

Labor Market Analysis for Program Recommendation:
 0702.00/Computer Information Systems
 (Cloud Computing and Security Certificate)
 (Cloud Computing Skills Certificate)
 Orange County Center of Excellence, April 2023



Summary

Program LMI Endorsement	Endorsed: All LMI Criteria Met <input type="checkbox"/>	Endorsed: Some LMI Criteria Met <input checked="" type="checkbox"/>	Not LMI Endorsed <input type="checkbox"/>
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Program LMI Endorsement Criteria

	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Supply Gap:		<p><i>Comments:</i> there is projected to be 1,708 annual job openings throughout Los Angeles and Orange counties for these cloud computing occupations, which is less than the 1,957 awards conferred by educational institutions. However, the related educational programs train for an additional 14 occupations that account for over 18,500 annual job openings. Therefore, supply is overstated for these cloud computing occupations.</p>
Living Wage: (Entry-Level, 25 th)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<p><i>Comments:</i> All annual job openings for these cloud computing occupations have entry-level hourly wages above the OC living wage of \$20.63.</p>	
Education:	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<p><i>Comments:</i> Two of these cloud computing occupations typically require a bachelor's degree and one typically requires an associate degree. However, more than one-third of workers in the field have completed some college or an associate degree as their highest level of education.</p>	

Emerging Occupation(s)

	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
	<p><i>Comments:</i> Cloud computing involves the delivery of computer systems and services over the internet (or "cloud"). Though the early stages of cloud computing developed in the mid 2000s, the knowledge, skills, and abilities required for workers that support cloud computing activity and infrastructure continues to evolve. According to McKinsey, the COVID-19 Pandemic accelerated cloud adoption, "as it triggered the need to speed the pace of enterprise digitization."¹</p>	

The Orange County Center of Excellence for Labor Market Research (OC COE) prepared this report to determine whether there is a supply gap in the Los Angeles/Orange County regional labor market related to four middle-skill occupations:

- Computer Network Support Specialists (15-1231)
- Computer Network Architects (15-1241)
- Network and Computer Systems Administrators (15-1244)

¹ <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/cloud-migration-opportunity-business-value-grows-but-missteps-abound>

Based on the available data there does not appear to be a supply gap for these cloud computing occupations. However, supply is overstated because the related educational programs that train for these cloud computing occupations also train for 14 other occupations not included in this report. Additionally, entry-level wages for these cloud computing occupations are above the living wage and typical education requirements align with a community college education. **Therefore, due to some of the regional labor market criteria being met, the COE endorses this proposed program.**

Exhibit 1 lists the occupational demand, supply, typical entry-level education, and educational attainment for the occupations included in this report.

Exhibit 1: Labor Market Endorsement Summary

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25 th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Computer Network Support Specialists (15-1231)	512	530	OC: \$25.48	Associate degree	40%
Computer Network Architects (15-1241)	435	298	OC: \$37.68	Bachelor's degree	37%
Network and Computer Systems Administrators (15-1244)	761	1,129	OC: \$34.98	Bachelor's degree	39%
Total	1,708	1,957	N/A	N/A	N/A

Demand:

- The number of jobs related to these cloud computing occupations are projected to increase 6% through 2026, equating to 1,708 annual job openings.
- Hourly entry-level wages for these cloud computing occupations range from \$25.48 to \$37.68 in Orange County; all annual job openings have entry-level wages above the living wage.
- There were 9,361 online job postings for these cloud computing occupations over the past 12 months. The highest number of postings were for network engineers, systems administrators, and network administrators.
- The typical entry-level education for these cloud computing occupations ranges from an associate degree or equivalent to a bachelor's degree.
- Between 37% and 40% of workers in the field have completed some college or an associate degree as their highest level of education.

Supply:

- There was an average of 1,320 awards conferred by all 28 community colleges in Los Angeles and Orange Counties from 2018 to 2021.
- Non-community college institutions conferred an average of 637 awards from 2017 to 2020.

- Orange County community college students that exited computer information systems programs in the 2019-20 academic year had a median annual wage of \$34,476 after exiting the program and 37% attained the regional living wage.
- Throughout Orange County, 68% of students that exited their program in 2018-19 reported that they are working in a job closely related to their field of study.

Demand

Occupational Projections:

Exhibit 2 shows the annual percent change in jobs for these cloud computing occupations from 2016 through 2026. There was a 6% decline across all occupations from 2019 to 2020 due to the COVID-19 pandemic and employment in these cloud computing occupations declined at the same rate in Orange County. These cloud computing occupations are projected to grow at a similar rate for all occupations through 2026.

Exhibit 2: Annual Percent Change in Jobs for Cloud Computing Occupations, 2016-2026

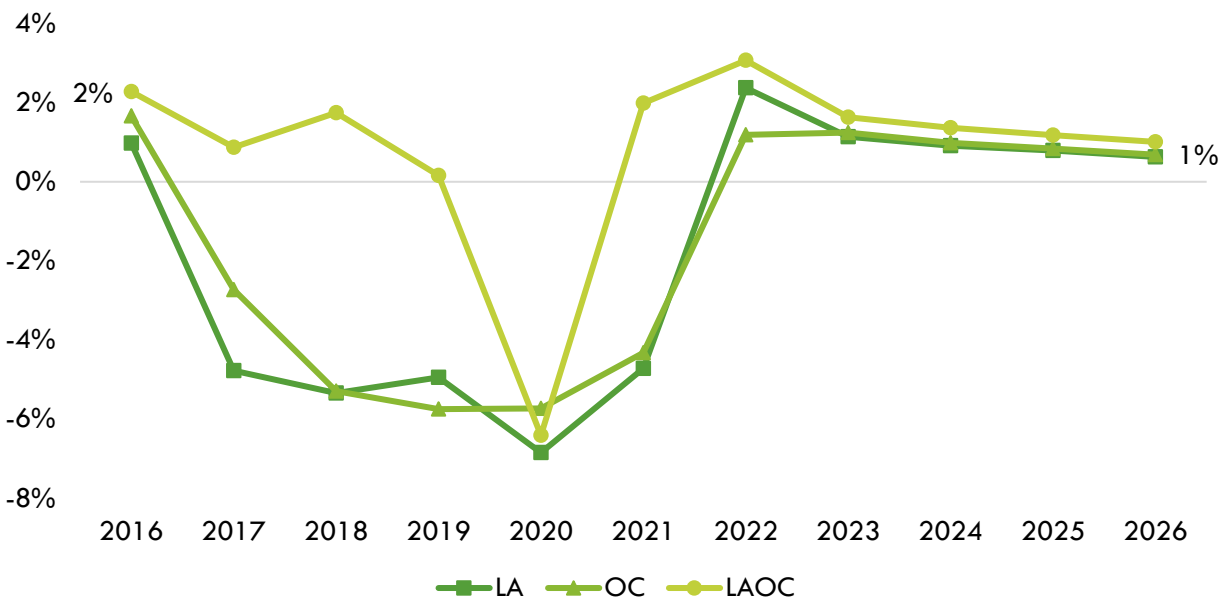


Exhibit 3 shows the five-year occupational demand projections for these cloud computing occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 6% through 2026. There is projected to be 1,708 jobs available annually.

Exhibit 3: Occupational Demand in Los Angeles and Orange Counties²

Geography	2021 Jobs	2026 Jobs	2021-2026 Change	2021-2026 % Change	Annual Openings
Los Angeles	14,747	15,627	880	6%	1,215
Orange	6,191	6,503	312	5%	493
Total	20,938	22,130	1,192	6%	1,708

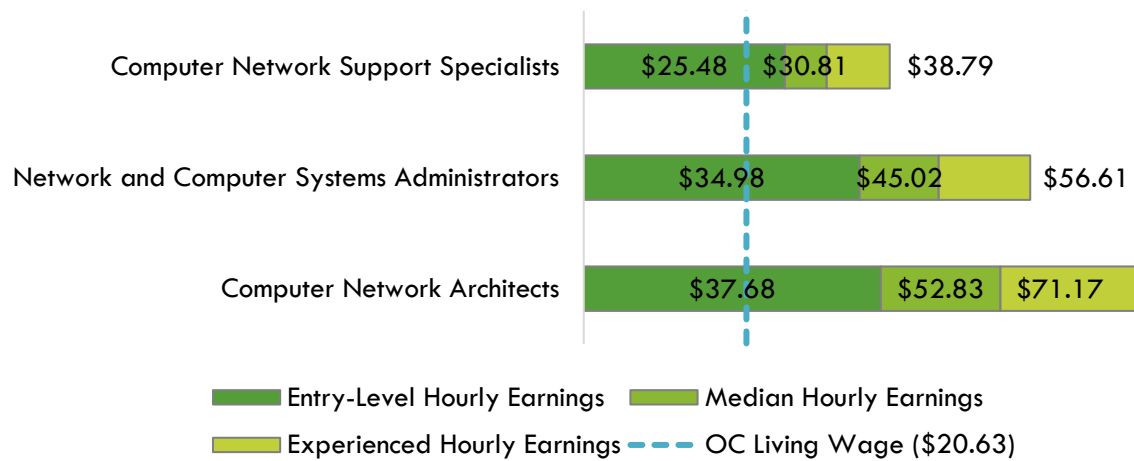
² Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

Wages:

The labor market endorsement in this report considers the entry-level hourly wages for these cloud computing occupations in Orange County as they relate to the county's living wage. Los Angeles County wages are included below in order to provide a complete analysis of the LA/OC region.

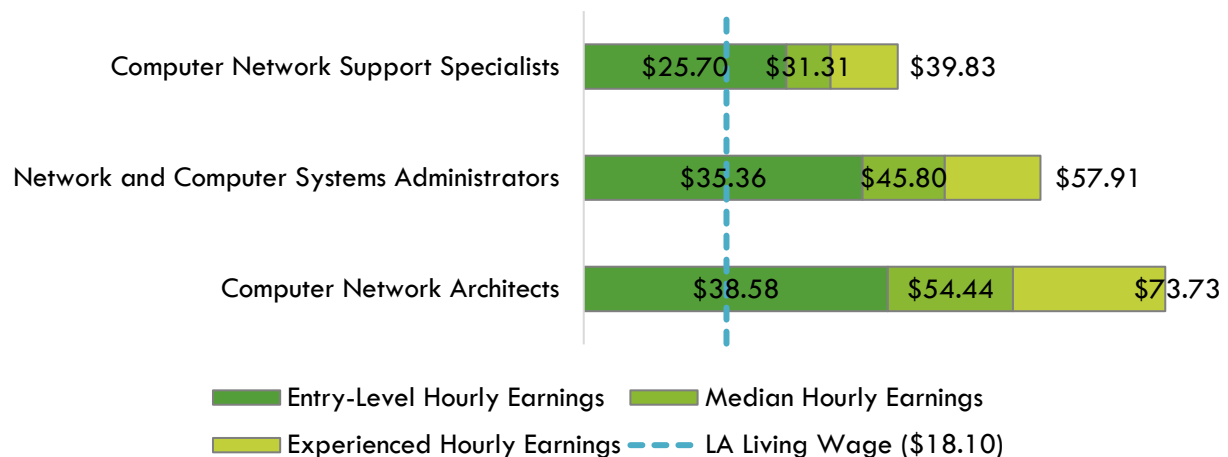
All annual openings for these cloud computing occupations have entry-level wages above the living wage for one adult (\$20.63 in Orange County). Typical entry-level hourly wages range between \$25.48 and \$37.68. Orange County's average wages are below the average statewide wage of \$51.11 for these occupations. Exhibit 4 shows the wage range for each of these cloud computing occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 4: Wages by Occupation in Orange County



All annual openings for these cloud computing occupations have entry-level wages above the living wage for one adult (\$18.10 in Los Angeles County). Typical entry-level hourly wages are in a range between \$25.70 and \$38.58. Los Angeles County's average wages are below the average statewide wage of \$51.11 for these occupations. Exhibit 5 shows the wage range for each of these cloud computing occupations in Los Angeles County how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 5: Wages by Occupation in Los Angeles County



Job Postings:

Important Online Job Postings Data Note: Online job postings data is sourced from Lightcast, a labor market analytics firm that scrapes, collects, and organizes data from online job boards such as LinkedIn, Indeed, Glassdoor, Monster, GovernmentJobs.com, and thousands more. Lightcast uses natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. However, NLP has limitations that include understanding contextual words of phrases; determining differences in words that can be used as nouns, verbs, and/or adjectives; and misspellings or grammatical errors.³ For these reasons, job postings could be assigned to the wrong employer, industry, or occupation within Lightcast's database.

Additionally, there are several limitations when analyzing job postings. A single job posting may not represent a single job opening, as employers may be creating a pool of candidates for future openings or hiring for multiple positions with a single posting. Additionally, not all jobs are posted online, and jobs may be filled through other methods such as internal promotion, word-of-mouth advertising, physical job boards, or a variety of other channels.

There were 9,361 online job postings related to these cloud computing occupations listed in the past 12 months. Exhibit 6 shows the number of job postings by occupation. Over 50% of job postings were for network and computer systems administrators.

Exhibit 6: Number of Job Postings by Occupation (n=9,361)

Occupation	Job Postings	Percentage of Job Postings
Network and Computer Systems Administrators	4,816	51%
Computer Network Architects	3,629	39%
Computer Network Support Specialists	916	10%
Total Postings	9,361	100%

The top employers in the region, by number of job postings, are shown in Exhibit 7.

Exhibit 7: Top Employers by Number of Job Postings (n=9,361)

Employer	Job Postings	Percentage of Job Postings
Northrop Grumman	270	3%
Boeing	259	3%
Robert Half	228	2%
Bowman Williams	156	2%
Randstad	127	1%
CyberCoders	123	1%
Elevance Health	106	1%
UnitedHealth Group	81	1%
Jobot	78	1%
Disney	75	1%

³ K. R. Chowdhary, Fundamentals of Artificial Intelligence (Basingstoke: Springer Nature, 2020), <https://link.springer.com/book/10.1007/978-81-322-3972-7>.

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown in Exhibit 8.

Exhibit 8: Top Skills by Number of Job Postings (n=9,361)

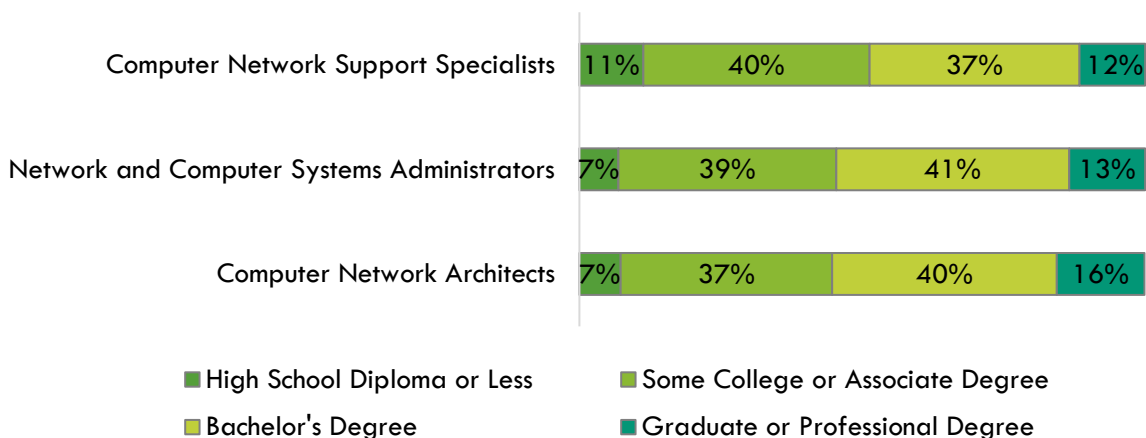
Top Specialized Skills	Top Soft Skills	Top Computer Skills
Computer Science (2,114)	Communications (4,106)	Firewall (1,723)
Firewall (1,723)	Troubleshooting (Problem Solving) (3,712)	Operating Systems (1,651)
Operating Systems (1,651)	Management (3,019)	Linux (1,358)
Network Switches (1,533)	Operations (2,651)	Active Directory (1,297)
Network Engineering (1,508)	Problem Solving (2,072)	Microsoft Azure (1,138)
Linux (1,357)	Customer Service (1,937)	Windows Servers (1,067)
Wide Area Networks (1,334)	Planning (1,667)	Python (Programming Language) (1,020)
Automation (1,311)	Leadership (1,579)	Amazon Web Services (967)
Active Directory (1,297)	Writing (1,367)	Microsoft Excel (895)
Local Area Networks (1,253)	Information Technology (1,362)	Microsoft Office (871)

Educational Attainment:

The Bureau of Labor Statistics (BLS) lists an associate degree as the typical entry-level education for *computer network support specialists* and a bachelor's degree for *network and computer systems administrators* and *computer network architects*. The national-level educational attainment data indicates between 37% and 40% of workers in the field have completed some college or an associate degree as their highest level of education. Exhibit 9 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Of the 59% of the cumulative job postings for these cloud computing occupations that listed a minimum education requirement in Los Angeles/Orange County, 24% (1,319) requested a high school diploma or an associate degree and 76% (2,885) requested a bachelor's degree.

Exhibit 9: National-level Educational Attainment for Occupations



Educational Supply

Community College Supply:

Exhibit 10 shows the three-year average number of awards conferred by community colleges in the related TOP codes: Information Technology, General (0701.00), Computer Information Systems (0702.00), Computer Software Development (0707.00), Computer Programming (0707.10), Computer Systems Analysis (0707.30), Computer Infrastructure and Support (0708.00), Computer Networking (0708.10), and Computer Support (0708.20). The colleges with the most completions in the region are: Mt. San Antonio, Long Beach, and Orange Coast. Over the past 12 months, there were two other related program recommendation requests from regional community colleges.

Exhibit 10: Regional Community College Awards (Certificates and Degrees), 2018-2021

TOP Code	Program	College	2018-2019 Awards	2019-2020 Awards	2020-2021 Awards	3-Year Award Average
0701.00	Information Technology, General	East LA	23	10	4	13
		Glendale	0	0	3	1
		LA Harbor	0	0	1	0
		LA Mission	1	3	1	2
		LA Southwest	0	0	2	0
		Long Beach	34	64	106	68
		Mt San Antonio	74	90	49	71
		Santa Monica	39	0	1	13
		West LA	4	5	0	3
		LA Subtotal	175	172	167	171
		Santa Ana	0	0	3	1
		OC Subtotal	0	0	3	1
		Supply Subtotal/Average			175	172
0702.00	Computer Information Systems	Citrus	5	8	4	6
		Compton	1	0	0	0
		East LA	19	15	23	20
		El Camino	14	21	11	16
		Glendale	0	5	6	4
		LA City	1	1	4	2
		LA Mission	5	1	1	2
		LA Trade	8	20	15	15
		Long Beach	0	0	3	1
		Mt San Antonio	0	79	6	28
		Rio Hondo	21	10	6	12
		West LA	8	10	9	9
		LA Subtotal	82	170	88	115

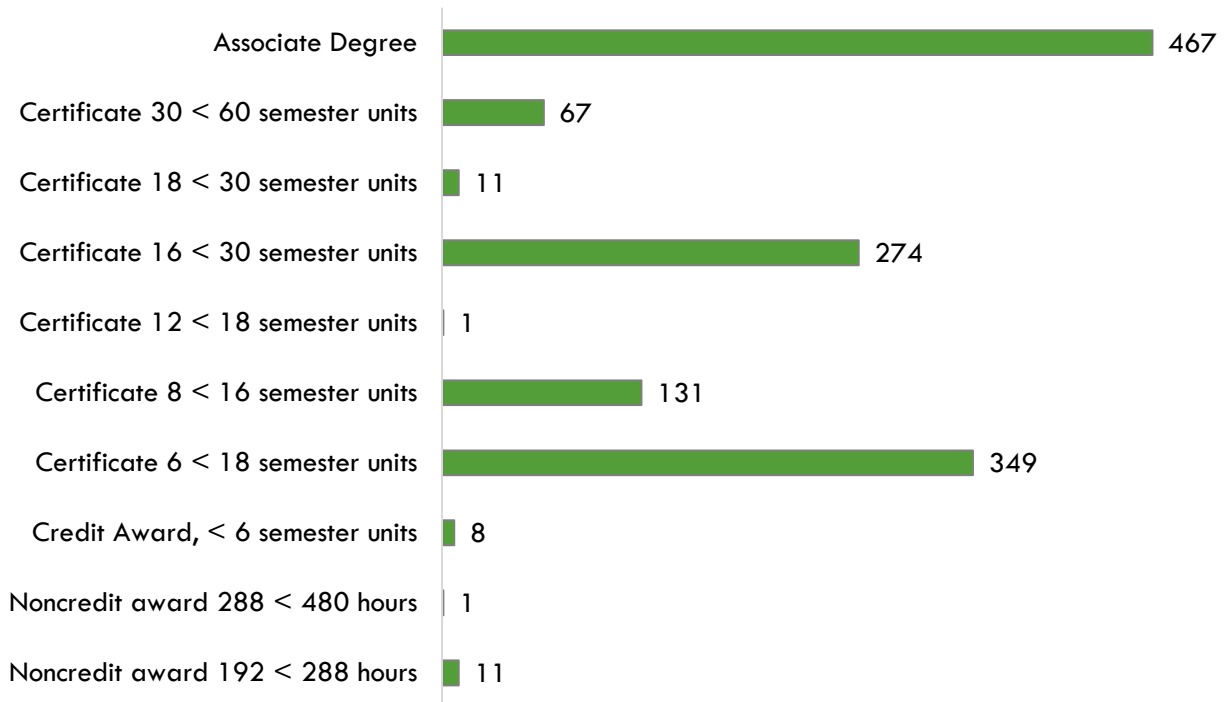
TOP Code	Program	College	2018-2019 Awards	2019-2020 Awards	2020-2021 Awards	3-Year Award Average
		Cypress	5	4	0	2
		Fullerton	15	11	31	19
		Irvine	0	2	0	1
		Orange Coast	4	2	0	2
		Saddleback	0	0	1	0
		Santa Ana	4	2	16	7
		Santiago Canyon	3	4	1	3
		OC Subtotal	31	25	49	34
Supply Subtotal/Average			113	195	137	149
0707.00	Computer Software Development	LA City	1	0	0	0
		LA Pierce	0	0	4	1
		Santa Monica	0	0	1	0
		LA Subtotal	1	0	5	1
		Cypress	1	1	0	1
		Golden West	4	2	6	4
		Orange Coast	7	2	2	4
		Saddleback	13	3	10	8
OC Subtotal	25	8	18	17		
Supply Subtotal/Average			26	8	23	18
0707.10	Computer Programming	Cerritos	0	2	3	1
		Citrus	0	1	3	1
		East LA	8	4	1	4
		Glendale	2	3	0	2
		LA City	0	6	8	5
		LA Harbor	0	0	2	0
		LA Mission	6	4	7	6
		LA Pierce	18	4	5	9
		LA Southwest	0	1	2	1
		LA Valley	7	6	13	9
		Long Beach	4	5	3	4
		Mt San Antonio	119	114	83	105
		Pasadena	11	21	23	19
		Santa Monica	44	46	65	52
		West LA	1	0	0	0
		LA Subtotal	220	217	218	218
		Cypress	22	20	6	16
Fullerton	16	28	24	23		

TOP Code	Program	College	2018-2019 Awards	2019-2020 Awards	2020-2021 Awards	3-Year Award Average
		Irvine	8	4	0	4
		Orange Coast	31	157	206	131
		Santa Ana	13	1	0	5
		Santiago Canyon	9	3	2	5
		OC Subtotal	99	213	238	184
		Supply Subtotal/Average	319	430	456	402
0707.30	Computer Systems Analysis	Cerritos	2	3	0	1
		East LA	0	1	0	0
		LA City	0	0	1	0
		LA Harbor	0	0	1	0
		LA Mission	0	1	1	1
		LA Pierce	0	0	6	2
		LA Subtotal	2	5	9	4
		Cypress	2	0	0	1
		OC Subtotal	2	0	0	1
		Supply Subtotal/Average	4	5	9	5
0708.00	Computer Infrastructure and Support	Cerritos	0	4	4	3
		Glendale	0	3	4	2
		LA City	0	3	5	3
		LA Harbor	1	1	1	1
		LA Mission	2	12	17	11
		LA Valley	5	2	4	4
		Long Beach	3	8	8	6
		Mt San Antonio	24	24	24	24
		Pasadena	1	1	24	9
		Rio Hondo	0	10	11	7
		West LA	4	15	16	12
		LA Subtotal	40	83	118	82
		Coastline	49	46	73	56
		Cypress	2	3	1	2
		Orange Coast	0	7	5	4
		Saddleback	0	0	3	1
		Santa Ana	0	0	27	9
		OC Subtotal	51	56	109	72
		Supply Subtotal/Average	91	139	227	154
0708.10	Computer Networking	Cerritos	11	9	8	9
		Glendale	3	3	0	2

TOP Code	Program	College	2018-2019 Awards	2019-2020 Awards	2020-2021 Awards	3-Year Award Average
		LA City	23	0	4	9
		LA Pierce	39	20	12	23
		Long Beach	55	47	48	51
		Mt San Antonio	8	11	4	7
		Rio Hondo	5	7	2	5
		West LA	77	48	58	61
		LA Subtotal	221	145	136	167
		Coastline	38	59	92	64
		Cypress	70	95	61	76
		Fullerton	0	0	1	0
		Irvine	11	21	10	14
		Saddleback	10	21	19	17
		Santa Ana	14	12	23	16
		OC Subtotal	143	208	206	187
		Supply Subtotal/Average			364	353
0708.20	Computer Support	Citrus	0	1	1	1
		Glendale	10	7	2	6
		LA Pierce	9	8	6	8
		LA Valley	0	0	1	0
		Long Beach	8	14	40	21
		Pasadena	7	30	34	23
		LA Subtotal	34	60	84	59
		Cypress	3	5	3	4
		Santa Ana	9	0	0	3
		OC Subtotal	12	5	3	7
Supply Subtotal/Average			46	65	87	66
Supply Subtotal/Average			1,138	1,367	1,451	1,320

Exhibit 11 shows the annual average community college awards by type from 2018-19 through 2020-21. The plurality of the awards are for associate degrees, followed by certificates between 6 and less than 18 semester units and certificates between 16 and less than 30 semester units.

Exhibit 11: Annual Average Community College Awards by Type, 2018-2021



Community College Student Outcomes:

Exhibit 12 shows the Strong Workforce Program (SWP) metrics for computer information systems programs in North Orange County Community College District (NOCCCD), the Orange County Region, and California. Of the 3,748 computer information systems students in the 2019-20 academic year, 67% (2,52) attended a NOCCCD college.

Additionally, 65% of NOCCCD students that exited computer information systems programs in the 2018-19 academic year were employed in their field of study, which is nearly equivalent to Orange County (68%) and statewide (67%).

Exhibit 12: Computer Information Systems (0702.00) Strong Workforce Program Metrics, 2020-21⁴

SWP Metric	NOCCCD	OC Region	California
SWP Students	2,502	3,748	23,082
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	35%	32%	36%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	Insufficient Data	7%	52%
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	26	39	600

⁴ All SWP metrics are for 2020-21 unless otherwise noted.

SWP Metric	NOCCCD	OC Region	California
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	226	264	2,053
SWP Students with a Job Closely Related to Their Field of Study (2018-19)	65%	68%	67%
Median Annual Earnings for SWP Exiting Students (2019-20)	\$33,744 (\$16.22)	\$34,476 (\$16.58)	\$35,840 (\$17.23)
Median Change in Earnings for SWP Exiting Students (2019-20)	27%	25%	23%
SWP Exiting Students Who Attained the Living Wage (2019-20)	35%	37%	50%

Non-Community College Supply:

For a comprehensive regional supply analysis, it is also important to consider the supply from other institutions in the region that provide training programs for these cloud computing occupations. Exhibit 13 shows the annual and three-year average number of awards conferred by these institutions in the related Classification of Instructional Programs (CIP) Codes: Computer and Information Sciences, General (11.0101), Information Technology (11.0103), Computer Programming/Programmer, General (11.0201), Computer Systems Analysis/Analyst (11.0501), Computer Systems Networking and Telecommunications (11.0901), Network and System Administration/Administrator (11.1001), Computer and Information Systems Security/Auditing/Information Assurance (11.1003), and Computer Support Specialist (11.1006).

Due to different data collection periods, the most recent three-year period of available data is from 2017 to 2020. Between 2017 and 2020, four-year colleges in the region conferred an average of 663 awards annually in related training programs.

Exhibit 13: Regional Non-Community College Awards, 2017-2020

CIP Code	Program	College	2017-2018 Awards	2018-2019 Awards	2019-2020 Awards	3-Year Award Average
11.0101	Computer and Information Sciences, General	Azusa Pacific University	26	30	21	26
		Brand College	2	0	0	1
		Brandman University	20	20	30	23
		Chapman University	12	13	18	14
		Los Angeles Pacific College	0	0	6	2
		Loyola Marymount University	42	32	27	34
		Mount Saint Mary's University	0	0	0	0
		Pacific States University	0	2	0	1
		The Master's University and Seminary	6	7	11	8
		University of California-Irvine	0	1	0	0
		University of La Verne	18	39	23	27
		University of the People	100	80	203	128

CIP Code	Program	College	2017-2018 Awards	2018-2019 Awards	2019-2020 Awards	3-Year Award Average
		Vanguard University of Southern California	1	0	0	0
		Supply Total/Average	227	224	339	264
11.0103	Information Technology	Abraham Lincoln University	1	1	0	1
		Bethesda University	0	0	0	0
		Brand College	37	50	13	33
		California Intercontinental University	0	0	2	1
		California State University-Dominguez Hills	1	5	4	3
		California State University-Los Angeles	130	128	166	141
		California State University-Northridge	54	54	29	46
		Platt College-Anaheim	1	11	15	9
		Platt College-Los Angeles	0	6	12	6
		Trident University International	93	75	0	56
		University of La Verne	0	3	2	2
				Supply Total/Average	317	333
11.0201	Computer Programming/ Programmer, General	ABCO Technology	23	29	46	33
		Platt College-Anaheim	4	4	4	4
		Platt College-Los Angeles	0	0	0	0
		Supply Total/Average	27	33	50	37
11.0501	Computer Systems Analysis/ Analyst	Brand College	2	0	0	1
		Supply Total/Average	2	0	0	1
11.0901	Computer Systems Networking and Telecommunications	Brand College	0	2	2	1
		PCI College	0	0	0	0
		Supply Total/Average	0	2	2	1
11.1001	Network and System Administration/ Administrator	ABCO Technology	13	5	25	14
		Brand College	6	23	9	13
		California Intercontinental University	1	3	1	2
		Supply Total/Average	20	31	35	29
11.1003		Azusa Pacific University	0	0	0	0
		Learnet Academy Inc	17	0	5	7

CIP Code	Program	College	2017-2018 Awards	2018-2019 Awards	2019-2020 Awards	3-Year Award Average
	Computer and Information Systems Security/Auditing/Information Assurance	Loyola Marymount University	0	0	0	0
		University of La Verne	0	0	0	0
Supply Total/Average			17	0	5	7
11.1006	Computer Support Specialist	Southern California Institute of Technology	26	25	26	26
Supply Total/Average			26	25	26	26
Supply Total/Average			636	648	700	663

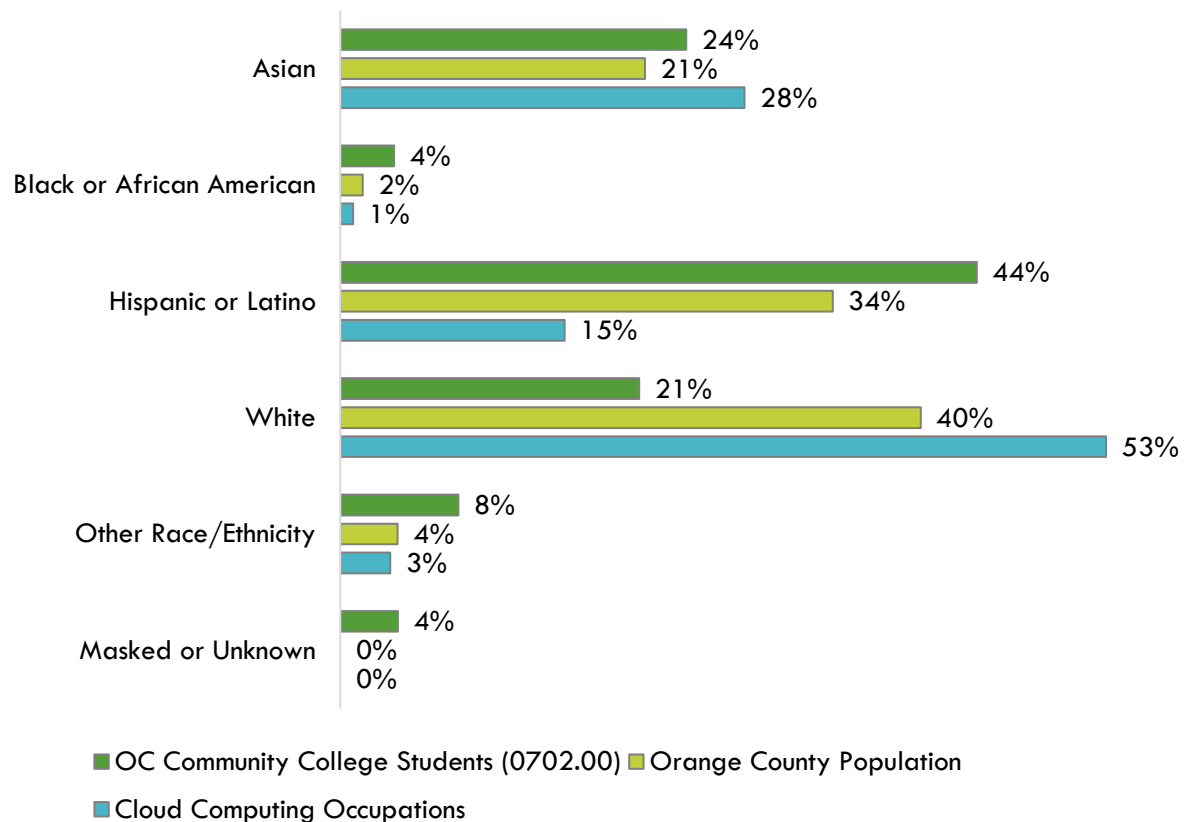
Regional Demographics

This section analyzes demographic data for Orange County community college students enrolled in computer information systems programs compared to the OC population, as well occupational data, for the purpose of identifying potential diversity and equity issues that can be addressed by community college programs.

Ethnicity:

Exhibit 14 shows the ethnicity of Orange County community college students enrolled in computer information systems programs compared to the overall Orange County population, as well as the three cloud computing occupations included in this report. Notably, 53% of workers employed in these cloud computing occupations are white, which is significantly higher than the population (49%) and community college computer information systems students (21%). Conversely, 44% of community college computer information systems students are Hispanic or Latino, which is significantly higher than the population (34%) and these cloud computing occupations (15%).

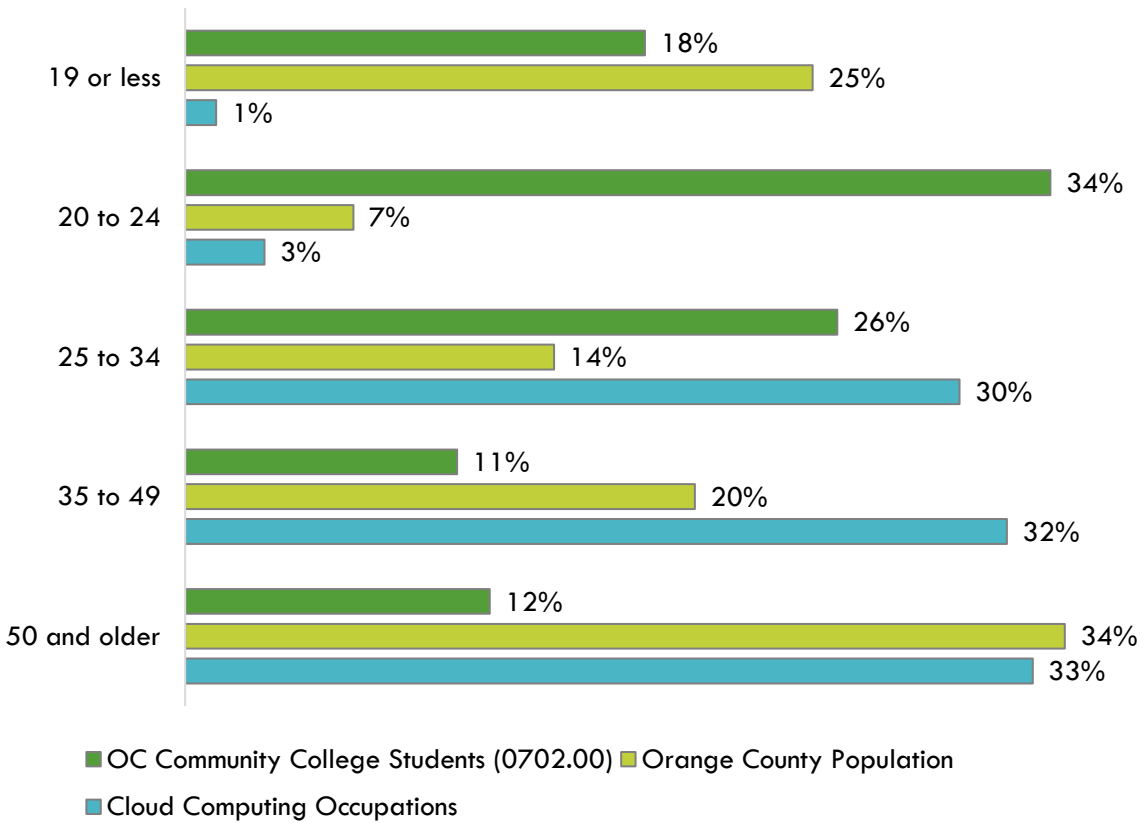
Exhibit 14: Program and County Demographics by Ethnicity



Age:

Exhibit 14 shows the age of Orange County community college students enrolled in computer information systems programs compared to the overall Orange County population, as well as the three cloud computing occupations included in this report. The majority (52%) of community college computer information systems students are 24 or less, which is significantly higher than both the population (32%), and these cloud computing occupations (4%). Conversely, 23% of computer information systems students are 35 and older, which is significantly lower than the population (54%) and these cloud computing occupations (65%).

Exhibit 14: Program and County Demographics by Age

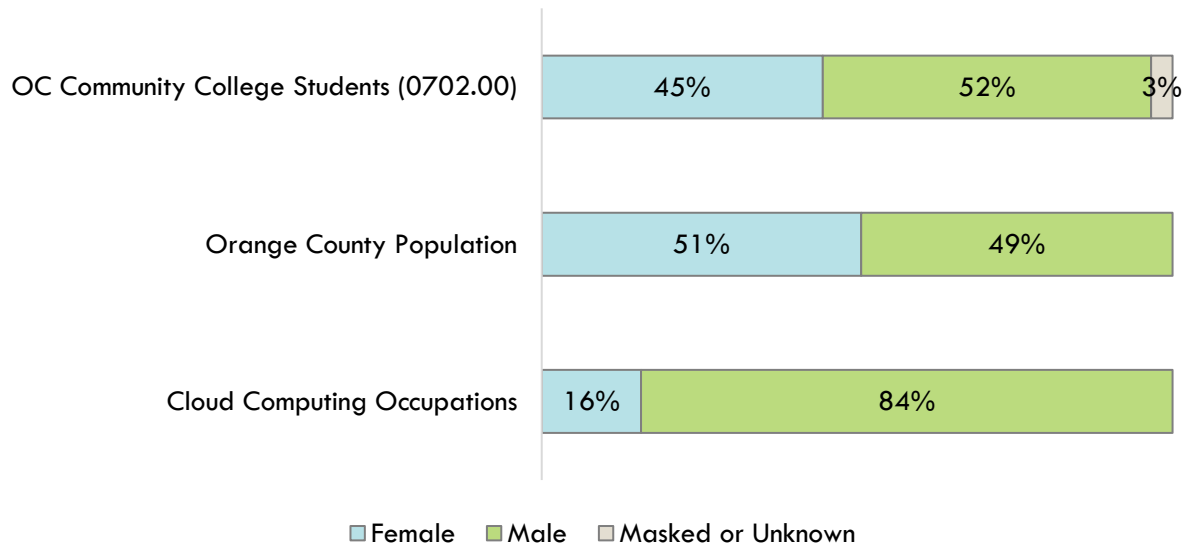


Sex:

Exhibit 15 shows the sex of Orange County community college students enrolled in computer information systems programs compared to the overall Orange County population as well as these cloud computing occupations.

Though the population is split evenly and community college computer information systems students are split nearly evenly, the vast majority (84%) of workers in these cloud computing occupations are men.

Exhibit 15: Program and County Demographics by Sex



Appendix A: Methodology

The OC COE prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Lightcast, a labor market analytics firm that consolidates data from the California Employment Development Department (EDD), U.S. Bureau of Labor Statistics (BLS) and other government agencies. Program supply data is drawn from two systems: Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP).

Using a TOP-SOC crosswalk, the OC COE identified middle-skill jobs for which programs within these TOP codes train. Middle-skill jobs include:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

The OC COE determined labor market supply for an occupation or SOC code by analyzing the number of program completers or awards in a related TOP or CIP code. The COE developed a “supply table” with this information, which is the source of the program supply data for this report. TOP code data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP code data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data), also known as IPEDS. TOP is a system of numerical codes used at the state level to collect and report information on California community college programs and courses throughout the state that have similar outcomes. CIP codes are a taxonomy of academic disciplines at institutions of higher education in the United States and Canada. Institutions outside of the California Community College system do not use TOP codes in their reporting systems.

Data included in this analysis represent the labor market demand for relevant positions most closely related to the proposed program as expressed by the requesting college in consultation with the OC COE. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study which can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions.

All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; 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 findings; however, neither the Centers of Excellence for Labor Market Research (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.

Appendix B: Data Sources

Data Type	Source
Occupational Projections, Wages, and Job Postings	<p>Traditional labor market information data is sourced from Lightcast, a labor market analytics firm. Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics and the American Community Survey. For more information, see https://lightcast.io/</p>
Living Wage	<p>The living wage is derived from the Insight Center’s California Family Needs Calculator, which measures the income necessary for an individual of family to afford basic expenses. The data assesses the cost of housing, food, child care, health care, transportation, and taxes. For more information, see: https://insightccd.org/family-needs-calculator/</p> <p>The living wage for one adult in Orange County is \$20.63 per hour (\$42,910.40 annually). This figure is used by the CCCCCO to calculate the percentage of students that attained the regional living wage.</p>
Typical Education and Training Requirements, and Educational Attainment	<p>The Bureau of Labor Statistics (BLS) provides information about education and training requirements for hundreds of occupations. BLS uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which BLS publishes projections data. For more information, see https://www.bls.gov/emp/documentation/education/tech.htm</p>
Emerging Occupation Descriptions, Additional Education Requirements, and Employer Preferences	<p>The O*NET database includes information on skills, abilities, knowledges, work activities, and interests associated with occupations. For more information, see https://www.onetonline.org/help/online/</p>
Educational Supply	<p>The CCCCCO Data Mart provides information about students, courses, student services, outcomes and faculty and staff. For more information, see: https://datamart.cccco.edu</p> <p>The National Center for Education Statistics (NCES) Integrated Postsecondary Integrated Data System (IPEDS) collects data on the number of postsecondary awards earned (completions). For more information, see https://nces.ed.gov/ipeds/use-the-data/survey-components/7/completions</p>
Student Metrics and Demographics	<p>LaunchBoard, a statewide data system supported by the California Community Colleges Chancellor's Office and hosted by Cal-PASS Plus, provides data on progress, success, employment, and earnings outcomes for California community college students. For more information, see: https://www.calpassplus.org/LaunchBoard/Home.aspx</p>

Data Type	Source
Population and Occupation Demographics	<p>The Census Bureau's American Community Survey (ACS) is the premier source for detailed population and housing information. For more information, see: https://www.census.gov/programs-surveys/acs</p> <p>Data is sourced from IPUMS USA, a database providing access to ACS and other Census Bureau data products. For more information, see: https://usa.ipums.org/usa/about.shtml</p>

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