

Amazon Web Services Cloud Computing Services

California

Introduction

This report aims to determine the demand for Amazon Web Service (AWS) cloud computing services jobs in the Inland Empire/Desert Region. Cloud computing is the delivery of computing services, such as computing power, storage, and databases, over the Internet (AWS, 2023). Many organizations use cloud computing for a variety of purposes, such as data backup, email, virtual desktops, software development, data analytics, and web applications (IBM, 2023).

This report analyzes online job advertisements (ads) from employers seeking AWS cloud computing workers to understand the necessary knowledge, skills, and abilities (KSAs) to enter this field. The United States Bureau of Labor Statistics (BLS) does not identify any occupation that specifically utilizes AWS cloud computing services in its Standard Occupational Classification (SOC) system; therefore, this report analyzes all occupations requiring AWS skills according to online job ads over the previous year.

The Taxonomy of Programs (TOP), developed by the California Community Colleges Chancellor's Office, does not contain a TOP code that directly provides AWS cloud computing training. According to the California Community Colleges Chancellor's Office Curriculum Inventory (COCI), two community colleges in the region currently offer programs that provide training related to AWS cloud computing (COCI, 2023).

AWS Cloud Computing Summary of Findings

Traditional labor market information is not available for AWS cloud computing workers. For this reason, online employer job advertisements are the basis of this report's job demand assessment. Online job ads are helpful for capturing KSAs, education requirements, and other employer hiring preferences. While efforts were made to de-duplicate job ads, employers may list jobs they do not end up filling or use a single ad to hire multiple workers. Therefore, the number of online job ads is neither comparable nor indicative of annual opening demand for any given occupation. Following is an overview of this report's key findings.

Key Findings:

- Over the past 12 months (April 2022 to March 2023), there were 5,104 AWS cloud computing job ads were posted in California. Of these job postings, 47 AWS cloud computing job ads were located in the Inland Empire/Desert Region.
 - Approximately 66% of employer job ads for AWS cloud computing workers were concentrated in the software developers occupation.

- Overall, online job ad salary information reveals that employers in the state are willing to pay these positions \$141,190 annually, well above the \$45,386 annual (\$21.82 hourly) MIT living wage standard.
- Within job ads, nearly 97% of employers sought candidates with a bachelor’s degree, while less than 1% sought candidates with an associate degree, and more than 2% sought candidates with a high school diploma or equivalent.
- Approximately 96% of employer job ads with experience requirements sought candidates with two or more years of previous work experience, indicating that work experience is valued for AWS cloud computing workers.
- Two community colleges in the region currently offer programs related to AWS cloud computing. Award data is not available at this time.
 - Other regional postsecondary education institutions do not currently offer cloud computing programs (CIP 11.0902).

Job Advertisements

An online job ad search for jobs in AWS cloud computing workers was conducted to reveal the employers seeking these workers, including the median job ad duration, earnings information, and in-demand skills. Over the last twelve months, from April 2022 through March 2023, 47 job ads were posted for AWS cloud computing workers in the Inland Empire/Desert Region. The job ad search was expanded to include all AWS cloud computing job ads listed over the last 12 months in California to ensure that the job ad information included in this report is reliable and generalizable.

Exhibit 1 shows the occupations employers frequently associate with AWS cloud computing work, the number of job ads posted over the last twelve months in the state, and the median posting duration. On average, employers kept online job ads for AWS cloud computing workers open for 24 days. The average statewide online job is open for 28 days, indicating employers likely experience fewer challenges filling AWS cloud computing positions than they do with other jobs. Nearly two-thirds of AWS cloud computing job ads were for software developers.

Exhibit 1: Job ads and posting duration, California, April 2022 – March 2023

Occupations	Job Ads	Median Posting Duration (Days)
Software Developers	3,361	24
Database Administrators	510	24
Information Security Analysts	336	25
Database Architects	273	24
Computer Network Architects	175	25
Data Scientists	168	24

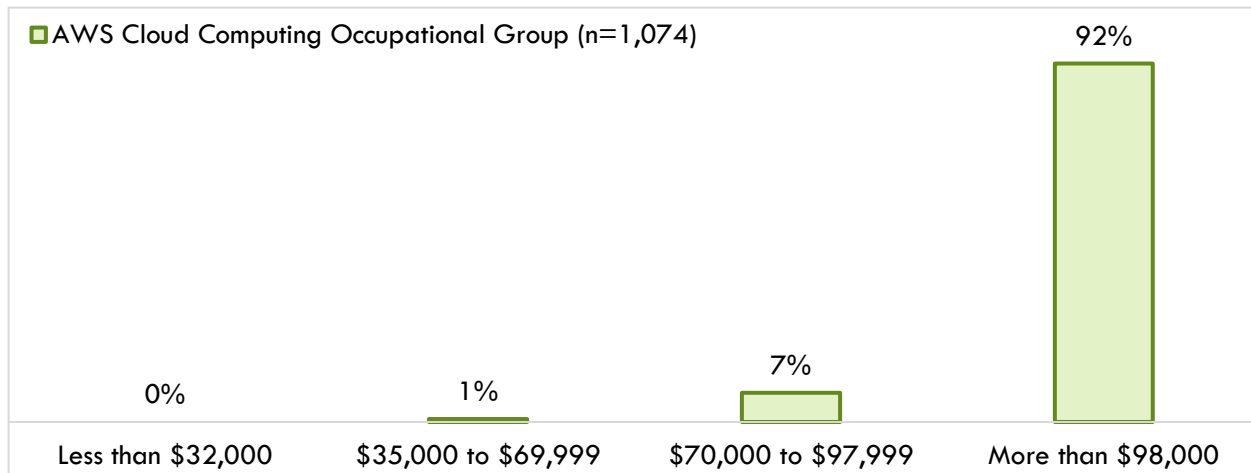
Occupations	Job Ads	Median Posting Duration (Days)
Network and Computer Systems Administrators	115	25
Computer Systems Analysts	85	31
Software Quality Assurance Analysts and Testers	46	23
Computer Programmers	35	25
Total	5,104	24

Source: Lightcast 2023.1

Advertised Salary from Online Job Ads

Exhibit 2 displays the online advertised salaries for the AWS cloud computing occupational group over the last 12 months. Online job ad salary information reveals that employers in the state are willing to pay AWS cloud computing workers an annual salary of \$141,190 or \$67.88 per hour, well above the \$21.82 hourly living wage standard. Consider the salary information with caution since only 21% (1,074 of 5,104) of online job ads for this occupational group provided salary information.

Exhibit 2. Online advertised salaries for the AWS cloud computing occupational group, California, April 2022 – March 2023



Source: Lightcast 2023.1

Job Titles, Employers, Skills, Education, and Work Experience

Exhibit 3 displays the job titles most frequently requested for AWS cloud computing worker jobs over the last 12 months in the state. Job titles may provide insight into the types of positions held by AWS cloud computing workers. The job title most frequently associated with AWS cloud computing workers in California over the last 12 months was DevOps Engineers, accounting for more than 10% of job ads.

Exhibit 3: Job titles most frequently requested for AWS cloud computing workers, California, April 2022 – March 2023

Job Titles	Job Ads
DevOps Engineers	517
Software Engineers	329
Data Engineers	274
Software Development Engineers	135
Cloud Engineers	129
AWS DevOps Engineers	90
Platform Software Engineers	82
Data Software Engineers	76
Back End Software Engineers	76
Lead Software Engineers	64
Full Stack Software Engineers	62
Principal Software Engineers	62
Cloud DevOps Engineers	61
Cloud Security Engineers	60
Cloud Network Architects	50
<i>All other job titles</i>	3,037
Total	5,104

Source: Lightcast 2023.1

Exhibit 4 displays the employers that posted the most job ads for AWS cloud computing workers during the last 12 months. Showing employer names provides insight into where students may find employment after completing a program. Amazon posted the most job ads for AWS cloud computing workers in the state over the last 12 months.

Exhibit 4: Employers posting the most job ads for AWS cloud computing jobs, California, April 2022 – March 2023

Top Employers	Jobs Ads
Amazon	358
Disney	168
Capital One	137
General Dynamics	80
Federal Reserve Bank	76
Deloitte	61
Sony Group	54
First American Financial	54
<i>All other employers</i>	<i>4,116</i>
Total	5,104

Source: Lightcast 2023.1

Exhibit 5 lists a sample of specialized, employability, and software and programming skills employers seek when looking for AWS cloud computing workers. Specialized skills are occupation-specific skills that employers request for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job ads may be utilized to guide curriculum development. The programming language Python was included in approximately 63% of employer job ads, indicating that this skill is important for AWS cloud computing workers.

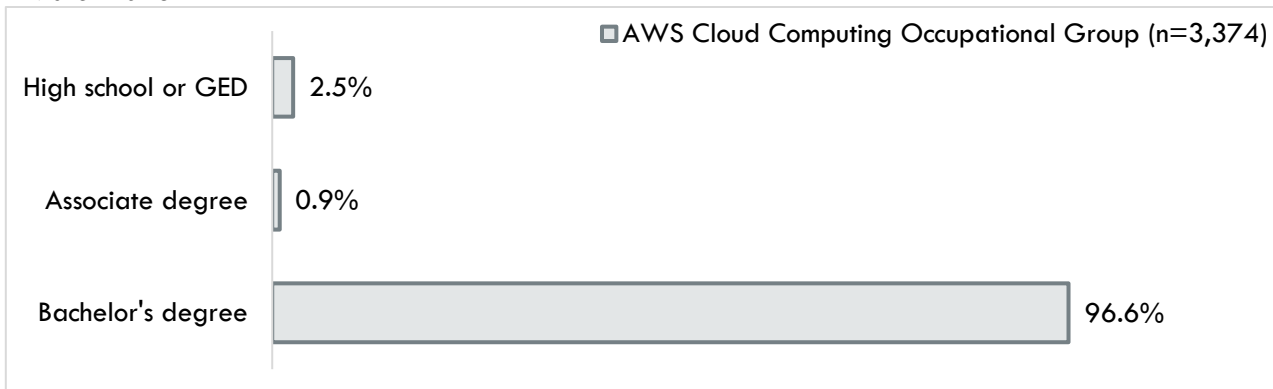
Exhibit 5: Sample of in-demand skills from employer job ads for AWS cloud computing workers, California, April 2022 – March 2023, (n=5,104)

Specialized Skills	Employability Skills	Software and Programming Skills
<ul style="list-style-type: none"> • Amazon Web Services • Computer Science • Automation • Continuation Integration/Continuous Delivery or Deployment • Agile Methodology • Software Engineering • Scalability 	<ul style="list-style-type: none"> • Communication Skills • Management • Operations • Troubleshooting (Problem-Solving) • Writing • Innovation • Planning • Self-Motivation 	<ul style="list-style-type: none"> • Python • Java • Terraform • AWS Cloud Formation • Kubernetes • Docker • Amazon S3 • Microsoft Azure • SQL • Application Programming Interface (API)

Source: Lightcast 2023.1

Exhibit 6 displays the minimum advertised education requirements for AWS cloud computing workers. Approximately 34% of employer job ads did not include minimum education requirements in job ads for AWS cloud computing workers. Most employer job ads (96.8%) for AWS cloud computing workers sought candidates with a bachelor’s degree.

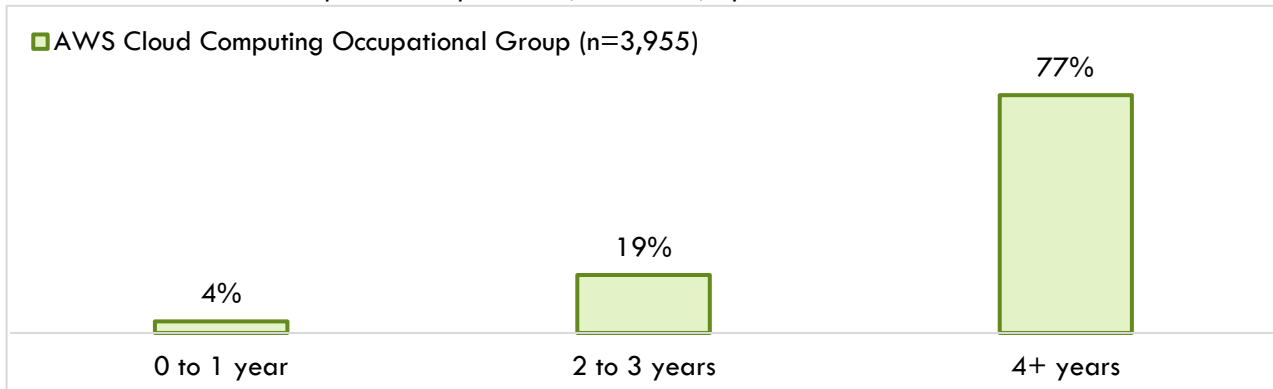
Exhibit 6: Minimum advertised education requirements for AWS cloud computing workers, California, April 2022 – March 2023



Source: Lightcast 2023.1

Exhibit 7 displays the real-time work experience requirements from employer job ads. Approximately 23% of employer job ads did not include work experience requirements for AWS cloud computing workers. About 96% of employer job ads with experience requirements sought candidates with two or more years of previous work experience, indicating that employers value AWS cloud computing workers with previous experience.

Exhibit 7: Real-time work experience requirements, California, April 2022 – March 2023



Source: Lightcast 2023.1

Certifications

Exhibit 8 displays the most frequently requested certifications by employers in job ads. Approximately 4% of employer job ads contained certification information. The most frequently requested AWS certifications were the AWS Certified Solutions Architect and AWS Certified Cloud Practitioner certifications. These entry-level AWS certifications aim to ensure a basic understanding of AWS and AWS cloud computing. Please visit the AWS website for more information regarding these certifications (AWS, 2023a).

Exhibit 8: Certifications most frequently required by employers, Inland Empire/Desert Region, April 2022 through March 2023

Certification	Jobs Ads
Certified Information Systems Security Professional	213
AWS Certified Solutions Architect	197
AWS Certified Cloud Practitioner	174
AWS Certified Solutions Architect Associate	153
AWS Certified Security Specialty	113
AWS Certified Developer	111
AWS Certified DevOps Engineer	100

Source: Lightcast 2023.1

Training Programs

Two community colleges in the region currently offer programs related to AWS and cloud computing using two program codes. Award data for programs specific to AWS cloud computing programs is unavailable because the colleges use the program codes for programs unrelated to AWS cloud computing. Exhibit 9 displays each regional program related to AWS cloud computing and the award types students earn upon program completion.

Exhibit 9: AWS cloud computing-related programs, Inland Empire/Desert Region, 2022-23 academic year

College	TOP Program (TOP Code)	Local Program Title	Award
Crafton Hills College	Computer Infrastructure and Support (0708.00)	Cloud Technology Specialists	Certificate
Riverside City College	Computer Networking (0708.10)	Amazon Web Services (AWS) Cloud Computing	Certificate

Source: COCI, 2022-23 Community College Catalogs

The following is the program description and program outcomes for Riverside City College’s Amazon Web Services (AWS) Cloud Computing program, and it may be helpful for program development.

The Cloud Computing program develops skills for the occupations of cloud architect and cloud technician using Amazon Web Services (AWS), the leading cloud computing provider. The program bridges traditional on premises data center skills of server installation, database management, and networking set-up and cabling into virtualizations of these information and computing technologies over online services. Job preparation will include industry certifications of AWS Cloud Practitioner and AWS Solutions Architect Associate mapped to course work (Riverside City College, 2023).

California program outcome data may provide useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP code and region is provided in Exhibits 10 and 11.

Exhibit 10: 0708.00 – Computer infrastructure and support strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0708.00 – Computer Infrastructure and Support Academic Year 2019-20, unless noted otherwise	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	195	6,735
Completed 9+ career education units in one year (2020-21)	47%	41%
Students who attained a noncredit workforce milestone in a year (2020-21)	80%	86%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	47	519
Transferred to a four-year institution (transfers)	10	333
Job closely related to the field of study (2018-19)	71%	75%
Median annual earnings (all exiters)	\$45,688	\$50,988
Median change in earnings (all exiters)	24%	18%
Attained a living wage (completers and skills-builders)	74%	63%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Exhibit 11: 0708.10 – Computer networking strong workforce program outcomes, Inland Empire/Desert Region, Academic Year 2019-2020 (Unless Noted)

Strong Workforce Program Metrics: 0708.10 – Computer Networking Academic Year 2019-20, unless noted otherwise	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2020-21)	799	8,138
Completed 9+ career education units in one year (2020-21)	47%	44%
Students who attained a noncredit workforce milestone in a year (2020-21)	60%	69%
Students who earned a degree, certificate, or attained apprenticeship (2020-21)	102	683
Transferred to a four-year institution (transfers)	37	368
Job closely related to the field of study (2018-19)	62%	73%
Median annual earnings (all exiters)	\$38,252	\$55,114
Median change in earnings (all exiters)	26%	17%
Attained a living wage (completers and skills-builders)	62%	66%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Other postsecondary institutions may utilize the cloud computing CIP code (11.0902) for their cloud computing programs. However, no other regional postsecondary education institution issued awards using this program code over the last three academic years. The following is the program description for cloud computing CIP programs.

A program that prepares individuals to design and implement enterprise software systems that rely on distributed computing and service-oriented architecture, including databases, web services, cloud computing, and mobile apps. Includes instruction in data management, distributed and cloud computing, enterprise software architecture, enterprise and cloud security, mobile systems and applications, server administration, and web development (IPEDS, 2023).

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Appendix: Methodology

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 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, 2023). 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, 2023).

Job ad data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job ads often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job ad or collect resumes for future hiring needs. A closed job ad may not be the result of a hired worker.

Appendix: Job Advertisement Search Parameters

Area Filter:

- California
- Riverside-San Bernardino-Ontario MSA

Occupation Filter:

- Computer Systems Analysts (SOC 15-1211)
- Information Security Analysts (15-1212)
- Computer Network Architects (15-1241)
- Database Administrators (15-1242)
- Database Architects (15-1243)
- Network and Computer Systems Administrators (15-1244)
- Computer Programmers (15-1251)
- Software Developers (15-1252)
- Software Quality Assurance Analysts and Testers (15-1253)
- Data Scientists (15-2051)

Education Filter:

- High school or GED
- Associate degree
- Bachelor's degree
- Education Not Listed

Skill Filter:

- AWS Cloud Computing
- AWS
- Cloud Computing

Keyword Filter:

- AWS
- Cloud Computing