Cybersecurity Education and Training for the Operational Technology Workforce

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Industrial Control Systems Cybersecurity Workforce

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Automation Federation
ICS & OT Security are Different than IT

<table>
<thead>
<tr>
<th>Information Technology</th>
<th>Operational Technology</th>
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<tbody>
<tr>
<td>Lean towards computer science</td>
<td>Lean towards engineering</td>
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<tr>
<td>Cybersecurity savvy</td>
<td>Safety savvy</td>
</tr>
<tr>
<td>New computer every 3 years</td>
<td>New ICS every 30 years</td>
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<tr>
<td>Patch the system every day</td>
<td>Expect the vendor to patch for them</td>
</tr>
<tr>
<td>Loss of a single client computer is low</td>
<td>Loss of a single controller can be a</td>
</tr>
<tr>
<td>impact event</td>
<td>catastrophic event</td>
</tr>
<tr>
<td>Mostly concerned about Confidentiality</td>
<td>Mostly concerned about Integrity of</td>
</tr>
<tr>
<td>of data (breaches)</td>
<td>data and Availability of systems</td>
</tr>
<tr>
<td>Everything on the Internet</td>
<td>Everything on the Internet</td>
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- OT systems are designed and expected to last decades – IT systems are replaced every few years
- Patching the control systems in a running factory or electrical grid isn’t easy
Obtaining IT Skillz

• In the IT training environment, there is a tendency by some to collect as many certifications as possible (GICSP, CISSP, CISM, CISA, CeH…)
• Employee expected to ‘come to the table’ with certifications already in hand
• Standards make the certifications relevant and transportable
• Utilize virtualized systems and equipment
How about ICS / OT Skillz?

• In the OT training environment, it seems that “on the job” training – followed by very specialized vendor training is the norm

• Your company pays for training only on the systems that you need rather than relying on industry wide certifications

• Proprietary, vendor specific systems impede common certification development, although certifications exist from organizations such as ISA (CAP, CCST)

• Require hands on equipment in industrial setting
Cybersecurity is a never ending process

- In the United States, the National Institute of Standards and Technology (NIST) created the Cybersecurity Framework
- This does a good job of defining the process to establish a cybersecurity program
Automation Competency Model (ACM)

- Defines the competencies – knowledge, skills and abilities required in automation
- Moving up in the model indicates more industry specific skills, not necessarily higher level of skill

www.careeronestop.org/competencymodel/competency-models/automation.aspx
### Apprenticeship as a model

#### Core Components of Registered Apprenticeship

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Employer Involvement Is Integral</strong></td>
<td>Employer is the foundation for the RA program and must be directly involved and provider of OJT</td>
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<tr>
<td><strong>Structured On-the-Job Learning with Mentoring</strong></td>
<td>Minimum of 2,000 hours Structured and Supervised</td>
</tr>
<tr>
<td><strong>Related Training and Instruction</strong></td>
<td>144 hours recommended per year Parallel</td>
</tr>
<tr>
<td><strong>Rewards for Skill Gains</strong></td>
<td>Increases in skills brings about increases in earnings</td>
</tr>
<tr>
<td><strong>National Occupational Credential</strong></td>
<td>Nationally recognized credential showing job proficiency. Sponsor certifies individual is fully competent for career</td>
</tr>
</tbody>
</table>
Apprenticeship concept in ICS / OT

• If you look at OT training – the concept of “hands on” training consistently shows up

• Other skills areas and trades, such as electricians, go through a series of education and hands on training through a progression of apprenticeship, journeyman and master craftsman

• The United Kingdom (UK) and other countries are actively promoting cybersecurity apprenticeship programs

• In general the United States has fewer trades that use apprenticeships than other countries – for example a Journeyman Instrument Technician
This is a global issue - Get Involved!

- Automation Federation, and our member organizations such as ISA and SANS – are working with global government departments and agencies – in countries such as the United States, Japan, Germany, Sweden and others
Thank You!

Follow the ICS discussion and get involved!

Twitter or LinkedIn

@ics_marty
Q & A
Steve Mustard
CEO
National Automation, Inc.
Existing resources – ISA/IEC62443 certificates
Existing resources - CMCP

- Mission Critical Operations Concepts
- Mission Critical Standards
- Mission Critical Technology
- Operations
- Safety and Physical Security
- Risk Management
- Emergency Response
OT Cybersecurity within other certifications
Q & A
Thank You for Joining Us!

Upcoming Webinar:
State Governments Pursuing New Tactics in the War for a Skilled Cybersecurity Workforce

When:
Wednesday, July 18, 2018 at 2:00pm – 3:00pm ET

Register:

nist.gov/nice/webinars