June 2021

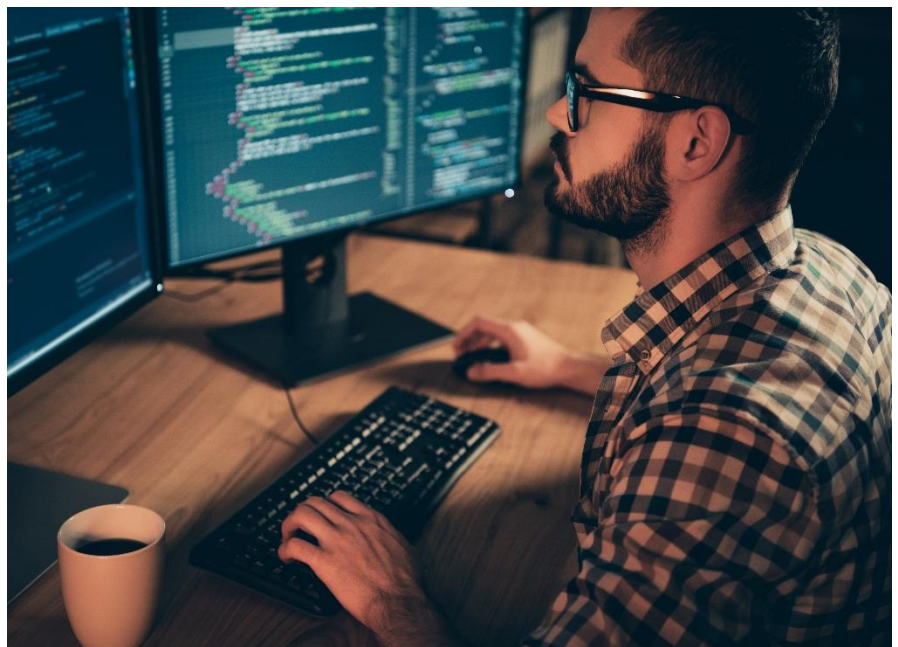# Labor Market Analysis

Security Professionals and System Administrators

POWERED BY

California Community Colleges

C·O·E
CENTERS OF EXCELLENCE
Inform Connect Advance

Prepared by the Central Valley/Mother Lode Center of Excellence

Table of Contents

COVID-19 Statement: This report includes employment projection data by Emsi. Emsi's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

If for any reason this document is not accessible or if you have specific needs for readability, please contact us and we will do our utmost to accommodate you with a modified version. To make a request, contact Nora Seronello by phone at (209) 575-6894 or by email seronellon@mjc.edu.

Summary

Please note the COVID-19 statement on page 2 when considering this report's findings.

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills, and postsecondary supply for security professionals and system administrators. Three occupations related to security professionals and system administrators were identified for Merced College:

- 15-1244, Network and Computer Systems Administrators
- 15-1212, Information Security Analysts
- 15-1241, Computer Network Architects

Key findings:

- **Occupational demand —** More than 650 workers were employed in jobs related to security professionals and system administrators in 2019 in the North Central Valley/Northern Mother Lode (NCV/NML) subregion. The largest occupation is network and computer systems administrators with 458 workers in 2019, a projected decline in employment of 2% over the next five years, and 31 annual openings.

- **Wages —** Information security analysts earn the highest entry-level wage, $41.63/hour in the subregion and $38.10/hour in the region.

- **Employers —** Employers with the most job postings in the subregion are Anthem Blue Cross, Danaher Corporation, and Adventist Health.

- **Occupational titles —** The most common occupational title in job postings in the subregion is network and computer systems administrators. The most common job title is network engineer.

- **Skills and certifications —** The top baseline skill is communication, the top specialized skill is Cisco, and the top software skill is Microsoft Office. The most in-demand certification is a driver's license.

- **Education —** A bachelor's degree is typically required for all three occupations, but more than 37% of network and computer system administrators and computer network architects have less than a bachelor's degree, making these middle-skill occupations that are complemented by community college education.

- **Supply —** Analysis of postsecondary completions in the region shows that on average 116 awards were conferred in the Central Valley/Mother Lode region each year.

Based on a comparison of occupational demand and supply, there is an undersupply of 43 trained workers in the subregion and 61 workers in the region. The COE recommends expanding existing computer systems analysis programs to meet the regional need for more workers in this field. To be clear, community college program completers will likely need to transfer to a four-year college or university to obtain a bachelor's degree before entering employment. Colleges considering this program should partner with a four-year postsecondary institution and local employers to ensure their training provides the skills and certifications needed to transfer to a four-year institution of higher education and obtain a job in this field.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Merced College to provide labor market information for security professionals and system administrators. The geographical focus for this report is the North Central Valley/Northern Mother Lode (NCV/NML) subregion, but regional demand and supply data has been included for broader applicability and use. The average living wage for a single adult in the NCV/NML subregion is $12.65/hour.[1] Analysis of the program and occupational data related to security professionals and system administrators resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 15-1244, Network and Computer Systems Administrators
- 15-1212, Information Security Analysts
- 15-1241, Computer Network Architects

The occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O*NET OnLine are shown below.

Network and Computer Systems Administrators
Job Description: Install, configure, and maintain an organization's local area network (LAN), wide area network (WAN), data communications network, operating systems, and physical and virtual servers. Perform system monitoring and verify the integrity and availability of hardware, network, and server resources and systems. Review system and application logs and verify completion of scheduled jobs, including system backups. Analyze network and server resource consumption and control user access. Install and upgrade software and maintain software licenses. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software.
Knowledge: Computers and Electronics, English Language, Customer and Personal Service, Engineering and Technology, Mathematics
Skills: Critical Thinking, Judgement and Decision Making, Reading Comprehension, Systems Analysis, Active Listening

Information Security Analysts
Job Description: Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.
Knowledge: Computers and Electronics, English Language, Administration and Management, Engineering and Technology, Telecommunications
Skills: Reading Comprehension, Critical Thinking, Active Listening, Complex Problem Solving, Speaking

Computer Network Architects
Job Description: Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning, including analysis of capacity needs for network infrastructures. May also design network and computer security measures. May research and recommend network and data communications hardware and software.
Knowledge: Computers and Electronics, Telecommunications, Engineering and Technology, English Language, Design
Skills: Critical Thinking, Active Listening, Complex Problem Solving, Reading Comprehension, Judgement and Decision Making

---

[1] The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: https://insightcced.org/tools-metrics/self-sufficiency-standard-tool-for-california/.

Occupational Demand

The North Central Valley/Northern Mother Lode subregion employed 653 workers in security professionals and system administrators occupations in 2019 (Exhibit 1). The largest occupation is network and computer systems administrators with 458 workers in 2019. This occupation is projected to decline by 2% over the next five years and has the greatest number of projected annual openings, 31.
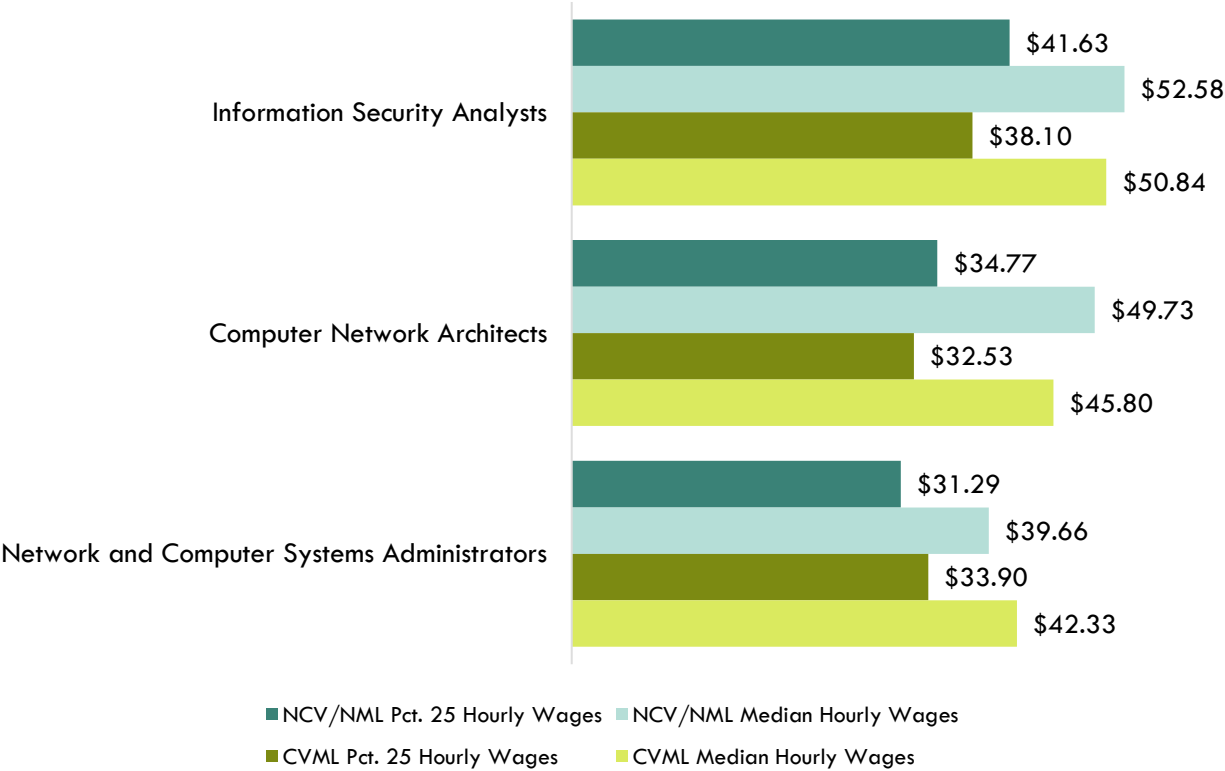
Exhibit 1. Security professionals and system administrators employment and occupational projections in the NCV/NML subregion

Occupation	2019 Jobs	2024 Jobs	5-Year Change	5-Year % Change	Annual Openings
Network and Computer Systems Administrators	458	447	(11)	(2%)	31
Information Security Analysts	82	159	76	93%	22
Computer Network Architects	112	138	26	23%	13
TOTAL	**653**	**744**	**91**	**14%**	**67**

Wages

Exhibit 2 compares the entry-level and experienced wages of the security professionals and system administrators occupations. Information security analysts earn the highest entry-level wage, $41.63/hour in the subregion and $38.10/hour in the region.

Exhibit 2. Entry-level and experienced wage comparison in the NCV/NML subregion and region

Information Security Analysts
- $41.63
- $52.58
- $38.10
- $50.84

Computer Network Architects
- $34.77
- $49.73
- $32.53
- $45.80

Network and Computer Systems Administrators
- $31.29
- $39.66
- $33.90
- $42.33

■ NCV/NML Pct. 25 Hourly Wages　■ NCV/NML Median Hourly Wages
■ CVML Pct. 25 Hourly Wages　■ CVML Median Hourly Wages

Job Postings

There were 170 job postings for the three occupations in the NCV/NML subregion from November 2020 to April 2021.[2] The employers with the most job postings are listed in Exhibit 3.

Exhibit 3. Top employers of security professionals and system administrators by number of job postings

Employer	Job Postings	% Job Postings
Anthem Blue Cross	13	10%
Danaher Corporation	8	6%
Adventist Health	4	3%
Sutter Health	4	3%
Ciminocare	3	2%
Golden Valley Health Centers	3	2%
Valley Entry Systems Incorporated	3	2%
Agemark Senior Living Communities	2	2%
Blue Cross Blue Shield of California	2	2%
California State University Stanislaus	2	2%

Exhibit 4 shows how job postings for the targeted occupations in the NCV/NML subregion are distributed across four O*NET OnLine occupations. The occupational title network and computer systems administrators is listed in 75 job postings. Note how this occupational title dominates the job posting results. Common job titles in postings include Network Engineer in 12 job postings, Systems Administrator in eight job postings, and Network Administrator in six job postings.

Exhibit 4. Top occupational titles in job postings for security professionals and system administrators

Occupational Title	Job Postings	% of Job Postings
Network and Computer Systems Administrators	75	44%
Computer Network Architects	46	27%
Information Security Analysts	35	21%
Telecommunications Engineering Specialists	14	8%

Salaries

Exhibit 5 shows the "Market Salaries" for security professionals and system administrators that are calculated by Burning Glass which uses a machine learning model built off of millions of job postings every year, and accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

---

[2] Other than occupation titles and job titles, the categories below can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types, and an employer can indicate more than one education level.

Exhibit 5. Salaries for security professionals and system administrators

Market Salary Percentile	Salary Amount
10th Percentile	$40,938
25th Percentile	$55,846
50th Percentile	$77,148
75th Percentile	$93,371
90th Percentile	$109,230

Education

Of the 170 job postings, 92 listed an education level preferred for the positions being filled. Of those, 77% requested a bachelor's degree, 29% requested high school or vocational training, and 18% requested a master's degree (Exhibit 6). A job posting can indicate more than one education level. Hence, the percentages shown in the chart below may total more than 100%.
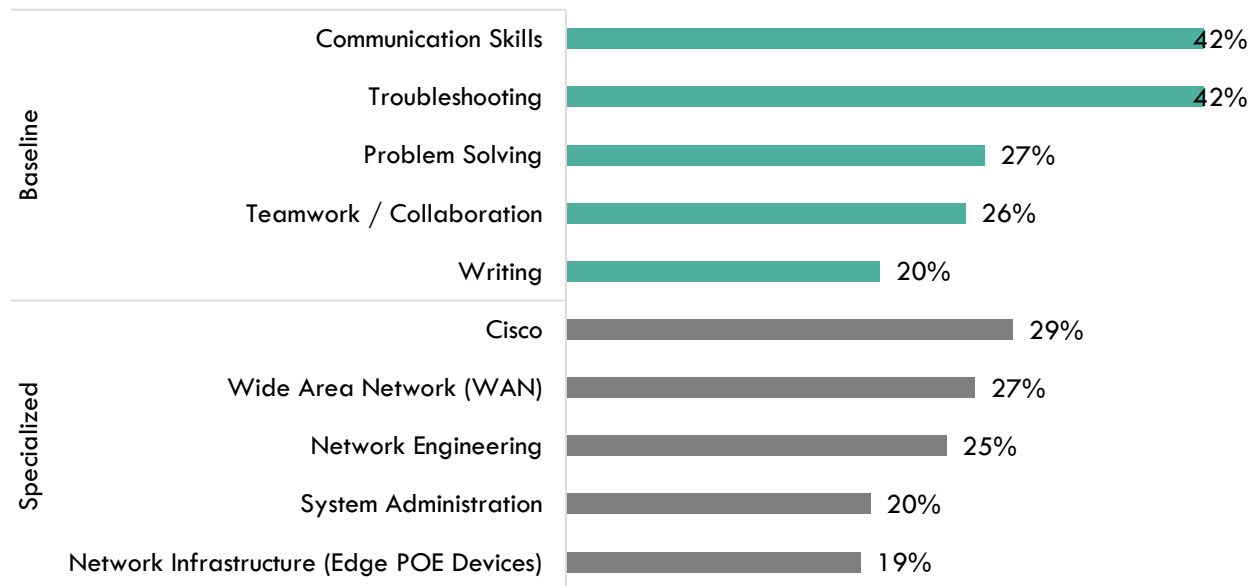
Exhibit 6. Education levels requested in job postings for security professionals and system administrators

Education Level	Job Postings	% of Job Postings
Bachelor's degree	71	77%
High school or vocational training	27	29%
Master's degree	17	18%
Associate degree	14	15%
Doctoral degree	13	14%

Baseline and Specialized Skills

Exhibit 7 depicts the top baseline and specialized skills for the targeted occupations. The three most important baseline skills are communication, 42% of job postings, troubleshooting, 42%, and problem solving, 27%. The top three specialized skills are Cisco, 29% of job postings, WAN, 27%, and network engineering, 25%.

Exhibit 7. In-demand baseline and specialized skills for security professionals and system administrators

	Skill	Percent
Baseline	Communication Skills	42%
Baseline	Troubleshooting	42%
Baseline	Problem Solving	27%
Baseline	Teamwork / Collaboration	26%
Baseline	Writing	20%
Specialized	Cisco	29%
Specialized	Wide Area Network (WAN)	27%
Specialized	Network Engineering	25%
Specialized	System Administration	20%
Specialized	Network Infrastructure (Edge POE Devices)	19%

Software Skills

Analysis also included the software skills most in demand by employers. Microsoft Office and voice over IP were the top two software skills identified in job postings (Exhibit 8).

Exhibit 8. In-demand software skills for security professionals and system administrators

Microsoft Office	Voice over IP (VoIP)	Microsoft Excel	Virtual Private Networking (VPN)	Linux
13.0%	11.2%	9.3%	9.3%	9%
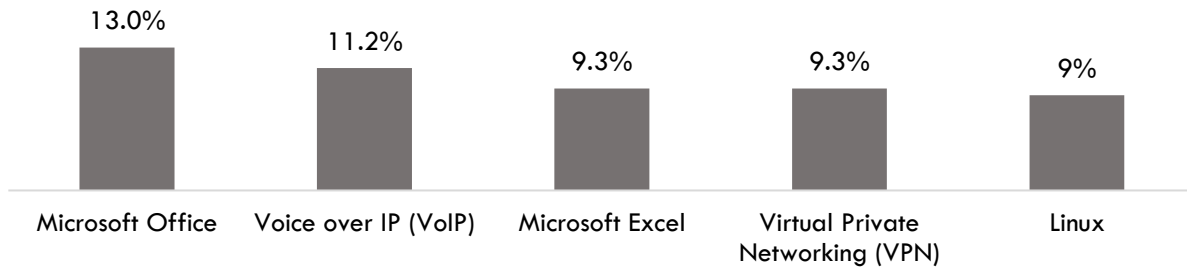
Certifications

Of the 170 job postings, 70 contained certification data. Among those, 30% indicated a need for a driver's license. The next top certifications are Cisco Certified Network Associate (CCNA) and Certified Information Systems Security Professional (CISSP) (Exhibit 9). (Due to the low number of job postings with certifications listed, the chart below may not be representative of the full sample.)

Exhibit 9. Top certifications requested in job postings for security professionals and system administrators

Driver's License	Cisco Certified Network Associate (CCNA)	Certified Information Systems Security Professional (CISSP)	Cisco Certified Network Professional (CCNP)	Certified Information Systems Auditor (CISA)
30%	27%	17%	11%	9%

Education, Work Experience & Training

A bachelor's degree is typically required for all three occupations, but more than 37% of network and computer system administrators and computer network architects have less than a bachelor's degree, making these middle-skill occupations that are complemented by community college education (Exhibit 10).

Exhibit 10. Education, work experience, training, and Current Population Survey results for security professionals and system administrators[3]

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Network and Computer Systems Administrators	Bachelor's degree	None	None	37.4%
Information Security Analysts	Bachelor's degree	Less than 5 years	None	25.7%
Computer Network Architects	Bachelor's degree	5 years or more	None	37.7%

---

[3] "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, https://www.bls.gov/cps/.

Supply

Analysis of program data from the California Community Colleges Chancellor's Office Data Mart included the TOP code and title: 070200 - Computer Information Systems. Analysis of the last three years of data shows that, on average, 116 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

Exhibit 11. Postsecondary supply for security professionals and system administrators occupations in the region

TOP Code - Title	Colleges	Associate Degree	Certificate 12 < 18 Semester Units	Certificate 18 < 30 Semester Units	Certificate 30 < 60 Semester Units	Certificate 6 < 18 Semester Units	Subtotal
070200 - Computer Information Systems	Bakersfield	2					2
	Cerro Coso	15		17	11		43
	Clovis			2			2
	Columbia	1					1
	Fresno City	6		0			6
	Merced	1					1
	Modesto	1					1
	Porterville	11			2		12
	Reedley College		14	8			22
	San Joaquin Delta	16					16
	Sequoias	6			3		8
	Taft					2	2
TOTAL		**58**	**14**	**27**	**15**	**2**	**116**

There is an undersupply of 43 security professionals and system administrators workers in the NCV/NML subregion and 61 workers in the region (Exhibit 12). The chart below includes four (4) bachelor's degree completions from four-year colleges and universities in the region, in this case California State University-Stanislaus, which was the only university issuing awards. Bachelor's degrees were included in this analysis because the occupation of information security analysts is an above-middle-skill occupation and typically requires at least a bachelor's degree. As a result, the number of awards in the subregion is 24 and the number of awards in the region is 120.

Exhibit 12. Security professionals and system administrators workforce annual demand and supply in the NCV/NML subregion and region

Legend: ■ Demand ■ Gap ■ Supply

Region	Demand	Gap	Supply
NCV/NML	67	43	24
CVML	181	61	120
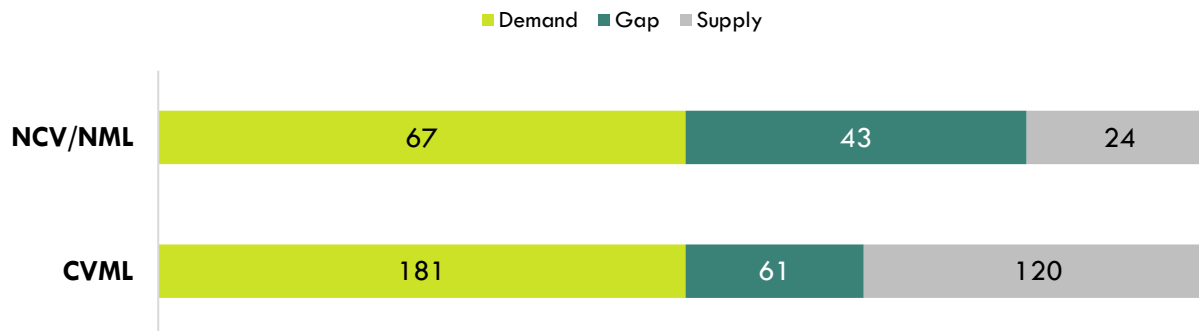
Student Outcomes

Exhibit 13 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for the TOP code related to security professionals and system administrators. Of note, there were 96 computer networking students who received a degree or certificate or attained apprenticeship journey status and 28 who transferred; 40% of students obtained a job closely related to their field of study; 12% reported a median change in earnings; and 74% attained a living wage.

Exhibit 13. Regional metrics for the TOP code related to security professionals and system administrators

Metric	Computer Information Systems 070200
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	96
Number of Students Who Transferred	28
Job Closely Related to Field of Study	40%
Median Change in Earnings	12%
Attained a Living Wage	74%
* denotes data not available.	

Conclusion

The entry-level wages of the three occupations exceed the NCV/NML subregion's average living wage. There were 170 job postings in the past six months for occupations related to security professionals and system administrators in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication, and the top specialized skill is Cisco.
- The top software skill is Microsoft Office.
- The top certification is a driver's license.

There is an undersupply of trained workers, a shortage of 43 in the NCV/NML subregion and 61 in the region.

Recommendation

The COE recommends expanding existing computer systems analysis programs to meet the regional need for more workers in this field. To be clear, community college program completers will likely need to transfer to a four-year college or university to obtain a bachelor's degree before entering employment. Colleges considering this program should partner with a four-year postsecondary institution and local employers to ensure their training provides the skills and certifications needed to transfer to a four-year institution of higher education and obtain a job in this field.

Appendix A: Methodology
& Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: economicmodeling.com.
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm.
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov.
Job Posting and Skills Data	Burning Glass: burning-glass.com/.
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org.

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state and local trends.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.