** DevOps & QA Occupations**

**Labor Market Information Report**

**City College of San Francisco**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

November 2020

# Recommendation

Based on all available data, there appears to be an undersupply of DevOps & QA 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 3,405 students in the Bay Region and 1,561 students in the Mid-Peninsula Sub-Region.

**Introduction**

This report provides student outcomes data on employment and earnings for TOP 0707.10-Computer Programming 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 and in the region.

This report profiles DevOps & QA Occupations in the 12 county Bay Region and in the Mid-Peninsula Sub-Region for a program modification of the “Build Automation for DevOps & QA” certificate for City College of San Francisco.

Labor market information (LMI) is not available at the eight-digit SOC Code level for Software Quality Assurance Engineers and Testers (15-1199.01), therefore, the data shown in Tables 1 and 2 is for Computer Occupations, All Other (at the six digit SOC level) and likely overstates demand for Software Quality Assurance Engineers and Testers. Tables 3, 4, 6, 9, 10 and 11 use job postings data from Burning Glass at the eight-digit SOC Code level for Software Quality Assurance Engineers and Testers (15-1199.01).

|  |
| --- |
| * **Computer Occupations, All Other (15-1299 /43-9011):** All computer occupations not listed separately. Excludes “Computer and Information Systems Managers” (11-3021), “Computer Hardware Engineers” (17-2061), “Electrical and Electronics Engineers” (17-2070), “Computer Science Teachers, Postsecondary” (25-1021), “Multimedia Artists and Animators” (27-1014), “Graphic Designers” (27-1024), “Computer Operators” (43-9011), and “Computer, Automated Teller, and Office Machine Repairs” (49-2011).
 |
| Entry-Level Educational Requirement: Bachelor's degree |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 35% |
|  |

**Occupational Demand**

**Table 1. Employment Outlook for DevOps & QA 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 Occupations, All Other |  38,974  |  42,324  | 3,350 | 9% |  19,456  |  3,891  | $41.02 | $56.51 |

*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 DevOps & QA 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 Occupations, All Other |  14,636  |  16,648  | 2,012 | 14% |  8,174  |  1,635  | $42.37 | $56.67 |

*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 (October 2019 - September 2020)**

| **Occupation** | **Bay Region** | **Mid-Peninsula Sub-Region** |
| --- | --- | --- |
| Software Quality Assurance Engineers and Testers | 11,324 | 3,630 |

*Source: Burning Glass*

**Table 4a. Top Job Titles for DevOps & QA Occupations for latest 12 months (October 2019 - September 2020) Bay Region**

|  |  |  |  |
| --- | --- | --- | --- |
| **Common Title** | **Bay** | **Common Title** | **Bay** |
| Quality Assurance Engineer | 582 | Quality Assurance Automation Engineer | 65 |
| Quality Assurance Analyst | 210 | Systems Test Engineer | 64 |
| Quality Assurance Lead | 179 | Automation Test Engineer | 63 |
| Test Engineer | 169 | Quality Engineer | 62 |
| Test Automation Engineer | 145 | Quality Assurance Engineer III | 62 |
| Quality Assurance Tester | 122 | Senior Software Test Engineer | 61 |
| Software Test Engineer | 116 | Mobile Tester | 60 |
| Senior Test Engineer | 115 | Oracle EBS Tester | 52 |
| Software Engineer In Test | 101 | Senior Software Quality Assurance Engineer | 51 |
| Quality Assurance | 98 | Assurance Senior | 51 |
| Performance Tester | 80 | Quality Assurance Automation | 49 |
| Software Quality Assurance Engineer | 74 | Network Test Engineer | 47 |
| Automation Tester | 73 | Senior Test Automation Engineer | 43 |
| Senior Quality Assurance Engineer | 70 | Quality Assurance Test Engineer | 42 |

**Table 4b. Top Job Titles for DevOps & QA Occupations for latest 12 months (October 2019 - September 2020) Mid-Peninsula Sub-Region**

|  |  |  |  |
| --- | --- | --- | --- |
| **Common Title** | **Mid-Peninsula** | **Common Title** | **Mid-Peninsula** |
| Quality Assurance Engineer | 207 | Software Quality Assurance Engineer | 21 |
| Quality Assurance Analyst | 102 | Senior Quality Assurance Engineer | 20 |
| Quality Assurance Lead | 87 | Test Engineer | 19 |
| Quality Assurance Tester | 52 | Automation Test Engineer | 19 |
| Software Engineer In Test | 48 | Senior Software Engineer In Test | 18 |
| Test Automation Engineer | 47 | Quality Assurance Automation Engineer | 17 |
| Oracle EBS Tester | 41 | Automation Tester | 16 |
| Software Test Engineer | 34 | Salesforce Quality Assurance | 15 |
| Quality Engineer | 33 | Performance Tester | 15 |
| Quality Assurance | 29 | Lead Quality Assurance Engineer | 15 |
| Automation Quality Assurance | 25 | Senior Software Test Engineer | 14 |
| Mobile Tester | 24 | Mobile Automation Tester | 14 |
| Senior Test Engineer | 23 | Assurance Senior | 14 |
| Quality Assurance Automation | 22 | Systems Test Engineer | 13 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring DevOps & QA 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 | 8,108 |  9,105  | 12% | 21% |
| Computer Systems Design Services | 4,635 |  4,986  | 8% | 12% |
| Software Publishers | 2,636 |  3,137  | 19% | 7% |
| Federal Government, Civilian, Excluding Postal Service | 2,441 |  2,428  | -1% | 6% |
| Internet Publishing and Broadcasting and Web Search Portals | 2,358 |  2,811  | 19% | 6% |
| Data Processing, Hosting, and Related Services | 1,867 |  2,187  | 17% | 5% |
| Corporate, Subsidiary, and Regional Managing Offices | 1,389 |  1,312  | -6% | 3% |
| Other Computer Related Services | 1,166 |  1,369  | 17% | 3% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) | 654 |  695  | 6% | 2% |
| Administrative Management and General Management Consulting Services | 506 |  596  | 18% | 1% |
| Local Government, Excluding Education and Hospitals | 474 |  478  | 1% | 1% |
| Colleges, Universities, and Professional Schools (State Government) | 465 |  475  | 2% | 1% |
| Electronic Computer Manufacturing | 451 |  478  | 6% | 1% |
| Colleges, Universities, and Professional Schools | 435 |  465  | 7% | 1% |
| Temporary Help Services | 435 |  429  | -1% | 1% |
| Research and Development in Biotechnology (except Nanobiotechnology) | 406 |  490  | 21% | 1% |

*Source: EMSI 2020.3*

**Table 6. Top Employers Posting DevOps & QA Occupations in Bay Region and Mid-Peninsula Sub-Region (October 2019 - September 2020)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Employer** | **Bay** | **Employer** | **Bay** | **Employer** | **Mid-Peninsula** |
| Apple Inc. | 257 | E2F | 26 | Amazon | 45 |
| Amazon | 121 | Avesta Computer Services | 26 | Wells Fargo | 31 |
| Cisco Systems Inc. | 89 | Ascent Technology Services | 26 | Facebook | 26 |
| Infosys | 73 | NTT Data | 25 | Visa | 23 |
| Wipro | 60 | Commscope | 25 | Infosys | 21 |
| Wells Fargo | 47 | Workday Inc. | 24 | Tests Assured | 18 |
| Virtusa | 46 | Vimerse Infotech Inc. | 24 | Infobahn Softworld  | 17 |
| Xoriant Inc. | 43 | Resource Logistics Inc. | 24 | Cisco Systems Inc. | 17 |
| Infobahn Softworld Inc. | 39 | Visa | 23 | Activision | 16 |
| Tesla | 37 | Infoobjects Inc. | 23 | Natera Inc. | 14 |
| Thermo Fisher Scientific Inc. | 31 | Splunk | 22 | Johnson & Johnson | 13 |
| Osi Engineering | 29 | Mumba Technologies | 22 | Thermo Fisher Scientific Inc. | 12 |
| Moss Adams LLP | 29 | Lockheed Martin Corporation | 22 | Telecoms.com | 12 |
| Tranzeal Inc. | 28 | Cystems Logic | 22 | Sony Electronics Inc. | 12 |
| Telecoms.com | 28 | Cloudious LLC | 22 | Ringcentral Inc. | 12 |
| VMware Inc. | 26 | Virtusa Corporation | 21 | Capgemini | 12 |
| Facebook | 26 | Tesla Motors | 21 | Wipro | 11 |

*Source: Burning Glass*

**Educational Supply**

There are 14 community colleges in the Bay Region issuing 485 awards on average annually (last 3 years ending 2018-19) on TOP 0707.10-Computer Programming. There are two (2) colleges in the Mid-Peninsula Sub-Region issuing 74 awards on average annually (last 3 years) on this TOP code.

There is one (1) other CTE Educational Institution in the Bay Region issuing one (1) award on average annually (last 3 years ending 2016-17) on TOP 0707.00-Computer Software Development. There are no other CTE Educational Institutions in the Mid-Peninsula Sub-Region issuing awards on this TOP code.

**Table 7a. Community College Awards on TOP 0707.10-Computer** **Programming in Bay Region**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **College** | **Sub-Region** | **Associates** | **Certificate Low Unit** | **Total** |
| Berkeley City | East Bay | 2 | 3 | 5 |
| Cabrillo | SC - Monterey | 2 | 15 | 17 |
| Contra Costa | East Bay | 1 |  | 1 |
| De Anza | Silicon Valley | 7 | 51 | 58 |
| Diablo Valley | East Bay | 90 | 139 | 229 |
| Gavilan | Silicon Valley | 14 | 6 | 20 |
| Hartnell | SC - Monterey | 40 | 3 | 43 |
| Laney | East Bay | 7 | 3 | 10 |
| Las Positas | East Bay | 1 |  | 1 |
| Ohlone | East Bay | 1 |  | 1 |
| San Francisco | Mid-Peninsula |  | 69 | 69 |
| San Jose City | Silicon Valley | 7 | 12 | 19 |
| San Mateo | Mid-Peninsula | 1 | 4 | 5 |
| Solano | North Bay | 6 | 1 | 7 |
| **Total Bay Region** | **179** | **306** | **485** |
| **Total Mid-Peninsula Sub-Region** |  **1**  |  **73**  |  **74**  |

Source: Data Mart

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

**Table 7b. Other CTE Institution Awards on TOP 0707.00 - Computer Software Development in Bay Region**

|  |  |  |  |
| --- | --- | --- | --- |
| College | Sub-Region | **Associate Degree** | **Grand Total** |
| Pacific Union College | North Bay | 1 | 1 |
| **Total Bay Region** | **1** | **1** |
| **Total Mid-Peninsula Sub-Region** | **0** | **0** |

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 labor market gap in the Bay Region with 3,891 annual openings for the DevOps & QA occupational cluster and 486 annual (3-year average) awards from community colleges and other institutions for an annual undersupply of 3,405 students. In the Mid-Peninsula Sub-Region, there is also a gap with 1,635 annual openings and 74 annual (3-year average) awards from community colleges and other institutions for an annual undersupply of 1,561 students.

# Student Outcomes

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0707.10-Computer** **Programming**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **2017-18** | **Bay** All CTE Programs | **CCSF**All CTE Programs | **State** 0707.10 | **Bay** 0707.10 | **Mid-Peninsula** 0707.10 | **CCSF**0707.10 |
| % Employed Four Quarters After Exit | 67% | 66% | 57% | 55% | 59% | 59% |
| Median Quarterly Earnings Two Quarters After Exit | $11,466 | $12,765 | $9,542 | $13,414 | $15,980 | $16,251 |
| Median % Change in Earnings | 31% | 25% | 29% | 25% | 21% | 17% |
| % of Students Earning a Living Wage | 53% | 46% | 56% | 56% | 55% | 58% |

*Source: Launchboard Pipeline (version available August 2020)*

# Skills, Certifications and Education

**Table 9. Top Skills for DevOps & QA Occupations in Bay Region (October 2019 - September 2020)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Skill** | **Postings** | **Skill** | **Postings** | **Skill** | **Postings** |
| Quality Assurance and Control | 6,826 | GIT | 1,211 | JUnit | 644 |
| Python | 3,868 | Performance testing | 1,147 | Product Development | 641 |
| Java | 3,469 | UNIX | 1,099 | Systems Development Life Cycle (SDLC) | 635 |
| Selenium | 2,968 | Continuous Integration (CI) | 1,021 | DevOps | 625 |
| Software Development | 2,268 | C++ | 965 | Unit Testing | 622 |
| SQL | 2,190 | TestNG | 885 | Web Application Development | 589 |
| Software Quality Assurance | 1,900 | Automation Tools | 852 | Computer Engineering | 547 |
| Atlassian JIRA | 1,871 | Oracle | 816 | Scheduling | 532 |
| Software Testing | 1,803 | Project Management | 803 | Apache JMeter | 529 |
| Linux | 1,729 | Appium | 759 | Black-box testing | 522 |
| Software Engineering | 1,598 | Bug tracking | 748 | Scenario testing | 520 |
| JavaScript | 1,548 | Quality Management | 723 | Microsoft C# | 518 |
| Debugging | 1,501 | PERL Scripting Language | 690 | JavaScript Object Notation (JSON) | 480 |
| Automated Testing | 1,313 | Regression Testing | 676 | Object-Oriented Analysis and Design (OOAD) | 480 |
| Scrum | 1,263 | Agile Development | 650 | Product Management | 479 |

*Source: Burning Glass*

**Table 10. Certifications for DevOps & QA Occupations in Bay Region (October 2019 - September 2020)**

Note: 95% 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** |
| Security Clearance | 92 | Juniper Networks Certified Internet Specialist | 17 |
| Driver's License | 69 | Juniper Networks Certified Internet Associate | 17 |
| Cisco Certified Network Associate (CCNA) | 53 | Certified Salesforce Administrator | 17 |
| Automation Certification | 47 | Cisco Certified Internetwork Expert (CCIE) | 15 |
| Cisco Certified Network Professional (CCNP) | 40 | Certified Information Systems Security Professional (CISSP) | 15 |
| Certified Quality Engineer (CQE) | 39 | Six Sigma Certification | 14 |
| American Society For Quality (ASQ) Certification | 35 | Certified Software Quality Engineer (CSQE) | 14 |
| Certified Quality Auditor (CQA) | 27 | Certified Ethical Hacker (CEH) | 13 |
| Project Management Certification | 22 | Six Sigma Black Belt Certification | 12 |
| ISTQB Certified | 22 | Project Management Professional (PMP) | 12 |
| IT Infrastructure Library (ITIL) Certification | 19 | Certified Scrum Trainer (CST) | 12 |
| Juniper Networks Certified Internet Professional | 18 | MBE Certified | 11 |

*Source: Burning Glass*

**Table 11. Education Requirements for DevOps & QA Occupations in Bay Region (October 2019 - September 2020)**

|  |  |  |
| --- | --- | --- |
| **Education (minimum advertised)** | **Latest 12 Mos. Postings** | **Percent 12 Mos. Postings** |
| High school or vocational training | 212 | 3% |
| Associate Degree | 60 | 1% |
| Bachelor’s Degree or Higher | 5,434 | 96% |

*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

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