**Internet of Things Occupations**

**Labor Market Information Report**

**City College of San Francisco**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

September 2020

# Recommendation

Based on all available data, there appears to be an undersupply of Internet of Things workers compared to the demand for this cluster of occupations in the Bay region and in the Mid-Peninsula sub-region (San Francisco and San Mateo Counties). There is a projected annual gap of about 2,471 students in the Bay region and 1,267 students in the Mid-Peninsula Sub-Region.

This report also provides student outcomes data on employment and earnings for TOP 0708.10-Computer Networking programs in the state and region. It is recommended that these data be reviewed to better understand how outcomes for students taking courses on this TOP code compare to potentially similar programs at colleges in the state and region, as well as to outcomes across all CTE programs at City College of San Francisco (CCSF) and in the region.

# Introduction

This report profiles Internet of Things Occupations in the 12 county Bay region and in the Mid-Peninsula sub-region for a proposed new program at City College of San Francisco.

|  |
| --- |
| * **Computer Network Support Specialists (15-1152 / 15-1231):** Analyze, test, troubleshoot, and evaluate existing network systems, such as local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Perform network maintenance to ensure networks operate correctly with minimal interruption. Excludes “Network and Computer Systems Administrators” (15-1142) and “Computer Network Architects” (15-1143). |
| Entry-Level Educational Requirement: Associate's degree |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 41% |
|  |
| * **Web Developers / Web Developers and Digital Interface Designers (15-1134 / 15-1257):** Design, create, and modify Web sites. Analyze user needs to implement Web site content, graphics, performance, and capacity. May integrate Web sites with other computer applications. May convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content. Excludes “Multimedia Artists and Animators” (27-1014). |
| Entry-Level Educational Requirement: Associate's *degree* |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 25*%* |
|  |
| * **Network and Computer Systems Administrators (15-1142 / 15-1244):** Install, configure, and support an organization’s local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability. May monitor and test Web site performance to ensure Web sites operate correctly and without interruption. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. May supervise computer user support specialists and computer network support specialists. May administer network security measures. Excludes “Information Security Analysts”(15-1122), “Computer User Support Specialists” (15-1151), and “Computer Network Support Specialists” (15-1152). |
| Entry-Level Educational Requirement: Bachelor's degree |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 38% |
|  |

**Occupational Demand**

**Table 1. Employment Outlook for Internet of Things Occupations in Bay Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation | 2019 Jobs | 2024 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 25% Hourly Wage | Median Hourly Wage |
| Computer Network Support Specialists | 6,417 | 7,464 | 1,048 | 16% | 3,896 | 779 | $29.20 | $39.11 |
| Web Developers / Web Developers and Digital Interface Designers | 11,305 | 13,309 | 2,004 | 18% | 6,679 | 1,336 | $29.02 | $45.01 |
| Network and Computer Systems Administrators | 12,699 | 14,417 | 1,718 | 14% | 6,483 | 1,297 | $38.45 | $49.94 |
| **TOTAL** | **30,420** | **35,190** | **4,770** | **16%** | **17,059** | **3,412** | **$32.99** | **$45.82** |

*Source: EMSI 2020.3*

**Bay Region includes:** Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano and Sonoma Counties

**Table 2. Employment Outlook for Internet of Things Occupations in Mid-Peninsula Sub-Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation | 2019 Jobs | 2024 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 25% Hourly Wage | Median Hourly Wage |
| Computer Network Support Specialists | 2,232 | 2,787 | 555 | 25% | 1,582 | 316 | $32.59 | $42.31 |
| Web Developers / Web Developers and Digital Interface Designers | 4,980 | 6,052 | 1,073 | 22% | 3,167 | 633 | $33.76 | $52.38 |
| Network and Computer Systems Administrators | 4,341 | 5,270 | 929 | 21% | 2,612 | 522 | $40.78 | $51.55 |
| **TOTAL** | **11,553** | **14,109** | **2,556** | **22%** | **7,362** | **1,472** | **$36.17** | **$50.12** |

*Source: EMSI 2020.3*

**Mid-Peninsula Sub-Region includes:** San Francisco and San Mateo Counties

### Job Postings in Bay Region and Mid-Peninsula Sub-Region

**Table 3. Number of Job Postings by Occupation for latest 12 months (Sept 2019 - Aug 2020)**

| Occupation | Bay Region | Mid-Peninsula Sub-Region |
| --- | --- | --- |
| Web Developers | 25,314 | 7,531 |
| Network and Computer Systems Administrators | 6,677 | 1,503 |
| Computer Network Support Specialists | 1,115 | 321 |
| **TOTAL** | **33,106** | **9,355** |

*Source: Burning Glass*

**Table 4a. Top Job Titles for Internet of Things Occupations for latest 12 months (Sept 2019 - Aug 2020) Bay Region**

|  |  |  |  |
| --- | --- | --- | --- |
| Common Title | Bay | Common Title | Bay |
| User Experience (UX) Designer | 2,083 | User Interface (UI) Designer | 472 |
| User Interface (UI) Developer | 1,920 | Engineer, Information And Technology Industry | 450 |
| Front End Developer | 1,710 | Senior Engineer, Information And Technology Industry | 434 |
| Web Developer | 1,452 | Ux Researcher | 430 |
| Systems Administrator | 1,426 | Java Developer | 395 |
| User Interface (UX)/User Experience (UX) Designer | 951 | Engineer | 385 |
| Software Development Engineer | 912 | Linux Administrator | 341 |
| Front End Engineer | 757 | PHP Developer | 316 |
| Senior Front End Engineer | 734 | Developer | 295 |
| Backend Engineer | 629 | Linux Systems Administrator | 284 |
| Senior Backend Engineer | 614 | Senior Systems Administrator | 281 |
| Senior Engineer | 613 | Ruby on Rails Developer | 280 |
| Front End Engineer, Information And Technology Industry | 602 | Network Administrator | 273 |
| Senior Front End Engineer, Information And Technology Industry | 487 | Web Engineer | 262 |

**Table 4b. Top Job Titles for Internet of Things Occupations for latest 12 months (Sept 2019 - Aug 2020) Mid-Peninsula Sub-Region**

|  |  |  |  |
| --- | --- | --- | --- |
| Common Title | Mid-Peninsula | Common Title | Mid-Peninsula |
| User Experience (UX) Designer | 722 | Developer | 98 |
| Front End Developer | 452 | User Interface (UI) Designer | 96 |
| User Interface (UI) Developer | 451 | Frontend Engineer | 93 |
| Web Developer | 368 | Head | 83 |
| Software Development Engineer | 355 | Ruby on Rails Developer | 75 |
| Systems Administrator | 328 | Customer Engineer | 75 |
| User Interface (UX)/User Experience (UX) Designer | 299 | Web Engineer | 74 |
| Senior Engineer | 286 | Senior Ux Researcher | 72 |
| Senior Front End Engineer | 208 | Information Technology Administrator | 72 |
| Senior Backend Engineer | 197 | Senior Developer | 68 |
| Front End Engineer | 197 | Senior Researcher | 64 |
| Backend Engineer | 175 | Senior Back End Engineer | 63 |
| Ux Researcher | 144 | Web Analyst | 62 |
| Engineer | 98 | Javascript Developer | 62 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Internet of Things Workers in Bay Region**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Industry – 6 Digit NAICS (No. American Industry Classification) Codes | Jobs in Industry (2019) | Jobs in Industry (2024) | % Change (2019-24) | % Occupation Group in Industry (2019) |
| Custom Computer Programming Services (541511) | 5,776 | 7,059 | 22% | 19% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 3,329 | 4,268 | 28% | 11% |
| Computer Systems Design Services (541512) | 3,255 | 3,810 | 17% | 11% |
| Software Publishers (511210) | 2,141 | 2,743 | 28% | 7% |
| Data Processing, Hosting, and Related Services (518210) | 1,407 | 2,017 | 43% | 5% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 1,063 | 1,092 | 3% | 3% |
| Other Computer Related Services (541519) | 858 | 1,073 | 25% | 3% |
| Electronic Computer Manufacturing (334111) | 761 | 802 | 5% | 3% |
| Local Government, Excluding Education and Hospitals (903999) | 568 | 588 | 4% | 2% |
| Colleges, Universities, and Professional Schools (State Government) (902612) | 522 | 547 | 5% | 2% |
| Colleges, Universities, and Professional Schools (611310) | 435 | 482 | 11% | 1% |
| Wired Telecommunications Carriers (517311) | 402 | 352 | -12% | 1% |

*Source: EMSI 2020.3*

**Table 6. Top Employers Posting Internet of Things Occupations in Bay Region and Mid-Peninsula Sub-Region (Sept 2019 - Aug 2020)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | Mid-Peninsula |
| Amazon | 377 | Infoobjects Inc | 64 | Wells Fargo | 101 |
| Apple Inc. | 223 | Intelliswift Software | 61 | Amazon | 97 |
| Vmware Incorporated | 209 | Salesforce | 60 | Salesforce | 60 |
| Wells Fargo | 188 | Splunk | 58 | Accenture | 41 |
| Cisco Systems Incorporated | 138 | Intuit | 58 | Infobahn Softworld Inc | 36 |
| Google Inc. | 130 | Osi Engineering, Inc | 56 | Autodesk Incorporated | 36 |
| Anthem Blue Cross | 125 | Nsys Design Systems | 54 | Anthem Blue Cross | 31 |
| Facebook | 115 | Wipro | 52 | Splunk | 30 |
| Infobahn Softworld Inc | 110 | Primus Global Services Inc | 52 | Jefferson Frank | 30 |
| Paypal | 105 | Lockheed Martin Corp | 52 | Coinbase | 30 |
| Oracle | 97 | Ascent Technology Services | 51 | Cisco Systems Inc | 30 |
| Xoriant Incorporated | 88 | Tesla | 50 | NTT Data | 27 |
| IBM | 88 | Tranzeal, Inc | 49 | Kraken Bitcoin Exchange | 27 |
| NTT Data | 87 | Pacific Gas and Electric Co | 48 | Adobe Systems | 27 |
| Accenture | 81 | Microsoft Corporation | 48 | Pacific Gas and Electric Co | 26 |
| Osi Engineering | 78 | JP Morgan Chase Company | 48 | Osi Engineering | 26 |
| Bayone Solutions | 75 | Idc Technologies | 47 | Bayone Solutions | 25 |

*Source: Burning Glass*

**Educational Supply**

There are 28 community colleges in the Bay Region issuing 801 awards on average annually (last 3 years ending 2018-19) on TOP 0708.10-Computer Networking. There are four colleges in the Mid-Peninsula Sub-Region issuing 178 awards on average annually (last 3 years) on this TOP code.

There are five (5) Other Educational Institutions in the Bay Region issuing 53 awards on average annually (last 3 years ending 2016-17) on TOP 0708.10-Computer Networking. There are two (2) Other Educational Institutions in the Mid-Peninsula Sub-Region issuing five (5) awards on average annually (last 3 years) on this TOP code.

There are four (4) Institutions in the Bay Region issuing 87 Bachelor’s degrees on average annually (last 3 years ending 2016-17) on TOP 0708.10-Computer Networking. There is one Institution in the Mid-Peninsula Sub-Region issuing 22 Bachelor’s degrees on average annually (last 3 years) on this TOP code.

**Table 7a. Community College Awards on TOP 0708.10-Computer Networking in Bay Region**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| College | Sub-Region | Associates | Certificate Low Unit | Noncredit | Total |
| Alameda | East Bay |  | 3 |  | 3 |
| Berkeley City | East Bay | 5 | 7 |  | 12 |
| Cabrillo | SC - Monterey | 19 | 32 |  | 51 |
| Canada | Mid-Peninsula | 7 | 13 |  | 20 |
| Chabot | East Bay | 16 | 29 |  | 45 |
| Contra Costa | East Bay |  | 6 |  | 6 |
| De Anza | Silicon Valley | 29 | 49 |  | 78 |
| Diablo Valley | East Bay | 14 | 36 |  | 50 |
| Evergreen Valley | Silicon Valley | 24 | 5 |  | 29 |
| Foothill | Silicon Valley | 26 | 15 | 48 | 89 |
| Gavilan | Silicon Valley | 6 | 3 |  | 9 |
| Hartnell | SC - Monterey |  | 6 |  | 6 |
| Laney | East Bay | 16 | 6 |  | 22 |
| Las Positas | East Bay |  | 8 | 1 | 9 |
| Los Medanos | East Bay | 16 | 9 |  | 25 |
| Marin | North Bay |  | 4 |  | 4 |
| Merritt | East Bay | 10 | 3 |  | 13 |
| Mission | Silicon Valley | 16 | 9 |  | 25 |
| Monterey | SC - Monterey | 6 | 5 |  | 11 |
| Napa | North Bay | 5 | 6 |  | 11 |
| Ohlone | East Bay | 5 | 40 |  | 45 |
| San Francisco | Mid-Peninsula | 7 | 15 |  | 22 |
| San Francisco Ctrs | Mid-Peninsula |  |  | 17 | 17 |
| San Jose City | Silicon Valley | 11 | 13 |  | 24 |
| San Mateo | Mid-Peninsula | 28 | 63 |  | 91 |
| Santa Rosa | North Bay |  | 35 |  | 35 |
| Skyline | Mid-Peninsula | 12 | 16 |  | 28 |
| Solano | North Bay | 11 | 9 |  | 20 |
| West Valley | Silicon Valley |  | 1 |  | 1 |
| **Total Bay Region** | | **289** | **446** | **66** | **801** |
| **Total Mid-Peninsula Sub-Region** | | **54** | **107** | **17** | **178** |

Source: Data Mart

Note: The annual average for awards is 2016-17 to 2018-19.

**Table 7b. Other Educational Institutions Awards on TOP 0708.10-Computer Networking in Bay Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| College | Sub-Region | | Associate Degree | | Award < 1 academic yr. | | Total | |
| Academy of Art University | Mid-Peninsula | | 4 | |  | | 4 | |
| Golden Gate University-San Francisco | Mid-Peninsula | |  | | 1 | | 1 | |
| ITT Technical Institute-Concord | East Bay | | 6 | |  | | 6 | |
| ITT Technical Institute-Oakland | East Bay | | 4 | |  | | 4 | |
| Unitek College | East Bay | |  | | 38 | | 38 | |
| **Total Bay Region** | | **14** | | **39** | | **53** | |
| **Total Mid-Peninsula Sub-Region** | | **4** | | **1** | | **5** | |

Source: Data Mart

Note: The annual average for awards is 2014-15 to 2016-17.

**Table 7c. Bachelor’s Degree Awards on TOP 0708.10-Computer Networking in Bay Region**

|  |  |  |
| --- | --- | --- |
| College | Sub-Region | Bachelor’s Degree |
| Academy of Art University | Mid-Peninsula | 22 |
| Cogswell College | Silicon Valley | 3 |
| ITT Technical Institute-Concord | East Bay | 7 |
| University of California-Santa Cruz | SC - Monterey | 55 |
| **Total Bay Region** | | **87** |
| **Total Mid-Peninsula Sub-Region** | | **22** |

Source: Data Mart

Note: The annual average for awards is 2014-15 to 2016-17.

**Gap Analysis**

Based on the data included in this report, there is a large labor market gap in the Bay region with 3,412 annual openings for the Internet of Things occupational cluster and 941 annual (3-year average) awards for an annual undersupply of 2,471 students. In the Mid-Peninsula Sub-Region, there is also a gap with 1,472 annual openings and 205 annual (3-year average) awards for an annual undersupply of 1,267 students.

**Student Outcomes**

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0708.10-Computer Networking**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **2017-18** | **Bay**  All CTE Programs | **CCSF**  All CTE Programs | **State** 0708.10 | **Bay** 0708.10 | **Mid-Peninsula** 0708.10 | **CCSF** 0708.10 |
| % Employed Four Quarters After Exit | 74% | 66% | 69% | 66% | 64% | 63% |
| Median Quarterly Earnings Two Quarters After Exit | $10,550 | $12,765 | $11,960 | $13,468 | $14,845 | $14,845 |
| Median % Change in Earnings | 46% | 25% | 22% | 25% | 31% | 32% |
| % of Students Earning a Living Wage | 63% | 46% | 66% | 58% | 54% | 54% |

*Source: Launchboard Pipeline (version available on (9/15/20)*

# Skills, Certifications and Education

**Table 9. Top Skills for Internet of Things Occupations in Bay Region (Sept 2019 - Aug 2020)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Skill** | **Postings** | **Skill** | **Postings** | **Skill** | **Postings** |
| JavaScript | 12,054 | HTML5 | 3,629 | User Interface (UI) Design | 2,376 |
| Java | 6,811 | Linux | 3,478 | UX Wireframes | 2,352 |
| React Javascript | 6,175 | MySQL | 3,308 | Content Management Systems (CMS) | 2,207 |
| Software Engineering | 5,962 | Unit Testing | 3,179 | User Research | 2,189 |
| Front-end Development | 5,714 | System Administration | 3,023 | Version Control | 2,163 |
| Python | 5,392 | Scalability Design | 2,994 | Node.js | 2,155 |
| Web Development | 5,094 | Cross-browser | 2,861 | Drupal | 2,145 |
| SQL | 4,920 | Adobe Indesign | 2,845 | jQuery | 2,142 |
| AngularJS | 4,017 | Hypertext Preprocessor (PHP) | 2,817 | Docker Software | 2,116 |
| Git | 4,011 | Adobe Illustrator | 2,780 | Project Management | 2,115 |
| Web Application Development | 3,939 | Adobe Acrobat | 2,708 | Product Management | 2,054 |
| Ruby | 3,878 | Adobe Creative Suite | 2,695 | Google Analytics | 2,017 |
| Adobe Photoshop | 3,796 | PostgreSQL | 2,691 | Microsoft C# | 1,989 |
| Ruby on Rails | 3,756 | CSS | 2,644 | Prototyping | 1,976 |
| Software Development | 3,636 | ECMAScript 2015 (ES2015 / ES6) | 2,425 | Django | 1,844 |

*Source: Burning Glass*

**Table 10. Certifications for Internet of Things Occupations in Bay Region (Sept 2019 - Aug 2020)**

Note: 94% of records have been excluded because they do not include a certification. As a result, the chart below may not be representative of the full sample.

|  |  |  |  |
| --- | --- | --- | --- |
| **Certification** | **Postings** | **Certification** | **Postings** |
| Cisco Certified Network Associate (CCNA) | 317 | Vmware Certified Professional (VCP) | 75 |
| IT Infrastructure Library (ITIL) Certification | 316 | Red Hat Certified Engineer (RHCE) | 68 |
| Security Clearance | 301 | Microsoft Certified Professional (MCP) | 63 |
| Driver's License | 288 | SANS/GIAC Certification | 50 |
| CompTIA Security+ | 230 | Mbe Certified | 43 |
| Microsoft Certified Solutions Expert (MCSE) | 210 | Certified Novell Administrator | 42 |
| Microsoft Certified Solutions Associate (MCSA) | 205 | Microsoft Certified Systems Administrator (Legacy) | 41 |
| Cisco Certified Network Professional (CCNP) | 158 | Red Hat Certified System Adminstrator (RHCSA) | 39 |
| Certified A+ Technician | 94 | Project Management Professional (PMP) | 39 |
| CompTIA Network+ | 87 | Systems Security Certified Practitioner (SSCP) | 32 |
| Certified Information Systems Security Professional (CISSP) | 84 | Linux Professional Institute Certification | 31 |
| Project Management Certification | 76 | GIAC Security Essentials Certification | 31 |

*Source: Burning Glass*

**Table 11. Education Requirements for Internet of Things Occupations in Bay Region**

|  |  |  |
| --- | --- | --- |
| **Education (minimum advertised)** | **Latest 12 Mos. Postings** | **Percent 12 Mos. Postings** |
| High school or vocational training | 560 | 3% |
| Associate Degree | 263 | 2% |
| Bachelor’s Degree or Higher | 15,262 | 95% |

*Source: Burning Glass*

# Methodology

Occupations for this report were identified by use of skills listed in O\*Net descriptions and job descriptions in Burning Glass. Labor demand data is sourced from Economic Modeling Specialists International (EMSI) occupation data and Burning Glass job postings data. Educational supply and student outcomes data is retrieved from multiple sources, including CTE Launchboard and CCCCO Data Mart.

# Sources

O\*Net Online

Labor Insight/Jobs (Burning Glass)

Economic Modeling Specialists International (EMSI)

CTE LaunchBoard [www.calpassplus.org/Launchboard/](http://www.calpassplus.org/Launchboard/)

Statewide CTE Outcomes Survey

Employment Development Department Unemployment Insurance Dataset

Living Insight Center for Community Economic Development

Chancellor’s Office MIS system

# Contacts

For more information, please contact:

* Doreen O’Donovan, Research Analyst, for Bay Area Community College Consortium (BACCC) and Centers of Excellence (CoE), [doreen@baccc.net](mailto:doreen@baccc.net) or (831) 479-6481
* John Carrese, Director, San Francisco Bay Center of Excellence for Labor Market Research, [jcarrese@ccsf.edu](mailto:jcarrese@ccsf.edu) or (415) 267-6544