










# Cybersecurity Occupations

Labor Market Analysis: San Diego County

October 2023

## Summary

NEW PROGRAM RECOMMENDATION?	EVIDENCE OF A SUPPLY GAP?	AT OR ABOVE THE LIVING WAGE?	EXPECTED EDUCATION FOR MAJORITY OF OCCUPATIONS ANALYZED
 <b>Do Not Proceed with New Program</b>	 	 	<input type="checkbox"/> Doctorate Degree <input type="checkbox"/> Master's Degree <input checked="" type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Apprenticeship <input type="checkbox"/> Associate Degree <input type="checkbox"/> Some College or Certificate <input type="checkbox"/> HS Diploma or Equivalent <input type="checkbox"/> Less Than a HS Diploma
SUPPORT FOR PROGRAM MODIFICATION?	NUMBER OF INSTITUTIONS THAT PROVIDE TRAINING	NUMBER OF ANNUAL JOB OPENINGS	
 	<div style="background-color: #0056b3; color: white; padding: 2px; font-weight: bold; font-size: 0.8em;">HIGH</div> 	<div style="background-color: #0056b3; color: white; padding: 2px; font-weight: bold; font-size: 0.8em;">HIGH</div> 	

This brief provides labor market information about *Cybersecurity Occupations* to assist the San Diego & Imperial Counties Community Colleges with program development and strategic planning. *Cybersecurity Occupations* include “Computer Network Architects”, Computer Network Support Specialists,” “Computer Occupations, All Other,” “Information Security Analysts,” and “Network and Computer Systems Administrators.” “According to available labor market information, *Cybersecurity Occupations* in San Diego County have a labor market demand of 1,521 annual job openings (while average demand for a single occupation in San Diego County is 289 annual job openings), and 26 institutions supply 1,604 awards for these occupations, suggesting that there is an oversupply in the labor market. This brief recommends that the colleges do not proceed with developing a **new** program for these occupations but supports a program modification because 1) entry-level and median earnings are above the living wage; and 2) there is a high number of annual job openings. However, supply is met by the awards from the region. **Colleges should note that employers typically require a bachelor’s degree as the minimum educational requirement.**

## Introduction

This report provides labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)<sup>1</sup> system:

- **Computer Network Architects** (SOC 15-1241): Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning, including analysis of capacity needs for network infrastructures. May also design network and computer security measures. May research and recommend network and data communications hardware and software.
- **Computer Network Support Specialists**(SOC 15-1231): Analyze, test, troubleshoot, and evaluate existing network systems, such as local area networks (LAN), wide area networks (WAN), cloud networks, servers, and other data communications networks. Perform network maintenance to ensure networks operate correctly with minimal interruption.
- **Computer Occupations, All Other** (SOC 15-1299): All computer occupations not listed separately.
- **Information Security Analysts** (SOC 15-1212): Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.
- **Network and Computer Systems Administrators** (SOC 15-1244): Install, configure, and maintain an organization's local area network (LAN), wide area network (WAN), data communications network, operating systems, and physical and virtual servers. Perform system monitoring and verify the integrity and availability of hardware, network, and server resources and systems. Review system and application logs and verify completion of scheduled jobs, including system backups. Analyze network and server resource consumption and control user access. Install and upgrade software and maintain software licenses. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software.

For the purpose of this report, these occupations are referred to as *Cybersecurity Occupations*.

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<sup>1</sup> The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. [bls.gov/soc/](https://www.bls.gov/soc/).

## Projected Occupational Demand

Between 2022 and 2027, employers in San Diego County will need to hire 1,521 workers annually to fill new jobs and backfill jobs in *Cybersecurity Occupations* due to attrition caused by turnover and retirement, for example (Exhibit 1). “Computer Occupations, All Other” are projected to have the most labor market demand between 2022 and 2027, with 769 annual job openings.

**Exhibit 1: Number of Jobs for Cybersecurity Occupations in San Diego County (2022-2027)<sup>2</sup>**

Occupational Title	2022 Jobs	2027 Jobs	2022 - 2027 Net Jobs Change	2022-2027 % Net Jobs Change	Annual Job Openings (Demand)
Computer Occupations, All Other	8,906	9,493	587	7%	769
Network and Computer Systems Administrators	3,867	4,083	216	6%	310
Information Security Analysts	1,503	1,793	290	19%	176
Computer Network Support Specialists	1,536	1,654	118	8%	146
Computer Network Architects	1,542	1,645	103	7%	120
<b>Total</b>	<b>17,354</b>	<b>18,668</b>	<b>1,314</b>	<b>8%</b>	<b>1,521</b>

## Earnings

The entry-level hourly earnings for *Cybersecurity Occupations* range from \$26.51 to \$41.27 (Exhibit 2a).

**Exhibit 2a: Hourly Earnings for Cybersecurity Occupations in San Diego County<sup>3</sup>**

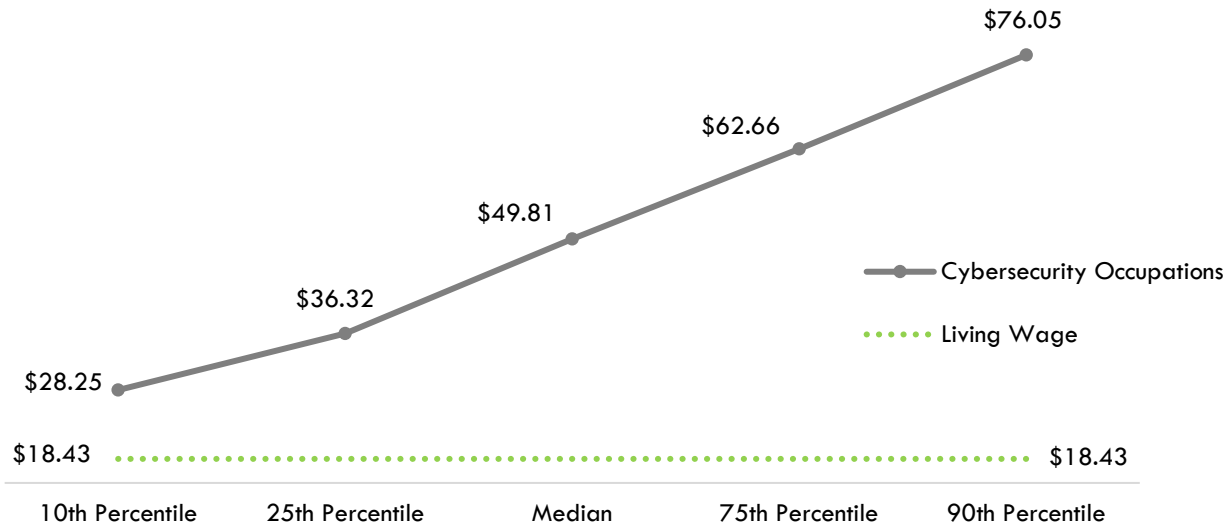
Occupational Title	Entry-Level Hourly Earnings (25 <sup>th</sup> Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75 <sup>th</sup> Percentile)
Information Security Analysts	\$41.27	\$54.88	\$70.66
Computer Network Architects	\$40.36	\$60.06	\$77.24
Network and Computer Systems Administrators	\$38.74	\$49.46	\$55.78
Computer Occupations, All Other	\$34.72	\$50.40	\$66.17
Computer Network Support Specialists	\$26.51	\$34.27	\$43.44

<sup>2</sup> Lightcast 2023.03; QCEW, Non-QCEW, Self-Employed.

<sup>3</sup> Lightcast 2023.03; QCEW, Non-QCEW, Self-Employed.

On average, the entry-level hourly earnings for *Cybersecurity Occupations* are **\$36.32**; this is more than the living wage for a single adult in San Diego County, which is **\$18.43** per hour (Exhibit 2b).<sup>4</sup>

**Exhibit 2b: Average Hourly Earnings<sup>5</sup> for Cybersecurity Occupations in San Diego County<sup>6</sup>**



## Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.<sup>7</sup> There are **eight** TOP codes and **17** CIP codes related to *Cybersecurity Occupations* (Exhibit 3).

**Exhibit 3: Related TOP and CIP Codes for Cybersecurity Occupations<sup>8</sup>**

TOP or CIP Code	TOP or CIP Program Title
TOP 0702.00	Computer Information Systems
TOP 0707.10	Computer Programming
TOP 0707.30	Computer Systems Analysis
TOP 0708.00	Computer Infrastructure and Support
TOP 0708.10	Computer Networking
TOP 0708.20	Computer Support

<sup>4</sup> "Family Needs Calculator (formerly the California Family Needs Calculator)," Insight: Center for Community Economic Development, last updated 2021. [insightcced.org/family-needs-calculator](https://insightcced.org/family-needs-calculator).

<sup>5</sup> 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.

<sup>6</sup> Lightcast 2023.03; QCEW, Non-QCEW, Self-Employed.

<sup>7</sup> TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart ([datamart.cccco.edu](https://datamart.cccco.edu)) and CIP data comes from the Integrated Postsecondary Education Data System ([nces.ed.gov/ipeds/use-the-data](https://nces.ed.gov/ipeds/use-the-data)).

<sup>8</sup> This brief uses a conservative estimate of program supply and only calculates awards from the TOP codes in Exhibit 3.

TOP or CIP Code	TOP or CIP Program Title
TOP 0709.00	World Wide Web Administration
TOP 0934.30	Telecommunications Technology
CIP 11.0201	Computer Programming/Programmer, General
CIP 11.0202	Computer Programming, Specific Applications
CIP 11.0203	Computer Programming, Vendor/Product Certification
CIP 11.0299	Computer Programming, Other
CIP 11.0301	Data Processing and Data Processing Technology/Technician
CIP 11.0501	Computer Systems Analysis/Analyst
CIP 11.0802	Data Modeling/Warehousing and Database Administration
CIP 11.0901	Computer Systems Networking and Telecommunications
CIP 11.1001	Network and System Administration/Administrator
CIP 11.1002	System, Networking, and LAN/WAN Management/Manager
CIP 11.1003	Computer and Information Systems Security/Information Assurance
CIP 11.1004	Web/Multimedia Management and Webmaster
CIP 11.1005	Information Technology Project Management
CIP 11.1006	Computer Support Specialist
CIP 15.0305	Telecommunications Technology/Technician
CIP 15.1202	Computer Technology/Computer Systems Technology
CIP 47.0103	Communications Systems Installation and Repair Technology

According to TOP data, nine community colleges supply the region with awards for these occupations: Cuyamaca College, Grossmont College, MiraCosta College, Palomar College, San Diego City College, San Diego College of Continuing Education, San Diego Mesa College, San Diego Miramar College, and Southwestern College. According to CIP data, 15 non-community-college institutions supply the region with awards: Ashford University, ATA College, California College San Diego, California Institute of Arts & Technology, California Institute of Arts & Technology-National City, California State University-San Marcos, ICOHS College, National University, Northcentral University, Poway Adult School, San Diego Global Knowledge University, San Diego State University, University of California-San Diego, University of San Diego, and Vista Adult School (Exhibit 4).

**Exhibit 4: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions  
(Program Year 2019-20 through Program Year 2020-21 Average)**

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY19-20 to PY21-22)	Other Institutions 2-Yr Annual Average Awards (PY19-20 to PY20-21)	Total Average Supply (PY19-20 to PY21-22)
0702.00	Computer Information Systems	<b>100</b>	<b>0</b>	<b>100</b>
	• MiraCosta	6	0	
	• Palomar	18	0	
	• San Diego Cont Ed	49	0	
	• San Diego Mesa	11	0	
	• San Diego Miramar	10	0	
	• Southwestern	6	0	
0707.10	Computer Programming	<b>39</b>	<b>0</b>	<b>39</b>
	• Grossmont	23	0	
	• MiraCosta	8	0	
	• Palomar	5	0	
	• Southwestern	3	0	
0707.30	Computer Systems Analysis	<b>197</b>	<b>0</b>	<b>197</b>
	• San Diego Cont Ed	197	0	
0708.00	Computer Infrastructure and Support	<b>551</b>	<b>0</b>	<b>551</b>
	• Grossmont	30	0	
	• MiraCosta	34	0	
	• Palomar	2	0	
	• San Diego Cont Ed	451	0	
	• San Diego City	34	0	
0708.10	Computer Networking	<b>48</b>	<b>0</b>	<b>48</b>
	• Cuyamaca	6	0	
	• Grossmont	2	0	
	• MiraCosta	4	0	
	• Palomar	13	0	
	• San Diego Cont Ed	22	0	
	• Southwestern	1	0	
0708.20	Computer Support	<b>295</b>	<b>0</b>	<b>295</b>
	• MiraCosta	2	0	
	• San Diego Cont Ed	290	0	
	• Southwestern	3	0	

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY19-20 to PY21-22)	Other Institutions 2-Yr Annual Average Awards (PY19-20 to PY20-21)	Total Average Supply (PY19-20 to PY21-22)
0709.00	World Wide Web Administration	<b>9</b>	<b>0</b>	<b>9</b>
	• Grossmont	9	0	
	• Southwestern	0	0	
0934.30	Telecommunications Technology	<b>2</b>	<b>0</b>	<b>2</b>
	• San Diego City	2	0	
11.0201	Computer Programming/Programmer, General	<b>0</b>	<b>9</b>	<b>9</b>
	• California College San Diego	0	9	
11.0202	Computer Programming, Specific Applications	<b>0</b>	<b>5</b>	<b>5</b>
	• California College San Diego	0	0	
	• California Institute of Arts & Technology	0	2	
	• California Institute of Arts & Technology-National City	0	3	
11.0299	Computer Programming, Other	<b>0</b>	<b>2</b>	<b>2</b>
	• Poway Adult School	0	2	
11.0301	Data Processing and Data Processing Technology/Technician	<b>0</b>	<b>8</b>	<b>8</b>
	• Northcentral University	0	7	
	• Poway Adult School	0	1	
11.0802	Data Modeling/Warehousing and Database Administration	<b>0</b>	<b>1</b>	<b>1</b>
	• San Diego State University	0	1	
11.0901	Computer Systems Networking and Telecommunications	<b>0</b>	<b>2</b>	<b>2</b>
	• California College San Diego	0	0	
	• Poway Adult School	0	2	
11.1001	Network and System Administration/Administrator	<b>0</b>	<b>39</b>	<b>39</b>
	• California Institute of Arts & Technology	0	18	
	• California Institute of Arts & Technology-National City	0	7	
	• ICOHS College	0	14	

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY19-20 to PY21-22)	Other Institutions 2-Yr Annual Average Awards (PY19-20 to PY20-21)	Total Average Supply (PY19-20 to PY21-22)
11.1002	System, Networking, and LAN/WAN Management/Manager	0	15	15
	• California Institute of Arts & Technology	0	11	
	• California Institute of Arts & Technology-National City	0	4	
11.1003	Computer and Information Systems Security/Auditing/Information Assurance	0	139	139
	• Ashford University	0	5	
	• California State University-San Marcos	0	9	
	• National University	0	82	
	• Northcentral University	0	8	
	• San Diego State University	0	1	
	• University of San Diego	0	31	
	• Vista Adult School	0	3	
11.1005	Information Technology Project Management	0	72	72
	• National University	0	52	
	• San Diego Global Knowledge University	0	1	
	• University of California-San Diego	0	19	
11.1006	Computer Support Specialist	0	1	1
	• ICOHS College	0	1	
15.1202	Computer/Computer Systems Technology/Technician	0	70	70
	• ATA College	0	5	
	• California Institute of Arts & Technology	0	38	
	• California Institute of Arts & Technology-National City	0	27	
			<b>Total</b>	<b>1,604</b>



## Demand vs. Supply

Comparing labor demand (annual openings) with labor supply<sup>9</sup> suggests that **supply is met** for these occupations in San Diego County, with **1,521** annual openings and **1,604** awards. Comparatively, there are **15,973** annual openings in California and **6,842** awards, suggesting that there is a **supply gap** across the state<sup>10</sup> (Exhibit 5).

**Exhibit 5: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)**

	<b>Demand</b> (Annual Openings)	<b>Supply<sup>11</sup></b> (Annual Awards)	<b>Supply Gap or Oversupply</b>
San Diego	1,521	1,604	<b>-83</b>
California	15,973	6,842	<b>9,131</b>

**Please note:** This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

<sup>9</sup> Labor supply can be found from two different sources: Lightcast or the California Community Colleges Chancellor's Office MIS Data Mart. Lightcast uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.

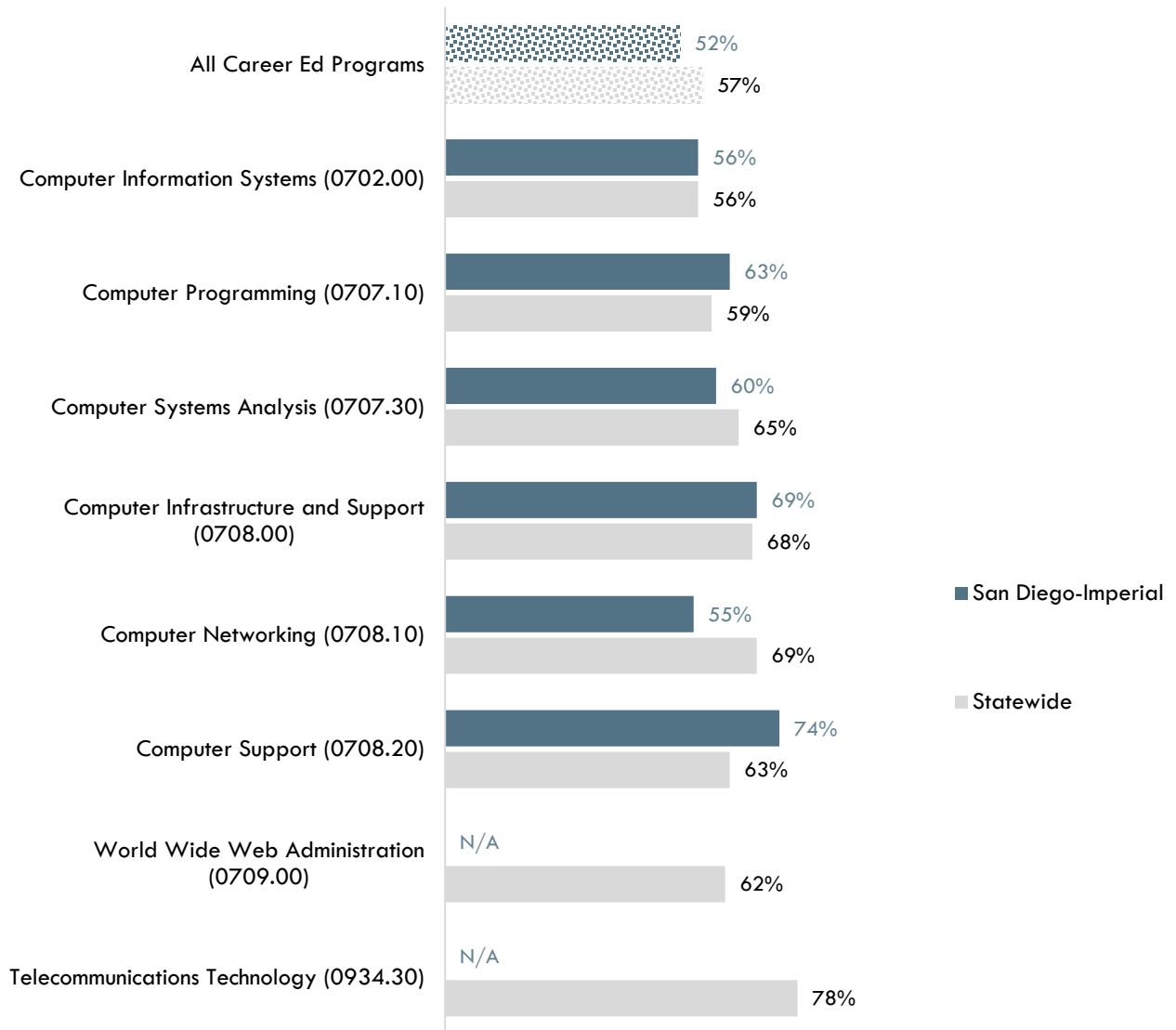
<sup>10</sup> "Supply and Demand," Centers of Excellence Student Outcomes, <https://coecc.net/our-resources/>.

<sup>11</sup> Awards included: associate degree; award <1 year; award 1<2 years; and postsecondary awards.

## Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, 55 to 74 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *Cybersecurity Occupations*, compared 56 to 78 percent statewide and 57 percent of students in Career Education programs in general across the state (Exhibit 6a).<sup>12</sup>

**Exhibit 6a: Percentage of Students Who Earned a Living Wage by Program, PY2020-21<sup>13</sup>**



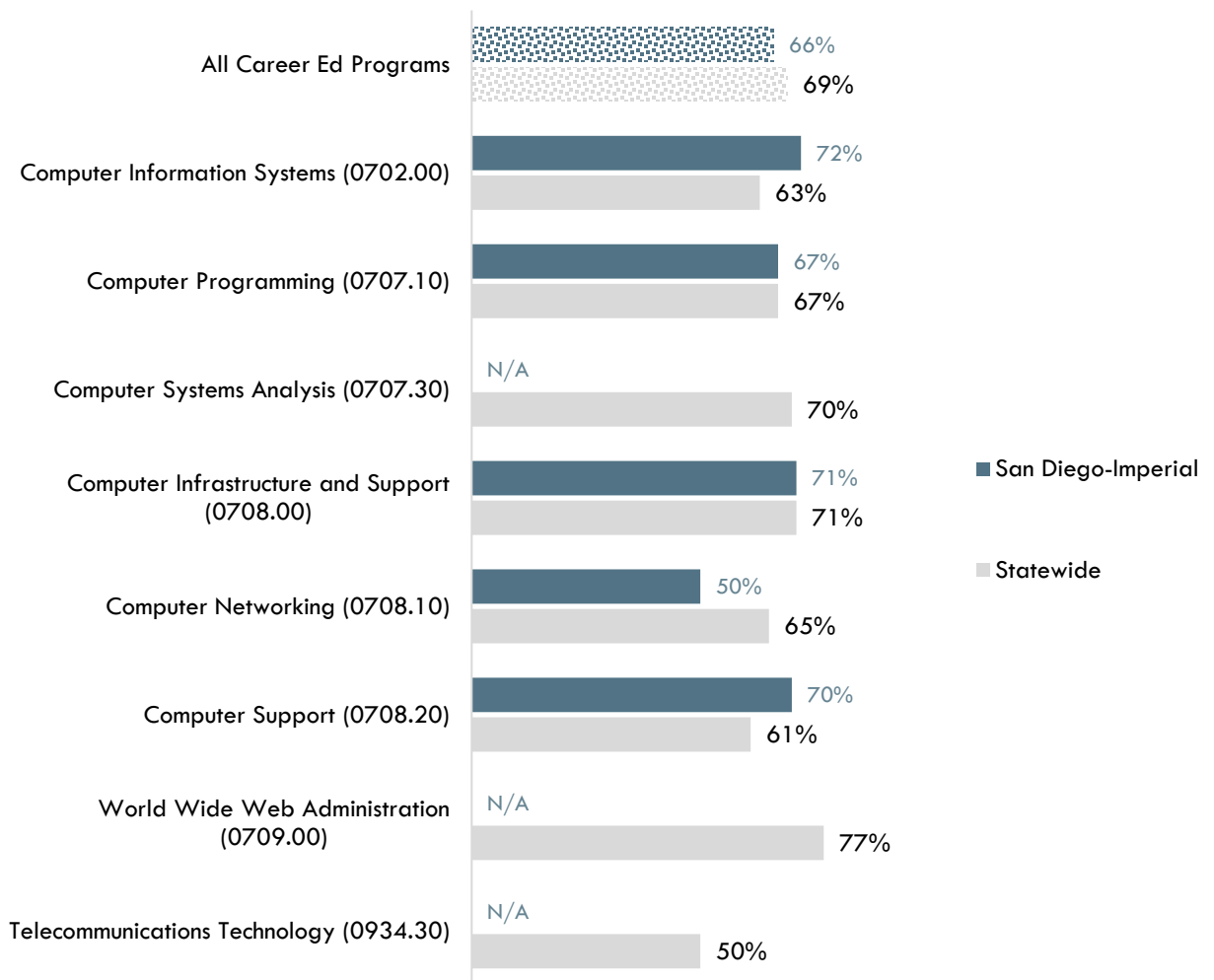
"N/A" indicates insufficient data

<sup>12</sup> "California Community Colleges Strong Workforce Program," California Community Colleges, [calpassplus.org/LaunchBoard/SWP.aspx](http://calpassplus.org/LaunchBoard/SWP.aspx).

<sup>13</sup> Most recent year with available data is Program Year 2020-21. Among completers and skills builders who exited, the percentage of students who attained a living wage.

According to the California Community Colleges LaunchBoard, 50 to 72 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a program related to *Cybersecurity Occupations*, compared to 50 to 77 percent statewide and 69 percent of students in Career Education programs in general across the state (Exhibit 6b).<sup>14</sup>

**Exhibit 6b: Percentage of Students in a Job Closely Related to Field of Study by Program, PY2019-20<sup>15</sup>**



"N/A" indicates insufficient data

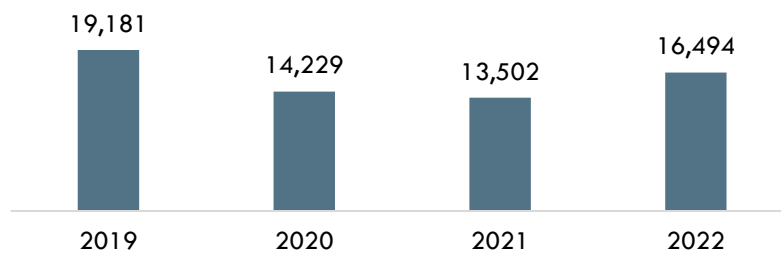
<sup>14</sup> "California Community Colleges Strong Workforce Program," California Community Colleges, [calpassplus.org/LaunchBoard/SWP.aspx](http://calpassplus.org/LaunchBoard/SWP.aspx).

<sup>15</sup> Most recent year with available data is Program Year 2019-20. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

## Online Job Postings

This report analyzes not only historical and projected (traditional LMI) data, but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market that are not captured by historical data. Between 2019 and 2022, there was an average of 13,469 online job postings per year for *Cybersecurity Occupations* in San Diego County (Exhibit 7). Please note that online job postings do **not** equal labor market demand; demand is represented by annual job openings (see Exhibit 1). While this brief includes online jobs postings data to help with curriculum development, the community colleges should note that this type of data is impacted by several variables: employers may post a position multiple times to increase the pool of applicants; a job posting can remain posted after a business decides not to fill a position; or an employer may use one posting to fill multiple positions, for example.

**Exhibit 7: Number of Online Job Postings for Cybersecurity Occupations in San Diego County (2019-2022)<sup>16</sup>**



<sup>16</sup> Lightcast; "Job Posting Analytics." 2018-2022.

## Top Employers

Between January 1, 2020 and December 31, 2022, the top five employers in San Diego County for *Cybersecurity Occupations* were [Qualcomm](#), [General Atomics](#), [Northrop Grumman](#), [Deloitte](#), and [Leidos](#) based on online job postings (Exhibit 8).

### Exhibit 8: Top Employers for Cybersecurity Occupations in San Diego County<sup>17</sup>

Top Employers	
<ul style="list-style-type: none"><li>• Qualcomm</li><li>• General Atomics</li><li>• Northrop Grumman</li><li>• Deloitte</li><li>• Leidos</li></ul>	<ul style="list-style-type: none"><li>• University of California San Diego</li><li>• Apple</li><li>• Booz Allen Hamilton</li><li>• CyberCoders</li><li>• SAIC</li></ul>

## Education, Skills, and Certifications

*Cybersecurity Occupations* have a national educational attainment ranging from an [associate degree](#) to a [bachelor's degree](#) (Exhibit 9a).

### Exhibit 9a: National Educational Attainment for Cybersecurity Occupations<sup>18</sup>

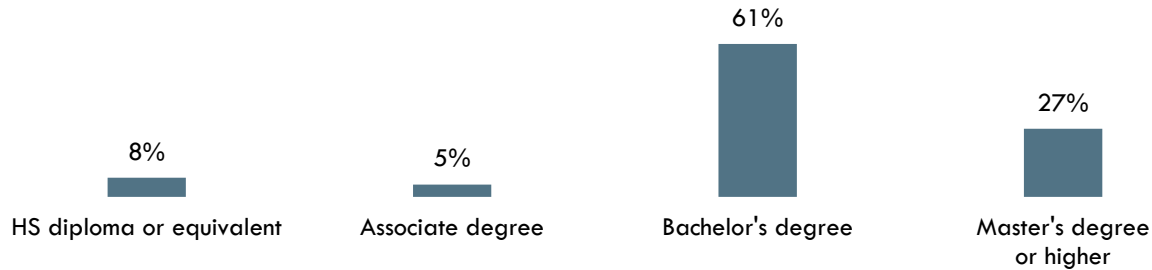
Occupational Title	Typical Entry-Level Education
Computer Network Architects	Bachelor's degree
Computer Occupations, All Other	Bachelor's degree
Information Security Analysts	Bachelor's degree
Network and Computer Systems Administrators	Bachelor's degree
Computer Network Support Specialists	Associate degree

<sup>17</sup> Lightcast; "Job Posting Analytics." 2020-2022.

<sup>18</sup> Lightcast 2023.03; QCEW, Non-QCEW, Self-Employed.

Based on online job postings between January 1, 2020 and December 31, 2022 in San Diego County, employers posted a **bachelor's degree** as the most requested educational requirement for *Cybersecurity Occupations* (Exhibit 9b).<sup>19</sup>

**Exhibit 9b: Educational Requirements for Cybersecurity Occupations in San Diego County<sup>20</sup>**



\*May not total 100 percent due to rounding

Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 10: Top Skills for Cybersecurity Occupations in San Diego County<sup>21</sup>**

Specialized Skills	Soft Skills	Software Skills
<ul style="list-style-type: none"> <li>• Computer Science</li> <li>• Project Management</li> <li>• Systems Engineering</li> <li>• Agile Methodology</li> <li>• Automation</li> <li>• Cyber Security</li> <li>• Scripting</li> <li>• Information Systems</li> <li>• Software Development</li> </ul>	<ul style="list-style-type: none"> <li>• Communications</li> <li>• Management</li> <li>• Operations</li> <li>• Troubleshooting</li> <li>• Leadership</li> <li>• Problem Solving</li> <li>• Planning</li> <li>• Customer Service</li> <li>• Writing</li> <li>• Information Technology</li> <li>• Coordinating</li> <li>• Detail Oriented</li> <li>• Research</li> <li>• Interpersonal Communications</li> <li>• Presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Python</li> <li>• Operating Systems</li> <li>• Linux</li> <li>• Amazon Web Services</li> <li>• Microsoft Office</li> </ul>

<sup>19</sup> Lightcast; "Job Posting Analytics." 2020-2022.

<sup>20</sup> "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified April 9, 2021. [bls.gov/emp/tables/educational-attainment.htm](https://bls.gov/emp/tables/educational-attainment.htm).

<sup>21</sup> Lightcast; "Job Posting Analytics." 2020-2022.

Exhibit 11 lists the top certifications that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 11: Top Certification for Cybersecurity Occupations in San Diego County<sup>22</sup>**

Top Certification in Online Job Postings

- Secret Clearance
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<sup>22</sup> Lightcast; "Job Posting Analytics." 2020-2022.

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San Diego & Imperial Center of Excellence

### **Important Disclaimers**

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.