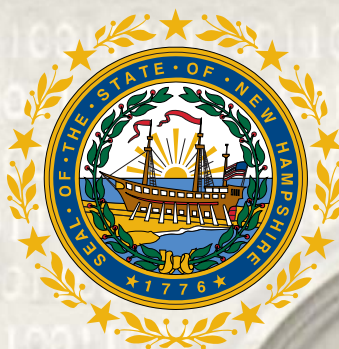


Computer Applications Software Engineers in New Hampshire

a Labor Market Information Report



State of New Hampshire
John H. Lynch, *Governor*

New Hampshire Employment Security
Richard S. Brothers, *Commissioner*
Darrell L. Gates, *Deputy Commissioner*

Economic and Labor Market Information Bureau
Richard Ricker, *Director*
Bruce DeMay, *Assistant Director*

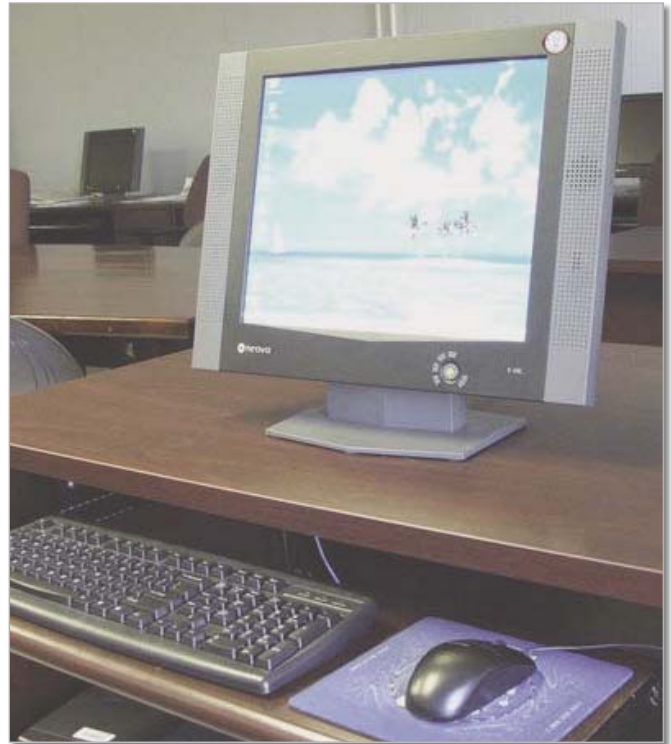
May 2007

Computer Applications Software Engineers in New Hampshire

From punchcards to the Internet . . .

One of the most significant technological developments of the last fifty years has been the advancement of computer technology. At one time, only very large organizations such as government, major corporations, and the military employed computer software engineers. Today, this occupation can be found in even the smallest of firms.

The U.S. Bureau of Labor Statistics makes a distinction between *Computer applications software engineers* and *Computer systems software engineers*. This publication will focus on *Computer applications software engineers*, an occupation that is primarily involved with the use of different programming languages to design, develop, maintain, and test many types of software. *Computer applications software engineers* must have strong programming skills, but work at a higher level of abstraction than *Computer programmers*.



Computer applications software engineers is a broad occupational title. Specific job titles include:

-  Applications Designers
-  Programmer Analysts
-  Software Designers
-  Information Security Specialists
-  Programmer Analysts
-  JAVA Developers
-  Business Systems Analysts
-  Software Development Engineers

What does a *Computer applications software engineer* do?

A *Computer applications software engineer* will be expected to have a broad knowledge of computer science, programming languages, mathematics, and engineering. On the job, they will be asked to apply this knowledge to design, develop, and test software to enable computers to perform specific applications.



Detailed tasks for *Computer applications software engineers*:¹

- ⦿ Design, develop, test, and evaluate software using analytical tools and mathematical models.
- ⦿ Modify existing software to meet the needs of users or to “debug” or adapt software to new hardware.
- ⦿ Confer with systems analysts, engineers, programmers, and others in designing systems. Obtain information on project requirements, performance requirements, and interfaces.
- ⦿ Consult with customers about system needs and apply corrective action if necessary.
- ⦿ Use computer languages such as C, C++, and Java (and less frequently, Fortran and COBOL) in the development of software programs. In some cases, they will design custom applications.
- ⦿ Work as part of a team along with engineering, marketing, manufacturing, and design departments.
- ⦿ Supervise the work of programmers and other engineering and support personnel.
- ⦿ Evaluate information and develop applications to ensure the security of computer systems.

¹ O*Net online <online.onetcenter.org/link/summary/15-1031.00>.

What Knowledge, Skills, and Abilities does a Computer applications software engineer need?

The following are some important areas of Knowledge, Skills, and Abilities for *Computer applications software engineers*, ranked by the relative importance assigned to that skill

by O*Net, a national source of occupational information. This source code rates each attribute's importance from 1-100.

Knowledge is a learned set of facts required in work situations			
Knowledge	Computers and Electronics	Knowledge of circuit boards, processors, chips, computer hardware and software for both applications and programming.	94
	Engineering and Technology	Knowledge of applying principles, techniques, and procedures of engineering to the design and production of goods and services.	71
	Mathematics	Knowledge of arithmetic, algebra, calculus, statistics, and their applications.	62
Skills are learned capabilities specific to job activities			
Skills	Programming	Writing computer programs.	99
	Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.	96
	Complex Problem Solving	Identifying complex problems and reviewing related information to develop solutions.	91
Abilities are attributes of an individual that influence performance. These attributes are needed to be successful in a particular job			
Abilities	Deductive Reasoning	Apply general rules to specific problems.	78
	Oral Comprehension	Listen to and understand information and ideas presented through spoken words.	78
	Inductive Reasoning	Combine pieces of information to form general rules and find a relationship among unrelated events.	75

Source: Occupational Information Network (O*Net), www.onetcenter.org/

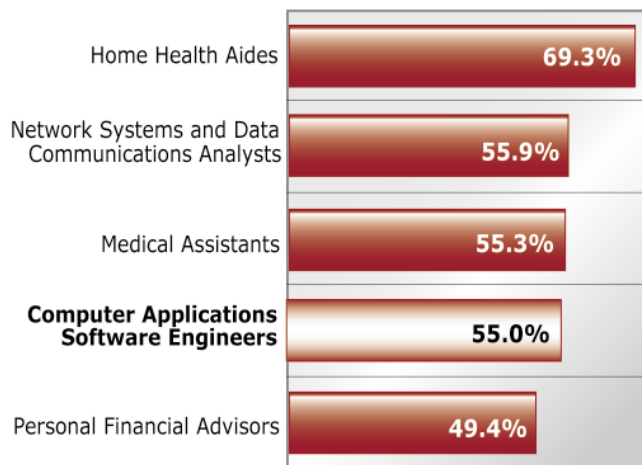
What is the job outlook for *Computer applications software engineers*?

Computer applications software engineers should be one of the fastest growing occupations in New Hampshire from 2004 to 2014.

In 2004 there were approximately 3,447 *Computer applications software engineers* working in the state. By 2014, that number is expected to increase to 5,344, a gain of 55.0 percent. Only three other large occupations (employment greater than 500 in 2004) are projected to grow faster. Nationally, employment of *Computer applications software engineers* is projected to increase from 460,000 to 682,000, a growth rate of 48.4 percent.

The gain of 1,897 jobs between 2004 and 2014 can be thought of as the number of jobs created because of expected growth in the occupation. *Computer applications software engineers* who leave their jobs to enter other occupations, retire, or leave the labor force for

Computer Applications Software Engineers are the fourth fastest-growing occupation in 2004-2014 projections



Computer Applications Software Engineers in New Hampshire by County

Area	2004 Employment	2014 Projected	Change		Annual Openings
			Number	Percent	
New Hampshire	3,447	5,344	1,897	55.0%	224
Belknap	n	n	n	n	n
Carroll	n	n	n	n	n
Cheshire	66	79	13	19.7%	2
Coos	n	n	n	n	n
Grafton	225	362	137	60.9%	16
Hillsborough	1,820	2,831	1,011	55.5%	119
Merrimack	134	175	41	30.6%	5
Rockingham	874	1,274	400	45.8%	49
Strafford	143	211	68	47.6%	8
Sullivan	n	n	n	n	n

n = not publishable

Computer Applications Software Engineers in New Hampshire

According to the Occupational Outlook Handbook (2006-2007 edition) published by the Bureau of Labor Statistics, *Computer applications software engineers* should be one of the fastest growing occupations in the U.S. for 2004-2014. The Handbook lists many reasons for the optimistic projection:

1. Integration of Internet technologies, networks, and intranets
2. Expansion of electronic commerce
3. A highly competitive business environment that rewards those firms best able to create, innovate, and maximize efficiency
4. Increased complexity of computer technology
5. Concern about security of computer systems, databases, and networks
6. New technologies will emerge in the future
7. Rapid growth in the Computer systems design and related services industry
8. Businesses with older systems will need to upgrade
9. Need to develop application for technologies such as hand-held computers and wireless networks
10. General expansion of business due to population and economic growth

other reasons will need to be replaced, creating additional job openings in the occupation. The estimated number of these replacement openings is 340 over the ten-year period. On an annual average, 190 openings are attributed to increasing demand and 34 are due to replacement needs, adding up to an average total of 224 openings per year.

Computer applications software engineers are employed throughout New Hampshire, with more than half employed in Hillsborough County. Another 25 percent work in Rockingham County, while Grafton accounts for nearly seven percent. Others are employed in the remaining counties. Due to confidentiality requirements (e.g. occupational employment is concentrated in a small number of firms), employment cannot be disclosed

for four counties. Projected growth in counties where employment levels can be disclosed should be close to the average rate for the occupation in the state, with the exception of Cheshire County, which is expected to grow slower than the state average.

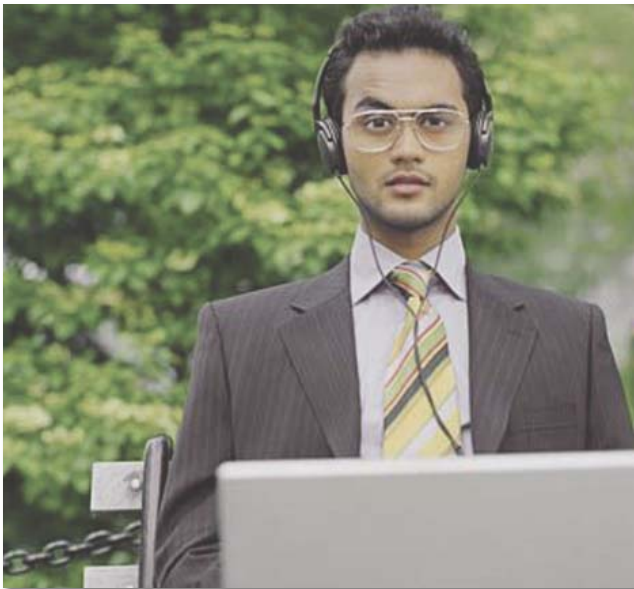
As the software industry matures, job growth may not be as rapid as in the past. There is some concern about the effects offshoring (jobs being contracted to service-providing firms in other countries) will have on this occupation. While some of the routine, repetitive tasks that do not require security clearance are increasingly being done overseas, opportunities will open up for *Computer applications software engineers* involved in jobs that are complex and require creativity, innovation, and research and development.²

² "Computer Applications Software Engineers." Occupational Outlook Handbook, 2006-07 Edition. Bureau of Labor Statistics, U.S. Department of Labor. Accessed April 13, 2007. <www.bls.gov/oco/ocos267.htm>.

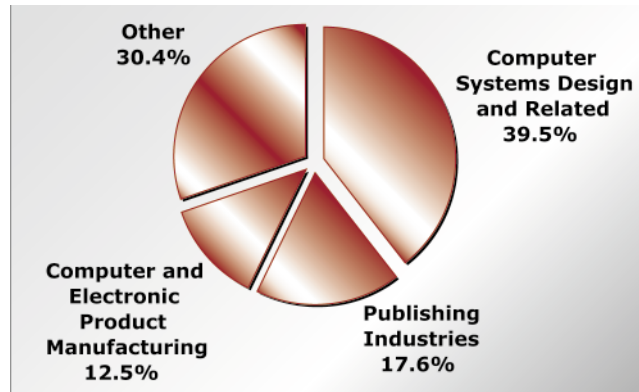
In what industries do Computer software applications engineers work?

According to the May 2005 survey of occupational employment in New Hampshire, 39.4 percent work in the Computer systems design and related services subsector. This includes establishments that provide expertise in information technology, in one or more of the following:³

1. Writing, modifying, testing and supporting software for a client;
2. Planning and designing computer systems, integrating hardware, software, and communications technologies;
3. Management of a client's computer systems and data processing.



Computer applications software engineers in New Hampshire are mostly employed in three industries



The second most common employer of *Computer applications software engineers* is the Publishing subsector, which includes software publishers as well as newspaper, book, and directory publishers. Other industry subsectors employing this occupation include Computer and electronic manufacturing, Insurance carriers and related activities, and Financial investment and related activities. Due to confidentiality requirements, the latter two industries are aggregated in an "Other" category in the accompanying chart.

The percentage of *Computer applications software engineers* that are self-employed is not available for the May 2005 survey, but previously published estimates for New Hampshire indicate the number to be in the range of 2.5 to 3.0 percent. That number is similar to national estimates of 2.4 percent.⁴

³ AutoNAICS. Bureau of Labor Market Information, Ohio Department of Job and Family Services for Bureau of Labor Statistics, U.S. Department of Labor. Version 2.1.8. September 29, 2006.












⁴ "Occupational Employment and Job Openings Data, Table IV-1." *Occupational Projections and Training Data, 2006-07 Edition*. Bureau of Labor Statistics, U.S. Department of Labor. Accessed April 13, 2007. <stats.bls.gov/emp/optd/optdtabiv_1.pdf>.

What are the educational requirements?

In some cases, a certificate may be enough to satisfy the entry-level requirements for some employers, but most prefer at least a Bachelors degree, plus some experience with computer systems. As the complexity of a job increases, employers may prefer a graduate degree.⁵

Because computer technology and software are constantly changing, a *Computer applications software engineer* should expect to acquire new skills by taking continuing education classes and participating in professional development seminars. Employers will often subsidize all or part of the training costs.

There is no set curriculum for *Computer applications software engineers*. Students enrolled at schools and colleges pursuing a degree in computer-related disciplines can take a variety of courses that would prepare them for this occupation. These courses are merely an example of what is available:

-  Introduction to Computer Science
-  Data Structures
-  Assembly Language Programming and Machine Organization
-  Analysis of Algorithms
-  Introduction to Networking
-  Programming Logic
-  Database Design and Management
-  Business Platform Technologies
-  Discrete Mathematics
-  Web Programming
-  Computer Security

Software engineering programs are accredited by the Accreditation Board for Engineering and Technology (ABET). Programs currently accredited by ABET in New Hampshire:⁶

-  **Plymouth State University**
Applied Computer Science
(Bachelor of Science)
-  **University of New Hampshire**
Computer Science
(Bachelor of Science)

Many schools offer programs that would qualify a graduate to work as a *Computer applications software engineer*.

To access information on schools and colleges in New Hampshire with academic programs related to Computer applications software engineers, go to the ELMIB web site and click on "Education and Training Providers by Program."

<http://nnetwork.nhes.state.nh.us/nnetwork/Session.aspx>

⁵ Occupational Outlook Handbook.

⁶ Accreditation Board for Engineering and Technology (ABET). Accessed April 16, 2007. <www.abet.org/schoolstatecac.aspx>.

Does a *Computer applications software engineer* need to be certified?

Certification or licensure is not required in the state of New Hampshire, but employers may ask for a prospective job candidate to have a professional credential. The Institute of Electrical and Electronics Engineers (IEEE) offers a program for mid-level software engineering professionals where one can take an examination and be qualified as a Certified Software Development Professional (CSDP), which is equivalent to professional certification in the software development field.⁷



How much can a *Computer applications software engineer* expect to earn?

On average, *Computer applications software engineers* in New Hampshire made \$38.17 an hour based on the Occupational Employment Statistics' May 2005 survey. This is nearly equal to the national average of \$38.24 for the occupation. At different levels of experience, the entry-level wage (average of the lower third) was \$25.79 per hour and the experienced level (average of the upper two-thirds) wage was \$44.36 in New Hampshire.

Computer applications software engineers who worked in Grafton County had the highest average hourly wage in 2005 at \$53.84. This was \$15.67 above the statewide average of \$38.17 for this occupation. On the other end of the scale (of those counties that had wage data available), Carroll County came in with the lowest average hourly wage for this occupation, at \$26.24 in the May 2005 survey. That was \$11.93 below the statewide average.

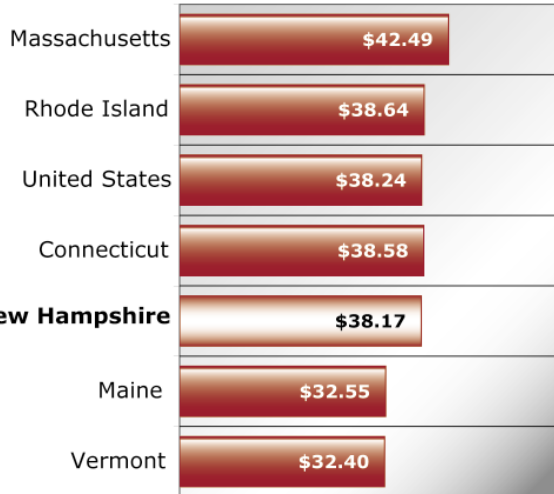
In New Hampshire, hourly wages range from \$18.52 an hour at the entry level for a *Computer applications software engineer* in Cheshire County to \$66.11 an hour for an experienced worker in Grafton County.

New Hampshire's average hourly wage of \$38.17 for *Computer applications software engineers* ranked as the fourth highest in New England. *Computer applications software engineers* in Massachusetts were paid the most, on average, at \$42.49 per hour. Vermont, with an average hourly wage of \$32.40 for this occupation, ranked lowest in New England and was below the national average of \$38.24.

⁷ Computer Software Development Professional/Institute of Electrical and Electronics Engineers. Accessed April 16, 2007. <www.computer.org/portal/site/ieeecs/index.jsp>.

Computer Applications Software Engineers in New Hampshire

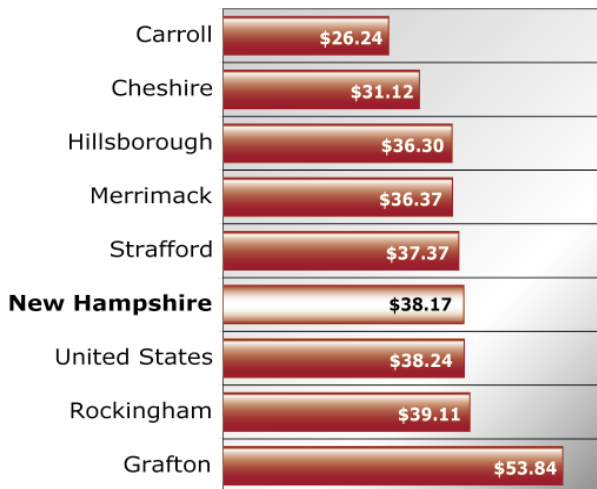
2005 Average Hourly Wage for Computer Applications Software Engineers



Wages can depend on the particular industry. While data for wages by industry is not available specifically for New Hampshire, the Bureau of Labor Statistics estimated the median annual earnings for the industries employing the largest number of *computer applications software engineers*:⁸

Software publishers	\$79,930
Management, scientific and technical consulting services	\$78,460
Computer systems design and related services	\$76,910
Management of companies and enterprises	\$70,520
Insurance carriers	\$68,440

2005 Average Hourly Wage for Computer Applications Software Engineers Comparing US to NH and its Counties



Note: Wage data for Belknap, Coos, and Sullivan Counties not publishable

⁸ Occupational Outlook Handbook.

New Hampshire Employment Security Locations

Berlin (752-5500)

151 Pleasant St., P.O. Box 159, 03570-0159

Claremont (543-3111)

404 Washington St., P.O. Box 180, 03743-0180

Concord (228-4100)

10 West St., P.O. Box 1140, 03302-1140

Conway (447-5924)

518 White Mountain Highway, 03818-4205

Keene (352-1904)

109 Key Rd., 03431-3926

Laconia (524-3960)

426 Union Ave., Ste. 3, 03246-2894

Lebanon (448-6340)

85 Mechanic St., 03766-1506

Littleton (444-2971)

646 Union St., Ste. 100, 03561-5314

Manchester (627-7841)

300 Hanover St., 03104-4957

Nashua (882-5177)

6 Townsend West, 03063-1217

Portsmouth (436-3702)

2000 Lafayette Rd., 03801-5673

Salem (893-9185)

29 South Broadway, 03079-3026

Somersworth (742-3600)

243 Rt. 108, 03878-1512

