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### San Diego’s computing talent pipeline

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[Verified Program]
Executive summary

Through Advancing San Diego’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 their importance 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 become a Verified Program of Computing Talent.

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.

- **Communicate industry demand**
  Regularly quantify and communicate broad regional workforce demand.

- **Adapt existing resources**
  Help adapt curriculum and workforce systems for better economic mobility.

- **Expand access for San Diegans**
  Explore unique solutions to remove barriers to entry into quality jobs.

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*In partnership with:*
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 Talent Pipeline Management® 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 series of regional Talent Demand Reports, the following pages serve as a snapshot of local demand for computing professionals.

Employer working group companies

ASML, The City of San Diego, COX, General Dynamics NASSCO, CUBIC, American Lithium Energy, illumina, ZUM Radio, Fastenal, Grifols, TALOSYS, Rady Children's Hospital San Diego, San Diego International Airport
Regional overview

The economy

3.3M+ POPULATION across 18 cities

$253B GDP San Diego County

$83.5K 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
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.
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**

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.

**Network and systems administrator**

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.
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

Software developers: 18,000
IT support technician: 8,000
Network and systems administrator: 4,000
Information security analyst: 2,000

San Diego: ■
National average: ●
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)

4,890
YTD unique job postings for entry-level talent

2022 software developer degree recipients

Gender

- Male: 82%
- Female: 18%

Ethnicity

- Hispanic/Latino: 26%
- White: 27%
- Asian: 19%
- Black: 26%
- Other: 2%

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.
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.

<table>
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<tr>
<th>K-12 PUBLIC SCHOOL ENROLLMENT</th>
<th>HIGH SCHOOL GRADUATES IN 2022</th>
<th>MEET A-G REQUIREMENTS IN 2022</th>
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<tr>
<td>481K</td>
<td>34K</td>
<td>19K</td>
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K-12 demographics

- Hispanic or Latino: 49%
- White: 29%
- Asian: 7%
- Black: 6%
- Two or more: 5%
- Other: 4%
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

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.

The chart highlights the most in-demand skills 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 JOBS
249 AVG MONTHLY HIRES
$61K AVG SALARY

Trending technical skills

- **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 JOBS
89 AVG MONTHLY HIRES
$99K 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 JOBS

595 AVG MONTHLY HIRES

$130K 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 **GIT**.

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 JOBS  65 AVG MONTHLY HIRES  $102K AVG 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:

- Security+
- SSCP
- CISA

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.

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.

Security+

Organizational security assessment and incident response procedures, basic threat detection, risk mitigation techniques, security controls, and basic digital forensics.

ITIL

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.

CCNA

Covers networking fundamentals, network access, IP services, security fundamentals, automation, and programmability.
Advancing San Diego
Verified Programs

Training programs receive recognition for:

- 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.

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

Apply by October 9th!
References

General economic data:
San Diego Regional EDC Regional Overview

K-12 data:
State of California Department of Education

Community college data:
CalPassPlus Community College Dashboard
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