Cloud Computing

Inland Empire/Desert Region (Riverside and San Bernardino counties combined) & California

Summary

- Employment for the cloud computing occupational group is expected to **increase by 8% and have 613 annual job openings** over the next five years, between 2018 and 2023.
- The 25th percentile, entry-level, wages for the cloud computing occupational group are **above the MIT Living Wage estimate of $14.75** for a two-adult household, both working, with one child living in the Inland Empire/Desert Region.
- There were no credentials issued from regional community college training programs over the last three academic years.

Introduction

The California Community College program most closely associated with cloud computing is the computer infrastructure and support (TOP 0708.00) program. This program provides students with knowledge of network and operation systems design and administration, including certification preparation (Taxonomy of Programs, 2012). The occupations included in the cloud computing occupational group are the following:

- *Computer Network Architects*
- *Computer Network Support Specialists*
- *Computer User Support Specialists*
- *Network and Computer Systems Administrators*

Job Opportunities

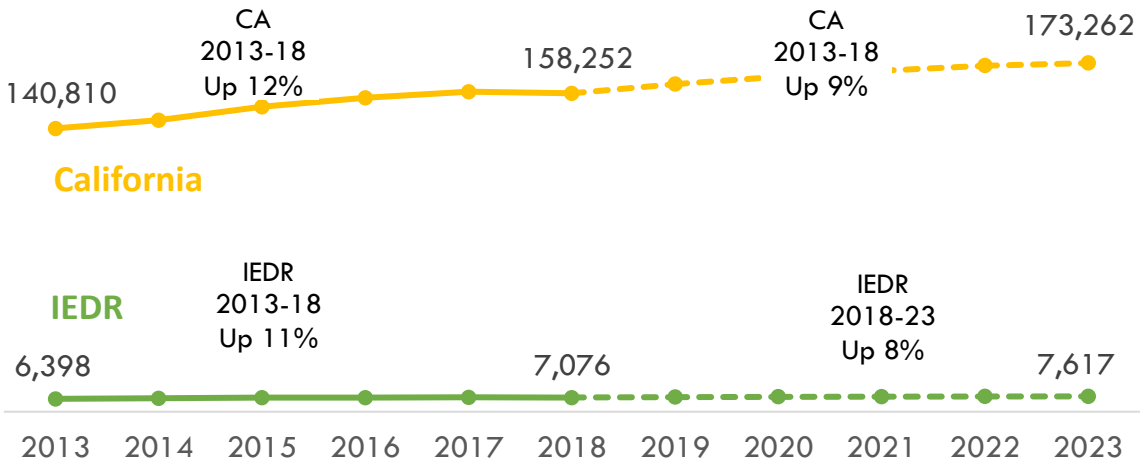
In 2018, there were 7,076 jobs related to the cloud computing occupational group in the Inland Empire/Desert Region (IEDR), accounting for 4% of statewide employment. This occupational group is projected to increase employment by 8% by 2023 and have 613 annual job openings. Exhibit 1 displays the five-year projected job growth for the cloud computing occupational group in the IEDR and California. Exhibit 2 displays historical and projected jobs for the cloud computing occupational group in the IEDR and California.

Exhibit 1: Five-year projections for the cloud computing occupational group

Region	2018 Jobs	5-Yr % Change (New Jobs)	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Inland Empire/Desert	7,076	8%	3,067	613	15%
California	158,252	9%	71,861	14,372	13%

Source: EMSI 2019.3

Exhibit 2: Historical and projected jobs for the cloud computing occupational group, 2013 – 2023



Source: EMSI 2019.3

Job Postings

To gauge demand for these occupations within cloud computing, job postings have been limited to those that requested cloud computing skills and experience. Over the last 12 months, October 2018 and September 2019:

2,966
Job postings for the four cloud computing occupations in the IEDR

5%
Of the 2,966 job postings request cloud computing skills and experience

1.3%
Of statewide cloud computing jobs ads are posted in the IEDR

Exhibit 3 displays the number of job ads posted during the last 12 months, along with the average time to fill for the cloud computing occupational group in the IEDR and California. On average, regional employers fill online job postings for the cloud computing occupational group within 42 days, three days longer than the statewide average of 39 days. This indicates that employers in the IEDR may face more challenges when seeking qualified candidates to fill cloud computing positions.

Exhibit 3: Job ads and time to fill for the cloud computing occupational group, last 12 months

Region	Occupation	Job Ads	Regional Average Time to Fill (Days)
IEDR	Computer User Support Specialists	62	39
	Network and Computer Systems Administrators	51	41
	Computer Network Architects	31	49
	Computer Network Support Specialists	6	39
	IEDR Total	**150**	**42**
CA	Network and Computer Systems Administrators	4,050	39
	Computer User Support Specialists	4,037	35
	Computer Network Architects	2,626	45
	Computer Network Support Specialists	364	35
	California Total	**11,077**	**39**

Source: Burning Glass – Labor Insights

Earnings and Benefits

The entry-level wages for the occupations in this group are above the MIT Living Wage estimate of $14.75 for a two-adult household, both working, with one child living in the IEDR. The MIT Living Wage Calculator measures the wage an individual must earn to support his or herself and their family (Glasmeier, 2019). The average IEDR household had 3.3 residents in 2017 (American Factfinder, 2018). Variations of the hourly and annual earnings necessary to support a three-person household are displayed in Exhibit 4.

Exhibit 4: Variations in hourly and annual MIT Living Wage estimates for three resident households

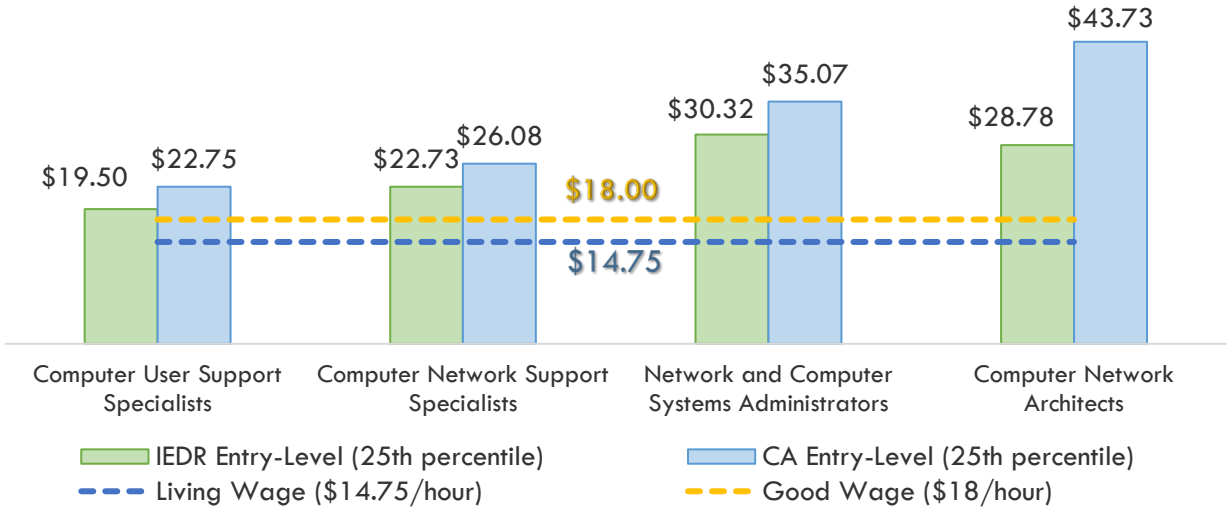
Three Resident Household	Hourly Wage	Annual Wage
2 Adults (Both Working), 1 Child	$14.75 (each adult)	$30,700 (each adult)
2 Adults (1 Working), 1 Child	$24.58	$51,100
1 Adult, 2 Children	$32.73	$68,100

Source: MIT Living Wage Calculator

The entry-level wages (25th percentile) for the occupations in this group are also above the $18.00 per hour ($37,440 per year) "good job" wage established by the Brookings Institute in their *Advancing Opportunity in California's Inland Empire* report (Shearer, Shah & Gootman, p. 25). According to occupational guides developed by the California Labor Market Information Division, occupations in the

cloud computing occupational group often receive health insurance in addition to other benefits (Detailed Guide, 2019). Exhibit 5 displays the entry-level hourly earnings for the cloud computing occupational group in the IEDR and California. Cloud computing wages are lower in the IEDR than the statewide average.

Exhibit 5: Hourly earnings for the cloud computing occupational group



Source: EMSI 2019.3, Brookings Institute

An alternative way to determine what wages workers can expect to earn is by extracting wage information from online job postings. Exhibit 6 displays advertised salary data from real-time job postings for the cloud computing occupational group over the last 12 months. This information should be viewed with caution, as only 19% of statewide job postings in mentioned salary information, 21% in the IEDR. Please note that salary figures are prorated to reflect full-time, annual wage status. There were too few postings for *computer network architects* and *computer network support specialists* in the IEDR to report reliable salary information.

Exhibit 6: Advertised salary information, last 12 months

Region	Occupation	Number of job postings	Real-Time Salary Information			
			Less than $35,000	$35,000 to $49,999	$50,000 to $74,999	More than $75,000
IEDR	Computer User Support Specialists	16	13%	56%	31%	-
	Network and Computer Systems Administrators	12	-	8%	8%	84%
	Computer Network Architects	2	-	-	-	-
	Computer Network Support Specialists	2	-	-	-	-
CA	Network and Computer Systems Administrators	714	2%	3%	22%	73%
	Computer User Support Specialists	1,022	3%	23%	47%	27%
	Computer Network Architects	257	2%	3%	7%	88%
	Computer Network Support Specialists	363	3%	8%	32%	57%

Source: Burning Glass – Labor Insights

Employers, Locations, Skills, Education, Work Experience, and Certifications

Exhibit 7 displays the employers posting the most job ads for the cloud computing occupational group during the last 12 months. There were too few postings for the cloud computing occupational group in the IEDR to obtain reliable employer information.

Exhibit 7: Employers posting the most job ads for the cloud computing occupational group, last 12 months

Region	Occupation	Employers	
IEDR	Computer User Support Specialists *(n=29)*	• -	• -
	Network and Computer Systems Administrators *(n=33)*	• -	• -
	Computer Network Architects *(n=11)*	• -	• -
	Computer Network Support Specialists *(n=5)*	• -	• -
CA	Network and Computer Systems Administrators *(n=2,296)*	• Northrop Grumman • Raytheon • Cisco Systems, Inc. • General Dynamics • Oracle Corporation	• University of Southern California • Scientific Research Corporation • Stanford Children's Hospital • Wedbush Securities, Inc.
	Computer User Support Specialists *(n=2,320)*	• Calance IT Services • IBM • Scoop Technologies • Citrix Systems, Inc. • SAP	• ServiceNow • Facebook, Inc. • Salesforce.com, Inc. • 8x8, Inc. • Viacom, Inc.
	Computer Network Architects *(n=1,401)*	• IBM • Anthem Blue Cross • Accenture • Booz Allen Hamilton, Inc. • Nutanix • Amazon.com, Inc.	• Dignity Health • Cisco Systems, Inc. • UC Irvine Health • Verizon Communications, Inc. • Stanford Children's Hospital • ServiceNow
	Computer Network Support Specialists *(n=253)*	• Northrop Grumman • Raytheon	• Scoop Technologies

Source: Burning Glass – Labor Insights

Exhibit 8 displays the work locations associated with the job postings for the cloud computing occupational group. The counties listed account for 94% of all the job postings for the cloud computing occupational group over the last 12 months in California. The IEDR only accounted for only 1.3% of job postings,

indicating lower demand for cloud computing skills and experience in the region than in Los Angeles, Orange, and San Diego counties, as well as the greater Bay Area.

Exhibit 8: Counties with the most job postings for the cloud computing occupational group, last 12 months

County	Job Postings
Los Angeles	2,640
Santa Clara	1,901
San Francisco	1,471
San Diego	1,232
Orange	1,106
Alameda	632
San Mateo	597
Sacramento	345
Contra Costa	217
Ventura	101
San Bernardino	99
Riverside	51
All other locations	*685*
Total	**11,077**

Source: Burning Glass – Labor Insights

Exhibit 9 displays a sample of specialized, employability, and software and programming skills that employers are seeking when looking for workers to fill positions in the cloud computing occupational group. Specialized skills are occupation-specific skills that employers are requesting for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is commonly referred to as "soft skills."

Exhibit 9: Sample of in-demand skills from employer job ads for the cloud computing occupational group, last 12 months

Region	Occupation	Specialized Skills	Employability Skills	Software and Programming Skills
IEDR	Computer User Support Specialists *(n=62)*	• Technical Support • Repair • Software Installation	• Troubleshooting • Communication Skills • Problem Solving	• Citrix • Microsoft Office • ServiceNow
	Network and Computer Systems Administrators *(n=51)*	• Hardware and Software Installation • Technical Writing/Editing • Disaster Recovery Planning	• Troubleshooting • Planning • Writing	• VMware • Windows Server • Microsoft PowerShell
	Computer Network Architects *(n=31)*	• Network Administration • Network Security • Virtualization	• Planning • Troubleshooting • Problem Solving	• VMware • Enhanced Interior Gateway Routing Protocol (EIGRP) • Cisco Switching
	Computer Network Support Specialists *(n=6)*	• Technical Support • IT Infrastructure Library	• Problem Solving • Planning • Communication Skills	• ServiceNow • Microsoft Project • Enterprise Resource Planning (ERP)
CA	Network and Computer Systems Administrators *(n=4,023)*	• Virtualization • Technical Support • Disaster Recovery Planning	• Troubleshooting • Communication Skills • Problem Solving	• VMware • Linux • Windows Server • Microsoft PowerShell
	Computer User Support Specialists *(n=4,018)*	• Technical Support • Customer Service • Hardware and Software Installation	• Troubleshooting • Communication Skills • Problem Solving	• Microsoft Office • ServiceNow • Citrix
	Computer Network Architects *(n=2,596)*	• Network Engineering • Virtualization • Routers	• Troubleshooting • Communication Skills • Teamwork/ Collaboration	• Linux • VMware • Python • Border Gateway Protocol
	Computer Network Support Specialists *(n=359)*	• Technical Support • Customer Service • System Administration	• Troubleshooting • Communication Skills • Problem Solving	• Linux • VMware • SQL

Source: Burning Glass – Labor Insights

Exhibit 10 displays the entry-level education typically required to enter each occupation according to the Bureau of Labor Statistics (BLS), educational attainment for incumbent workers with "some college, no

degree" and an "associate degree" according to the U.S. Census (2016-17), and the minimum advertised education requirement from employer job ads.

Exhibit 10: Typical entry-level education, educational attainment, and minimum advertised education requirements for the cloud computing occupational group, last 12 months

Region	Occupation	Typical Entry-Level Education Requirement	Educational Attainment (Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework)	Minimum Advertised Education Requirement from Job Ads			
				Number of Job Ads (n=)	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
IEDR	Computer User Support Specialists	Some college, no degree	41%	*43*	44%	16%	40%
	Network and Computer Systems Administrators	Bachelor's degree	38%	*36*	28%	-	72%
	Computer Network Architects	Bachelor's degree	35%	*12*	-	-	100%
	Computer Network Support Specialists	Associate degree	41%	*3*	-	-	100%
CA	Network and Computer Systems Administrators	Bachelor's degree	38%	*2,394*	7%	5%	88%
	Computer User Support Specialists	Some college, no degree	41%	*2,130*	15%	11%	74%
	Computer Network Architects	Bachelor's degree	35%	*1,403*	5%	2%	93%
	Computer Network Support Specialists	Associate degree	41%	*203*	8%	2%	90%

Source: EMSI 2019.3, Burning Glass – Labor Insights

Exhibit 11 displays the work experience typically required to enter each occupation and the real-time work experience requirement from employer job ads. Real-time work experience for the cloud computing occupational group exceeds the typical work experience required, established by BLS, most likely as a result of employers seeking candidates with cloud computing work experience in addition to what is typically required for employment.

Exhibit 11: Work experience required and real-time work experience requirements, last 12 months

Region	Occupation	Work Experience Typically Required	Real-Time Work Experience			
			Number of job postings	0 – 2 years	3 – 5 years	6+ years
IEDR	Computer User Support Specialists	None	*49*	47%	51%	2%
	Network and Computer Systems Administrators	None	*39*	10%	67%	23%
	Computer Network Architects	5 years or more	*13*	8%	23%	69%
	Computer Network Support Specialists	None	*6*	-	67%	33%
CA	Network and Computer Systems Administrators	None	*2,918*	13%	53%	34%
	Computer User Support Specialists	None	*2,746*	38%	48%	14%
	Computer Network Architects	5 years or more	*1,858*	9%	34%	57%
	Computer Network Support Specialists	None	*267*	15%	55%	30%

Source: EMSI 2019.3, Burning Glass – Labor Insights

Exhibit 12 displays in-demand certifications for each occupation in the cloud computing occupational group. Knowing which certifications are currently in demand may be useful for program development.

Exhibit 12: In-demand certifications for the cloud computing occupational group, last 12 months

Region	Occupation	Certification
IEDR	Computer User Support Specialists *(n=30)*	• Microsoft Certified Solutions Expert (MCSE) • CompTIA A+ Technician
	Network and Computer Systems Administrators *(n=25)*	• Microsoft Certified Solutions Expert (MCSE) • Microsoft Certified Solutions Associate (MCSA)
	Computer Network Architects *(n=10)*	• Cisco Certified Network Professional (CCNP) • Cisco Certified Internetwork Expert (CCIE)
	Computer Network Support Specialists *(n=4)*	• IT Infrastructure Library (ITIL) Certification
CA	Network and Computer Systems Administrators *(n=1,515)*	• IT Infrastructure Library (ITIL) Certification • Microsoft Certified Solutions Expert (MCSE)
	Computer User Support Specialists *(n=1,386)*	• IT Infrastructure Library (ITIL) Certification • CompTIA A+ Technician
	Computer Network Architects *(n=945)*	• Cisco Certified Network Professional (CCNP) • IT Infrastructure Library (ITIL) Certification
	Computer Network Support Specialists *(n=125)*	• CompTIA Security+ • IT Infrastructure Library (ITIL) Certification

Source: Burning Glass – Labor Insights

Student Completions and Outcomes

This section contains completion and outcome data for the California Community College computer infrastructure and support (TOP 0708.00) program. Exhibit 13 displays the average annual regional California Community College (CCC) credentials conferred during the three academic years between 2015 and 2018, from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart, along with the enrollments from the most recent year available on LaunchBoard. Credentials are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case in order to calculate an annual average. This is done to minimize the effect of atypical variation that might be present in a single year. Enrollments are the count of enrollments in courses assigned to the TOP code in the selected year. Between 2015 and 2018, no credentials were issued for the computer infrastructure and support program in the region.

Exhibit 13: Annual average community college credentials and enrollments for the computer infrastructure and support program in the Inland Empire/Desert region

0708.00 – Computer Infrastructure and Support	CCC Annual Average Credentials, Academic Years 2015-18	CCC Enrollments, Academic Year 2016-17
Chaffey	-	300
Mt. San Jacinto	-	49
San Bernardino Valley	-	36
Total	**0**	**385**

Source: LaunchBoard, MIS Data Mart

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from records provided by California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported in order to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2019a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2017). Data from the latest academic year for each metric is provided in Exhibit 14.

Exhibit 14: 0708.00 – Computer infrastructure and support strong workforce program outcomes

Strong Workforce Program Metrics: 0708.00 – Computer Infrastructure and Support Academic Year 2015-16, unless noted otherwise	Inland Empire/Desert Region	California Median
Course enrollments (2016-17)	385	124
Completed 12+ units in one year (2016-17)	81	30
Economically disadvantaged students (2016-17)	79%	66%
Transferred to a four-year institution (transfers)	13	16
Employed in the fourth fiscal quarter after exit (all exiters)	68%	72%
Median annual earnings (all exiters)	$40,136	$38,869
Job closely related to the field of study (2014-15)	100%	93%
Median change in earnings (all exiters)	21%	37%
Attained a living wage (completers and skills-builders)	61%	65%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Contact

Michael Goss, Director
Center of Excellence, Inland Empire/Desert Region
michael.goss@chaffey.edu
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Appendix: Occupation definitions, sample job titles, five-year projections for cloud computing occupations

Occupation Definitions (SOC) code), Education and Training Requirement, Community College Educational Attainment

Network and Computer Systems Administrators (15-1142)

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.

Sample job titles: Information Analyst, Information Systems Manager (IS Manager), Information Technology Specialist (IT Specialist), LAN Specialist (Local Area Network Specialist), Local Area Network Administrator (LAN Administrator), Network Administrator, Network Coordinator, Network Manager, Network Specialist, Systems Administrator

Entry-Level Educational Requirement: Bachelor's degree
Training Requirement: None
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 38%

Computer Network Architects (15-1143)

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. May also design network and computer security measures. May research and recommend network and data communications hardware and software.

Sample job titles: Design Engineer, Network Analyst, Network and Security Engineer, Network Consultant, Network Systems Consultant, Networking Systems and Distributed Systems Engineer, Solutions Architect, Telecommunications Analyst

Entry-Level Educational Requirement: Bachelor's degree
Training Requirement: None
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 35%

Computer User Support Specialists (15-1151)

Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems.

Sample job titles: Computer Specialist, Computer Support Specialist, Computer Technician, Desktop Support Technician, Help Desk Analyst, Help Desk Technician, Information Technology Specialist (IT Specialist), Network Technician, Support Specialist, Technical Support Specialist

Entry-Level Educational Requirement: Some college, no degree
Training Requirement: None
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 41%

Computer Network Support Specialists (15-1152)

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.

Sample job titles: Computer Network Specialist, IT Consultant (Information Technology Consultant), Network Engineer, Network Specialist, Network Support Specialist, Network Technical Analyst, Network Technician, Personal Computer Network Analyst, Senior IT Assistant (Senior Information Technology Assistant), Systems Specialist

Entry-Level Educational Requirement: Associate degree
Training Requirement: None
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 41%

Table 1: 2018 to 2023 job growth, wages, education, training, and work experience required for the cloud computing occupational group, Inland Empire/Desert region

Occupation (SOC)	2018 Jobs	5-Yr Change (New Jobs)	5-Yr % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (25th to 75th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Typical Entry-Level Education & On-The-Job Training Required	Work Experience Required
Computer User Support Specialists (15-1151)	3,715	323	9%	343	$19.50 to $34.06	$26.07	$58,300	Some college, no degree & None	None
Network and Computer Systems Administrators (15-1142)	1,808	111	6%	136	$30.32 to $50.42	$38.42	$84,600	Bachelor's degree & None	None
Computer Network Support Specialists (15-1152)	1,107	83	7%	99	$22.73 to $37.26	$27.99	$66,700	Associate degree & None	None
Computer Network Architects (15-1143)	447	24	5%	34	$28.78 to $62.88	$49.47	$101,200	Bachelor's degree & None	5 years or more
Total	**7,076**	**541**	**8%**	**613**	**-**	**-**	**-**	**-**	**-**

Source: EMSI 2019.3

Table 2: 2018 to 2023 job growth, wages, education, training, and work experience required for the cloud computing occupational group, California

Occupation (SOC)	2018 Jobs	5-Yr Change (New Jobs)	5-Yr % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (25th to 75th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Typical Entry-Level Education & On-The-Job Training Required	Work Experience Required
Computer User Support Specialists (15-1151)	81,948	8,862	11%	8,000	$22.75 to $38.64	$29.53	$66,800	Some college, no degree & None	None
Network and Computer Systems Administrators (15-1142)	38,954	2,927	8%	3,069	$35.07 to $57.24	$44.90	$97,400	Bachelor's degree & None	None
Computer Network Support Specialists (15-1152)	19,824	1,863	9%	1,869	$26.08 to $45.28	$34.36	$76,500	Associate degree & None	None
Computer Network Architects (15-1143)	17,526	1,357	8%	1,435	$43.73 to $75.71	$59.17	$126,800	Bachelor's degree & None	5 years or more
Total	**158,252**	**15,010**	**9%**	**14,372**	**-**	**-**	**-**	**-**	**-**

Source: EMSI 2019.3