

COMPUTER SYSTEMS ENGINEERS

A DEEP DIVE FOR SKILLS-BASED HIRING

REV: 04/04/16

Occupation Overview: Computer Systems Engineers

Foundational Competencies

- **Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- **Complex Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- **Operations Analysis:** Analyzing needs and product requirements to create a design.
- **Systems Evaluation:** Identifying measures or indicators of system performance and the actions needed to improve or correct performance relative to the goals of the system.
- **Systems Analysis:** Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
- **Monitoring:** Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
- **Active Learning:** Understanding the implications of new information for both current and future problem solving and decision making.
- **Programming:** Writing programs for various purposes.
- **Judgment and Decision Making:** Considering the relative costs and benefits of potential actions to choose the most appropriate one.
- **Quality Control Analysis:** Conducting tests and inspections of products, services, or processes to evaluate quality or performance.

Occupation-Specific Competencies

- **Intermediate Systems Design and Implementation:** Demonstrated ability to assist customers in the gathering of requirements and design, implement, and support simple technology solutions to existing business problems.
- **Intermediate Network Protocols:** Demonstrated ability for enterprise-wide leadership to facilitate communications across DNS, DHCP, SMTP, SNMP, TCP/IP, and other common network protocols.
- **Basic Telecommunications:** Familiarity with installing and maintaining telecommunications over common audio and video channels, like: AURA, Avaya and VoIP; familiarity with telecommunications vectoring and video conferencing.
- **Basic General Database:** Demonstrated proficiency with SQL basics (e.g., selecting, inserting, updating, deleting records), at least one database management software application, and database fundamentals such as normalization, schemas, and relationships.
- **Basic Core Operating Systems:** Familiarity with the use of multiple operating systems (e.g., Apple, Microsoft, Android, Linux/Unix) for computer and mobile devices and some knowledge of how to install, configure, and maintain one of those operating systems.
- **Basic IT/Hardware:** Familiarity with the use of multiple computer and device hardware and IT systems and some knowledge of how to assemble, configure, install, maintain, and repair some of the hardware/systems.
- **Basic Core Coding Languages:** Basic familiarity with the process of developing simple front-end, back-end and/or mobile applications utilizing core coding languages (e.g., Java, C#, Objective C, JavaScript) on a development platform; basic familiarity with integrating data storage (including SQL), libraries, methods, interfaces, and objects; basic ability to use code analysis and debugging techniques.
- **Basic Network Administration:** Basic proficiency with the operation and maintenance of network devices, including hardware, software and operating systems; able to perform basic network monitoring and analysis on NAS, NFS or RAID.
- **Intermediate Testing:** Demonstrated ability to design tests, create test scripts, ensure that test cases mimic user usage, and execute and validate unit, system, and performance test routines for a team; Demonstrated ability to use appropriate test tools.
- **Intermediate General Information Security:** Demonstrated ability to install, configure, troubleshoot, test, and maintain in a secure manner the portion of the IT environment under their responsibility (networks, communication, hardware, software, and other devices) to ensure their confidentiality, integrity, and availability.

Job Description (Example)

Design and develop solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions.

- Perform systems monitoring activities with the goal of maintaining general health and uptime leveraging monitoring and reporting tools.
- Review and maintain existing monitoring processes and related interfaces.
- Participate in infrastructure projects as a project lead or resource, executing tasks and producing deliverables as outlined in the project plan and directed by the project manager.
- Build, monitor, and maintain remote servers following standard processes.
- Work with team members to evaluate server needs and requirements.
- Perform software upgrades, security patches, and planned maintenance and reporting, following established procedures.
- Review, improve, and maintain technical documentation for administration, security, and emergency management.

Activities (Example List)

- Communicate with staff or clients to understand specific system requirements.
- Provide advice on project costs, design concepts, or design changes.
- Document design specifications, installation instructions, and other system-related information.
- Verify stability, interoperability, portability, security, or scalability of system architecture.
- Collaborate with engineers or software developers to select appropriate design solutions or ensure the compatibility of system components.
- Evaluate current or emerging technologies to consider factors such as cost, portability, compatibility, or usability.
- Provide technical guidance or support for the development or troubleshooting of systems.
- Identify system data, hardware, or software components required to meet user needs.

Prioritized Foundational Competencies: Computer Systems Engineers

Most Common Required Competencies	
1	Critical Thinking: Using logic and reasoning to identify, organize, and rank the strengths and weaknesses of alternative solutions, conclusions or approaches to problems; pinpointing issues through root-cause analysis; considering current and future impact of problems and solutions.
2	Active Learning: Recognizing areas of needed improvement and taking action to improve them through independent learning, integration, and intelligent application of learnings; actively creating and testing new hypotheses for encountered scenarios while accepting that you may fail and need to adapt your approach.
3	Systems Evaluation: Identifying and designing around important measures or indicators of system performance, relative to the goals of the system; taking on the mindset that “you cannot manage what you cannot measure”; seeing the far reaching system impacts of individual measures.

Most Common Break Point Competencies	
1	Monitoring: Monitoring/assessing performance of yourself and organization to make improvements or take corrective actions; able to evaluate your surroundings, identify your role, and adjust your work style appropriately; constant assessment of the internal/external market and where to focus personal education and development.
2	Active Learning: <i>See previous.</i>
3	Critical Thinking: <i>See previous.</i>

Most Preferred Competencies	
1	Critical Thinking: <i>See previous.</i>
2	Complex Problem Solving: Identifying complex problems and brainstorming with teammates to gather multiple insights to develop and evaluate options and implement solutions; able to decompose problems into smaller, inter-related sub-components and clearly communicate to stakeholders.
3	Active Learning: <i>See previous.</i>

Most Hard-to-Find Competencies	
1	Critical Thinking: <i>See previous.</i>
2	Complex Problem Solving: <i>See previous.</i>
3	Judgment and Decision Making: Considering the systemic and ongoing implications of potential actions (e.g., supportability, scalability, security); knowing when to reach out for additional input and approval; collaborating with all affected stakeholders, taking into account cross-functional considerations and downstream consequences.

Most Evolving Competencies	
1	Programming: Evolution driven by increasingly important role of software in all aspects of business, especially with a focus on the automation of processes; changes make it more important to keep abreast of what is now possible through the use of customized programming.
2	Active Learning: Evolution driven by continuously expanding access to new data and improved tools; changes make it more important to effectively absorb and apply new knowledge to all aspects of problem solving.
3	Systems Analysis: Evolution driven by growing complexity and dynamism of modern computer networks, elevating the importance of understanding the concept of a system or network beyond hardware components; changes make it more important to have a greater breadth of technical knowledge around hardware given the diversity of interlinked components.

Prioritized Occupation-Specific Competencies: Computer Systems Engineers

Most Common Required Competencies	
1	Basic IT/Hardware: Familiarity with how to assemble, configure, install, maintain, and repair multiple computer and device hardware and IT systems (e.g., BIOS, motherboard components, RAM, and expansion cards) leveraging a manual as guidance; basic proficiency with Management Information Systems (MIS).
2	Intermediate Network Protocols: Demonstrated ability to facilitate communications utilizing multiple network protocols and services, including VPN, VLAN, DNS, DHCP, SMTP, SNMP, TCP/IP; understanding the basis and application seven layers within the OSI model.
3	Basic Core Operating Systems: Familiarity with the use of multiple operating systems (such as OSX, Windows, iOS, Android, or Linux/Unix) for computer and mobile devices and some knowledge of how to deploy, configure, and maintain at least one of those operating systems; can perform enterprise-wise functions under leadership supervision.

Most Preferred Competencies	
1	Basic Core Operating Systems: <i>See previous.</i>
2	Basic Network Administration: Familiarity with how to install, configure, test, operate, maintain and manage network devices using directory services in a supervised setting, including hardware, software, and operating systems; familiarity in performing network monitoring and analysis on many platforms such as: NAS, NFS, and RAID.
3	Intermediate Systems Design and Implementation: <i>See previous.</i>

Most Evolving Competencies	
1	Basic Network Administration: Evolution driven by an increase in the occurrence of distributed networking as systems move into cloud-based instances; changes make it important to fully understand the implications and leverage the benefits of remote network administration (on-demand instances, powerful system management tools, reduced cost centers).
2	Intermediate Information Security: Evolution driven by information security becoming a primary design criteria as more complex systems bring greater vulnerability to sensitive data; changes make it important to keep credentials and methodologies up-to-date to protect from constantly evolving threats.
3	Intermediate Testing: Evolution driven by accelerated time to market and the increased prevalence of live testing; changes make it important to design and implement tests that are as efficient and thorough as possible, reducing the number of cycles required to get a final product.

Most Common Break Point Competencies	
1	Intermediate Testing: Demonstrated ability to design tests, create test scripts, ensure that test cases mimic user usage, execute and validate unit tests through completion, and use appropriate test tools for their own changes; generating ongoing tests to validate through user testing.
2	Intermediate Systems Design and Implementation: Demonstrated ability to assist customers in the gathering of requirements, implementation of solutions, and ongoing support of technology solutions for business problems; aligning technical solutions to business needs in most beneficial format.
3	Basic Core Operating Systems: <i>See previous.</i>

Most Hard-to-Find Competencies	
1	Intermediate General Information Security: Demonstrated ability to install, configure, troubleshoot, test, and maintain in a secure manner the portion of the IT environment under their responsibility (networks, communication, hardware, software, and other devices) to ensure their confidentiality, integrity, and availability.
2	Intermediate Systems Design and Implementation: <i>See previous.</i>
3	Basic Telecommunications: Familiarity with installing and maintaining telecommunications over many common A/V channels, like AURA, Avaya, and VoIP; familiarity with telecommunications vectoring and video conferencing over cloud-based systems; understanding of relevant network protocol design and layering.

Occupation Deep Dive: Computer Systems Engineers

Job Titles Within This Occupation

- Network Engineer
- Solutions Architect
- Systems Architect
- Technical Architect
- Enterprise Architect
- Network Analyst
- Systems Engineer
- Security Engineer
- HPC Engineer
- Software Engineer/Programmer
- Systems Analyst

Certification and Education Preferences (Example)

- Cisco Certified Network Professional (CCNP)
- Cisco Certified Network Associate (CCNA)
- Cisco Certified Internetwork Expert (CCIE)
- Certified Information Systems Security Professional (CISSP)
- Security +
- Juniper Networks Certified Internet Associate

Tools Used (Example List)

- Cisco Software/Hardware
- LINUX/UNIX
- Perl/Python/Ruby Languages
- OSPF
- Oracle Software/Hardware
- TCP/IP
- Active Directory
- Network Packet Scanner
- OSI Model
- System Deployment Tools

Other Relevant Foundational Competencies

1	Active Listening
2	Reading Comprehension
3	Speaking
4	Writing
5	Time Management
6	Coordination
7	Instructing
8	Service Orientation
9	Social Perceptiveness
10	Persuasion
11	Learning Strategies
12	Management of Personnel Resources
13	Negotiation
14	Science
15	Mathematics
16	Operation Monitoring
17	Troubleshooting
18	Management of Financial Resources
19	Equipment Selection
20	Equipment Maintenance
21	Technology
22	Management of Material Resources
23	Repairing
24	Operation and Control
25	Installation

Other Relevant Occupation-Specific Competencies

1	Network Administration
2	Software Development
3	Information Security
4	General Data Techniques
5	Microsoft Office
6	System Administration
7	Microsoft Project Management Tools
8	Basic Web Development Languages
9	Business Process and Analysis
10	Operations Analysis
11	Database Administration
12	Scripting
13	Advanced JAVA for Web Development
14	Product Management
15	Server Administration
16	Microsoft Stack
17	Software Administration
18	Microsoft Stack
19	Software Administration
20	Business Solutions
21	Data Storage
22	Sales and Business Development
23	Strategizing
24	Employee Training
25	Engineering Activities



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