Internet of Things: Preparing the Future Technical Workforce
IoT Coordination Network: Overview

- Includes representatives of industry, manufacturers, academia, and users of integrated smart devices.

- The network plans to complete research projects on IoT products, technologies, standards, and applications that will help to inform decisions about how to optimally develop IoT programs at community colleges.

- The network also intends to include experts on protecting the users and environments that are affected by the application of IoT devices.

- The network will convene regularly to examine emerging technologies, explore new products and devices, and provide guidance to educators preparing the next generation of IoT technicians.
IoT Coordination Network: Research Data

- Define work roles (WR)
- Identify technician WR
- Student competencies
- Program outcomes with majors, certificates, and courses
Business Members

IoT Coordination Network: Business Members

- Verizon
- EMC
- Argonne National Labs
- Dell SecureWorks
- Cisco Systems
- TRUMPF Group
- NIST NICE
- VMware
- Amazon Web Services (AWS)
- Palos Health
- Espo Systems
- Arduino
- National Security Agency (NSA)
- Hewlett Packard Enterprise, Americas IoT Innovation Lab in Houston
- Luminary Labs
- Marriott
- Ramsac
- Digital Manufacturing & Design Innovation Institute MxD
- Heartland Science and Technology Group
- Northrop Grumman
- McDonald’s Corporation
- City of Chicago, Cook County Emergency Management
- Network Development Group (NDG)
- Center for Occupational Research and Development
- CBT Technology Inc
-Gradientts
- Bayer Agriculture
- City of Houston, Port Services
- Advocate Healthcare Systems
- Delta Airlines
- Information Trust Institute
- CompTIA
- Chicago Transit Authority (CTA)
- Meraki
- Department of Education
- SANS Institute
- CitiBank
- Discover
- Critical Infrastructure Resilience Institute at the University of Illinois
- WASTC
- Lockheed Martin
- Ford Motor Company
Leveraged and partnered with Cisco and The Gartner Group to focus on the technical workforce.
## Targeted Work Roles

<table>
<thead>
<tr>
<th>Sub-Family</th>
<th>Description</th>
<th>Typical Entry-Level Job Categories</th>
</tr>
</thead>
</table>
| **Field Service** | Responsible for the physical management of assets/devices, including installation, maintenance and retirement. Roles may be with the device vendor under product/customer support or may be in-house under OT. These roles may be handled by the vendor or a third party (e.g., Philips) if they are managing the IoT devices. | Device Installer  
Field Service Engineer/Representative/Technician |
| **Device Administration** | Responsible for the logical management of assets/devices, including software updates, communications management, monitoring, diagnostics, configuration and security. Roles may fall under IT or under LoB/OT. Roles may also manage the transfer and structure of data from devices. Depends on the organization. These roles may be handled by the vendor or a third party (e.g., GE) if they are managing the IoT platform. | Device Administrator  
(Note: May be handled by Systems Administration or Network Administration under IT.) |

<table>
<thead>
<tr>
<th>Sub-Family</th>
<th>Typical Entry-Level Job Categories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field Service</strong></td>
<td><strong>Device Installer</strong></td>
<td>Performs on-site activities related to installation and calibration of devices (as required for device). Likely to be done by a team focused on initial installation or upgrade over a short period of time.</td>
</tr>
<tr>
<td><strong>Field Service</strong></td>
<td><strong>Field Service Engineer/Representative/Technician</strong></td>
<td>Performs on-site activities related to maintenance, break/fix, troubleshooting and removal of devices. Expected to be lower touch as devices will be administered remotely.</td>
</tr>
<tr>
<td><strong>Device Administration</strong></td>
<td><strong>Device Administrator</strong></td>
<td>Performs remote activities related to installation, provisioning, operation, monitoring and maintenance of devices and related software. While the scale of these activities may be quite dramatic, this is expected to be highly automated (e.g., issue an update command on a group of devices). Selected due to its closeness with network administration role.</td>
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</tbody>
</table>
## Identify Workforce Competencies for Technicians

### IoT Technical Work Roles

<table>
<thead>
<tr>
<th>Field Service Technician</th>
<th>Device Manager</th>
<th>Junior Data Scientist</th>
<th>Data Management Analyst</th>
<th>Data Quality Analyst</th>
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</thead>
<tbody>
<tr>
<td>Academic Requirements</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Associate’s Degree</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Bachelor’s Degree</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Certifications</td>
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<tr>
<td>Proficiency Requirements</td>
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<tr>
<td>Skills</td>
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<tr>
<td>Technical</td>
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<tr>
<td>Analytics</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Applications</td>
<td>✔</td>
<td>✓</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Device Management</td>
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<tr>
<td>Integration and Connectivity</td>
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<tr>
<td>Network Management</td>
<td>✔</td>
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<td>✔</td>
<td></td>
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<tr>
<td>Security and Privacy</td>
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<tr>
<td>User Product/Experience</td>
<td>✔</td>
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<tr>
<td>Business Context</td>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✔</td>
</tr>
<tr>
<td>Communications</td>
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<td>✓</td>
<td>✓</td>
<td>✔</td>
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<tr>
<td>Critical Thinking</td>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✔</td>
</tr>
<tr>
<td>Social Interaction</td>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✔</td>
</tr>
<tr>
<td>Teamwork/Collaboration</td>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✔</td>
</tr>
<tr>
<td>Vertical Understanding</td>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✔</td>
</tr>
</tbody>
</table>
Teaching IoT Technologies

- College Curriculum
- IoT Educators Academy
- IoT Educational Resources
IoT Fundamentals Course

- Designed as an introductory course with no prerequisites
- **Multidisciplinary**: electronics & programming
- Project-based learning
- Focuses on designing **embedded systems**
- Maps to **Arduino Fundamentals Certificate**
- Future courses will focus on **IoT connectivity**
Arduino Certification Program
IoT Educators Academy

- Faculty development for faculty interested in learning more about electronics and embedded systems who want to introduce IoT concepts into their curriculum

- **Basic Electronics for IoT**
  - For faculty who either do not have an electronics background or need a refresher.

- **IoT Fundamentals**
  - Same content as our credit course and offers faculty a student perspective as well as resources that will assist them to include concepts into their curriculum.

- All material is freely shared with participants via Canvas.
Additional IoT Curriculum

- **IoT Workbook** that exposes students to real-world problems and solutions.
- Problem-based learning that uses scaffolding to expose students to a variety of embedded systems utilizing sensors, actuators, and programming using Tinkercad.
- **Tinkercad** is used to make exercises more accessible.
- **Multidisciplinary** workbook that can supplement course work in a variety of subject matters.
Questions or Comments?

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