

DEPARTMENT OF EMPLOYMENT TRAINING AND REHABILITATION

# State of Nevada

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# Information Technology Occupations



Presented by Research and Analysis Bureau

## **Executive Summary**

### **1. Information Technology Occupations in Nevada:**

- In 2015 there were 30,000 Information Technology (IT) related jobs in Nevada. IT occupations in Nevada represent 2.4 percent of total employment. Statewide there were 954 annual openings. In Reno MSA there were 4,700 jobs and 165 annual openings.
- In 2015 the average annual wage for computer and mathematical occupations was \$74,400 in Nevada, compared to \$84,000 nationwide. In the Reno-Sparks area the wage was \$70,700.
- The top five industry sectors employing IT occupations are professional/business services, manufacturing, management of companies/enterprises, and information.
- In 2015 there were 17,800 online IT related job postings in Nevada. This is a 55 percent increase over the 2014 total of 11,500 ads. Washoe county, Storey county, and Carson City combined totaled 4,293 job postings. Most employers in terms of ad total were from the following industries: casino hotels, insurance, gaming equipment, computer system design, and state government.
- In 2015 there were 9,800 ads in Nevada that specified an educational requirement. About 70 percent of ads required a Bachelor's degree.
- Regarding skills requirements 13,900 job postings specified skills in 2015. The most requested specialized skills were SQL, technical support, and JAVA. The most requested baseline skills were communication, writing, and organizational skills.

### **2. Computer Programmer Occupation:**

- In 2015 there were 1,291 computer programmer jobs in Nevada. This occupation represents 0.1 percent of total employment. Statewide there were 42 annual openings.
- In 2015 the average annual wage was \$79,480 in Nevada, compared to \$82,700 nationwide.
- The top industry sectors employing this occupation are professional/scientific/technical services, wholesale trade and government.
- In 2015 there were 657 computer programmer online job postings in Nevada. This is an 80 percent increase over the 2014 total of 363 ads. Most employers in terms of total ads were from the following industries: traveler accommodation, colleges/universities/professional schools, and government.
- In 2015 a total of 265 ads in Nevada specified an educational requirement. About 65 percent of ads required a Bachelor's degree.
- Regarding skills requirements 467 job postings specified skills in 2015. The most requested specialized skills were: SQL, JAVA, and Net Programming. The most requested baseline skills were: communication, writing, and troubleshooting.

### **3. Web Developer Occupation:**

- In 2015 there were 850 computer programmer jobs in Nevada. This occupation represents 0.1 percent of total employment. Statewide there were 30 annual openings.
- In 2015 the average annual wage was \$58,780 in Nevada, compared to \$68,670 nationwide.
- The top industry sectors employing this occupation in 2015 were professional/scientific/technical services, retail trade, and non-store retailers.
- In 2015 there were 800 web developer online job postings in Nevada. This is a 90 percent increase over the 2014 total of 420 ads. Most employers in terms of total ads were from the following industries: management/scientific/technical consulting services, traveler accommodation, and colleges/universities/professional schools.
- In 2015 a total of 250 ads in Nevada specified an educational requirement. About 80 percent of ads required a Bachelor's degree.
- Regarding skills requirements 580 job postings specified skills in 2015. The most requested specialized skills were: JavaScript, Website development, and web development. The most requested baseline skills were: writing, communication, and creativity.

### **4. Network Computer Systems Administrator Occupation:**

- In 2015 there were 1,800 network computer systems administrator jobs in Nevada. This occupation represents 0.1 percent of total employment. Statewide there were 54 annual openings.
- In 2015 the average annual wage was \$86,600 in Nevada, compared to \$79,800 nationwide.
- The top industry sectors employing this occupation are professional/scientific/technical services, information, and management of companies/enterprises.
- In 2015 there were 950 network computer systems administrator online job postings in Nevada. This is a 38 percent increase over the 2014 total of 690 ads. Most employers in terms of total ads were from the following industries: traveler accommodation, general medical/surgical hospitals, and national security.
- In 2015 a total of 530 ads in Nevada specified an educational requirement. About 60 percent of ads required a Bachelor's degree.
- Regarding skills requirements 805 job postings specified skills in 2015. The most requested specialized skills were: systems administration, system administration, and software installation. The most requested baseline skills were: troubleshooting, communication, and writing.

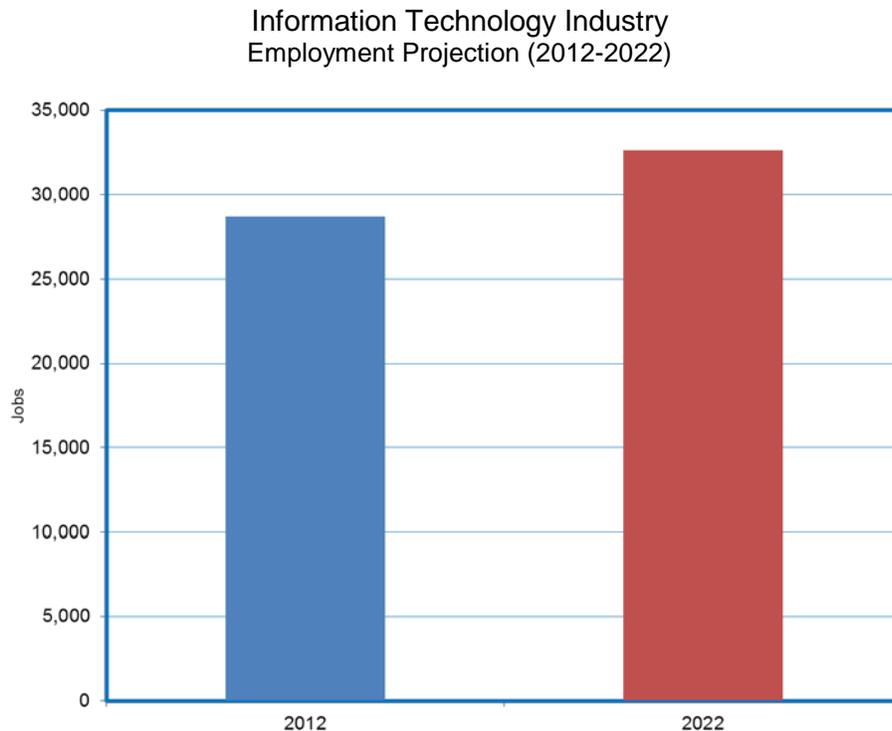
## Nevada Statewide Overview- Information Technology Occupations

The Information Technology (IT) area is a growing occupational sector in Nevada. The following report provides a general overview of Nevada's information technology labor market for the periods 2012-2022. The report highlights IT related occupational employment, employment projections, education, skills, and training needed to meet the changing needs of Nevada's employers. Data sources for this report include: Quarterly Census of Employment and Wages (QCEW), Occupational Employment Statistics (OES), Economic Modeling Specialists International (EMSI), Occupational Information Network (O-NET), and Burning Glass Technologies/Labor Insight.

### I. Employment for Information Technology Occupations

The IT occupations for this report are defined based on the O-NET occupational classification system, as well as supplementary information from EMSI. A total of 44 occupations related to IT are included (for detailed listing, see Appendix).

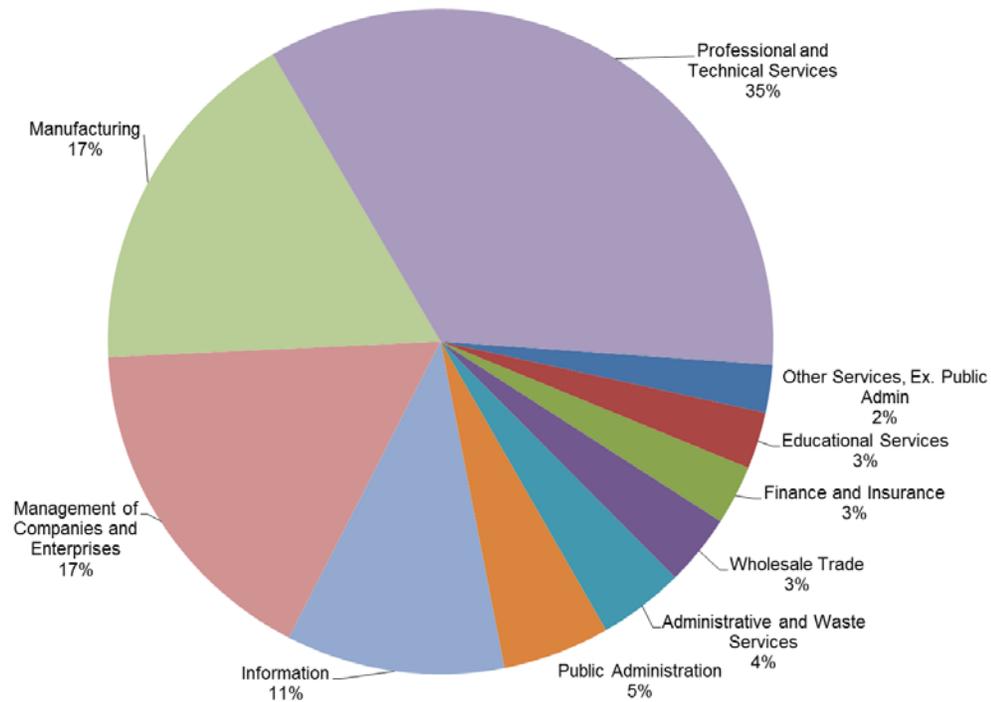
In 2012, total information technology employment in Nevada was 28,700 jobs, representing 2.4 percent of total employment statewide. By 2022 IT employment is expected to reach 32,600 jobs and maintain its share of employment. Over this period IT employment is expected to increase by three percent, with 954 total annual openings. According to OES data, in 2015 the average annual wage for Computer and Mathematical occupations in Nevada was \$74,400. This compares to \$84,000 nationwide and \$70,700 in the Reno-Sparks Area.



Source: Quarterly Census of Employment and Wages (QCEW)

In 2012 the top five industry sectors employing IT Occupations according to QCEW data were professional/business services, manufacturing, management of companies/enterprises, and information. It is expected that this trend will continue through 2022.

Information Technology Employment By Industry Sector  
(2012-2022 Projected Share of Employment)

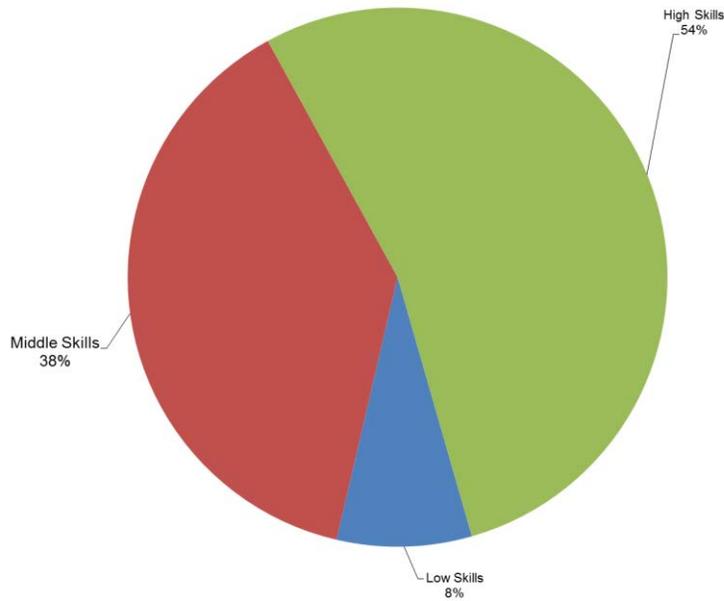


Source: Quarterly Census of Employment and Wages (QCEW)

In terms of required education and training, three categories of skill level jobs are define: Low Skills Jobs are those requiring a High School Diploma or less, Middle Skills Jobs include those requiring more than high school but less than a bachelor degree (includes occupations requiring on the job training), and High Skills Jobs include those requiring a bachelor’s degree or above.

Based on OES data, 60 percent of IT occupations in Nevada required high skills, 27 percent required middle skills, and 13 percent required low skills. It is expected that this trend will continue through 2022. Total employment for these occupations in 2015 reached 31,950 jobs.

### IT Occupational Employment Skill Level Requirements (2015 Percentage Share)



Source: Occupational Employment Statistics (OES)

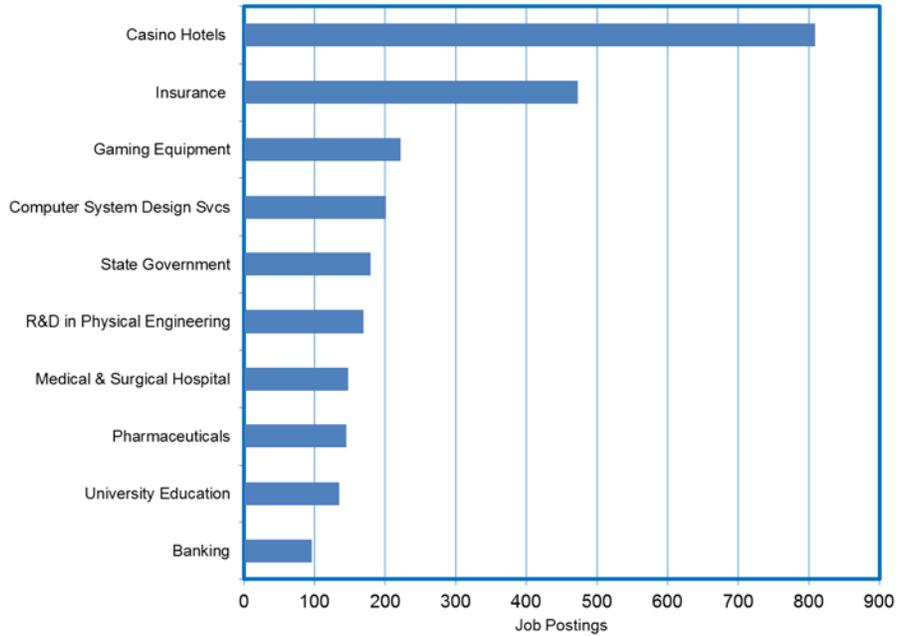
Using the Labor Insight tool developed by Burning Glass Technologies, a supplier of “real time” labor market information, we can assess online job ads via the Department of Employment, Training and Rehabilitation (DETR) Silver State Solutions initiative<sup>1</sup>.

In 2015 there were 17,800 online IT related job postings in Nevada. This is a 55 percent increase over the 2014 total of 11,500 job postings. Washoe county, Storey county, and Carson City combined totaled 4,293 job postings. The employers with the highest posting volume in 2015 were from the following industries: casino hotels, insurance, gaming equipment, computer system design, and state government.

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<sup>1</sup> Burning Glass focus more on high skills and high wages specified in online ads, certain industries are not represented in online ads.

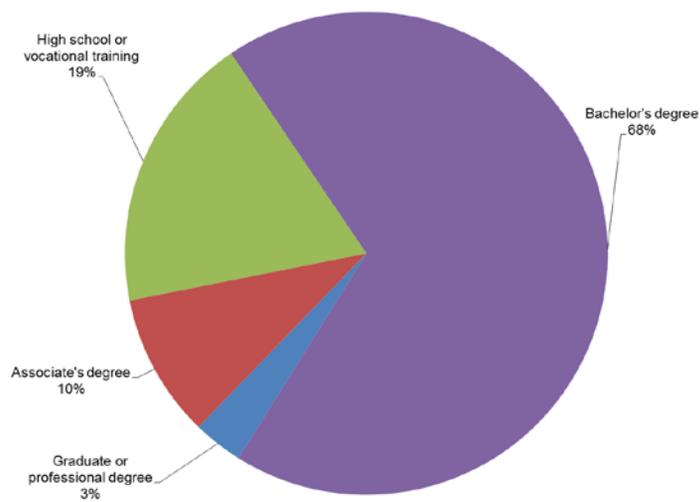
### Online Job Ad Posting Volume by Industry (2015 Job Postings)



\* 57% of online job postings specified an Industry  
Source: Burning Glass Technologies/Labor Insight.

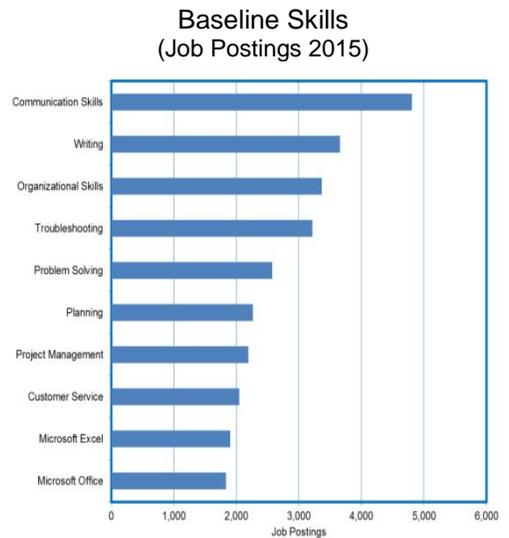
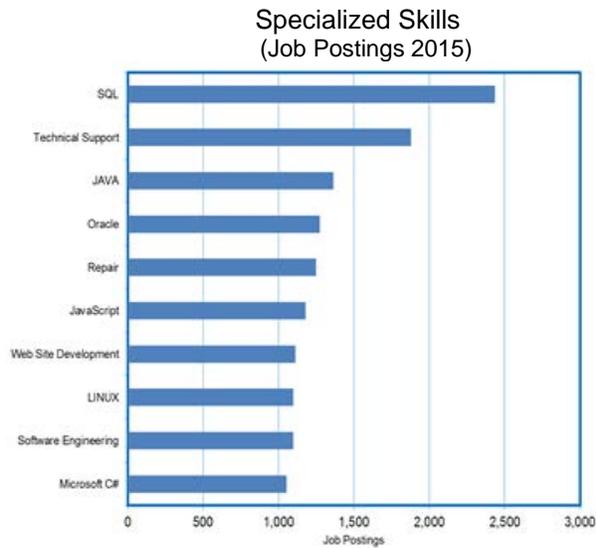
Out of the total job postings, 9,800 specified a minimum education requirement. About 70 percent of job postings required a Bachelor's degree.

### Education Requirements for IT Occupations (2015 Job Postings)



\* 55% of online job postings specified an educational requirement  
Source: Burning Glass Technologies/Labor Insight.

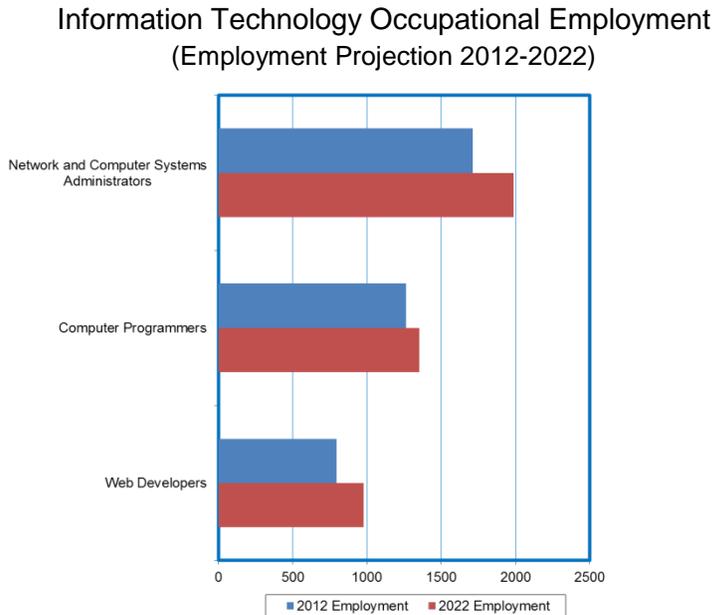
Regarding skills requirements, Burning Glass shows two groups of skills in job postings, specialized skills and baseline skills. In 2015 a total of 13,900 postings specified skill requirements. The most requested specialized skills were SQL, Technical Support, and JAVA. The most requested baseline skills were communication skills, writing, and organizational skills.



\* 78% of online job postings specified skill requirements  
Source: Burning Glass Technologies/Labor Insight

## II. Occupations Breakout Analysis

The following is an analysis of three IT occupations: Computer Programmers (SOC-Code: 151131), Web developers (SOC-Code: 151134), and Network and Computer Systems Administrators (SOC-Code: 151142). According to employment projections based on OES data, in 2012 there were 3,800 jobs for these three occupation groups. The projected growth for the 2012-2020 period is 14 percent, reaching 4,300 jobs in 2020.



Source: Occupational Employment Statistics (OES)

### A. Computer Programmers Occupation

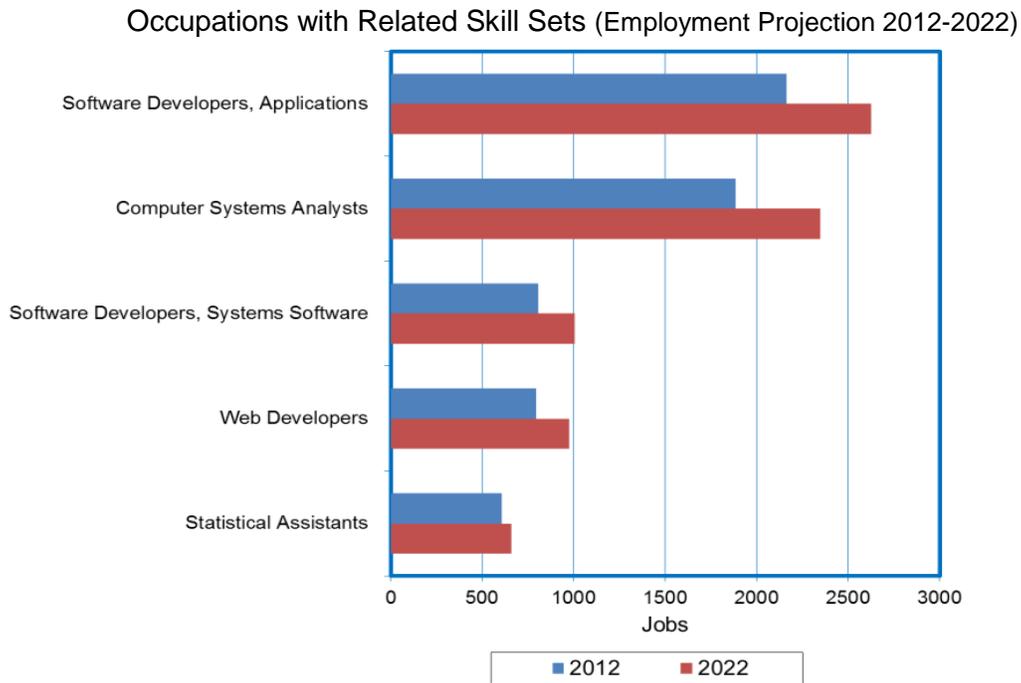
The O-NET occupational classification system defines Computer Programmers as those who create, modify, and test the code, forms, and script that allow computer applications to run, utilizing specifications drawn up by software developers and others. They may assist software developers by analyzing user needs and designing software solutions. They may also develop and write computer programs to store, locate, and retrieve specific documents, data, and information.

#### 1. Employment:

Employment for Computer Programmers was at 1,291 jobs in 2015 and is expected to reach 1,354 jobs in 2022. For 2012-2022 periods the total annual job openings average 42 jobs statewide. According to OES data, the average annual wage in 2015 was \$79,480 in Nevada, compared to \$82,700 nationwide.

Other occupations that use similar or transferable skills include: Computer Systems Analysts, Applications Software Developers, Systems Software Developers, Web Developers, Database Administrators, Software Quality Assurance Engineers and Testers, Geographic Information

Systems Technicians, Social Science Research Assistants, Computer Operators, and Statistical Assistants.

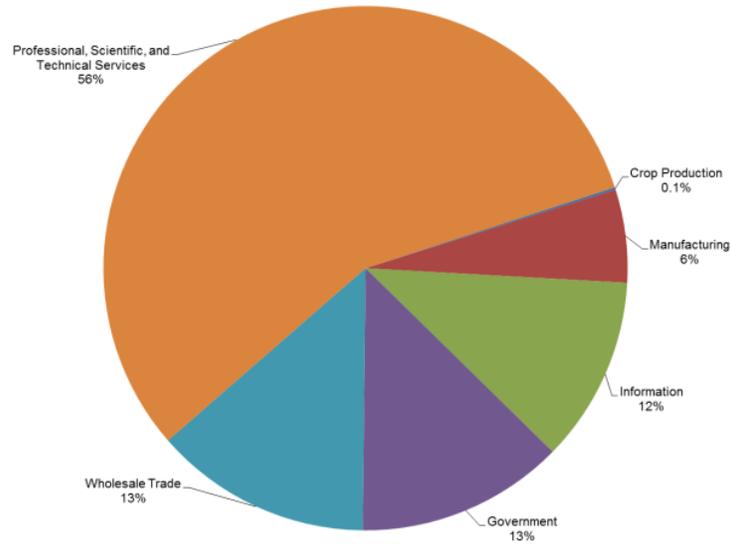


Source: Occupational Employment Statistics (OES)

According to QCEW data, in 2012 the top five industry sectors that employed computer programmers were: Professional/Scientific/Technical Services, Wholesale Trade, Government, Information, and Manufacturing. It is expected that this trend will continue through 2022.

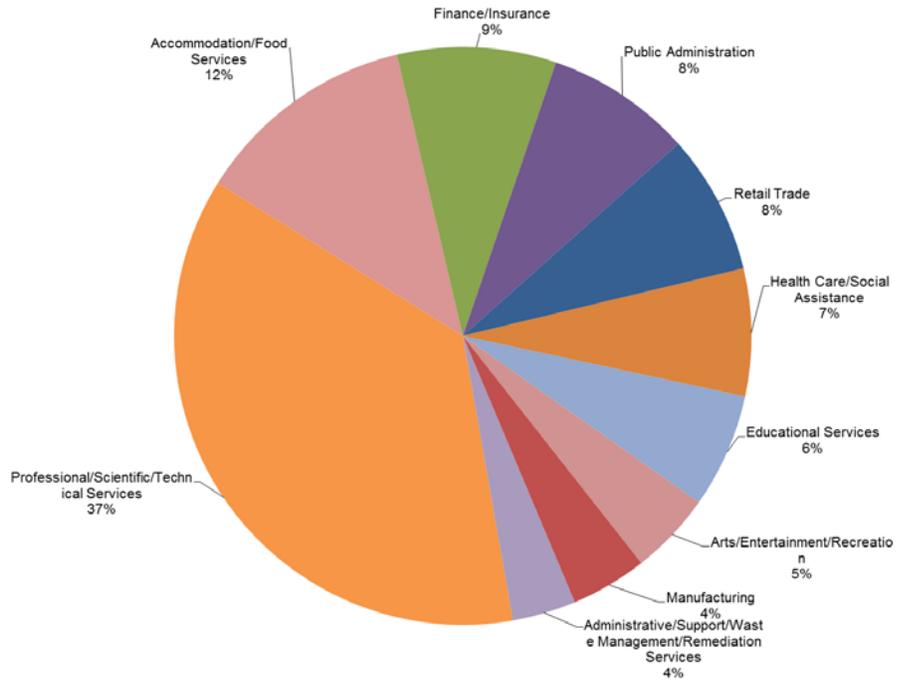
Based on data from Burning Glass, in 2015 there were 657 online job postings for computer programmers in Nevada, up from 363 job postings in 2014. The top five industries offering jobs for this occupation (according to 310 job postings) were professional/scientific/technical services, accommodation/food services, finance/insurance, public administration, and retail trade.

### Computer Programmers Employment by Industry Sector (2012-2022 Employment Percentage Share)



Source: Quarterly Census of Employment and Wages (QCEW)

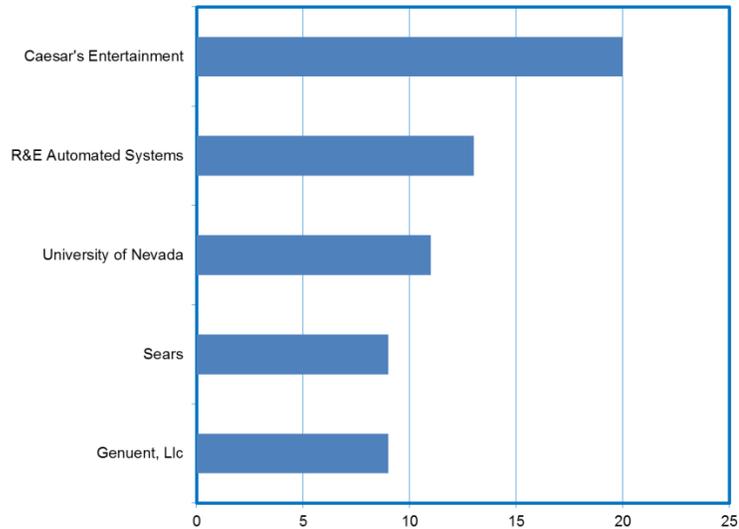
### Computer Programmers Online Ads By Industry (2015 Percentage Share)



\* 47% of online job postings specified an Industry  
Source: Burning Glass Technologies/Labor Insight

The Employers with most ads based on 349 online job postings (53 percent of total ads) were Caesar's Entertainment, R&E Automated Systems, and The University of Nevada.

Employers With the Most Online Ads for Computer Programmers  
(2015 Job Postings)



\* 53% of online job postings specified an employer  
Source: Burning Glass Technologies/Labor Insight

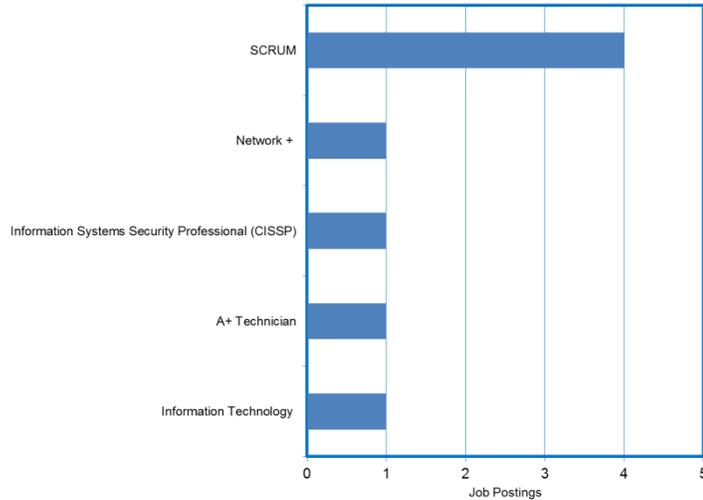
## 2. Education, Training, and Skills:

Based on OES data, the education level required for Computer Programmers is a Bachelor's Degree. This occupation may require a background in computer science. The ONET-Occupational System Classification cites over 150 certifications for computer programmers, for details see <http://www.onetonline.org/link/summary/15-1131.00>. Following is a list of some certifications/certifying organization:

- Certified Ethical Hacker /EC-Council
- Java SE 5 and 6, Certified Associate/Oracle Corporation
- SAP Certified Technology Associate-Process Integration with SAP NetWeaver (PI 7.3)/SAP America, Inc.
- Certified Software Quality Engineer/American Society for Quality (This certification is third-party industry-endorsed and is related to military occupational specialties)
- Database Design Specialists/Certified Internet Web Professionals

Information from Burning Glass Technologies shows 26 job postings (only 4 percent of all job postings) for computer programmers specified a certification in 2015. The top certifications listed were SCRUM, Network +, and Information Systems Security Professional.

**Certifications Requested for Computer Programmers  
(Job Postings 2015)**

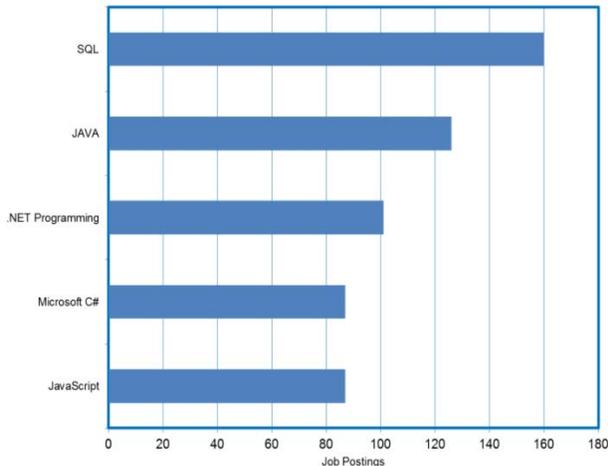


\* 4% of online job postings specified a certification requirement  
Source: Burning Glass Technologies/Labor Insight

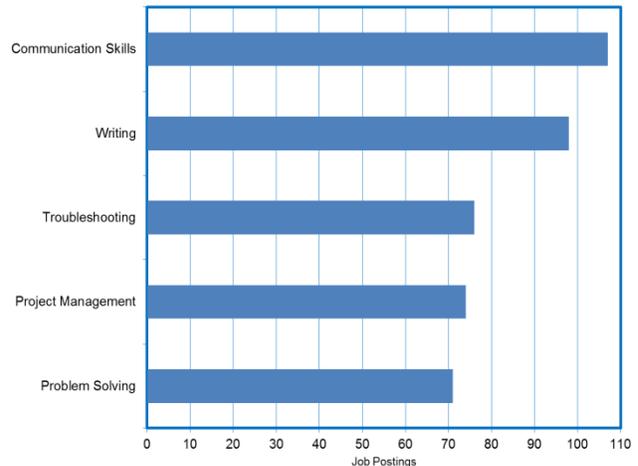
Regarding skills and abilities, the Nevada Career Information System (NCIS) indicates it is important for computer programmers to have the ability to, among other things, communicate, reason and solve problems, use math and science(for details see Appendix).

Information from Burning Glass Technologies shows 467 job postings specified required skills for Computer Programmers in 2015. The top specialized skills in demand were SQL, JAVA, and .NET Programming. The top baseline skills were communications skills, writing, and troubleshooting.

**Specialized Skills for Computer Programmers  
(Job Postings 2015)**



**Baseline Skills for Computer Programmers  
(Job Postings 2015)**



\* 71% of online job postings specified skill requirements. Source: Burning Glass Technologies/Labor Insight

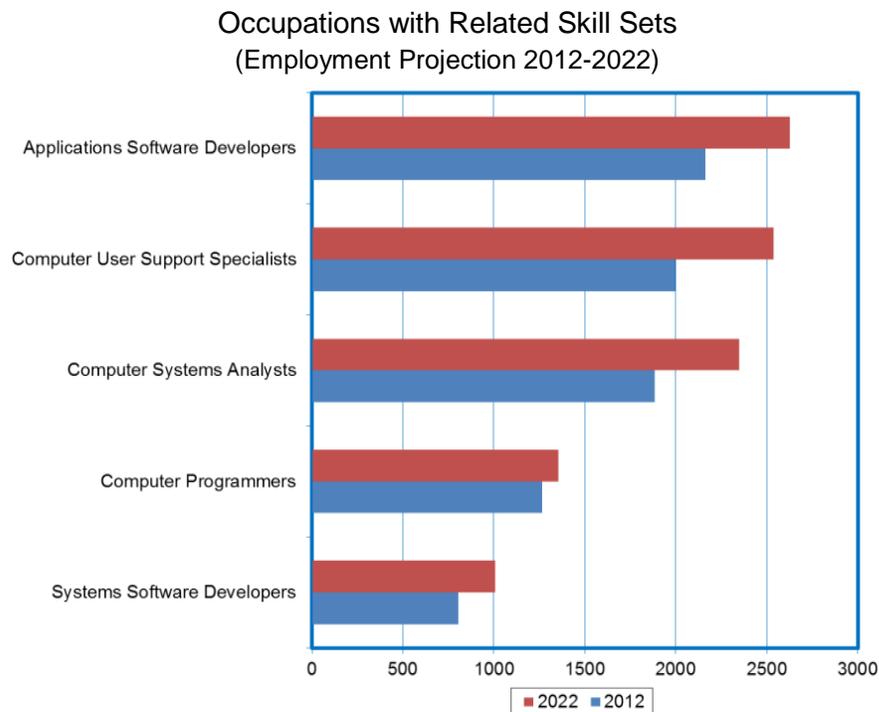
## B. Web Developers Occupation

The O-NET occupational classification system defines Web Developers as those who design, create, modify Web sites and analyze user needs to implement Web site content, graphics, performance, and capacity. They may integrate Web sites with other computer applications, convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content.

### 1. Employment:

Employment for Web Developers was at 850 jobs in 2015 and is expected to reach 976 in 2022. For 2012-2022 periods the total annual openings average 30 jobs statewide. According to OES data, the average annual wage was \$58,780 in Nevada, compared to \$68,670 nationwide.

Other occupations that use similar or transferable skills include: Desktop Publishers, Computer Systems Analysts, Computer Programmers, Applications Software Developers, Systems Software Developers, Database Administrators, Computer User Support Specialists, Software Quality Assurance Engineers and Testers, Web Administrators, and Computer Operators.

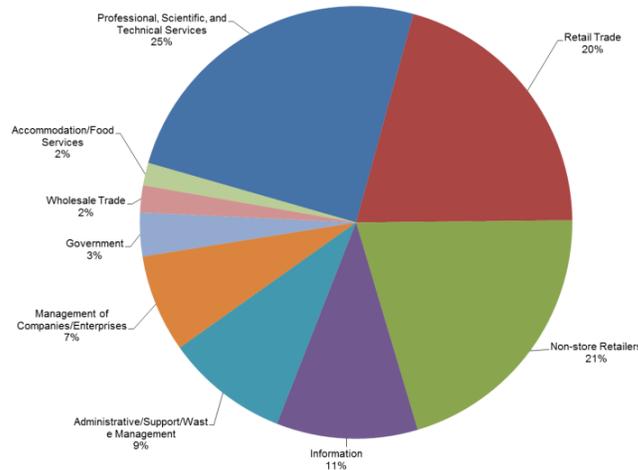


Source: Occupational Employment Statistics (OES)

According to QCEW data, in 2012 the top five industry sectors that employed web developers according to QCEW data were: Professional/Scientific/Technical Services, Retail Trade, Non-

store Retailers, Information, and Administrative/Support/Waste Management. It is expected that this trend will continue through 2022.

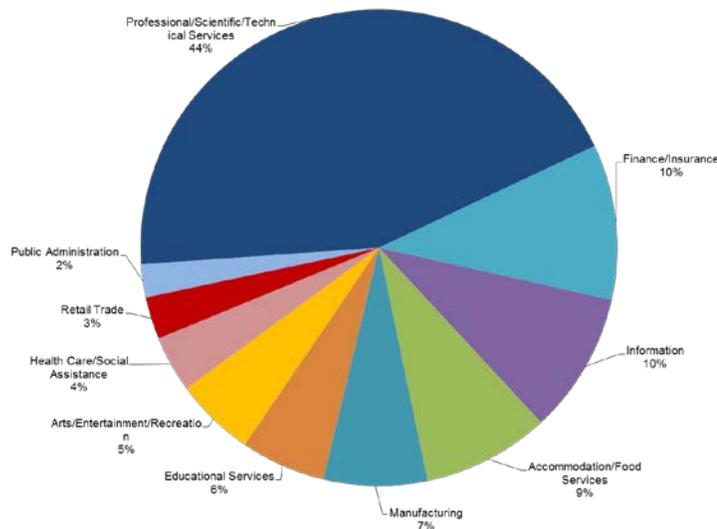
Web Developers Employment By Industry Sector  
(2012-2022 Employment Percentage Share)



Source: Quarterly Census of Employment and Wages (QCEW)

Based on data from Burning Glass, in 2015 there were 800 jobs postings for web developers in Nevada, up from 420 in 2014. The top five industries offering jobs for this occupation (according to 224 job postings) were management/scientific/technical consulting services, travel accommodation, insurance carriers, gambling industries, and legal services.

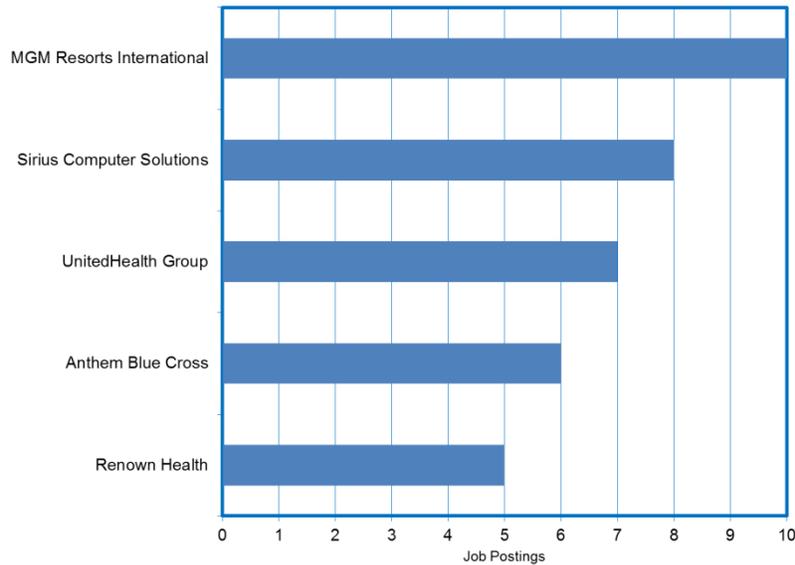
Web Developers Online Ads By Industry  
(2015 Percentage Share)



\* 41% of online job postings specified an Industry  
Source: Burning Glass Technologies/Labor Insight

The Employers with most ads based on 254 job postings (32% of total ads) were MGM Resorts International, Sirius Computer Solutions, and UnitedHealth Group.

Employers for Web Developers  
(2015 Job Postings)



\* 32% of online job postings specified Employer's name  
Source: Burning Glass Technologies/Labor Insight

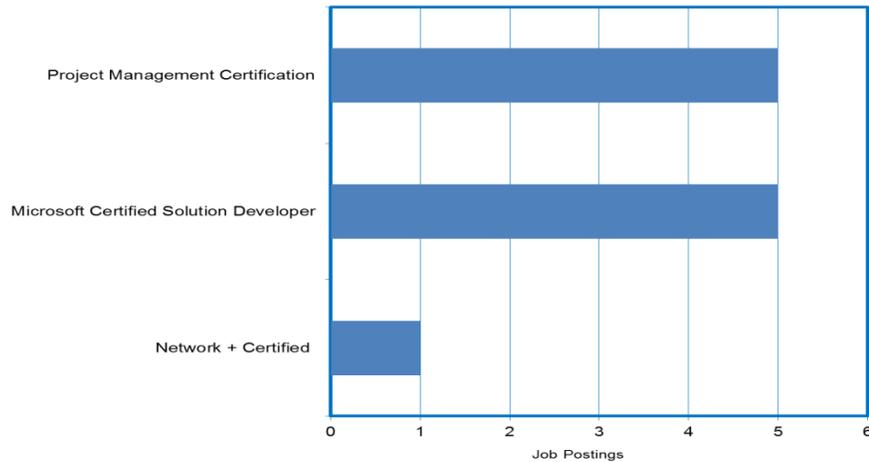
## 2. Education, Training, and Skills:

Based on OES data the education level required for web developers is an Associate's degree. The most common majors are computer programming, computer science, and graphic design. The ONET-Occupational System Classification cites various certifications for web developers, more details can be found at: <http://www.onetonline.org/link/summary/15-1134.00>. Following is a list of some certifications/certifying organization:

- Web Application Developer Associate 10.2/Environmental Systems Research Institute
- IBM Certified Associate Developer-Rational Test Virtualization Server V8/IBM Corporation
- CIW E-Commerce Specialist/Certified Internet Web Professionals
- CIW Web Design Specialist/Certified Internet Web Professionals
- Database Design Specialists/Certified Internet Web Professionals

Information from Burning Glass Technologies shows 24 job postings (only 3 percent of all job postings) for web developers specified a certification in 2015. The top certifications in demand were Project Management, Microsoft Certified Solution Developer, and Network + Certified.

### Certifications Requested for Web Developers (Job Postings 2015)

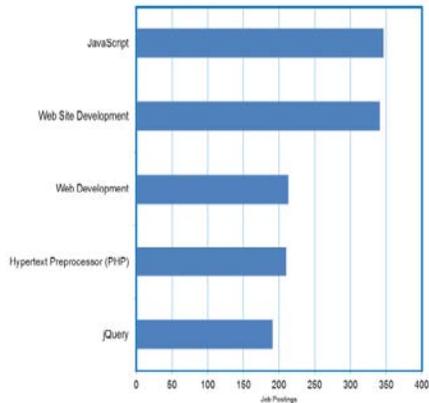


\* 3% of online job postings specified a certification requirement  
Source: Burning Glass Technologies/Labor Insight

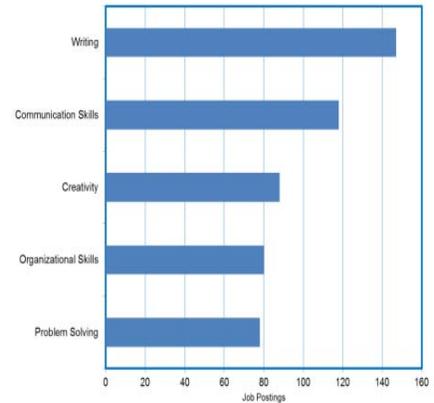
Regarding skills and abilities, the Nevada Career Information System (NCIS) indicates it is important for web developers to have the ability to, among other things, communicate, reason and solve problems, use math and science (for details see Appendix).

Information from Burning Glass Technologies shows 580 job postings specified required skills for Web Developers in 2015. The top specialized skills in demand were JavaScript, Web Site Development, and Web Development. The top baseline skills in demand were writing, communication skills, and creativity.

Specialized Skills for Web Developers  
(Jobs Postings 2015)



Baseline Skills for Web Developers  
(Job Postings 2015)



\* 73% of online job postings specified skills requirements. Source: Burning Glass Technologies/Labor Insight

## C. Network and Computer Systems Administrators Occupation

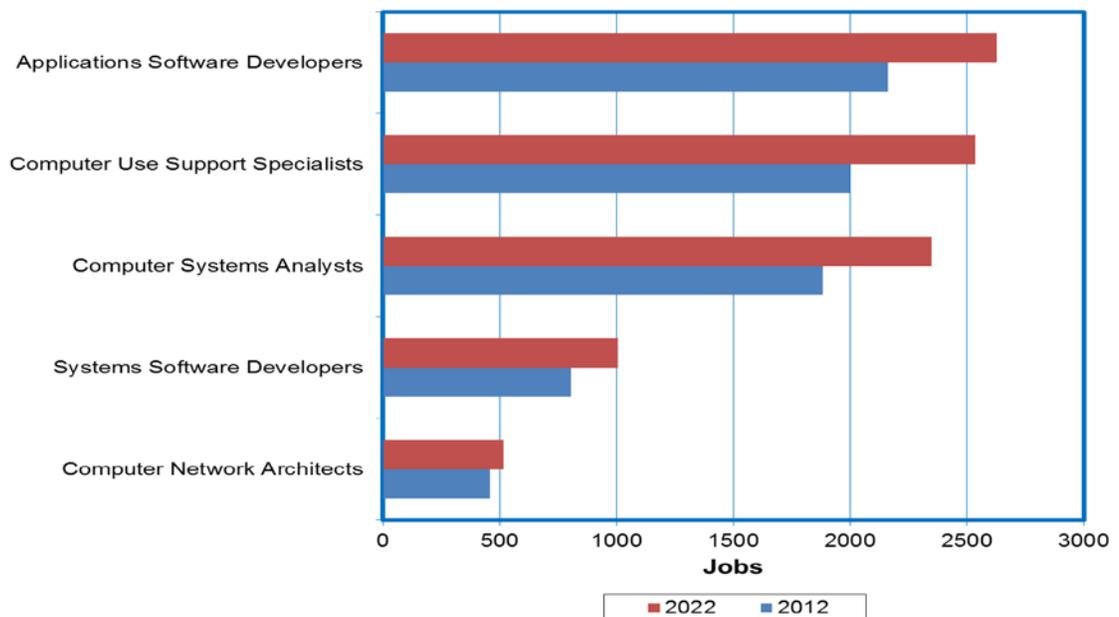
The O-NET occupational classification system defines Network and Computer Systems Administrators as those who install, configure, and support an organization's local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. They monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability. They may monitor and test Web site performance to ensure Web sites operate correctly and without interruption, may assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. They may supervise computer user support specialists, and administer network security measures.

### 1. Employment:

Employment for Network and Computer Systems Administrators was 1,800 in 2015 and is expected to be 2,000 in 2022. For 2012-2022 periods the total annual job openings average 54 jobs statewide. According to OES data, in 2015 the average annual wage was \$86,600 in Nevada, compared to \$79,800 nationwide.

Other occupations that use similar or transferable skills include: Computer Systems Analysts, Information Security Analysts, Applications Software Developers, Systems Software Developers, Database Administrators, Computer Network Architects, Computer Use Support Specialists, Computer Systems Engineers/Architects, Web Administrators, and Computer Operators.

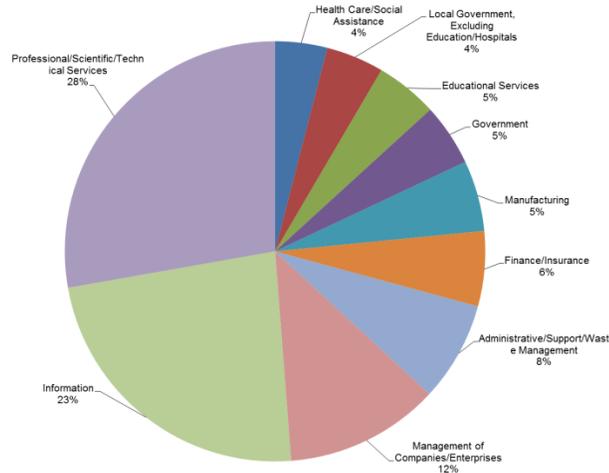
Occupations with Related Skill Sets  
(Employment Projection 2012-2022)



Source: Occupational Employment Statistics (OES)

According to QCEW data, in 2012 the top five industry sectors that employed network and computer systems administrators were: Professional/Scientific/Technical Services, Information, Management of Companies/Enterprises, Administrative/Support/Waste Management, and Finance/Insurance. It is expected that this trend will continue through 2022.

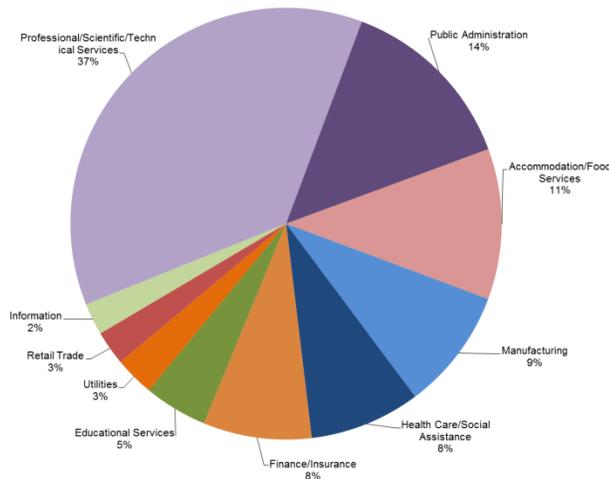
Network/Computer Systems Administrators Employment By Industry Sector  
(2012-2022 Employment Percentage Share)



Source: Quarterly Census of Employment and Wages (QCEW)

Based on data from Burning Glass, in 2015 there were 950 job postings for network and computer systems administrators in Nevada, up from 690 in 2014. The top five industries offering jobs for this occupation (according to 400 job postings) were traveler accommodation, general medical/surgical hospitals, and national security/international affairs.

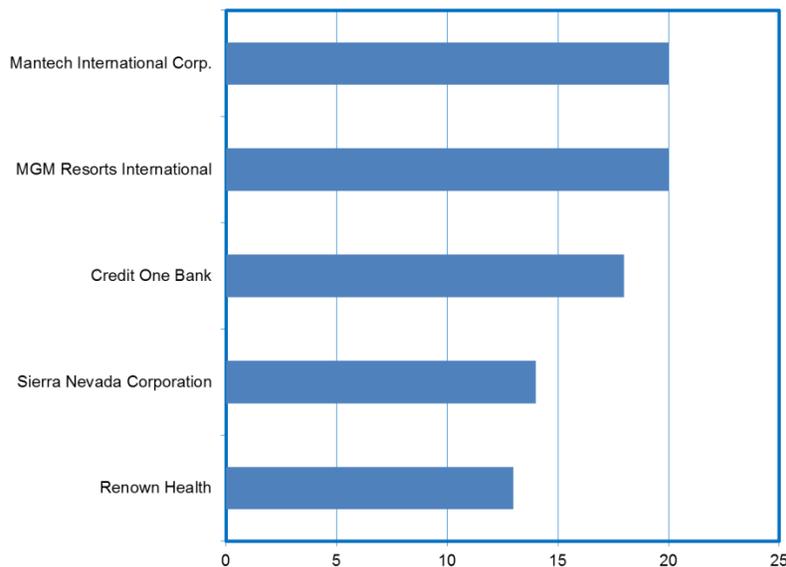
Network/Computer Systems Administrators Online Ads by Industry  
(2015 Percentage Share)



\* 59% of online job postings specified an Industry  
Source: Burning Glass Technologies/Labor Insight

The Employers with most ads based on 580 job postings (42 percent of total ads) were Mantech International Corporation, MGM Resorts International, and Credit One Bank.

Top Employers for Network and Computer Systems Administrators  
(2015 Job Postings)



\* 42% of job postings specified Employer's name  
Source: Burning Glass Technologies/Labor Insight

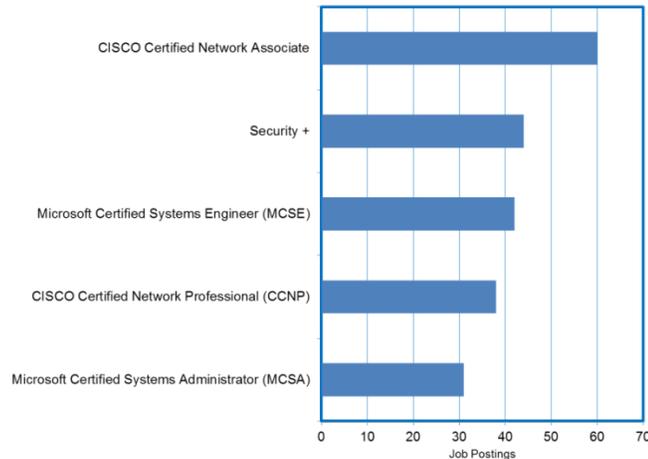
### 3. Education, Training, and Skills:

Based on OES data, the education level required for Network and Computer Systems Administrators is a Bachelor's degree, and five years or more experience in a related occupation. The ONET-Occupational System Classification, shows various certifications for Network/Computer Systems Administrators, for details see <http://www.online.org/link/summary/15-1142.00>. Following is a list of some certifications/certifying organization:

- Administering and Deploying System Center 2012 Configuration Manager/Microsoft Corporation
- Implementing an Advanced Server Infrastructure/Microsoft Corporation
- Certified Wireless Network Administrator/Certified Wireless Network Professional
- Server + Certification/Computing Technology Industry Association (Comp TIA)
- Cloud Architect/EMC Corporation
- 

Information from Burning Glass Technologies shows 239 job postings (only 25 percent of all job postings) for network computer systems administrators specified a certification in 2015. The top certifications listed were CISCO Certified Network Associate, Security +, and Microsoft Certified Systems Engineer (MCSE).

## Certifications Requested for Network Computer Systems Administrators (Job Postings 2015)

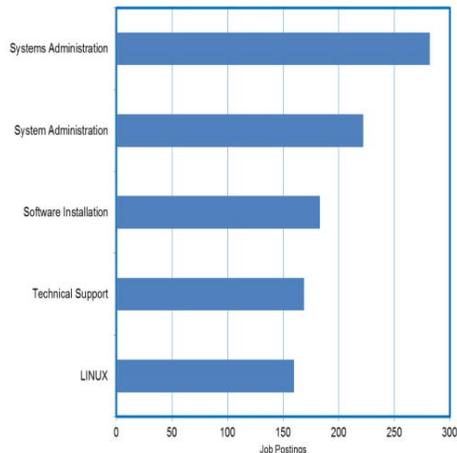


\* 25% of job postings specified certification requirements  
Source: Burning Glass Technologies/Labor Insight

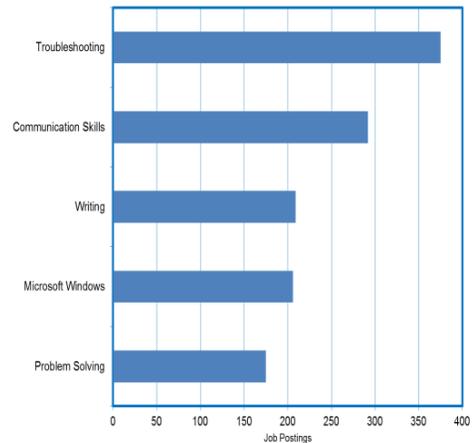
Regarding skills and abilities, the Nevada Career Information System (NCIS) indicates that it is important for network computer systems administrators to have the ability to, among other things, communicate, reason and solve problems, use math and science (for details see Appendix).

Information from Burning Glass Technologies shows 805 job postings specified required skills for network computer systems administrators in 2015. The top specialized skills in demand were systems administration, system administration, and software installation. The top baseline skills in great demand were troubleshooting, communication skills, and writing.

**Specialized Skills for Network Computer  
Systems Administrators  
(Job Postings 2015)**



**Baseline Skills for Network Computer  
Systems Administrators  
(Job Postings 2015)**



\* 84% of online job postings specified skills requirements  
Source: Burning Glass Technologies/Labor Insight

### III. Information Technology Survey

The Research and Analysis Bureau conducted a survey of the firms in the Governor’s Industry Sector Councils about their Information Technology (IT) use and trends.

We received a total of 18 responses to the survey. As a result, the statistical significance is limited. The “(number)” denotes the number of responses to the respective question. 11 out of 18 respondents specified the industry sector they were from: Education (3), manufacturing (3), health care (2), hospitality (1), utilities (1), and professional services (2). The complete survey and responses are listed below.

1. Please list the programming languages/application frameworks currently being used for by your IT department for web development.

Programming Language	Instances
Java	8
Java Script	8
Structured Query Language (SQL)	7
Hyper Text Markup Language 5 (HTML5)	7
Extensive Markup Language (XML)	5
Active Server Page (ASP)	4
Hyper Text Markup Language (HTML)	4
Hypertext Processor (PHP)	4
Visual Basic. Net	4
Cascading Style Sheets (CSS)	3
Angular Java Script (AngularJS)	2
C#	2
AWS	1
C	1
C++	1
Cold Fusion	1
Drupal	1
Hadoop	1
JavaScript Object Notation (JSON)	1
Objective-C	1
Perl	1
R	1
Scala	1
Shell	1
Spark	1
Swift/iOS	1

2. Aside from web development, what other programming languages do you currently use? PowerShell, T-SQL, Visual Basic, HL7, J2EE, AS400 & COBOL

3. Are there any specific programming languages (used for any purpose) that you see gaining in importance in the next 5 years?  
Teradata-SQL, Javascript, HTML5, mobility and big data tools, Drupal
4. For the following occupational categories, does your organization use specialized positions or do personnel have to be able to fill all responsibilities? If you specialize, please provide a general breakdown. For example- Network Administration may include specializations like network security, database administration, customer support, or data interface personnel.
- Network Administration
  - Server Administration
  - Web Design
  - Computer Programming
- Do you specialize? Yes (8)

A. Network Administration (9): Network Administrator, Network Manager, Security(3), Local Area Network (LAN), Wide Area Network (WAN), Desktop, Helpdesk, Network Infrastructure, Network Technology, Network Security, Wireless, and Unified Communication.

B. Server Administration (9): Business Analyst, IT Administration, Support Technician, UNIX (2), Windows OS (2), Oracle Database, SQL, Database, IBM Mainframe, Server Administration, Advanced Interactive Executive (AIX from IBM), Linux (2), Storage, and Identity Management.

C. Web Design (10): Web Design, Content Management System (CMS) Administrator, Web Development, Java, Drupal, and Web Architecture.

D. Computer Programming (9): Project Management, Developer, Business Analyst, Java, SQL, PeopleSoft, Workday, and Application Integration.

5. For each of the following positions, please specify what certifications are required/essential? What additional certifications could a candidate possess that you would find beneficial?
- Network Administration- entry level\advanced.
  - Server Administration- entry level\advanced.
  - Web Design- entry level\advanced.
  - Computer Programming- entry level\advanced.

Required credentials	Additional credentials
Network Administration-Entry Level (10 responses) <ul style="list-style-type: none"> <li>• Associates Degree (2)</li> <li>• CCNA</li> <li>• Security</li> <li>• Cisco Certified Network Professional (CCNP)</li> <li>• CompTIA Network + (Network +)</li> </ul>	(4) <ul style="list-style-type: none"> <li>• TCP/IP</li> <li>• LAN</li> </ul>

Network Administration- Advanced (6)	(6)
<ul style="list-style-type: none"> <li>• CCNA (3)</li> <li>• Certified Information Systems Security Professional (CISSP)</li> <li>• CCNP</li> <li>• Cisco Certified Internetwork Expert (CCIE)</li> </ul>	<ul style="list-style-type: none"> <li>• CCNP (2)</li> <li>• Cisco Cybersecurity Specialist certification (SCYBER)</li> <li>• CCIE</li> <li>• Microsoft Certified Solutions Expert (MCSE)(2)</li> <li>• Red Hat Certified Engineer (RHCE)</li> </ul>
Server Administration- Entry Level (10)	(6)
<ul style="list-style-type: none"> <li>• Associates Degree (2)</li> <li>• Microsoft Certified Professional (MCP)</li> <li>• Security +</li> <li>• Windows Certified Engineer</li> <li>• Red Hat Certified Engineer</li> <li>• Advanced Interactive Executive (AIX)</li> </ul>	<ul style="list-style-type: none"> <li>• CompTIA A+</li> </ul>
Server Administration – Advanced (6)	(5)
<ul style="list-style-type: none"> <li>• Microsoft Certified Solutions Associate (MCSA)</li> <li>• Windows Certified Engineer</li> <li>• Red Hat Certified Engineer</li> <li>• Advanced Interactive Executive (AIX)</li> <li>• Solaris</li> <li>• Linux</li> <li>• Windows Operating System (OS)</li> <li>• VMWare</li> </ul>	<ul style="list-style-type: none"> <li>• MCSE</li> </ul>
Web Design – Entry Level (9)	(3)
<ul style="list-style-type: none"> <li>• Associates Degree</li> <li>• Drupal Experience</li> <li>• None or N/A (6)</li> </ul>	<ul style="list-style-type: none"> <li>• HTML</li> <li>• PHP (Personal Home Page or Hypertext Processor)</li> </ul>
Web Design – Advanced (5)	(3)
<ul style="list-style-type: none"> <li>• Bachelors Degree</li> <li>• Drupal Experience</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
Computer Programming – Entry Level (8)	• None
<ul style="list-style-type: none"> <li>• Associates Degree</li> </ul>	
Computer Programming- Advanced (5)	• None
<ul style="list-style-type: none"> <li>• Bachelors Degree</li> </ul>	

6. Are there any certifications that were used in the past that are now obsolete?  
No responses to this question provided any specific details on outdated certifications. Most respondents indicated that they felt most certifications were still relevant.
7. Are there any IT occupations that you are having a difficult time finding qualified candidates for?
- Electronic Medical Record (EMR) Support
  - Application Developer
  - Server Administrator
  - IT Security Professional (2)

- Database Administrators
  - Project Manager
  - Network Specialist
  - AS400 Engineer
  - Enterprise Resource Planning (ERP) Developer
  - Senior Developers/Programmers
8. What are the specific skills that you need, but have a hard to finding?
- Software Administration
  - Application system administration
  - Applications (3)
  - Big Data
  - Drupal Programming
  - Knowledge of Informatica
  - Knowledge of Service-Oriented Architecture (SOA)
  - Knowledge of Enterprise Service Bus (ESB)
9. What are the key areas that you think educational institutions should focus on in their IT curriculums?
- Data Mining
  - Specialized tracks once general understanding of IT is attained.
  - Hospitality
  - Oracle
  - SAP Development
  - Big Data
  - Mobility Software
  - Cloud Computing
  - Network Security (2)
  - Web Development
  - Network Architecture (2)
10. Do you have any additional comments or have any suggestions about questions that should be included in any future IT surveys?
- Future surveys should ask more questions about IT security.
  - Future surveys should ask about college degree requirements.

## APPENDIX

**Table 1: Information Technology Occupations/SOC/ONET Codes**

Occupation Code	Occupation
1	113021 Computer and Information Systems Managers
2	119041 Engineering Managers
3	151111 Computer and Information Research Scientists (*)
4	151121 Computer Systems Analysts
5	151122 Information Security Analysts (**)
6	151131 Computer Programmers
7	151132 Software Developers, Applications
8	151133 Software Developers, Systems Software
9	151134 Web Developers
10	151141 Database Administrators
11	151142 Network and Computer Systems Administrators
12	151143 Computer Network Architects
13	15114301 Telecommunications Engineering Specialists
14	151151 Computer User Support Specialists
15	151152 Computer Network Support Specialists
16	151199 Computer Occupations, All Others (***)
17	172011 Aerospace Engineers
18	172061 Computer Hardware Engineers
19	172112 Industrial Engineers
20	173021 Aerospace Engineering and Operations Technicians (*)
21	173026 Industrial Engineering Technicians
22	193099 Social Scientists and Related Workers, All Other
23	251032 Engineering Teachers, Postsecondary (*)
24	251021 Computer Science Teachers, Postsecondary
25	271014 Multi-Media Artists and Animators
26	271024 Graphic Designers
27	274011 Audio and Video Equipment Technicians
28	274013 Radio Operators
29	292071 Medical Records and Health Information Technicians
30	432011 Switchboard Operators, Including Answering Service
31	439011 Computer Operators
32	492021 Radio Mechanics
33	492022 Telecommunications Equipment Installers/Repairers, Except Line Installers
34	499052 Telecommunications Line Installers/Repairers
35	514012 Numerical Tool and Process Control Programmers
36	15119908 Business Intelligence Analysts
37	15119902 Computer Systems Engineers
38	15119912 Document Management Specialists,
39	15119909 IT Project Managers,
40	15119903 Web Administrators
41	15119907 Data Warehousing Specialists
42	15119906 Database Architects
43	15119901 Software Quality Insurance Engineers and Testers
44	15119911 Video Game Designer

(\*) Data not available  
 (\*\*) Only Wages Information available  
 (\*\*\*) Includes occupations 36 through 44 among others.

**Table 2. Computer Programmers/Skills and Abilities**

Communicate:

- Read and understand work-related materials.
- Understand written information.
- Understand spoken information.
- Listen to others and ask questions.
- Speak clearly so listeners can understand.
- Write clearly so other people can understand.

Reason and Problem Solve

- Follow guidelines to arrange objects or actions in a certain order.
- Analyze ideas and use logic to determine their strengths and weaknesses.
- Recognize the nature of a problem.
- Combine several pieces of information and draw conclusions.
- Use reasoning to discover answers to problems.
- Notice when something is wrong or is likely to go wrong.
- Judge the costs and benefits of a possible action.
- Concentrate and not be distracted while performing a task.
- Identify what must be changed to reach goals.
- Recognize when important changes happen or are likely to happen in a system.
- Develop rules that group items in various ways.
- Understand new information or materials by studying and working with them.

Use Math and Science

- Choose a mathematical method or formula to solve problems.
- Add, subtract, multiply, and divide quickly and correctly.
- Use math skills to solve problems.

Manage Oneself, People, Time, and Things

- Manage the time of self and others.
- Check how well one is learning or doing something.

Work with Things

- Write computer programs.
- Inspect and evaluate the quality of products.
- Analyze needs and requirements when designing products.

Perceive and Visualize

- Quickly and accurately compare letters, numbers, objects, pictures, or patterns.

**Table 3. Web Developers/Skills and Abilities**

Communicate

- Read and understand work-related materials.
- Listen to others and ask questions.
- Understand spoken information.
- Understand written information.
- Write clearly so other people can understand.
  - Speak clearly so listeners can understand.

Reason and Problem Solve

- Analyze ideas and use logic to determine their strengths and weaknesses.
- Use reasoning to discover answers to problems.
- Notice when something is wrong or is likely to go wrong.
- Recognize the nature of a problem.
- Develop rules that group items in various ways.
- Follow guidelines to arrange objects or actions in a certain order.
- Concentrate and not be distracted while performing a task.
- Combine several pieces of information and draw conclusions.
- Understand new information or materials by studying and working with them.
- Think of new ideas about a topic.
- Judge the costs and benefits of a possible action.
- Recognize when important changes happen or are likely to happen in a system.
- Think of original, unusual, or creative ways to solve problems.
- Identify what must be changed to reach goals.

Manage Oneself, People, Time, and Things

- Check how well one is learning or doing something.
- Manage the time of self and others.

Work with People

- Change behavior in relation to others' actions.
- Be aware of others' reactions and understand the possible causes.

Work with Things

- Write computer programs.
- Analyze needs and requirements when designing products.

Perceive and Visualize

- Quickly and accurately compare letters, numbers, objects, pictures, or patterns.
- Identify a pattern (a figure, object, word, or sound) that is hidden in distracting material.
- Imagine how something will look if it is moved around or its parts are rearranged.

**Table 4. Network Computer Systems Administrators Skills and Abilities**

Communicate

- Read and understand work-related materials.
- Speak clearly so listeners can understand.
- Understand written information.
- Understand spoken information.
- Listen to others and ask questions.
- Write clearly so other people can understand.

Reason and Problem Solve

- Follow guidelines to arrange objects or actions in a certain order.
- Recognize when important changes happen or are likely to happen in a system.
- Analyze ideas and use logic to determine their strengths and weaknesses.
- Identify what must be changed to reach goals.
- Use reasoning to discover answers to problems.
- Notice when something is wrong or is likely to go wrong.
- Recognize the nature of a problem.
- Combine several pieces of information and draw conclusions.
- Judge the costs and benefits of a possible action.
- Concentrate and not be distracted while performing a task.
- Develop rules that group items in various ways.
- Think of new ideas about a topic.
- Understand new information or materials by studying and working with them.
- Think of original, unusual, or creative ways to solve problems.

Use Math and Science

- Add, subtract, multiply, and divide quickly and correctly.
- Choose a mathematical method or formula to solve problems.

Manage Oneself, People, Time, and Things

- Check how well one is learning or doing something.
- Manage the time of self and others.

Work with People

- Be aware of others' reactions and understand the possible causes.
- Change behavior in relation to others' actions.

Work with Things

- Watch gauges, dials, and output to make sure a machine is working properly.
- Determine the causes of technical problems and find solutions for them.
- Write computer programs.
- Inspect and evaluate the quality of products.
- Operate and control equipment.
- Maintain equipment on a routine basis. Determine when and what kind of maintenance is needed.
- Analyze needs and requirements when designing products.
- Determine the tools and equipment needed to do a job

Perceive and Visualize

- Identify a pattern (a figure, object, word, or sound) that is hidden in distracting material.
- Imagine how something will look if it is moved around or its parts are rearranged.
- Quickly and accurately compare letters, numbers, objects, pictures, or patterns.

## **Career Paths for IT Occupations**

Based on information from the National Center for Education Statistics, a summary of instructional programs was made to provide some guidelines about career paths for the IT Occupations analyzed in this report.

### **A. Computer Programmers Occupation**

The Classification of Instructional Programs (CIP) provides the following list of programs for Computer Programmers:

-Computer Programming/Programmer, General: this program focuses on the general writing and implementation of generic and customized programs to drive operating systems and that generally prepares individuals to apply the methods and procedures of software design and programming to software installation and maintenance. It includes instruction in software design, low- and high-level languages and program writing; program customization and linking; prototype testing; troubleshooting; and related aspects of operating systems and networks.

-Computer Programming, Specific Applications: this program prepares individuals to apply the knowledge and skills of general computer programming to the solution of specific operational problems and customization requirements presented by individual software users and organizational users. It includes training in specific types of software and its installation and maintenance.

-Computer Programming, Vendor/Product Certification: this program prepares individuals to fulfill the requirements set by vendors for professional qualification as certified installation, customization, and maintenance engineers for specific software products and/or processes. It includes training in specific vendor-supported software products and their installation and maintenance.

### **B. Web Developers Occupation**

The Classification of Instructional Programs (CIP) provides the following list of programs for Web Developers:

-Web Page, Digital/Multimedia and Information Resources Design: this program prepares individuals to apply HTML, XML, Javascript, graphics applications, and other authoring tools to the design, editing, and publishing (launching) of documents, images, graphics, sound, and multimedia products on the World Wide Web. It includes instruction in Internet theory, web page standards and policies, elements of web page design, user interfaces, vector tools, special effects, interactive and multimedia components, search engines, navigation, morphing, e-commerce tools, and emerging web technologies.

-Data Modeling/Warehousing and Database Administration: this program prepares individuals to design and manage the construction of databases and related software programs and applications, including the linking of individual data sets to create complex searchable databases

(warehousing) and the use of analytical search tools (mining). Includes instruction in database theory, logic, and semantics; operational and warehouse modeling; dimensionality; attributes and hierarchies; data definition; technical architecture; access and security design; integration; formatting and extraction; data delivery; index design; implementation problems; planning and budgeting; and client and networking issues.

-Computer Graphics: this program that focuses on the software, hardware, and mathematical tools used to represent, display, and manipulate topological, two-, and three-dimensional objects on a computer screen and that prepares individuals to function as computer graphics specialists. Includes instruction in graphics software and systems; digital multimedia; graphic design; graphics devices, processors, and standards; attributes and transformations; projections; surface identification and rendering; color theory and application; and applicable geometry and algorithms.

-Modeling, Virtual Environments and Simulation: this program focuses on the principles of applied visual simulation technology and the application of quantitative analyses to human-computer interaction. It includes instruction in object-oriented programming, artificial intelligence, computer communications and networks, computer graphics, virtual worlds and simulation systems, probability, statistics, stochastic modeling, data analysis, human-performance evaluation, and human-behavior modeling.

-Game and Interactive Media Design: this program that focuses on the design, development, and programming of interactive media entertainment, including computer and video games, virtual environments, Internet applications, and other interactive media. It includes instruction in theory of games, turn-based games, real-time games, visual and interactive design, story development, animation, simulation, and programming.

### **C. Network and Computer Systems Administrators Occupation**

The Classification of Instructional Programs (CIP) provides the following list of programs for Network and Computer Systems Administrators:

-Network and System Administration/Administrator: this program prepares individuals to manage the computer operations and control the system configurations emanating from a specific site or network hub. Includes instruction in computer hardware and software and applications; local area (LAN) and wide area (WAN) networking; principles of information systems security; disk space and traffic load monitoring; data backup; resource allocation; and setup and takedown procedures. For example: Network Administration.

-System, Networking, and LAN/WAN Management/Manager: this program prepares individuals to oversee and regulate the computer system and performance requirements of an entire organization or network of satellite users. Includes instruction in performance balancing; redundancy; local area (LAN) and wide area (WAN) network management; system migration and upgrading; outage control; problem diagnosis and troubleshooting; and system maintenance, budgeting, and management.

-Computer and Information Systems Security/Information Assurance: this program prepares individuals to assess the security needs of computer and network systems, recommend safeguard solutions, and manage the implementation and maintenance of security devices, systems, and procedures. Includes instruction in computer architecture, programming, and systems analysis; networking; telecommunications; cryptography; security system design; applicable law and regulations; risk assessment and policy analysis; contingency planning; user access issues; investigation techniques; and troubleshooting. For example: Information Assurance, IT Security, Internet Security, Network Security, and Information Systems Security.

-Cyber/Computer Forensics and Counterterrorism: this program focusing on the principles and techniques used to identify, search, seize and analyze digital media and to conduct cyber investigations against criminal and terrorist activity. Includes instruction in computer boot processes and drives, jumper setting, file access and reconstruction, hacking, network systems, cryptography, programming, investigative techniques, forensic imagery, web-based investigation methods, cyberterrorism, and applicable laws and administrative procedures. For example: Internet Investigation.

-Web/Multimedia Management and Webmaster: this program prepares individuals to develop and maintain web servers and the hosted web pages at one or a group of web sites, and to function as designated webmasters. It includes instruction in computer systems and networks, server installation and maintenance, web page design and editing, information resources management, web policy and procedures, Internet applications of information systems security, user interfacing and usability research, and relevant management and communications skills. For example: Website Development, Web Development, and Webmaster.

- Information Technology Project Management: this program prepares individuals to design, develop, and manage information technology projects in a variety of companies and organizations. It includes instruction in principles of project management, risk management, procurement and contract management, information security management, software management, organizational principles and behavior, communications, quality assurance, financial analysis, leadership, and team effectiveness.

-Project Management: this program prepares individuals to apply quantitative and qualitative knowledge, skills, tools, and techniques to manage projects in a wide range of fields and occupations. It includes instruction in project planning, risk management, cost and time management, contracts and procurement, accounting, statistics, decision making, and human resources.

- Computer Support Specialist: this program prepares individuals to provide technical assistance, support, and advice to computer users to help troubleshoot software and hardware problems. It includes instruction in computer concepts, information systems, networking, operating systems, computer hardware, the Internet, software applications, help desk concepts and problem solving, and principles of customer service. For example: Technical Support Specialist, Help Desk Specialist, and IT Support Specialist.

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