June 2022

Labor Market Analysis

Cybersecurity

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California Community Colleges

Prepared by the Central Valley/Mother Lode Center of Excellence

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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.

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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 Cybersecurity. Four occupations related to Cybersecurity were identified for Merced College:

- 15-1211, Computer Systems Analysts
- 15-1212, Information Security Analysts
- 15-1244, Network and Computer Systems Administrators
- 15-1299, Computer Occupations, All Other

Key findings:

- **Occupational demand —** Nearly 2,000 workers were employed in jobs related to Cybersecurity in 2021 in the North Central Valley/Northern Mother Lode (NCV/NML) subregion. The largest occupation is computer occupations, all other with 765 workers, a projected growth rate of 6% over the next five years, and 66 annual openings.

- **Wages —** Information security analysts earn the highest entry-level wage, $41.64/hour in the subregion.

- **Employers —** Employers with the most job postings in the subregion are Anthem Blue Cross, The Save Mart Companies, and Danaher Corporation.

- **Occupational titles —** The most common occupational title in job postings in the subregion is Computer Systems Analysts. The most common job title is Home Product Tester.

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

- **Education —** A bachelor's degree is typically required for the four occupations.

- **Supply —** Analysis of postsecondary completions shows that on average 135 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 158 trained workers in the subregion and 396 workers in the region. The Center of Excellence recommends that Merced College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Cybersecurity workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Merced College to provide labor market information for Cybersecurity. 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 Cybersecurity resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 15-1211, Computer Systems Analysts
- 15-1212, Information Security Analysts
- 15-1244, Network and Computer Systems Administrators
- 15-1299, Computer Occupations, All Other

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. There was no O*NET data available for Computer Occupations, All Other.

Computer Systems Analysts
Job Description: Analyze science, engineering, business, and other data processing problems to develop and implement solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions, improve existing computer systems, and review computer system capabilities, workflow, and schedule limitations. May analyze or recommend commercially available software.
Knowledge: Computers and Electronics, English Language, Customer and Personal Service, Mathematics, Administration and Management
Skills: Active Listening, Critical Thinking, Reading Comprehension, Speaking, Systems Analysis

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

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, Mathematics, Engineering and Technology
Skills: Active Listening, Critical Thinking, Reading Comprehension, Judgment and Decision Making, Systems Analysis

[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 NCV/NML subregion employed 1,993 workers in Cybersecurity occupations in 2021 (Exhibit 1). The largest occupation is computer occupations, all other with 765 workers in 2021. This occupation is projected to grow by 6% over the next five years and has the greatest number of projected annual openings, 66.

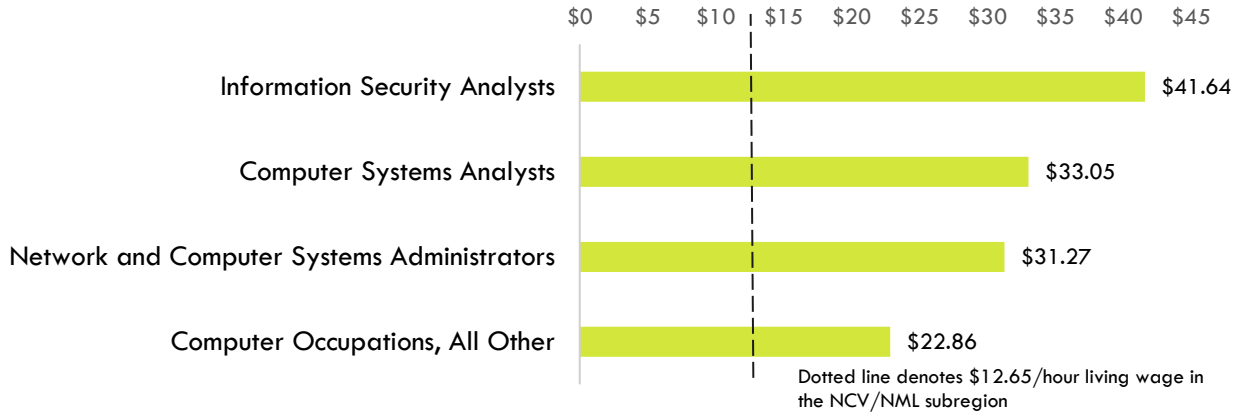
Exhibit 1. Cybersecurity employment and occupational projections in the NCV/NML subregion

Occupation	2021 Jobs	2026 Jobs	5-Year Change	5-Year % Change	Annual Openings
Computer Occupations, All Other	765	813	47	6%	66
Computer Systems Analysts	658	705	47	7%	57
Network and Computer Systems Administrators	431	471	40	9%	37
Information Security Analysts	139	163	24	17%	15
TOTAL	**1,993**	**2,152**	**159**	**8%**	**176**

Wages

Exhibit 2 shows the entry-level hourly wages of the Cybersecurity occupations. Information security analysts earn the highest entry-level wage, $41.64/hour in the subregion[2].

Exhibit 2. Cybersecurity entry-level wages in the NCV/NML subregion



Job Postings

There were 1,931 job postings for the four occupations in the NCV/NML subregion from December 2021 to May 2021.[3] The employers with the most job postings are listed in Exhibit 3.

[2] Entry-level wages are derived from the 25th percentile.

[3] 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 3. Top employers of Cybersecurity by number of job postings

Employer	Job Postings	% Job Postings
Anthem Blue Cross	210	14%
The Save Mart Companies	56	4%
Danaher Corporation	45	3%
Pacific Gas and Electric Company	39	3%
University Pacific	30	2%
Ej Gallo	26	2%
Amazon	23	2%
Cepheid	23	2%
Gallo Glass Company	22	1%
Ej Gallo Winery	21	1%

Exhibit 4 shows how job postings for the targeted occupations in the NCV/NML subregion are distributed across 10 O*NET OnLine occupations. The occupational title Computer Systems Analysts is listed in 367 job postings. Note how this occupational title dominates the job posting results. Common job titles in postings include Home Product Tester in 31 job postings, Product Tester Home in 28 job postings, and Systems Administrator in 28 job postings.

Exhibit 4. Top occupational titles in job postings for Cybersecurity

Occupational Title	Job Postings	% of Job Postings
Computer Systems Analysts	367	19%
Information Technology Project Managers	342	18%
Business Intelligence Analysts	245	13%
Network and Computer Systems Administrators	205	11%
Computer Systems Engineers/Architects	169	9%
Information Security Analysts	151	8%
Software Quality Assurance Engineers and Testers	146	8%
Document Management Specialists	125	6%
Database Architects	48	2%
Video Game Designers	36	2%

Salaries

Exhibit 5 shows the "Market Salaries" for Cybersecurity occupations. These are calculated by Burning Glass using a machine learning model built off of millions of job postings every year. This accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

Exhibit 5. Salaries for Cybersecurity occupations

Market Salary Percentile	Salary Amount
10th Percentile	$35,526
25th Percentile	$49,458
50th Percentile	$71,692
75th Percentile	$93,319
90th Percentile	$112,780

Education

Of the 1,931 job postings, 1,435 listed an education level preferred for the positions being filled. Among those, 75% requested a bachelor's degree, 32% requested high school or vocational training, and 20% 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%.

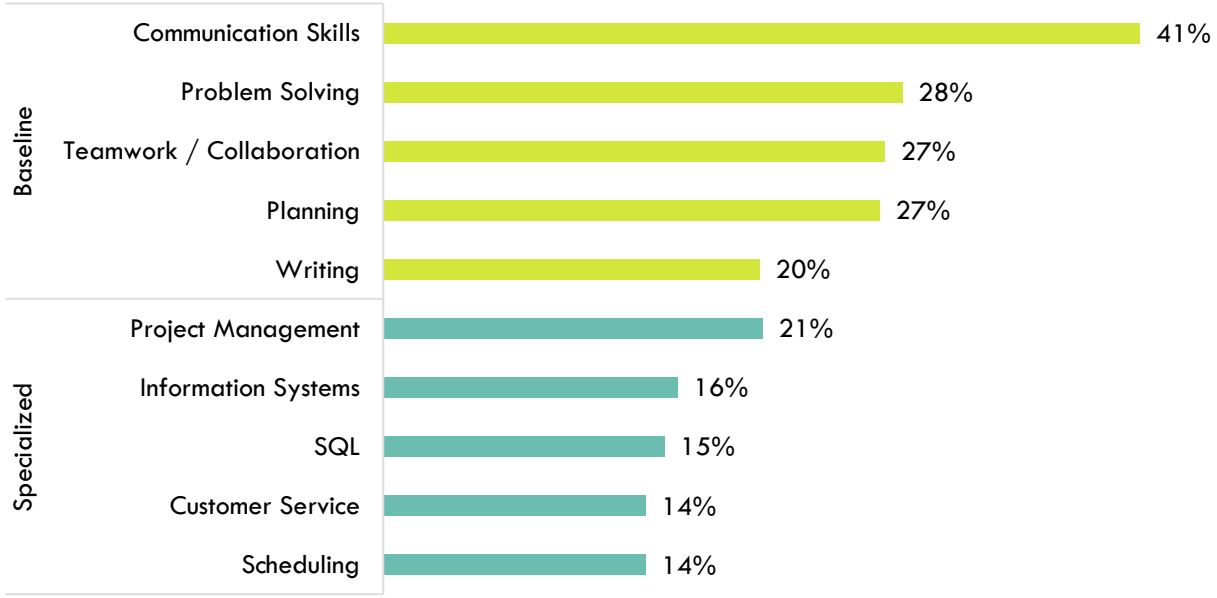
Exhibit 6. Education levels requested in job postings for Cybersecurity

Education Level	Job Postings	% of Job Postings
Bachelor's degree	1,082	75%
High school or vocational training	455	32%
Master's degree	287	20%
Associate's degree	153	11%
Doctoral degree	83	6%

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 skills, 41% of job postings, problem solving, 28%, and teamwork/ collaboration, 27%. The top three specialized skills are project management, 21% of job postings, information systems, 16%, and SQL, 15%.

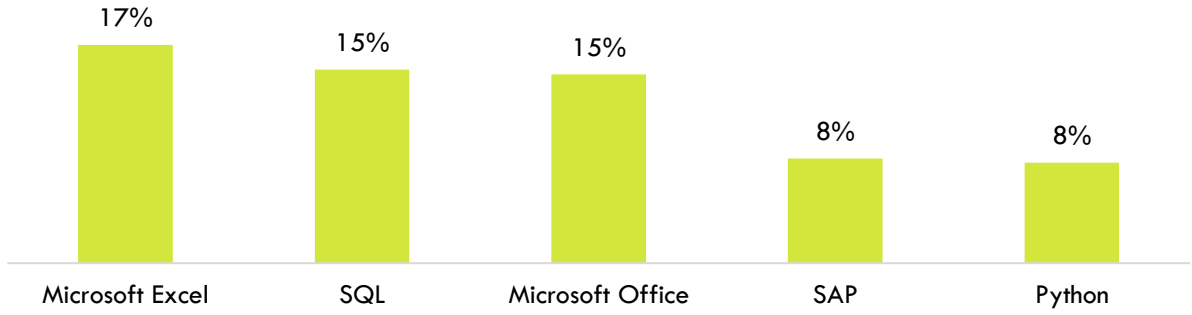
Exhibit 7. In-demand Cybersecurity baseline and specialized skills



Software Skills

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

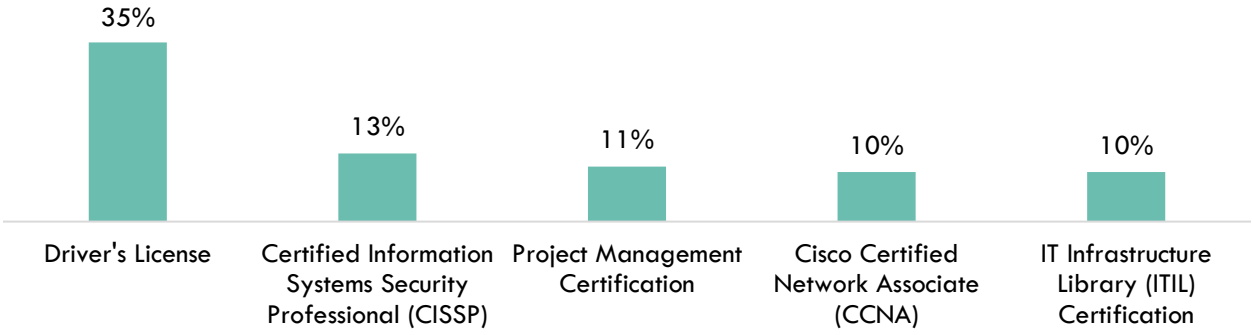
Exhibit 8. In-demand Cybersecurity software skills



Certifications

Of the 1,931 job postings, 577 contained certification data. Among those, 35% indicated a need for a driver's license. The next top certifications are certified information systems security professional (CISSP) and project management certification (Exhibit 9).

Exhibit 9. Top Cybersecurity certifications requested in job postings



Education, Work Experience & Training

A bachelor's degree is typically required for the four occupations (Exhibit 10).

Exhibit 10. Education, work experience, training, and Current Population Survey results for Cybersecurity occupations[4]

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Computer Occupations, All Other	Bachelor's degree	None	Moderate-term	27.2%
Computer Systems Analysts	Bachelor's degree	None	None	20.8%
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%

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

Supply

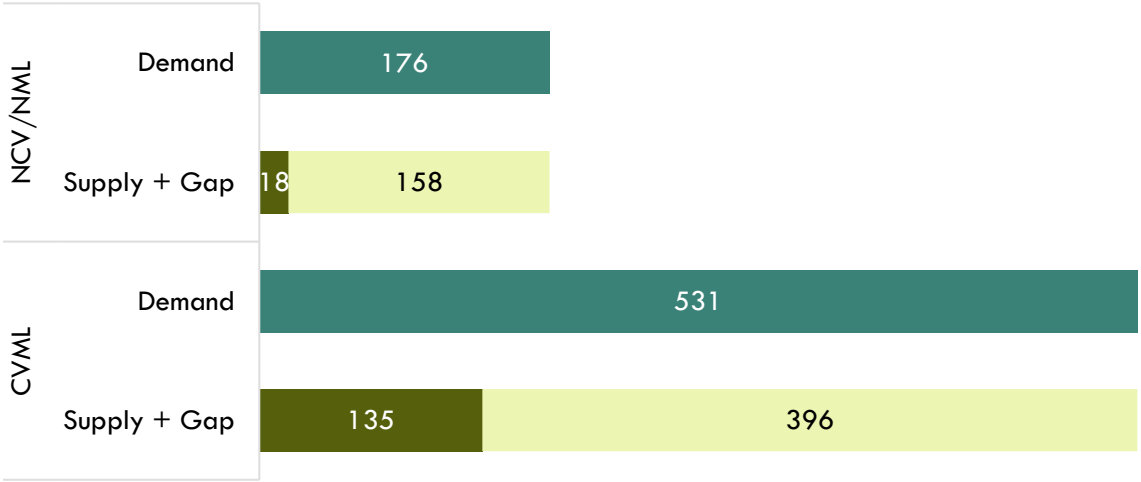
Analysis of program data from the Integrated Postsecondary Education Data System (IPEDS) included the TOP code and title: 070200 - Computer Information Systems. Analysis of the last three years of data shows that, on average, 135 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

Exhibit 11. Postsecondary supply for Cybersecurity occupations in the region

TOP/ CIP Code- Title	College	Associate Degree	Certificate 12 < 18 Semester Units	Certificate 16 < 30 Semester Units	Certificate 18 < 30 Semester Units	Certificate 30 < 60 Semester units	Certificate 6 < 18 Semester Units	Subtotal
070200 - Computer Information Systems	Bakersfield	1						1
	Cerro Coso	16		7	18	15		55
	Clovis			0	1			1
	Columbia	1						1
	Fresno City	7		1				8
	Merced	2						2
	Porterville	11				1		12
	Reedley College		10	15	7			32
	San Joaquin Delta	15						15
	Sequoias	5				2		7
	Taft						2	2
TOTAL		**57**	**10**	**23**	**26**	**18**	**2**	**135**

There is an undersupply of 158 Cybersecurity workers in the NCV/NML subregion and 396 workers in the region (Exhibit 12).

Exhibit 12. Cybersecurity workforce demand (annual job openings), postsecondary supply of students (awards), and additional students needed to fill gap in the NCV/NML subregion and region



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 Cybersecurity. Of note, 15 computer information systems students received a degree or certificate or attained apprenticeship journey status.

Exhibit 13. Regional metrics for the TOP code related to Cybersecurity

Metric	Computer Information Systems 070200
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	15
Number of Students Who Transferred	*
Job Closely Related to Field of Study	*
Median Change in Earnings	*
Attained a Living Wage	*
* denotes data not available.	

Conclusion

The entry-level wages of the four occupations exceed the NCV/NML subregion's average living wage. There were 1,931 job postings in the past six months for occupations related to Cybersecurity in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication skills, and the top specialized skill is project management.
- The top software skill is Microsoft Excel.
- The top certification is a driver's license.

There is an undersupply of trained workers, a shortage of 158 in the NCV/NML subregion and 396 in the region.

Recommendation

Based on these findings, it is recommended that Merced College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Cybersecurity workers in the region.

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.