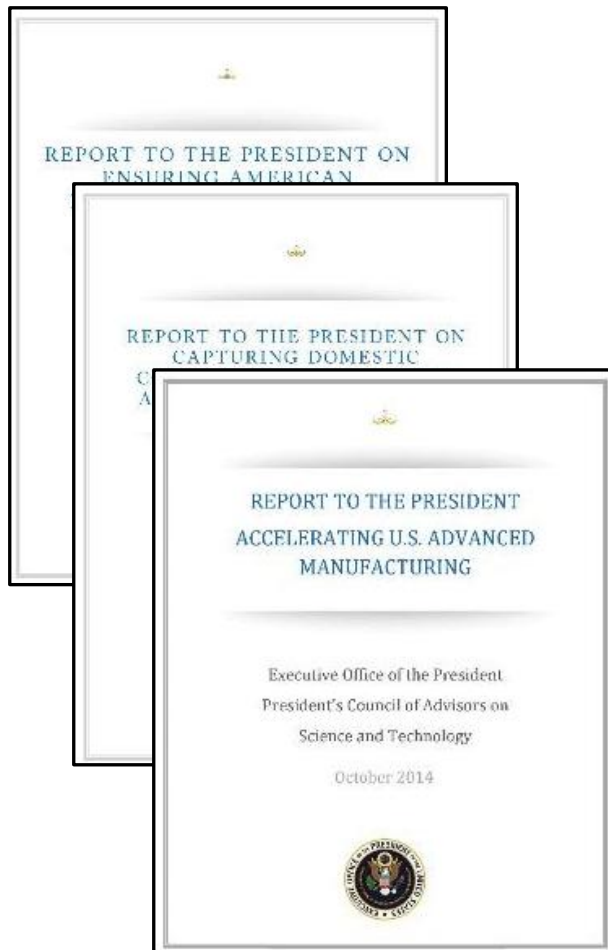


Deficit in U.S. trade balance of advanced technologies

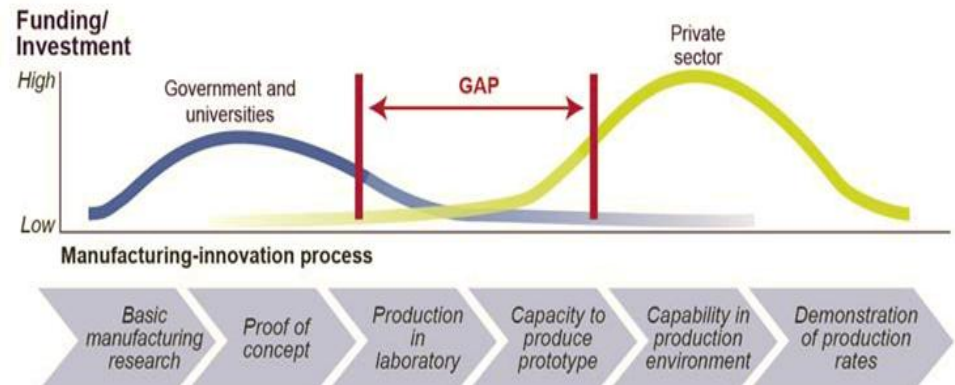


There's Innovation In Manufacturing

President's Council of Advisors on Science and Technology



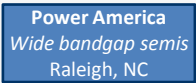
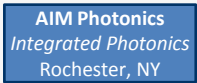
Market Failure in Pre-Competitive Applied Manufacturing R&D



Public-Private Partnerships = NOT “Business as Usual”

- Technology leadership
- Leveraged investment
- Collaborative constituencies
- Customized training
- Business opportunities
- Innovation ecosystems
- Networked expertise
- Rejuvenated Neighborhoods

Nine Manufacturing USA Institutes Established



- \$600M+ Fed matched by \$1.3B+ non-Fed

➤ 30+ states

A Snapshot of Federal Priority Technology Areas

ADVANCED MANUFACTURING:

*A Snapshot of Priority Technology Areas
Across the Federal Government*

PRODUCT OF THE
Subcommittee for Advanced Manufacturing
OF THE NATIONAL SCIENCE AND TECHNOLOGY COUNCIL



April 2016

Technology areas with strong interagency support for expansion and multi-agency coordination:

- Advanced materials manufacturing: *materials by design, science of scale-up*
- Engineering biology to advance biomanufacturing: *predict behavior of and effectively design complex biological systems*
- Bio-manufacturing for regenerative medicine: *manufacturing to replace cells, tissues, organs*
- Advanced Bioproducts Manufacturing: *plants (agricultural and forest material) to products*
- Continuous manufacturing of pharmaceuticals: *flow production methods to manufacture without interruption*

Manufacturing Day: Inspiring the Next Gen.



MANUFACTURING DAY | 10.07.16
See Manufacturing in Action Across America

- **Announcements by 5 Federal Agencies**, including grants to strengthen manufacturing supply chains by NIST, challenges to catalyze next-generation technologies by NASA, and initiatives to support more American Veterans pursuing technical training in advanced manufacturing by the VA.
- **Commitments by more than 110 organizations**, including the first MOOC of its kind by MIT, 18 expanded and inaugural Grand Challenge Scholars Programs, and 30 new manufacturing apprenticeships by the Manufacturing Association of Central New York.
- **A new report by the National Economic Council**, highlighting an Administration-long focus to strengthen the competitiveness of American manufacturing.

<https://www.whitehouse.gov/the-press-office/2016/10/06/fact-sheet-new-progress-resurgent-american-manufacturing-sector>

Some Manufacturing Mega-Trends

Business models

- Sell capabilities, not equipment
- Supply chain innovation
- Small batches of personalized products
- On-site manufacturing
- Democratizing manufacturing
- Self-training jobs

Digitization

- Cloud computing
- Internet of things
- Cybersecurity
- Artificial intelligence (design for advanced materials and manufacturing)
- Virtual/augmented reality

Additive Manufacturing

- Hierarchical/intelligent placement
- Additive at all scales

Product Design

- Advanced materials
- Sustainability

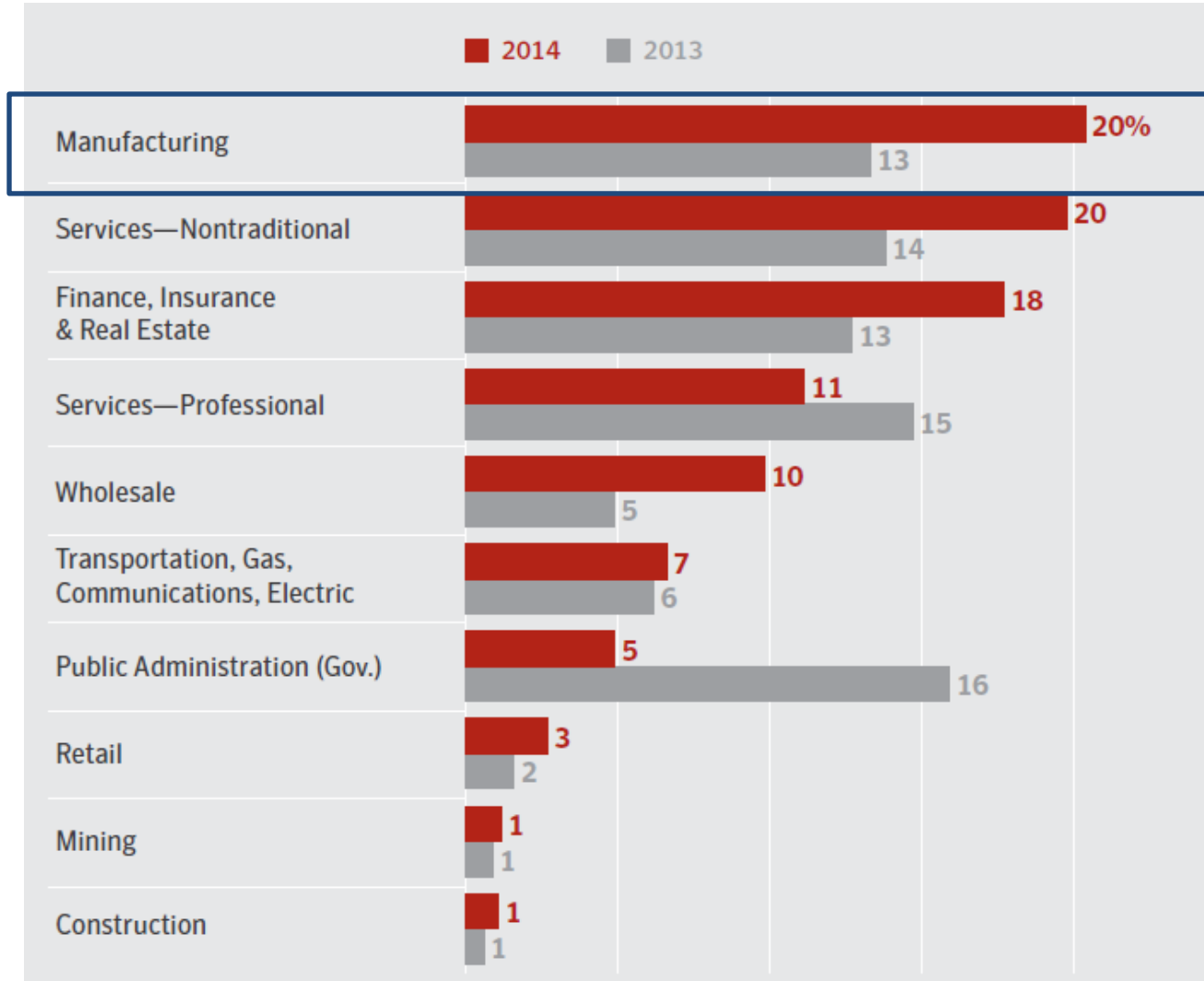
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Mfg'ers receive record volumes of cyber attacks

Industry distribution of **spear-phishing** attacks

1 in 3
mfg'ers



Attackers Want Manufacturers' Secrets

Percent of **total attacks** in a given industry, within top 6 incident classification patterns

Incident pattern ►	POS intrusions	Web app attacks	Cyber-espionage	Crimeware	Insider and privilege misures	Payment card skimmers
Industry (NAICS #) ▼						
Accommodation (72)	53%	1%			3%	
Administrative (56)		4%	1%		6%	
Educational services (61)		9%	12%	22%	11%	
Entertainment (71)	58%	11%	11%		5%	
Financial services (52)		17%	1%	21%	6%	7%
Healthcare (62)	7%	8%	3%	3%	20%	
Information (51)		26%	9%	46%	1%	
Manufacturing (31-33)		3%	36%	19%	3%	
Mining (21)			11%		67%	6%
Other services (81)	1%	28%	3%	36%	6%	
Professional services (54)	2%	2%	26%	10%	1%	
Public (92)				18%	26%	
Retail (44-45)	20%	2%		25%	1%	4%
Transportation (48-49)			41%	9%	18%	5%
Utilities (22)		17%	50%	17%		

The cyber threat is **dynamic**, with growing sophistication and frequency

Mfg Supply Chain = Notoriously Long, Complex

- Cyber attacks can occur **anywhere along the supply chain**
 - 45% of cyber breaches in 2014 were attributed to past business partners
- Small manufacturers are challenged to adopt new technologies, in part because of **complicated cybersecurity standards**
- Large manufacturers may demand minimal digital safeguards to **maximize interoperability** amongst suppliers

Malware for ICS = Notable Shift in Targets, Techniques

 LOGIN | CREATE ACCOUNT


FRONTPAGE WND TV OPINION MONEY DIVERSIONS

FROM JOSEPH FARAH'S G2 BULLETIN

'DRAGONFLY' VIRUS STRIKES U.S. POWER PLANTS

Cyberattacks seek to control or even sabotage America's energy grid

Published: 07/06/2014 at 6:32 PM

 Symantec Official Blog


Sandworm Windows zero-day vulnerability being actively exploited in targeted attacks

Critical new Windows zero-day has reportedly been used in a limited number of targeted cyberespionage attacks to deliver a back door on to the victim's computer.

By: Symantec Security Response  SYMANTEC EMPLOYEE

Created 14 Oct 2014

+3
3 Votes

 Menu ▾

NEWS

Technology

Hack attack causes 'massive damage' at steel works

🕒 22 December 2014 | Technology

PCWorld
Work. Life. Productivity.

Attack campaign infects industrial control systems with BlackEnergy malware

Lucian Constantin

IDG News Service Oct 29, 2014 8:05 AM

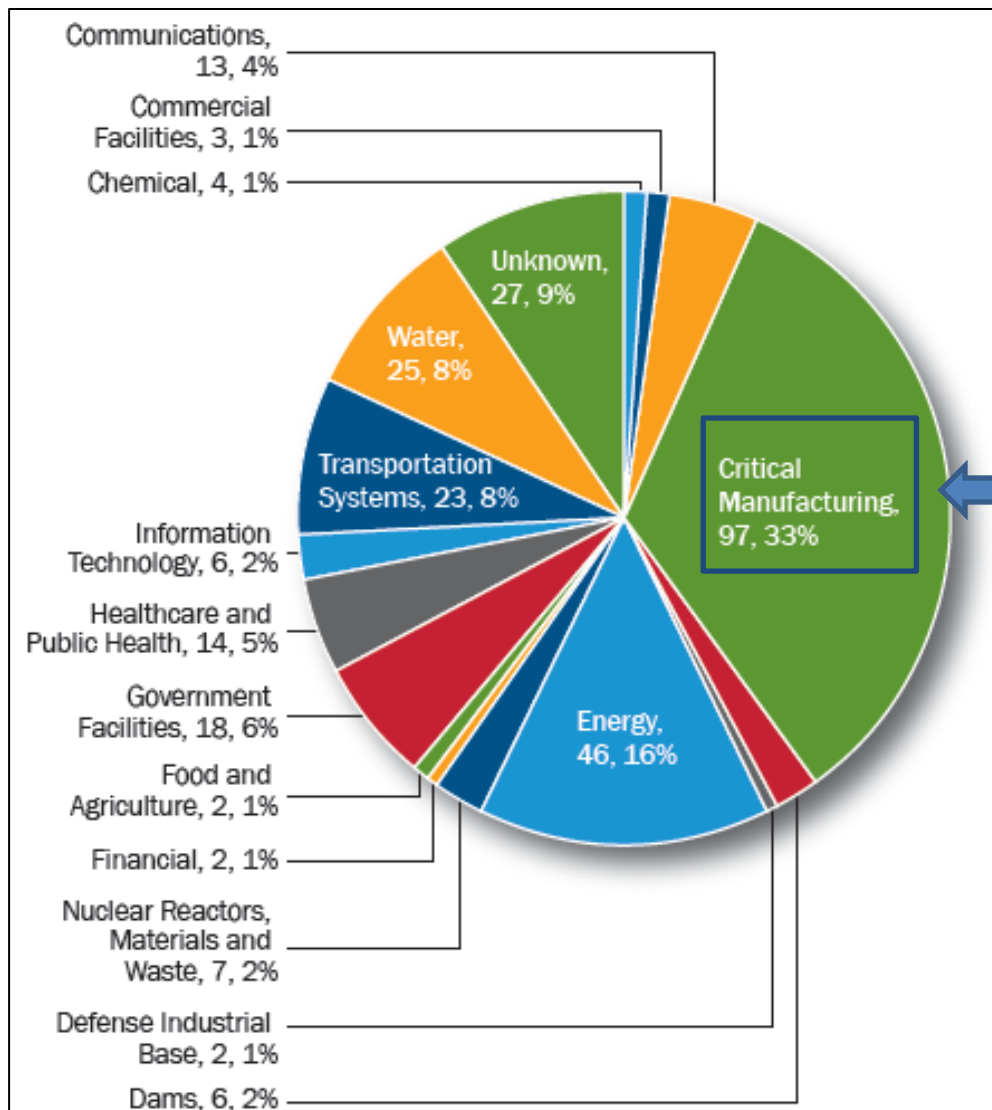
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KIM ZETTER SECURITY 11.03.14 6:30 AM

AN UNPRECEDENTED LOOK AT STUXNET, THE WORLD'S FIRST DIGITAL WEAPON

Malware for ICS = Notable Shift in Targets, Techniques

Distribution of **ICS** attacks by critical infrastructure sector in FY15



2X as many attacks as FY14

Malware for ICS = Notable Shift in Targets, Techniques

Metric	Information Technology (IT)	Operational Technology (OT)
Role	Supports people	Controls machines
Purpose	Process transactions, provide information	Control/monitor physical process and equipment
Lifetime	~5 years, updated regularly	15-30 years, little/no tolerance for delays or downtime required to update
Architecture	Generic	Custom: event-driven, real-time, embedded hardware/software
Interfaces	GUI, web, keyboard	Electromechanical, sensors, actuators, coded displays, hand-held devices
Ownership	CIO, IT	Engineers, technicians, operators, managers
Connectivity	Corporate network (IP)	Control networks (hard-wired twisted pair and IP)

Mfg'ers Recognize Threats, But Struggle To Respond

Manufacturing is behind the curve

- “On a scale of 1 to 100, we are at a 0.0001. It’s why the government is offering us money”
- “Machine shops are still in the dark ages of digitization”
- “Nothing is obvious anymore when compared to pre-cyber security problems”

The threat is significant

- “We need to be successful 100% of the time, but the bad guys only need to be successful once”
- “There are two types of companies - ones that have been hacked and ones that don’t know they have been hacked”
- “Havoc is more easily recognized and responded to but the subtle attacks (e.g., taking over a machine) are what keep people up at night”

Companies underestimate the risks

- “Security isn’t going to pay the bills”
- “The mindset is that it’s always someone else who is going to be hacked”
- “There is a constant optimization problem of where to put the next dollar”
- “You don’t think about back door being unlocked”
- “How many people have seen a password taped to a machine tool?”

We need to act quickly

- “Cyber security is the next arms race”
- “How do we position ourselves for excellence that is survivable?”
- “Government can provide the playground for industry and academia”



Guides for Small Businesses from FTC and NIST



DRAFT NISTIR 7621
Revision 1

Small Business Information Security: The Fundamentals

Celia Paulsen
Patricia Toth

This publication is available free of charge from:
<http://dx.doi.org/10.6028/NIST.IR.XXXX>

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

<https://www.ftc.gov/tips-advice/business-center/guidance/start-security-guide-business>

<http://csrc.nist.gov/publications/PubsNISTIRs.html>

<http://sba.gov/cybersecurity>

DHS Cyber Security Evaluation Tool

The image displays three overlapping windows from the DHS Cyber Security Evaluation Tool (CSET).

Cybersecurity Standard Selection Window: This window allows users to select standards for an assessment. It features a search bar, a list of standards (e.g., NIST Special Publication 800-53, NERC CIP-002), and a "# of Questions" indicator showing 593. The "Type" is set to "Multi-Standard Assessment" and "Sort By" is "Recommended".

Diagram Tool Window: This window provides a visual representation of the system being assessed. It includes a toolbar with options like "Clear", "Templates", "Layers", "Analyze Network", "Diagram Inventory", "Print", "Export as Image", "Import Diagram", "Export Visio", "Import Visio", "Export Marlin", and "Grass". The main area shows a network diagram with various components like "Configuration Server", "DCS", "EWS", "FEP", "Historian", "HMI", "IED", "MTU", "PLC", "RTU", "SIS", "Terminal Server", and "Unidirectional Device".

Dashboard Window: This window provides a quick view of the assessment data. It includes a "Available Results" section with links to "Dashboard", "Ranked Questions", "Overall Ranked Categories", "Standards", "Components", "Summary", "Ranked Categories", "Results by Category", "Component Types", and "Network Warnings". The dashboard also features four charts: "Assessment Compliance" (Overall, Standards, Components), "Top Ranked Categories" (Account Management, Plans, Monitoring & Malware, Access Control, Password, System Protection), "Standards Summary", and "Components Summary".

<https://ics-cert.us-cert.gov/Assessments>
<https://cset.inl.gov/SitePages/Webinar.aspx>

DFARS CUI Webinar

What is NIST SP 800-171 and How Does It Apply to Small Business?

Agenda

- | | |
|---|-----------------------------------|
| • Opening Remarks | Barry Hansen — DHS |
| • The Role of NIST SP 800-171
in National Security | Vicki Michetti, Mary Thomas — DoD |
| • What is NIST SP 800-171? | Ron Ross —NIST |
| • Cyber Security Evaluation
Tool (CSET) | Barry Hansen — DHS |
| • Questions from Audience | Megan Brewster — EOP/OSTP |

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