

## Computers

### Computer Software Engineers: Systems Software

**Computer Software Engineers** design and develop software. They apply the theories and principles of computer science and mathematical analysis to create, test, and evaluate the software applications and systems that make computers work.

Software engineers design and develop many types of software, including computer games, business applications, operating systems, and network control systems. Computer software engineers begin by analyzing users' needs, and then design, test, and develop software to meet those needs. During this process they create flowcharts, diagrams, and other documentation, and may create the detailed sets of instructions, called algorithms, that actually tell the computer what to do. They are sometimes responsible for converting these instructions into a computer language, a process called programming or coding, but this usually is the responsibility of computer programmers.

Computer systems software engineers coordinate the construction, maintenance, and expansion of an organization's computer systems. Working with the organization, they coordinate each department's computer needs - ordering, inventory, billing, and payroll recordkeeping, for example - and make suggestions about its technical direction. They also might set up the organization's intranets - networks that link computers within the organization and ease communication among various departments. Often, they are responsible for the design and implementation of system security and data assurance.

Computer software engineers normally work in clean, comfortable offices or in the laboratories in which computer equipment is located. Their work week is generally 40 hours. Software engineers who work for software vendors and consulting firms frequently travel to meet with customers. Telecommuting is becoming more common as technological advances allow more work to be done from remote locations.

### Education/Training

#### *How to Obtain:*

Systems Software Engineers positions usually require the completion of a Bachelor's Degree (BA/BS) program, generally in computer science or computer information systems. Employers look for applicants with a broad knowledge of, and experience with, a variety of computer systems and technologies. A Master's Degree (MA/MS), in one of these fields may be required for some more complex jobs or for career advancement (completion time is generally 1-2 years).

Certification programs are generally offered by product vendors or software firms, which may require professionals who work with their products to be certified. Voluntary

certification is available through various other organizations, such as the Institute for Certified Computing Professionals (ICCP) and the Institute of Electrical and Electronics Engineers (IEEE).

The ICCP offers the Certified Computing Professional (CCP) designation. To earn this certification, a candidate must:

- Pass the core exam
- Pass two specialty exams.

Examples of specialty exams include:

- Information Systems - CORE
- Business Information Systems
- Business Process Management
- Data Management
- Database Administration
- Data and Information Quality

IEEE offers the Certified Software Development Associate (CSDA) designation. To earn this certification, a candidate must:

- Pass the CSDA exam.

Major product vendors and software firms offering certification include, but are not limited to Microsoft and Novell.

- Microsoft: Microsoft Certified Systems Engineer (MCSE). This certification requires a candidate to take and pass seven exams.
- Novell: Novell Certified Engineer Enterprise Services (NCE ES). This certification requires a candidate to take and pass one exam.

*More Information on Certification:*

- ICCP Certified Computing Professionals (CCP):  
<http://www.iccp.org/iccpnew/ccp.html>
- IEEE Certified Software Development Associate (CSDA):  
<http://www.computer.org/portal/web/certification/csda>
- Microsoft Certified Systems Engineer (MCSE):  
<http://www.microsoft.com/learning/en/us/certification/mcse.aspx#tab2>

- Novell Certified Engineer Enterprise Services (NCE ES):  
<http://www.novell.com/training/certinfo/nce/>

*Average Costs:*

Tuition and fees for a master's degree earned at a public university in an area like computer science or computer information systems costs an average of \$12,800\* per year. Completion time is generally two years.

Total Cost of Certification Exams, not including the cost of exam study aids:

- ICCP Certified Computing Professional: \$855
- IEEE Certified Software Development Associate (CSDA): \$295 - \$395
- Microsoft Certified Systems Engineer (MCSE): \$875
- Novell Certified Engineer Enterprise Services (NCE ES): \$125 - \$195

\*Note: This figure does not include federal, state, or university financial aid resources such as grants, fellowships, scholarships or work study. It also does not include vocational rehabilitation or other state resources available specifically to people with disabilities. Out-of-pocket expense may be significantly less.