

# Amazon Web Services (AWS)

*Inland Empire/Desert region (Riverside and San Bernardino counties combined)*

## Summary

- Middle-skill employment related to the Amazon Web Services occupational group is expected to **increase by 8% between 2018 and 2023** in the Inland Empire/Desert region (IEDR). A total of **2,214 job openings or 443 annual job openings** will be available over the five-year timeframe.
- The 25<sup>th</sup> percentile, entry-level, wages for the Amazon Web Services occupational group are **above the MIT Living Wage estimate of \$14.75** for a two-adult household with one child living in the Inland Empire/Desert Region.
- There are **119 credentials issued annually** from regional community college computer networking programs.

## Introduction

The California Community College program most closely associated with Amazon Web Services (AWS) is the computer networking (TOP 0708.10) program. This program provides students with the principles of local, metropolitan, and wide-area computer networking design, installation, maintenance, and troubleshooting. (Taxonomy of Programs, 2012). While there are entry-level positions with AWS, the majority of occupations working in this field typically require a bachelor's degree.

For this reason, the AWS occupational group is separated into **middle-skill occupations** and **high-skill occupations** to illuminate the opportunities available to students with various levels of educational attainment. The supply and demand portion of this report focuses solely on the middle-skill jobs students are likely to obtain after completing a community college computer networking program. A section detailing demand for AWS certifications and skills begins on page eight.

The **middle-skill AWS occupational group** consists of entry-level occupations that typically require workers to obtain some postsecondary education. The occupations included in the middle-skill AWS occupational group are:

- *Computer Network Support Specialists*
- *Computer User Support Specialists*

The **high-skill AWS occupational group** consists of occupations that typically require workers to obtain a bachelor’s degree. The occupations included in the high-skill AWS occupational group are:

- *Computer Network Architects*
- *Computer Systems Analysts*
- *Network and Computer Systems Administrator*
- *Database Administrators*
- *Information Security Analysts*

## Job Opportunities

In 2018, there was a potential middle-skill workforce of 4,821 jobs in the AWS occupational group in the Inland Empire/Desert Region (IEDR). This occupational group is projected to increase employment by 8% by 2023. Employers in the region will need to hire 2,214 middle-skill-level workers over the next five years to fill new jobs and backfill jobs that workers are permanently vacating (includes occupational transfers and retirements). Middle-skill jobs represent 53% of all job openings in this group over the next five years.

High-skill AWS jobs are expected to have 396 annual job openings over the next five years. Detailed occupation definitions, job growth, and wages for each occupation are available in the Appendix section of this report.

Please note that traditional labor market data does not identify jobs that work exclusively in AWS. The figures below represent the potential workforce that has the knowledge, skills, and abilities to work with AWS.

*Exhibit 1: Five-year projections for the AWS occupational group*

Occupational Group	2018 Jobs	5-Yr % Change (New Jobs)	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Middle-Skill	4,821	8%	2,214	443	16%
High-Skill	5,031	7%	1,980	396	17%
<b>Total</b>	<b>9,852</b>	<b>8%</b>	<b>4,193</b>	<b>839</b>	<b>16%</b>

Source: EMSI 2019.3

## Job Postings

Exhibit 2 displays the number of job ads posted during the last 12 months along with the regional and statewide average time to fill for the AWS occupational group in the IEDR. On average, local employers fill online job postings for the AWS occupational group within 43 days. This regional average is four days

longer than the statewide average, indicating that it may be more difficult for local employers to find qualified candidates. Job postings have been limited to positions that are available to recent community college graduates, requiring an associate degree or high school diploma or equivalent. The 2,714 job postings included in this report represent 62% of total postings for the AWS occupational group.

Exhibit 2: Job ads and time to fill, Sep 2018 – Aug 2019

Group	Occupation	Job Ads	Regional Average Time to Fill (Days)	California Average Time to Fill (Days)
Middle-Skill	Computer User Support Specialists	1,414	39	35
	Computer Network Support Specialists	62	39	35
	<b>Middle-Skill Subtotal</b>	<b>1,476</b>	<b>-</b>	<b>-</b>
High-Skill	Computer Systems Analysts	351	45	42
	Network and Computer Systems Administrators	295	41	39
	Database Administrators	233	45	41
	Computer Network Architects	196	48	44
	Information Security Analysts	140	48	44
	<b>High-Skill Subtotal</b>	<b>1,215</b>	<b>-</b>	<b>-</b>
<b>Total</b>		<b>2,691</b>	<b>43</b>	<b>39</b>

Source: Burning Glass – Labor Insights

## Earnings and Benefits

The entry-level wages (25<sup>th</sup> percentile) for the occupations in this group are 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). Occupations in the AWS occupational group often receive medical insurance in addition to other benefits according to occupational guides developed by the California Labor Market Information Division (Detailed Guide, 2019).

The entry-level wages for the occupations in this group are also above the MIT Living Wage estimate of \$14.75 for a two-adult household 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 3. Exhibit 4 displays earnings for the AWS occupational group in the IEDR.

*Exhibit 3: 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	\$30,700
2 Adults (1 Working), 1 Child	\$24.58	\$51,100
1 Adult, 2 Children	\$32.73	\$68,100

Source: MIT Living Wage Calculator

*Exhibit 4: Earnings for the AWS occupational group*

Group	Occupation	Entry to Experienced Hourly Wage Range (25 <sup>th</sup> to 75 <sup>th</sup> percentile)	Median Wage (50 <sup>th</sup> percentile)	Average Annual Earnings
Middle-Skill	Computer Network Support Specialists	\$22.73 to \$37.26	\$27.99	\$66,700
	Computer User Support Specialists	\$19.50 to \$34.06	\$26.07	\$58,300
High-Skill	Information Security Analysts	\$42.49 to \$66.58	\$55.01	\$110,200
	Computer Network Architects	\$28.78 to \$62.88	\$49.47	\$101,200
	Database Administrators	\$33.92 to \$61.30	\$46.75	\$97,800
	Computer Systems Analysts	\$31.56 to \$50.65	\$39.75	\$89,300
	Network and Computer Systems Administrators	\$30.32 to \$50.42	\$38.42	\$84,600

Source: EMSI 2019.3

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

Exhibit 5 displays the employers posting the most job ads for the AWS occupational group during the last 12 months in the IEDR. Each employer posted at least 13 job postings for each occupation listed.

Exhibit 5: Employers posting the most job ads, Sep 2018 – Aug 2019

Group	Occupation	Employers	
Middle-Skill	Computer User Support Specialists (n=916)	<ul style="list-style-type: none"> <li>• Best Buy</li> <li>• Riverside County</li> <li>• Niagara Bottling, LLC</li> </ul>	<ul style="list-style-type: none"> <li>• General Dynamics</li> <li>• Live Nation Worldwide</li> </ul>
	Computer Network Support Specialists (n=47)	<ul style="list-style-type: none"> <li>• NCR Corporation</li> <li>• H&amp;R Block</li> </ul>	<ul style="list-style-type: none"> <li>• Frontier Communications</li> </ul>
High-Skill	Computer Systems Analysts (n=220)	<ul style="list-style-type: none"> <li>• Kaiser Permanente</li> <li>• Riverside County</li> </ul>	<ul style="list-style-type: none"> <li>• San Bernardino County</li> <li>• Arrowhead Regional Medical Center</li> </ul>
	Network and Computer Systems Administrators (n=166)	<ul style="list-style-type: none"> <li>• Mt. San Jacinto College</li> <li>• Booz Allen Hamilton, Inc.</li> <li>• San Bernardino County</li> </ul>	<ul style="list-style-type: none"> <li>• Loma Linda University Health</li> <li>• San Manuel Band of Mission Indians</li> </ul>
	Database Administrators (n=124)	<ul style="list-style-type: none"> <li>• Pechanga Resort Casino</li> <li>• UnitedHealth Group</li> </ul>	<ul style="list-style-type: none"> <li>• Rialto Unified School District</li> <li>• Soboba Casino Resort</li> </ul>
	Information Security Analysts (n=81)	<ul style="list-style-type: none"> <li>• Riverside County</li> <li>• Exeter Government Services, LLC</li> <li>• San Bernardino Community College District</li> </ul>	<ul style="list-style-type: none"> <li>• Dorel Juvenile Group</li> <li>• Stater Bros Markets</li> </ul>
	Computer Network Architects (n=68)	<ul style="list-style-type: none"> <li>• Anthem Blue Cross</li> <li>• Aztecs Telecom</li> </ul>	<ul style="list-style-type: none"> <li>• San Bernardino County</li> </ul>

Source: Burning Glass – Labor Insights

Exhibit 6 displays in-demand certifications for each occupation in the AWS occupational group. Knowing which certifications are currently in demand may be useful for program development. There were too few job postings for *database administrators* to obtain reliable certification information.

Exhibit 6: In-demand certifications, Sep 2018 – Aug 2019

Group	Occupation	Certification
Middle-Skill	Computer User Support Specialists (n=486)	<ul style="list-style-type: none"> <li>• CompTIA A+</li> <li>• CompTIA Network+</li> </ul>
	Computer Network Support Specialists (n=27)	<ul style="list-style-type: none"> <li>• CompTIA A+</li> <li>• CompTIA Network+</li> <li>• Cisco Network Associate (CCNA)</li> </ul>
High-Skill	Computer Systems Analysts (n=99)	<ul style="list-style-type: none"> <li>• Project Management Certification</li> <li>• IT Infrastructure Library (ITIL) Certification</li> </ul>
	Network and Computer Systems Administrators (n=100)	<ul style="list-style-type: none"> <li>• CompTIA Security+</li> <li>• Cisco Certified Network Associate (CCNA)</li> </ul>
	Database Administrators (n=53)	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
	Information Security Analysts (n=68)	<ul style="list-style-type: none"> <li>• Certified Information Systems Security Professional (CISSP)</li> <li>• CompTIA Security+</li> </ul>
	Computer Network Architects (n=58)	<ul style="list-style-type: none"> <li>• Cisco Certified Network Associate (CCNA)</li> <li>• CompTIA Security+</li> </ul>

Source: Burning Glass – Labor Insights

Exhibit 7 displays a sample of specialized, employability, and software and programming skills that employers are seeking when looking for workers to fill positions in the AWS 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.” The skills requested in job postings may be utilized as a helpful guide for curriculum development.

Exhibit 7: Sample of in-demand skills from employer job ads, Sep 2018 – Aug 2019

Group	Occupation	Specialized Skills	Employability Skills	Software and Programming Skills
High-Skill	Computer Systems Analysts (n=318)	<ul style="list-style-type: none"> <li>• Business Process</li> <li>• Project Management</li> <li>• Customer Service</li> </ul>	<ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Problem Solving</li> <li>• Troubleshooting</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• SQL</li> <li>• SAP</li> </ul>
	Network and Computer Systems Administrators (n=264)	<ul style="list-style-type: none"> <li>• Wide Area Network (WAN)</li> <li>• System/Network Configuration</li> <li>• Technical Support</li> </ul>	<ul style="list-style-type: none"> <li>• Troubleshooting</li> <li>• Communication Skills</li> <li>• Planning</li> </ul>	<ul style="list-style-type: none"> <li>• VMWare</li> <li>• Linux</li> <li>• Windows Server</li> </ul>
	Database Administrators (n=209)	<ul style="list-style-type: none"> <li>• Database Management</li> <li>• Data Entry</li> <li>• Database Tuning</li> </ul>	<ul style="list-style-type: none"> <li>• Troubleshooting</li> <li>• Communication Skills</li> <li>• Writing</li> </ul>	<ul style="list-style-type: none"> <li>• SQL</li> <li>• Teradata DBA</li> <li>• Oracle</li> </ul>
	Information Security Analysts (n=119)	<ul style="list-style-type: none"> <li>• Information Systems</li> <li>• Network Security</li> <li>• Information Assurance</li> </ul>	<ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Planning</li> <li>• Writing</li> </ul>	<ul style="list-style-type: none"> <li>• Linux</li> <li>• Python</li> <li>• UNIX</li> </ul>
	Computer Network Architects (n=165)	<ul style="list-style-type: none"> <li>• Network Engineering</li> <li>• Telecommunications</li> <li>• Customer Service</li> </ul>	<ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Troubleshooting</li> <li>• Problem Solving</li> </ul>	<ul style="list-style-type: none"> <li>• Python</li> <li>• Linux</li> <li>• Debugging</li> </ul>
Middle-Skill	Computer User Support Specialists (n=1,290)	<ul style="list-style-type: none"> <li>• Technical Support</li> <li>• Repair</li> <li>• Hardware and Software Installation</li> </ul>	<ul style="list-style-type: none"> <li>• Troubleshooting</li> <li>• Communication Skills</li> <li>• Problem Solving</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Windows</li> <li>• Microsoft Office</li> <li>• SQL</li> </ul>
	Computer Network Support Specialists (n=57)	<ul style="list-style-type: none"> <li>• Customer Service</li> <li>• Technical Support</li> <li>• System/Network Configuration</li> </ul>	<ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Troubleshooting</li> <li>• Problem Solving</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Voice over IP (VoIP)</li> <li>• Virtual Private Networking (VPN)</li> </ul>

Source: Burning Glass – Labor Insights

Exhibit 8 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. Please note, job postings requiring a bachelor’s degree have been excluded from this search.

Exhibit 8: Typical education requirements (middle-skill occupations appear below the line), Sep 2018 – Aug 2019

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 postings	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Computer User Support Specialists	Some college, no degree	41%	551	68%	32%	-
Computer Network Support Specialists	Associate degree	41%	34	76%	24%	-
Computer Systems Analysts	Bachelor's degree	21%	114	71%	29%	-
Network and Computer Systems Administrators	Bachelor's degree	38%	112	77%	23%	-
Database Administrators	Bachelor's degree	22%	71	75%	25%	-
Information Security Analysts	Bachelor's degree	28%	53	62%	38%	-
Computer Network Architects	Bachelor's degree	35%	32	62%	38%	-

Source: EMSI 2019.3, Burning Glass – Labor Insights

Exhibit 9 displays the work experience typically required to enter each occupation and the real-time work experience requirement from employer job ads. Most employers hiring for middle-skill AWS occupations are seeking candidates with zero to two years of experience.



Exhibit 9: Work experience required and real-time work experience requirements (middle-skill occupations appear below the line), Sep 2018 – Aug 2019

Occupation	Work Experience Typically Required	Real-Time Work Experience Required from Job Ads			
		Number of job postings	0 – 2 years	3 – 5 years	6+ years
Computer User Support Specialists	None	800	66%	30%	4%
Computer Network Support Specialists	None	43	47%	44%	9%
Computer Systems Analysts	None	212	37%	50%	13%
Network and Computer Systems Administrators	None	179	26%	60%	14%
Database Administrators	None	140	36%	54%	10%
Information Security Analysts	Less than 5 years	86	26%	38%	36%
Computer Network Architects	5 years or more	105	32%	43%	25%

Source: EMSI 2019.3, Burning Glass – Labor Insights

## Demand for Amazon Web Services Certifications

Amazon Web Services (AWS) is a subsidiary of Amazon that provides computing services to individuals, companies, and governments. AWS allows for the customization of its cloud-based platform to fit individual business needs. AWS offers certifications for their web services, which validates an individual's cloud expertise. There are four levels of AWS certifications: foundational, associate, professional, and specialty (AWS Certification, 2019). While AWS offers training for certification exams, it also recommends that individuals get as much real-world experience as possible. The suggested real-world experience ranges from six months for a foundational certification to two years for an AWS professional certification.

Over the last 12 months (September 2018 to August 2019), there were seven job postings specifying a need for AWS certifications in the IEDR. All seven postings required an AWS Solutions Architect certification while one of the job postings was looking for an additional SysOps Administrator certification. Both of these are associate-level certifications, indicating one year of experience solving problems and implementing solutions using the AWS Cloud. Real-time employer, skill, education, and work-experienced

required data could not be obtained due to the low number of postings with these certification requirements.

During the same period, more than 369 job ads specified a desire for AWS skills. The significant difference between the desire for AWS skills and certifications may be the result of employers being unaware of AWS certifications, an employer expectation that job candidates already have these certifications, or employers only seeking individuals with general AWS skills and experience.

## Demand for Amazon Web Services Skills

A job posting search was conducted to determine the demand for AWS skills in the IEDR. Over the last 12 months, 369 employer job ads specified a desire for at least one of the 19 AWS skills. Exhibit 10 displays AWS skills and their frequency in job postings.

*Exhibit 10: Number of job postings for AWS skills, Sep 2018 – Aug 2019*

Skill	Job Postings
Amazon Web Services (AWS)	180
AWS Elastic Compute Cloud (EC2)	166
AWS Simple Storage Service (S3)	72
AWS Simple Queue Service (SQS)	56
AWS Redshift	37
AWS CloudFormation	29
Amazon DynamoDB	27
Amazon Redshift	25
AWS Elastic MapReduce (EMR)	17
Amazon Virtual Private Cloud (VPC)	17
Amazon CloudFront	14
Amazon Relational Database Service (RDS)	10
AWS SimpleDB	9
AWS Key Management Service (KMS)	9
AWS Elastic Beanstalk	3
AWS Elastic Block Store (EBS)	3
AWS Kinesis	1
AWS ElastiCache	1
AWS Direct Connect	0

Source: Burning Glass – Labor Insights

Exhibit 11 displays the number of job ads for occupations that employers frequently request AWS skills.

*Exhibit 11: Job ads for occupations requiring AWS skills, Sep 2018 – Aug 2019*

Occupation	Job Ads
Software Developers, Applications	141
Web Developers	38
Computer Systems Engineers/Architects*	30
Database Administrators	19
Computer Systems Analysts	13
Database Architects*	11
<i>Job ads for all other occupations</i>	<i>117</i>
<b>Total</b>	<b>369</b>

Source: Burning Glass – Labor Insights

\**Computer Systems Engineers/Architects* and *Database Architects* are both emerging occupations that are embedded within the broader occupation, *Computer Occupations, All Other (SOC 15-1199)*.

## Employers, Skills, Education, and Work Experience

Exhibit 12 displays the employers posting the most job ads specifying a desire for AWS skills during the last 12 months in the IEDR. There were too few postings for the *web developers* and the *database architects* occupations to report reliable employer job posting information.

*Exhibit 12: Employers posting the most job ads for AWS skills, Sep 2018 – Aug 2019*

Occupation	Employers
Software Developers, Applications (n=65)	<ul style="list-style-type: none"> <li>• Esri</li> <li>• Amazon</li> </ul>
Web Developers (n=7)	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Computer Systems Engineers/Architects (n=15)	<ul style="list-style-type: none"> <li>• Amazon</li> </ul>
Database Administrators (n=9)	<ul style="list-style-type: none"> <li>• Anthem Blue Cross</li> </ul>
Computer Systems Analysts (n=10)	<ul style="list-style-type: none"> <li>• University of California, Riverside</li> </ul>
Database Architects (n=4)	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

Source: Burning Glass – Labor Insights

Exhibit 13 displays a sample of specialized, employability, and software and programming skills that employers are seeking in addition to AWS skills. 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.” The skills requested in job postings may be utilized as a helpful guide for curriculum development.

Exhibit 13: Sample of in-demand skills from employer job ads for occupations requiring AWS skills, Sep 2018 – Aug 2019

Occupation	Specialized Skills	Employability Skills	Software and Programming Skills
Software Developers, Applications (n=141)	<ul style="list-style-type: none"> <li>• Cloud Computing</li> <li>• Debugging</li> <li>• Software Engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Teamwork/ Collaboration</li> <li>• Troubleshooting</li> <li>• Communication Skills</li> </ul>	<ul style="list-style-type: none"> <li>• AWS Elastic Compute Cloud (EC2)</li> <li>• Java</li> <li>• SQL</li> </ul>
Web Developers (n=38)	<ul style="list-style-type: none"> <li>• Information Systems</li> <li>• Version Control</li> <li>• Software Engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Teamwork/ Collaboration</li> <li>• Communication Skills</li> <li>• Problem Solving</li> </ul>	<ul style="list-style-type: none"> <li>• JavaScript</li> <li>• MySQL</li> <li>• Hypertext Preprocessor (PHP)</li> </ul>
Computer Systems Engineers/Architects (n=30)	<ul style="list-style-type: none"> <li>• Cloud Computing</li> <li>• Software Development</li> <li>• Performance Tuning</li> </ul>	<ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Troubleshooting</li> <li>• Teamwork/ Collaboration</li> </ul>	<ul style="list-style-type: none"> <li>• Linux</li> <li>• Apache HTTP Webserver</li> <li>• Puppet</li> </ul>
Database Administrators (n=19)	<ul style="list-style-type: none"> <li>• Data Architecture</li> <li>• Data Management</li> <li>• Machine Learning</li> </ul>	<ul style="list-style-type: none"> <li>• Troubleshooting</li> <li>• Planning</li> <li>• Leadership</li> </ul>	<ul style="list-style-type: none"> <li>• SQL</li> <li>• Python</li> <li>• Linux</li> </ul>
Computer Systems Analysts (n=13)	<ul style="list-style-type: none"> <li>• System Architecture</li> <li>• Business Processes</li> <li>• Cloud Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting Deadlines</li> <li>• Research</li> <li>• Communication Skills</li> </ul>	<ul style="list-style-type: none"> <li>• Amazon Web Services (AWS)</li> <li>• Object-Oriented Analysis and Design (OOAD)</li> </ul>
Database Architects (n=11)	<ul style="list-style-type: none"> <li>• Data Warehousing</li> <li>• Business Intelligence</li> <li>• Data Integration</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership</li> <li>• Teamwork/ Collaboration</li> <li>• Communication Skills</li> </ul>	<ul style="list-style-type: none"> <li>• Amazon Web Services (AWS)</li> <li>• AWS Elastic Computer Cloud (EC2)</li> <li>• AWS Elastic MapReduce (EMR)</li> </ul>

Source: Burning Glass – Labor Insights

Exhibit 14 displays the minimum advertised education requirement from employer job ads. Of the 262 job ads that included a minimum education requirement, 97% are seeking individuals with a bachelor’s degree or higher.

*Exhibit 14: Minimum advertised education requirements for occupations requiring AWS skills, Sep 2018 – Aug 2019*

Occupation	Minimum Advertised Education Requirement from Job Ads			
	Number of job postings	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Software Developers, Applications	106	3%	-	97%
Web Developers	25	-	-	100%
Computer Systems Engineers/Architects	18	6%	-	94%
Database Administrators	16	-	-	100%
Computer Systems Analysts	12	-	-	100%
Database Architects	10	-	-	100%

Source: EMSI 2019.3, Burning Glass – Labor Insights

Exhibit 15 displays the real-time work experience requirement from employer job ads. Job postings indicate that the majority of employers are seeking candidates with three to five years of experience working with Amazon Web Services.

*Exhibit 15: Real-time work experience requirements for occupations requiring AWS skills, Sep 2018 – Aug 2019*

Occupation	Real-Time Work Experience Required from Job Ads			
	Number of job postings	0 – 2 years	3 – 5 years	6+ years
Software Developers, Applications	115	16%	69%	15%
Web Developers	28	39%	61%	-
Computer Systems Engineers/Architects	26	15%	27%	58%
Database Administrators	15	7%	13%	80%
Computer Systems Analysts	12	25%	8%	67%
Database Architects	10	-	20%	80%

Source: EMSI 2019.3, Burning Glass – Labor Insights

## Student Completions and Program Outcomes

Exhibit 16 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 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. Please note, a credential is not always equal to a single person in search of a job opening since a student may earn more than one credential, such as two or three complimentary certificates. There are no associate degrees offered at the regional computer networking training programs.

*Exhibit 16: Annual average community college credentials and enrollments for the computer networking program in the Inland Empire/Desert region*

0708.10 – Computer Networking	Certificates				CCC Annual Average Credentials, Academic Years 2015-18	CCC Enrollments, Academic Year 2016-17
	6 to <18 Semester Units	12 to <18 Semester Units	18 to <30 Semester Units	30 to <60 Semester Units		
<b>Chaffey</b>	1*	6	64	22	92	217
<b>Mt. San Jacinto</b>	-	-	-	2	2	112
<b>Riverside</b>	24	-	1	-	25	259
<b>Victor Valley</b>	-	-	-	-	-	30
<b>Total</b>	<b>25</b>	<b>6</b>	<b>65</b>	<b>24</b>	<b>119</b>	<b>618</b>

Source: LaunchBoard, MIS Data Mart

\*Chaffey issued one 6 to < 18-semester unit certificate in 2016-17,

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 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 17.

*Exhibit 17: 0708.10 – Computer networking strong workforce program outcomes*

<b>Strong Workforce Program Metrics: 0708.10 – Computer Networking Academic Year 2015-16, unless noted otherwise</b>	<b>Inland Empire/Desert region</b>	<b>California Median</b>
Course enrollments (2016-17)	618	168
Completed 12+ units in one year (2016-17)	129	31
Economically disadvantaged students (2016-17)	82%	71%
Transferred to a four-year institution (transfers)	22	15
Employed in the fourth fiscal quarter after exit (completers)	75%	72%
Median annual earnings (completers)	\$45,582	\$39,155
Job closely related to the field of study (2014-15)	74%	75%
Median change in earnings (completers)	14%	59%
Attained a living wage (completers and skills-builders)	61%	74%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

## Recommendation

The California Community College computer networking program is most closely associated with Amazon Web Services (AWS) training. The computer networking program provides students with the principles of local, metropolitan, and wide-area computer networking design, installation, maintenance, and troubleshooting. Middle-skill occupations associated with the training provided by this program will have 443 annual job opening over the next five years. High-skill jobs in this group will have 396 annual job openings for students that pursue an advanced degree, a bachelor's degree or higher. All jobs examined in this report have a 25<sup>th</sup> percentile, entry-level wage that will allow a household of two adults and one child to be self-sustainable. Employers posted 369 job ads specifying a desire for at least one of the 19 AWS skills over the last 12 months. Local community college computer networking conferred an annual average of 119 certificates in the previous three academic years. The COE recommends expanding or creating more computer networking programs in the IEDR. Please consult with local employers about their specific need for more workers and Amazon Web Services certifications.

## Contact

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## Appendix: Occupation definitions, sample job titles, five-year projections for AWS occupations

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

### High-Skill Occupations

#### **Computer Systems Analysts (15-1121)**

Analyze science, engineering, business, and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations. May analyze or recommend commercially available software.

**Sample job titles:** Applications Analyst, Business Analyst, Business Systems Analyst, Computer Analyst, Computer Systems Analyst, Computer Systems Consultant, Information Systems Analyst (ISA), Information Technology Analyst (IT Analyst), System Analyst, Systems Analyst

*Entry-Level Educational Requirement: Bachelor's degree*

*Training Requirement: None*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 21%*

#### **Information Security Analysts (15-1122)**

Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. 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.

**Sample job titles:** Data Security Administrator, Information Security Officer, Information Security Specialist, Information Systems Security Analyst, Information Systems Security Officer, Information Technology Security Analyst (IT Security Analyst), Information Technology Specialist, Network Security Analyst, Security Analyst, Systems Analyst

*Entry-Level Educational Requirement: Bachelor's degree*

*Training Requirement: None*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 28%*

### **Database Administrators (15-1141)**

Administer, test, and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. May plan, coordinate, and implement security measures to safeguard computer databases.

**Sample job titles:** Data Architect, Database Administration Manager, Database Administrator (DBA), Database Analyst, Database Coordinator, Database Developer, Database Programmer, Information Systems Manager, Management Information Systems Director (MIS Director), System Administrator

*Entry-Level Educational Requirement: Bachelor's degree*

*Training Requirement: None*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 22%*

### **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

*Entry-Level Educational Requirement: Bachelor's degree*

*Training Requirement: None*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 35%*

#### Middle-Skill Occupations

#### **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 amazon web services occupational group, Inland Empire/Desert region (high-skill occupations listed first, middle-skill occupations second)

Occupation (SOC)	2018 Jobs	5-Yr Change (New Jobs)	5-Yr % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry to Experienced Hourly Wage Range (25 <sup>th</sup> to 75 <sup>th</sup> percentile)	Median Wage (50 <sup>th</sup> percentile)	Average Annual Earnings	Typical Entry-Level Education & On-The-Job Training Required	Work Experience Required
Computer Systems Analysts (15-1121)	1,995	143	7%	159	\$31.56 to \$50.65	\$39.75	\$89,300	Bachelor's 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
Database Administrators (15-1141)	556	37	7%	44	\$33.92 to \$61.30	\$46.75	\$97,800	Bachelor's 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
Information Security Analysts (15-1122)	224	34	15%	23	\$42.49 to \$66.58	\$55.01	\$110,200	Bachelor's degree & none	Less than 5 years
<b>High-Skill Subtotal</b>	<b>5,031</b>	<b>348</b>	<b>7%</b>	<b>396</b>	-	-	-	-	-
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
Computer Network Support Specialists (15-1152)	1,107	83	7%	99	\$22.73 to \$37.26	\$27.99	\$66,700	Associate degree & none	None
<b>Middle-Skill Subtotal</b>	<b>4,821</b>	<b>407</b>	<b>8%</b>	<b>443</b>	-	-	-	-	-
<b>Total</b>	<b>9,852</b>	<b>755</b>	<b>8%</b>	<b>839</b>	-	-	-	-	-

Source: EMSI 2019.3