

SAN DIEGO REGIONAL



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### San Diego's computing talent pipeline

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# **Executive summary**

Through <u>Advancing San Diego</u>'s employer working groups (EWG), San Diego Regional EDC gains a real-time understanding of regional labor market information. The following Talent Demand Report is the culmination of the information gleaned from a series of working group meetings and surveys, all which serve to help San Diego training providers align curriculum to the needs of industry.

Given <u>their importance</u> in San Diego's innovation economy, as well as significant skill overlap lending to a buildable career, this report focuses on four computing roles: **IT support technicians, systems and network administrators, software developers, and information and security analysts.** The report outlines the way employers prioritize employability skills (also known as soft skills) as well as certifications requirements for all four occupations together. Trending technical skills (also known as hard skills) are assessed for each role individually.

**Training providers and educational programs are encouraged to use this report as a guide for curriculum development.** Those that are already meeting these requirements, or are in the process of updating curriculum according to these standards, are encouraged to apply to <u>become a Verified Program of Computing Talent</u>.

Employers interested in connecting with qualified programs can attend events hosted by EDC or reach out directly for a warm introduction.

### Contact us:

### **Taylor Dunne**

Sr. Manager, Talent Initiatives td@sandiegobusiness.org Andrea Crisantes Suarez Coordinator, Talent Initiatives acs@sandiegobusiness.org













# Overview Advancing San Diego

Advancing San Diego is a collaborative effort to better prepare San Diegans for quality jobs via locally-serving education institutions and expand access to diverse, qualified talent for San Diego companies.

The program is helping the region meet its **Inclusive Growth goals** by strengthening relationships between local industry and education systems. Better alignment between these systems will allow the region to adequately prepare San Diegans for high-demand jobs, while allowing local employers—especially small businesses—to establish or expand recruitment relationships with locally-serving institutions.



san diego county office of EDUCATION FUTURE WITHOUT BOUNDARIES"











# Overview Employer working group

Skilled computing professionals are a central feature of San Diego's innovation economy. Individuals and companies rely on sophisticated technologies to protect data, improve productivity, support collaboration, and drive advancements across nearly every industry. This paired with the rapid advancements and integration of data science, precision health, unmanned systems, and more put **computing professionals in high demand in San Diego.** 

Leveraging strategies from the U.S. Chamber of Commerce Foundation's <u>Talent Pipeline Management®</u> framework, San Diego Regional EDC convened 13 local companies for its employer working group that collectively employ more than 21K people in the region to gain a real-time picture of San Diego's talent needs. As part of a <u>series of regional Talent</u> <u>Demand Reports</u>, the following pages serve as a **snapshot of local demand for computing professionals**.



# Regional overview The economy



\$253**B** 

**POPULATION** across 18 cities **GDP** San Diego County



MEDIAN INCOME per household

The San Diego region is consistently recognized for its **established tech and entrepreneurial ecosystem**, supported by distinguished universities and an **unrivaled quality of life**.

San Diego's economy combined with the region's diverse communities, population, and global connectivity—supports the attraction and retention of top talent and **some of the world's most innovative companies**.

But there is work to be done to ensure San Diego can maintain this competitiveness. As a region, we must **prioritize economic inclusion** so more San Diegans can thrive.



Learn more at: inclusivesd.org

# Industry overview Innovation economy



San Diego's innovation economy sits on a foundation of established industries, including **life sciences, aerospace, and information and communication technologies**. Over the last decade, the intellectual capital generated across these pillars has **accelerated growth in cybersecurity, software development, biotech, and clean energy**.

**Fueled by a collaborative culture and sophisticated support systems** focused on commercializing research and growing entrepreneurial, knowledge-based companies, San Diego's innovation economy plays a crucial role in the region's continued growth.



Every job in innovation supports another two jobs elsewhere in the economy



Life Science Tech

### Total VC in science and technology

### Occupation overview Occupations

This report will cover four in-demand, high-wage computing occupations. The analysis will serve as a high-level guide for education providers about the skills and competencies students need for entry-level openings in San Diego.

### IT support technician

### Network and systems administrator

Those who provide technical support and assistance to customers to ensure a client's ability to properly operate any machinery or technology. Additionally, they support and maintain organizational computer systems, desktops, and peripherals. This includes occupations like help desk technician, desktop support technician, and network diagnostic support specialist.

Responsible for system performance, design, reliability, and the security and optimization of computer systems. They must have an in-depth understanding of computer software, hardware, and networks. Additionally, they are responsible for installing, maintaining, and upgrading any software or hardware required to efficiently run a computer network.

# Occupation overview Occupations

### Software developer

Those who research. design, and develop computer and network infrastructure or specialized utility programs. They analyze user needs and develop software solutions, apply principles and techniques of computer science, engineering, and mathematical analysis. This includes occupations like computer applications or computer systems engineer, and mobile applications developer.

### Information security analyst

Responsible for protecting a company's network and systems from cyber attacks. This involves researching IT trends, creating contingency plans, reviewing suspicious activities, reporting security breaches, and educating the rest of the company on security measures. This includes occupations such as computer security specialist, IT risk specialist, and network security analyst.



#### Potential career pathways

### Talent demand

# Computing demand: Job postings

# Software developer is the most in-demand occupation in San Diego's innovation economy

And **the second most in-demand job in the economy overall,** falling short only of registered nurses. In 2022, San Diego had **more than 17K software developer jobs**. As technology evolves these roles, and skills associated with these roles more broadly, are becoming critical in nearly every industry.



2022 jobs

# Talent demand Computing demand: Job growth



2019 - 2022 % Change in San Diego

The most significant growth over the last three years has been in roles related to cybersecurity, including **information security analysis with a 19 percent increase**. In the same timeframe, demand for **IT support technicians** and **software developers** has grown at steady **11 percent** each. In contrast, there is still **a lag for network and systems administrators**; however, the change is insignificant enough that it may be residual impacts of the COVID-19 pandemic.

# Talent supply Public universities

1,028 software developer degree recipients at San Diego public universities (2022)



2022 software developer degree recipients



Gender



More significant gender gap at public universities as compared to community colleges.

# Talent supply Community colleges

In the 2020-21 academic year, there were **more than 3,200 students enrolled** in software development related courses across all 10 of the region's community colleges, but only **167 students completed** programs related to software development. An associate's degree or certificate is an important pathway into entry-level IT roles.

However, gaps between enrollment and completion raise concern for the health of the overall talent pipeline. The charts below reveal the demographic breakdown of the 167 program completers.



Gender

# Talent supply The workforce of tomorrow

In the graduating class of 2022, only **47.7 percent of Hispanic** and **52.2 percent of Black** students met A-G requirements, which qualify them to attend an education institution in the California State University or University of California systems. Comparatively, **76.7 percent of Asian students** and **66 percent of White students** met these requirements. Students that identify as people of color make up more than half of our future workforce. There is a continued **need to invest in San Diego's Hispanic and Black youth**.



# Talent supply K-12 career technical education



CTE information communication technology enrollment



There continues to be a misalignment between the available career technical education (CTE) pathways at K-12 public schools and the overall job market in San Diego, where roles in **professional, scientific, and technical services** dominate. There is also a gender gap when it comes to K-12 CTE enrollment, especially in computing pathways as is depicted above.

### **Skills and competencies**

# **General trends**

Writing

According to our employer working group members, the **roles that require less training, such as IT technicians, are paid a higher median hourly wage** than what the labor market information indicates.

As seen in the skills chart below, **employability (soft) skills are becoming more important** for these occupations.

With more than **24,109 unique job postings** for these roles over the last 12 months, there are roughly **4,032 employers competing for this talent in the region.** 

/lar 2022 - May 2022 Jun 2022	- Aug 2022 Sej	p 2022 - Nov 2022	Dec 2022 - Feb 2023	Mar 2023 - May 2023
Communications	Communications	Communications	Communicati	ions
Computer Saisasa	Computer Science	Computer Science	Computer Sc	ience
Computer Science	Computer Science	Software Engineering	Troubleshoot	ing (Problem Solving)
Software Engineering	Software Engineering	Management	Software Eng	gineering
Troubleshooting (Problem Solving)	Troubleshooting (Problem Solv	ring) Troubleshooting (Problem	Management	
Management	Management	Software Development	Python (Prog	ramming Language)
Cofficient Development	Python (Programming Language	ge) Python (Programming La	nguage) Software Dev	velopment
Software Development	Software Development	Problem Solving	Arile Method	
Java (Programming Language)	Backlan Ochica	Customer Service	Customer Se	rvice
Problem Solving	Problem Solving	Agile Methodology	Java (Progra	mming Language)
Python (Programming Language)	Java (Programming Language)	) Java (Programming Lang	uage) 📫 Leadership	-
Agile Methodology	Agile Methodology	Leadership	Linux	X-
Customer Service	Amazon Web Services	Operations	Amazon Web	Services
Amazon Web Services	Customer Service	Linux	Automation	logramming Language)
SQL (Programming Language)	Operations	Automation	C++ (Program	mming Language)
Leadership	C++ (Programming Language)	Amazon Web Services	Operations	
Operations	Leadership	SQL (Programming Lange	uage) Writing	mming Language)
JavaScript (Programming Language)	SQL (Programming Language)	Writing		
C++ (Programming Language)	Automation	Juage) JavaScript (Programming	(Language)	
Automation	Linux	The chart hig	hlights the most ir	n-demand skills
Linux	Writing	from unique job	from unique job postings from 2022 – 2023. Each	

from unique job postings from 2022 – 2023. Each skill (highlighted in different colors) is tracked on how often the skill is mentioned in job postings for computing roles in San Diego.

# Skills and competencies Employability skills

### Collaboration

Works effectively with others to accomplish goals. Demonstrates respect for cultural and individual values. Listens to and considers ideas from others.

# Dependability

Building trust with others by keeping your word. Managing your time by planning and controlling how your work time is spent to achieve goals.

### Problem solving

Applies critical thinking skills to solve problems by generating, evaluating, and implementing effective solutions.

# Verbal communication

Effective exchange of ideas, information, and message through spoken words in person or digitally to convey information.

# Skills and competencies IT support technicians 6.7K 249





Trending technical skills

JOBS

- **IT security:** Knowledge of security principles and methods (e.g. firewalls, demilitarized zones, encryption), and implementation (administering identify, access management, public key infrastructure (PKI), basic cryptography, wireless, and end-to-end security)
- **Computer networking:** Configure, manage, and maintain network devices; design, implement, evaluate, and improve functional and resilient networks; troubleshoot network problems.
- **Hardware and equipment:** Identify, use, and connect hardware components and devices; configure and support PC, mobile, and IoT device hardware; troubleshoot device issues.



40% of EWG members require a high school diploma for entry-level IT support techs

# Skills and competencies IT support technicians cont.

### Trending technical skills

- **Basic systems and technologies:** Knowledge of operating systems (e.g. Unix/Linux, IOS, Android, Windows), systems administration concepts, file extensions (e.g. .dll, .bat, .zip), and basic IT system operation, maintenance, and security to keep equipment functioning properly.
- **Governance and risk:** An understanding of methods for assessing and mitigating risk, and compliance to regulations, such as PII, PHI, and PCI data security standards, SOX, GDPR, FISMA, NIST, and CCPA.
- **Systems testing:** Knowledge of systems testing and evaluation methods, including test procedures, principles, and methodologies.



Employers are struggling with managing remote work expectations, especially with entry-level talent. While many companies are committing to flexibility in the workplace, the first few months of an entry-level job often must be done in-person with a supervisor or trainer present.

# Skills and competencies System and network administrators 3K 89 \$99K JOBS AVG MONTHLY AVG SALARY

### Trending technical skills

- **Hardware and equipment:** Identify, use, and connect hardware components and devices; configure and support PC, mobile, and IoT device hardware; troubleshoot device issues.
- **Basic systems and technologies:** Knowledge of operating systems (e.g. Unix/Linux, IOS, Android, Windows), systems administration concepts, file extensions (e.g. .dll, .bat, .zip), and basic IT system operation, maintenance, and security to keep equipment functioning properly.
- **Computer networking:** Configure, manage, and maintain network devices; design, implement, evaluate, and improve functional and resilient networks; troubleshoot network problems.
- **Network administration:** Knowledge of network infrastructure principles, including network equipment (routers, switches, servers, etc.), network connections (Local and Wide Area Networks), network communication (e.g. LAN, WAN, MAN, WLAN, WWAN), and how traffic flows across the network (e.g. TCP, IP, ISI, ITIL)

### **Skills and competencies**

### System and network administrators cont.

### Trending technical skills

- **Cybersecurity basis:** Knowledge of laws, regulations, policies, and ethics of cybersecurity and privacy. Knowledge of cyber-attacks, threats, and vulnerabilities, and specific operational impacts of cybersecurity lapses.
- **Network security:** Ability to identify and protect against security vulnerabilities for devices and their network connections. Knowledge of network security concepts including topology, protocols, components, and principles.
- **IT security:** Knowledge of security principles and methods (e.g. firewalls, demilitarized zones, encryption), and implementation (administering identify, access management, PKI, basic cryptography, wireless, and end-to-end security)
- **Systems testing:** Knowledge of systems testing and evaluation methods, including test procedures, principles, and methodologies.
- **Scripting:** The ability to program language that executes tasks within a special run-time environment by an interpreter instead of a compiler.



50% of EWG members prefer a bachelor's degree, 25% require a bachelor's degree, and 25% prefer an associate's degree for entry-level systems and network administrator positions.

# Skills and competencies Software developers

17.5K	595	<b>\$130K</b>
JOBS	AVG MONTHLY HIRES	AVG ANNUAL WAGES

### Trending technical skills

- **Debugging:** The process of detecting and removing existing and potential errors (also called 'bugs') in a software code that can cause it to behave unexpectedly or crash.
- **Scalability:** Ability to increase or decrease a system's ability in performance and cost in response to changes in application and system processing demands.
- **Scripting:** The ability to program language that executes tasks within a special run-time environment by an interpreter instead of a compiler.
- **Version control:** Ability to leverage software that helps track changes in the source code. One common example is <u>GIT</u>.



50% of EWG members prefer a bachelor's degree for entry-level software developers.

# Skills and competencies Software developers

### **Other considerations**

- **Programming language:** When surveyed on eight different coding languages, EWG members ranked **Python** the most relevant.
  - Labor market information indicates that JavaScript remains a relevant skill for software developers.
  - Employers agreed that once a student knows one language, it becomes easier to learn others.
- **Operating systems:** When surveyed on four different operating systems, EWG members ranked **Microsoft** the most relevant.
- **Project management:** EWG members emphasized **agile** as an important software development project management methodology that focuses on flexibility, collaboration, and efficiency that allows teams to deliver quality products.

Employers were in agreeance that experience indicating a proven interest in software rises above other qualifications. Candidates with less formal training that can articulate how they have independently pursued opportunities are more appealing than those that are fully trained but disinterested.



### Skills and competencies

Information security analyst

1.5K	65	<b>\$102K</b>
JOBS	AVG MONTHLY	AVG
	HIRES	ANNUAL WAGES

### Trending technical skills

- **Cybersecurity basics:** Knowledge of laws, regulations, policies, and ethics of cybersecurity and privacy. Knowledge of cyber attacks, threats, and vulnerabilities, and specific operational impacts of cybersecurity lapses.
- **Network security:** Ability to identify and protect against security vulnerabilities for devices and their network connections. Knowledge of network security concepts including topology, protocols, components, and principles.
- **IT security:** Knowledge of security principles and methods (e.g. firewalls, demilitarized zones, encryption), and implementation (administering identify, access management, PKI, basic cryptography, wireless, and end-to-end security)

### **Highest-ranked certifications:**





Not typically considered an entry-level position, 66% of EWG member require a bachelor's degree.

# Skills and competencies Certifications

In IT, industry certifications are a key sign of a qualified candidate. Some companies require that new hires gain needed certificates within some timeframe of being hired. **Others give preference to candidates that are already certified**. These ranked as the most important certificates for the employer working group.

# **A+**

Identify, use, **connect hardware components and devices;** broad knowledge of devices, especially those necessary to support the remote workforce.



### Organizational security assessment and incident

**response** procedures, basic threat detection, risk mitigation techniques, security controls, and basic digital forensics.

### Network+

Understand **security concepts and network attacks** to harden networks against threats; troubleshoot **common cable**, **connectivity** and software issues related to networking; **monitor and optimize networks** to ensure continuity



Library of **best practices for managing and improving IT support and service levels;** ensure IT services align with business objectives, even as business objectives change.



Covers networking fundamentals, network access, IP services, security fundamentals, automation, and programmability.

# Advancing San Diego Verified Programs

Training programs receive recognition for:









Refining critical employability skills

Ensuring access for a diverse population





Consistently engaging with industry

Demonstrating a history of collaboration in the region

### Verified Program benefits:

- Employer-recognized curriculum.
- Networking opportunities with regional employers and workforce partners.
- Public recognition through EDC's marketing channels, feature on EDC's talent dashboard (launching Fall 2023), and highlights on EDC's blog.
- EDC "short-list" for industry partnerships.
- Paid work-based learning opportunities for students.

Apply by October 9th!

For more information, contact Andrea Crisantes at acs@sandiegobusiness.org

# References

### General economic data:

San Diego Regional EDC Regional Overview

### K-12 data:

State of California Department of Education

### Community college data:

<u>CalPassPlus Community College Dashboard</u> TOP code referenced: 0707

### Public university data:

San Diego State University Institutional Research CSU San Marcos Institutional Research UC San Diego Institutional Research

### Labor market information data:

Lightcast Occupation Snapshot Report

Learn more at AdvancingSD.org