

salary guide

for technology professionals



CRACKING THE CODE FOR TECHNOLOGY TALENT



Robert Half®
Technology

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INTRODUCTION

Many hiring managers today are struggling to “crack the code” when it comes to finding and keeping the best technology talent. Money may not be all IT employees consider when choosing to join or stay with your firm, but it’s certainly one of their key benchmarks.

As the best people see increasing job opportunities, your business needs to ensure your pay remains competitive. Robert Half Technology publishes an annual *Salary Guide* to give our clients the latest information on starting salaries and new directions in hiring, retention and staff management in the information technology field.

We hope you find the data and tips in our *2013 Salary Guide* useful.



If something in this guide looks **aWry**, visit **rht.com/salarycenter** to find out why.





DECODING THE WAR FOR TECHNOLOGY TALENT

Hiring the best technology professionals today is akin to writing that elusive “perfect” code. Technology is so essential to the basic operations of just about every business that employers with open positions must compete with companies of all types, across all industries, for promising professionals. Many companies are offering a tempting array of benefits — such as generous salaries, innovative perks and numerous professional development opportunities — to convince top IT talent to join their organizations.

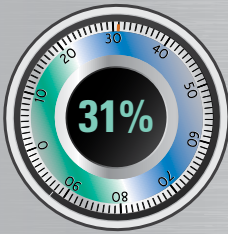
Throughout 2012, the majority of chief information officers (CIOs) surveyed for

the *Robert Half Technology IT Hiring Index and Skills Report* said that finding skilled professionals posed a challenge. Research by the U.S. Bureau of Labor Statistics makes it easy to understand *why*: The need for these professionals is **g**rowing. Employment of database administrators, for example, is projected to grow 31 percent from 2010 to 2020 — much faster than the average for all occupations.¹ In addition, employment of information security analysts, web developers and computer network architects is projected to grow 22 percent in the same time period, faster than the average for all occupations.²



Research conducted for the *Robert Half Technology 2013 Salary Guide* indicates that the hiring environment for technology talent is only going to become tougher for employers in the year ahead. The pool of available candidates continues to shrink, while the demand for technology experts is climbing. Competition is expected to be particularly fierce for professionals who can support mobile, big data, cloud and virtualization initiatives. Talented candidates with high-demand skills may receive multiple job offers — and most will be very selective when choosing an opportunity.

Meanwhile, as businesses struggle to fill critical technology roles, existing staff members are being asked to take on extra responsibilities. This can quickly overburden teams and, ultimately, lead to turnover. Keeping workloads manageable will remain essential to success for employers. Hiring consultants or temporary personnel can help fill the void and mitigate the supply-and-demand imbalance that has become a trademark of the technology hiring environment.



Employment of database administrators is projected to grow **31 percent** from 2010 to 2020.

¹ *Occupational Outlook Handbook, 2012-13 Edition*, Bureau of Labor Statistics, U.S. Department of Labor, July 18, 2012, <http://www.bls.gov/ooh/computer-and-information-technology/database-administrators.htm>.

² *Occupational Outlook Handbook, 2012-13 Edition*, Bureau of Labor Statistics, U.S. Department of Labor, March 29, 2012, <http://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts-web-developers-and-computer-network-architects.htm>.



DECODING THE WAR FOR TECHNOLOGY TALENT

To gain an edge in the war for talent, companies are relying on a combination of strategies to attract and retain skilled technology professionals, including:

- 1 Paying competitively:** Salary isn't the only key to job satisfaction, but the lack of appropriate compensation can prompt talented technology professionals to seek other career opportunities.
- 2 Providing great benefits:** From health plans to flexible work hours to paid time off, employers are asking technology professionals what perks they want — and doing their best to deliver them.
- 3 Offering professional development opportunities:** Robert Half Technology surveys show that most IT professionals are eager for opportunities to grow their knowledge and skills. Employers are trying to meet that need by offering mentoring programs, e-learning courses and other educational incentives.

The bottom line on the battle for technology talent: Companies that don't make hiring and retention a priority risk not only their ability to operate effectively but also the resources critical to future growth.



Source Code: Using the Guide



To help you pay competitively, we provide salaries for more than 70 technology positions in our annual *Salary Guide*. Our information sources include:

- Market observations of Robert Half Technology staffing and recruiting professionals who specialize in the technology field and make thousands of interim and full-time placements each year
- Robert Half Technology's comprehensive analysis of current and future hiring trends
- Exclusive workplace research we conduct regularly among CIOs and employees at firms throughout the United States and Canada

The figures in the guide are national averages but can be adjusted for 150 markets across the United States and Canada using the local variance information beginning on Page 14.

The salary ranges represent starting compensation only because factors such as seniority and work ethic make ongoing pay difficult to measure. Bonuses, incentives and other forms of compensation, such as benefits and retirement packages, also are not taken into account.

We publish a new guide every year to ensure our data reflect the most recent employment trends. Information from the *Salary Guide* is so well-regarded that the U.S. Bureau of Labor Statistics has used it when compiling the *Occupational Outlook Handbook*.

Visit the Robert Half Technology Salary Center at rht.com/salarycenter to access our Salary Calculator or download our mobile app, which is available for iPhone and Android devices, at rht.com/mobileapp.



TECHNOLOGY SALARIES – UNITED STATES

JOB TITLE	2012	2013	% CHANGE
ADMINISTRATION			
Chief Information Officer (CIO)	\$ 139,750 - \$ 225,500	\$ 145,500 - \$ 234,750	4.1%
Chief Technology Officer (CTO)	\$ 120,750 - \$ 188,250	\$ 125,500 - \$ 195,500	3.9%
Chief Security Officer (CSO)	\$ 115,000 - \$ 172,250	\$ 119,750 - \$ 179,250	4.1%
Vice President of Information Technology	\$ 123,000 - \$ 179,750	\$ 127,750 - \$ 186,500	3.8%
Information Technology Manager	\$ 91,000 - \$ 130,750	\$ 94,000 - \$ 135,000	3.3%
APPLICATIONS DEVELOPMENT (a)			
Manager	\$ 91,750 - \$ 130,000	\$ 95,250 - \$ 135,000	3.8%
Project Manager	\$ 79,000 - \$ 117,250	\$ 83,500 - \$ 124,000	5.7%
Systems Analyst	\$ 68,500 - \$ 97,750	\$ 72,500 - \$ 103,500	5.9%
Applications Architect	\$ 97,500 - \$ 132,000	\$ 103,750 - \$ 140,500	6.4%
Business Systems Analyst	\$ 67,000 - \$ 97,500	\$ 71,000 - \$ 103,250	5.9%
CRM Business Analyst	\$ 71,750 - \$ 97,750	\$ 76,000 - \$ 103,500	5.9%
CRM Technical Developer	\$ 80,000 - \$ 106,750	\$ 84,000 - \$ 112,250	5.1%
Developer/Programmer Analyst	\$ 60,750 - \$ 107,500	\$ 64,750 - \$ 114,500	6.5%
ERP Business Analyst	\$ 75,000 - \$ 103,250	\$ 79,250 - \$ 109,250	5.8%
ERP Technical/Functional Analyst	\$ 80,750 - \$ 112,000	\$ 85,250 - \$ 118,250	5.6%
ERP Technical Developer	\$ 83,500 - \$ 115,250	\$ 88,250 - \$ 122,000	5.8%
Lead Applications Developer	\$ 89,250 - \$ 123,500	\$ 94,000 - \$ 130,000	5.3%
Mobile Applications Developer	\$ 85,000 - \$ 122,500	\$ 92,750 - \$ 133,500	9.0%
Technical Writer	\$ 49,500 - \$ 78,250	\$ 51,250 - \$ 81,000	3.5%
CONSULTING & SYSTEMS INTEGRATION			
Director	\$ 103,000 - \$ 153,500	\$ 107,250 - \$ 160,000	4.2%
Practice Manager	\$ 102,250 - \$ 140,250	\$ 106,750 - \$ 146,500	4.4%
Project Manager/Senior Consultant	\$ 84,750 - \$ 121,750	\$ 89,000 - \$ 127,750	5.0%
Staff Consultant	\$ 65,750 - \$ 91,750	\$ 69,250 - \$ 96,500	5.2%
Senior IT Auditor	\$ 94,500 - \$ 130,000	\$ 100,250 - \$ 138,000	6.1%
IT Auditor	\$ 81,500 - \$ 113,250	\$ 86,250 - \$ 119,750	5.8%

(a) Add the percentage below, based on national averages, to IT salaries for the following skills:

AJAX (Asynchronous JavaScript and XML) development skills	6%	LAMP (Linux, Apache, MySQL and Perl/PHP/Python) skills	8%
Business Objects skills	7%	.NET development skills	8%
C# development skills	9%	PHP development skills	9%
C++ development skills	4%	SAP development skills	8%
Hyperion skills	7%	SharePoint skills	12%
Java development skills	9%	Visual Basic development skills	4%
Java EE/J2EE development skills	9%		



TECHNOLOGY SALARIES – UNITED STATES

JOB TITLE	2012	2013	% CHANGE
DATA/DATABASE ADMINISTRATION (b)			
Database Manager	\$ 96,500 - \$133,500	\$101,750 - \$140,750	5.4%
Database Developer	\$ 82,000 - \$119,750	\$ 86,500 - \$126,250	5.5%
Database Administrator	\$ 79,000 - \$113,750	\$ 83,000 - \$119,500	5.1%
Data Analyst/Report Writer	\$ 61,000 - \$ 91,000	\$ 64,250 - \$ 96,000	5.4%
Data Architect	\$ 97,500 - \$134,250	\$104,250 - \$143,500	6.9%
Data Modeler	\$ 85,500 - \$117,750	\$ 92,000 - \$126,750	7.6%
Data Warehouse Manager	\$101,250 - \$135,750	\$108,750 - \$145,750	7.4%
Data Warehouse Analyst	\$ 88,000 - \$119,000	\$ 93,500 - \$126,500	6.3%
Business Intelligence Analyst	\$ 87,750 - \$123,500	\$ 94,250 - \$132,500	7.3%
Portal Administrator	\$ 80,500 - \$106,500	\$ 86,500 - \$114,500	7.5%
QUALITY ASSURANCE (QA) & TESTING (c)			
QA/Testing Manager	\$ 80,250 - \$107,000	\$ 83,250 - \$111,000	3.7%
QA Associate/Analyst	\$ 55,250 - \$ 85,500	\$ 57,500 - \$ 89,000	4.1%
INTERNET & E-COMMERCE (d)			
Senior Web Developer	\$ 85,750 - \$118,500	\$ 92,000 - \$127,250	7.3%
Web Developer	\$ 61,250 - \$ 99,250	\$ 65,750 - \$106,500	7.3%
Web Administrator	\$ 58,500 - \$ 88,250	\$ 61,500 - \$ 92,750	5.1%
Web Designer	\$ 53,750 - \$ 88,000	\$ 57,000 - \$ 93,500	6.2%
Electronic Data Interchange (EDI) Specialist	\$ 66,000 - \$ 93,500	\$ 68,500 - \$ 97,000	3.8%
E-Commerce Analyst	\$ 72,000 - \$103,750	\$ 75,000 - \$108,250	4.3%
Messaging Administrator	\$ 62,250 - \$ 90,750	\$ 65,250 - \$ 95,000	4.7%

(b) Add the percentage below, based on national averages, to IT salaries for the following skills:

IBM DB2 database skills	5%
Microsoft SQL Server database skills	10%
Oracle database skills	9%

(c) Add the percentage below, based on national averages, to IT salaries for the following skills:

Performance testing (e.g., Mercury Interactive Tools) skills	5%
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(d) Add the percentage below, based on national averages, to IT salaries for the following skills:

AJAX (Asynchronous JavaScript and XML) development skills	6%
ASP development skills	4%
C# development skills	9%
Cold Fusion development skills	5%
Content management system (CMS) skills	7%
DCOM/COM/ActiveX development skills	5%
Java development skills	9%
Java EE/J2EE development skills	9%
LAMP (Linux, Apache, MySQL and Perl/PHP/Python) skills	8%
.NET development skills	8%
PHP development skills	9%
SharePoint skills	12%
Virtualization skills	10%
Web services development skills	8%



TECHNOLOGY SALARIES – UNITED STATES

JOB TITLE	2012	2013	% CHANGE
NETWORKING/TELECOMMUNICATIONS (e)			
Network Architect	\$ 95,500 - \$137,000	\$102,250 - \$146,500	7.0%
Network Manager	\$ 82,750 - \$114,500	\$ 88,500 - \$122,500	7.0%
Network Engineer	\$ 75,000 - \$107,750	\$ 80,750 - \$116,250	7.8%
Wireless Network Engineer	\$ 79,250 - \$108,500	\$ 85,500 - \$117,000	7.9%
Network Administrator	\$ 58,750 - \$ 87,250	\$ 62,750 - \$ 93,250	6.8%
Pre-Sales Engineer/Technical Engineer	\$ 71,750 - \$101,500	\$ 76,250 - \$107,750	6.2%
Telecommunications Manager	\$ 76,250 - \$103,500	\$ 78,500 - \$106,750	3.1%
Telecommunications Specialist	\$ 52,250 - \$ 79,250	\$ 54,000 - \$ 82,000	3.4%
OPERATIONS			
Manager	\$ 60,500 - \$ 84,000	\$ 62,500 - \$ 86,750	3.3%
Computer Operator	\$ 32,250 - \$ 44,500	\$ 32,750 - \$ 45,250	1.6%
Mainframe Systems Programmer	\$ 56,250 - \$ 78,250	\$ 57,500 - \$ 80,000	2.2%
SECURITY (f)			
Data Security Analyst	\$ 89,000 - \$121,500	\$ 95,000 - \$129,750	6.8%
Systems Security Administrator	\$ 85,250 - \$117,750	\$ 89,500 - \$123,750	5.0%
Network Security Administrator	\$ 85,000 - \$116,750	\$ 89,750 - \$123,500	5.7%
Network Security Engineer	\$ 88,500 - \$116,750	\$ 93,500 - \$123,250	5.6%
Information Systems Security Manager	\$103,500 - \$143,500	\$108,000 - \$149,750	4.4%

(e) Add the percentage below, based on national averages, to IT salaries for the following skills:

Cisco network administration skills.....	9%
Linux/Unix administration skills	8%
Voice over Internet Protocol (VoIP) administration skills ...	8%
Windows 2000/Windows 2003/XP/Vista skills	4%
Windows Server 2008 skills.....	6%
Windows 7 skills	7%

(f) Add the percentage below, based on national averages, to IT salaries for the following skills:

Check Point Firewall administration skills.....	7%
Cisco network administration skills.....	9%
Linux/Unix administration skills	8%



TECHNOLOGY SALARIES – UNITED STATES

JOB TITLE	2012	2013	% CHANGE
SOFTWARE DEVELOPMENT (g)			
Product Manager	\$ 90,750 - \$ 124,750	\$ 95,250 - \$ 130,750	4.9%
Software Engineer	\$ 78,250 - \$ 119,500	\$ 83,500 - \$ 127,750	6.8%
Software Developer	\$ 70,000 - \$ 111,000	\$ 74,500 - \$ 118,250	6.5%
TECHNICAL SERVICES, HELP DESK & TECHNICAL SUPPORT (h)			
Manager	\$ 70,000 - \$ 99,750	\$ 72,750 - \$ 103,750	4.0%
Desktop Support Analyst	\$ 47,250 - \$ 69,250	\$ 48,250 - \$ 70,750	2.1%
Systems Administrator	\$ 56,250 - \$ 87,500	\$ 59,500 - \$ 92,500	5.7%
Systems Engineer	\$ 70,250 - \$ 102,000	\$ 74,000 - \$ 107,500	5.4%
Help Desk Tier 3	\$ 47,750 - \$ 61,500	\$ 50,250 - \$ 64,750	5.3%
Help Desk Tier 2	\$ 38,250 - \$ 49,500	\$ 40,000 - \$ 52,000	4.8%
Help Desk Tier 1	\$ 30,250 - \$ 40,500	\$ 31,750 - \$ 42,500	4.9%
Instructor/Trainer	\$ 48,500 - \$ 77,000	\$ 50,000 - \$ 79,500	3.2%
PC Technician	\$ 30,000 - \$ 44,250	\$ 31,250 - \$ 46,000	4.0%
Business Continuity Analyst	\$ 78,750 - \$ 112,000	\$ 83,250 - \$ 118,500	5.8%

(g) Add the percentage below, based on national averages, to IT salaries for the following skills:

ASP development skills	4%
C# development skills	9%
C++ development skills	4%
DCOM/COM/ActiveX development skills	5%
Java development skills	9%
Java EE/J2EE development skills	9%
.NET development skills	8%
PHP development skills	9%
Visual Basic development skills	4%
Web services development skills	8%

(h) Add the percentage below, based on national averages, to IT salaries for the following skills:

Basis administration skills	5%
Cisco network administration skills	9%
Linux/Unix administration skills	8%
Virtualization skills	10%
Windows 2000/Windows 2003/XP/Vista skills	4%
Windows Server 2008 skills	6%
Windows 7 skills	7%



TECHNOLOGY SALARIES – CANADA

JOB TITLE	2012	2013	% CHANGE
ADMINISTRATION			
Chief Information Officer (CIO)	\$137,000 - \$204,000	\$143,000 - \$213,000	4.4%
Chief Technology Officer (CTO)	\$125,500 - \$180,250	\$131,500 - \$188,750	4.7%
Chief Security Officer (CSO)	\$113,750 - \$187,250	\$119,500 - \$196,750	5.1%
Vice President of Information Technology	\$134,000 - \$195,500	\$138,750 - \$202,500	3.6%
Information Technology Manager	\$ 96,750 - \$126,750	\$ 99,750 - \$130,750	3.1%

APPLICATIONS DEVELOPMENT (a)

Manager	\$ 96,750 - \$127,750	\$100,500 - \$132,500	3.8%
Project Manager	\$ 81,250 - \$125,500	\$ 85,750 - \$132,500	5.6%
Systems Analyst	\$ 69,500 - \$ 94,250	\$ 73,500 - \$ 99,500	5.6%
Applications Architect	\$ 93,500 - \$123,000	\$ 98,000 - \$128,750	4.7%
Business Systems Analyst	\$ 78,500 - \$108,750	\$ 82,000 - \$113,750	4.5%
CRM Business Analyst	\$ 78,500 - \$ 97,500	\$ 81,250 - \$100,750	3.4%
CRM Technical Developer	\$ 77,750 - \$103,250	\$ 80,750 - \$107,250	3.9%
Developer/Programmer Analyst	\$ 66,250 - \$ 99,000	\$ 70,250 - \$104,750	5.9%
ERP Business Analyst	\$ 82,750 - \$108,750	\$ 86,000 - \$113,000	3.9%
ERP Technical/Functional Analyst	\$ 85,750 - \$123,000	\$ 89,250 - \$128,250	4.2%
ERP Technical Developer	\$ 89,250 - \$127,500	\$ 93,250 - \$133,000	4.4%
Lead Applications Developer	\$ 82,500 - \$114,250	\$ 86,750 - \$120,250	5.2%
Mobile Applications Developer	\$ 72,500 - \$102,750	\$ 79,000 - \$112,000	9.0%
Technical Writer	\$ 48,000 - \$ 75,250	\$ 49,000 - \$ 77,000	2.2%

CONSULTING & SYSTEMS INTEGRATION

Director	\$104,250 - \$137,500	\$109,000 - \$143,750	4.6%
Practice Manager	\$ 90,000 - \$131,000	\$ 93,750 - \$136,500	4.2%
Project Manager/Senior Consultant	\$ 86,000 - \$132,500	\$ 89,750 - \$138,250	4.3%
Staff Consultant	\$ 54,500 - \$ 75,000	\$ 57,000 - \$ 78,500	4.6%
Senior IT Auditor	\$ 99,500 - \$152,500	\$105,500 - \$161,750	6.1%
IT Auditor	\$ 78,000 - \$101,500	\$ 82,500 - \$107,500	5.8%

Note: All salary ranges on Pages 10-13 are in Canadian dollars.

(a) Add the percentage below, based on national averages, to IT salaries for the following skills:

AJAX (Asynchronous JavaScript and XML) development skills	4%	LAMP (Linux, Apache, MySQL and Perl/PHP/Python) skills	6%
Business Objects skills	6%	.NET development skills	8%
C# development skills	8%	PHP development skills	6%
C++ development skills	6%	SAP development skills	8%
Hyperion skills	5%	SharePoint skills	13%
Java development skills	6%	Visual Basic development skills	3%
Java EE/J2EE development skills	6%		



TECHNOLOGY SALARIES – CANADA

JOB TITLE	2012	2013	% CHANGE
DATA/DATABASE ADMINISTRATION (b)			
Database Manager	\$ 92,750 - \$124,250	\$ 96,500 - \$129,250	4.0%
Database Developer	\$ 73,750 - \$103,750	\$ 77,500 - \$109,250	5.2%
Database Administrator	\$ 73,750 - \$100,500	\$ 77,000 - \$105,000	4.4%
Data Analyst/Report Writer	\$ 65,750 - \$ 90,250	\$ 68,750 - \$ 94,500	4.6%
Data Architect	\$ 92,250 - \$126,000	\$ 97,250 - \$132,750	5.4%
Data Modeler	\$ 77,250 - \$105,000	\$ 81,250 - \$110,500	5.2%
Data Warehouse Manager	\$ 89,750 - \$121,250	\$ 93,750 - \$126,500	4.4%
Data Warehouse Analyst	\$ 81,750 - \$111,250	\$ 86,000 - \$117,000	5.2%
Business Intelligence Analyst	\$ 70,750 - \$ 98,500	\$ 76,000 - \$105,750	7.4%
Portal Administrator	\$ 65,250 - \$ 88,750	\$ 68,000 - \$ 92,500	4.2%
QUALITY ASSURANCE (QA) & TESTING (c)			
QA/Testing Manager	\$ 74,750 - \$100,000	\$ 76,750 - \$102,750	2.7%
QA Associate/Analyst	\$ 62,500 - \$ 87,250	\$ 64,500 - \$ 90,250	3.3%
INTERNET & E-COMMERCE (d)			
Senior Web Developer	\$ 80,000 - \$103,500	\$ 84,750 - \$109,500	5.9%
Web Developer	\$ 58,750 - \$ 85,000	\$ 62,000 - \$ 89,750	5.6%
Web Administrator	\$ 59,500 - \$ 78,250	\$ 62,250 - \$ 81,750	4.5%
Web Designer	\$ 62,000 - \$ 85,750	\$ 65,250 - \$ 90,000	5.1%
Electronic Data Interchange (EDI) Specialist	\$ 64,000 - \$ 89,000	\$ 66,250 - \$ 92,000	3.4%
E-Commerce Analyst	\$ 63,750 - \$ 91,500	\$ 66,000 - \$ 94,750	3.5%
Messaging Administrator	\$ 60,500 - \$ 76,250	\$ 63,500 - \$ 80,000	4.9%

(b) Add the percentage below, based on national averages, to IT salaries for the following skills:

IBM DB2 database skills	5%
Microsoft SQL Server database skills	8%
Oracle database skills	7%

(c) Add the percentage below, based on national averages, to IT salaries for the following skills:

Performance testing (e.g., Mercury Interactive Tools) skills	4%
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(d) Add the percentage below, based on national averages, to IT salaries for the following skills:

AJAX (Asynchronous JavaScript and XML) development skills	4%
ASP development skills	4%
C# development skills	8%
Cold Fusion development skills	5%
Content management system (CMS) skills	7%
DCOM/COM/ActiveX development skills	3%
Java development skills	6%
Java EE/J2EE development skills	6%
LAMP (Linux, Apache, MySQL and Perl/PHP/Python) skills	6%
.NET development skills	8%
PHP development skills	6%
SharePoint skills	13%
Virtualization skills	10%
Web services development skills	7%



TECHNOLOGY SALARIES – CANADA

JOB TITLE	2012	2013	% CHANGE
NETWORKING/TELECOMMUNICATIONS (e)			
Network Architect	\$ 86,250 - \$127,250	\$ 91,000 - \$134,500	5.6%
Network Manager	\$ 75,500 - \$ 99,250	\$ 79,000 - \$103,750	4.6%
Network Engineer	\$ 75,000 - \$ 98,250	\$ 79,500 - \$104,250	6.1%
Wireless Network Engineer	\$ 81,000 - \$104,000	\$ 85,250 - \$109,500	5.3%
Network Administrator	\$ 60,000 - \$ 79,000	\$ 63,000 - \$ 82,750	4.9%
Pre-Sales Engineer/Technical Engineer	\$ 78,750 - \$ 97,000	\$ 81,500 - \$100,500	3.6%
Telecommunications Manager	\$ 83,250 - \$107,250	\$ 85,750 - \$110,500	3.0%
Telecommunications Specialist	\$ 58,500 - \$ 81,500	\$ 60,500 - \$ 84,250	3.4%
OPERATIONS			
Manager	\$ 73,000 - \$ 86,750	\$ 75,250 - \$ 89,500	3.1%
Computer Operator	\$ 40,750 - \$ 51,500	\$ 41,500 - \$ 52,250	1.6%
Mainframe Systems Programmer	\$ 61,000 - \$ 85,000	\$ 62,250 - \$ 86,750	2.1%
SECURITY (f)			
Data Security Analyst	\$ 83,250 - \$124,500	\$ 87,750 - \$131,250	5.4%
Systems Security Administrator	\$ 73,000 - \$102,000	\$ 77,250 - \$107,750	5.7%
Network Security Administrator	\$ 81,500 - \$113,750	\$ 85,250 - \$119,000	4.6%
Network Security Engineer	\$ 85,250 - \$111,500	\$ 89,500 - \$117,250	5.1%
Information Systems Security Manager	\$ 94,000 - \$123,000	\$ 97,750 - \$127,750	3.9%

(e) Add the percentage below, based on national averages, to IT salaries for the following skills:

Cisco network administration skills.....8%
Linux/Unix administration skills.....7%
Voice over Internet Protocol (VoIP) administration skills.....6%
Windows 2000/Windows 2003/XP/Vista skills5%
Windows Server 2008 skills7%
Windows 7 skills.....7%

(f) Add the percentage below, based on national averages, to IT salaries for the following skills:

Check Point Firewall administration skills.....7%
Cisco network administration skills.....8%
Linux/Unix administration skills.....7%



TECHNOLOGY SALARIES – CANADA

JOB TITLE	2012	2013	% CHANGE
SOFTWARE DEVELOPMENT (g)			
Product Manager	\$ 92,750 - \$122,750	\$ 95,500 - \$126,500	3.0%
Software Engineer	\$ 75,250 - \$108,750	\$ 79,500 - \$114,750	5.6%
Software Developer	\$ 59,750 - \$ 99,750	\$ 63,250 - \$105,500	5.8%
TECHNICAL SERVICES, HELP DESK & TECHNICAL SUPPORT (h)			
Manager	\$ 76,000 - \$101,500	\$ 78,500 - \$104,750	3.2%
Desktop Support Analyst	\$ 52,000 - \$ 71,250	\$ 53,250 - \$ 73,000	2.4%
Systems Administrator	\$ 59,000 - \$ 81,750	\$ 62,000 - \$ 86,000	5.2%
Systems Engineer	\$ 68,750 - \$ 87,500	\$ 72,750 - \$ 92,500	5.8%
Help Desk Tier 3	\$ 57,500 - \$ 75,250	\$ 60,250 - \$ 78,750	4.7%
Help Desk Tier 2	\$ 46,250 - \$ 57,250	\$ 48,250 - \$ 59,750	4.3%
Help Desk Tier 1	\$ 36,000 - \$ 46,500	\$ 37,500 - \$ 48,500	4.2%
Instructor/Trainer	\$ 52,000 - \$ 71,500	\$ 53,000 - \$ 73,000	2.0%
PC Technician	\$ 43,500 - \$ 61,750	\$ 44,500 - \$ 63,000	2.1%
Business Continuity Analyst	\$ 68,750 - \$ 98,500	\$ 71,750 - \$102,750	4.3%

(g) Add the percentage below, based on national averages, to IT salaries for the following skills:

ASP development skills.....	4%
C# development skills	8%
C++ development skills	6%
DCOM/COM/ActiveX development skills.....	3%
Java development skills.....	6%
Java EE/J2EE development skills	6%
.NET development skills.....	8%
PHP development skills.....	6%
Visual Basic development skills.....	3%
Web services development skills	7%

(h) Add the percentage below, based on national averages, to IT salaries for the following skills:

Basis administration skills.....	4%
Cisco network administration skills.....	8%
Linux/Unix administration skills.....	7%
Virtualization skills.....	10%
Windows 2000/Windows 2003/XP/Vista skills	5%
Windows Server 2008 skills	7%
Windows 7 skills.....	7%



LOCAL VARIANCES

The starting salary ranges provided on the previous pages reflect the national averages for each position. To determine the estimated salary range for a position in your area, use the local variance numbers below. Move the decimal point in the variance number two places to the left, then multiply this figure by the low and high ends of the salary range.

UNITED STATES

ALABAMA

Birmingham	95.0
Huntsville	93.0
Mobile	86.0

ARIZONA

Phoenix	108.0
Tucson	100.0

ARKANSAS

Fayetteville	95.0
Little Rock	95.0

CALIFORNIA

Fresno	90.0
Irvine	124.5
Los Angeles	125.0
Oakland	125.0
Ontario	111.0
Sacramento	101.5
San Diego	118.5

San Francisco	135.5
San Jose	133.0
Santa Barbara	121.0
Santa Rosa	98.0
Stockton	85.0

COLORADO

Boulder	113.3
Colorado Springs	90.5
Denver	102.8
Fort Collins	92.8
Greeley	83.8
Loveland	90.5
Pueblo	76.0

CONNECTICUT

Hartford	116.5
New Haven	112.0
Stamford	131.0

DELAWARE

Wilmington	102.0
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DISTRICT OF COLUMBIA

Washington	130.0
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FLORIDA

Fort Myers	87.5
Jacksonville	93.0
Melbourne	89.5
Miami/Fort Lauderdale	106.7
Orlando	98.5
St. Petersburg	94.0
Tampa	96.5
West Palm Beach	99.5

GEORGIA

Atlanta	105.0
Macon	82.5
Savannah	82.5

HAWAII

Honolulu	92.0
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Source: U.S. Department of Labor's Bureau of Labor Statistics and Robert Half Technology. City index figures are reflective of all industries and are not specific to the information technology field.

Note: Please contact a Robert Half Technology account executive for salary information regarding cities not listed above.



LOCAL VARIANCES

IDAHO

Boise 86.1

ILLINOIS

Chicago 123.0
Naperville 112.0
Rockford 80.0
Springfield 91.0

INDIANA

Fort Wayne 81.0
Indianapolis 94.0

IOWA

Cedar Rapids 89.0
Davenport 89.0
Des Moines 97.0
Sioux City 78.1
Waterloo/Cedar Falls 80.7

KANSAS

Kansas City 97.0

KENTUCKY

Lexington 87.5
Louisville 90.5

LOUISIANA

Baton Rouge 99.0
New Orleans 99.0

MAINE

Portland 95.0

MARYLAND

Baltimore 103.0

MASSACHUSETTS

Boston 133.0
Springfield 104.0

MICHIGAN

Ann Arbor 100.5
Detroit 100.0
Grand Rapids 85.0
Lansing 84.0

MINNESOTA

Bloomington 105.5
Duluth 79.6
Minneapolis 105.5
Rochester 100.5
St. Cloud 80.0
St. Paul 102.0

MISSOURI

Kansas City 97.2
St. Joseph 91.0
St. Louis 100.3

NEBRASKA

Lincoln 78.2
Omaha 94.0

NEVADA

Las Vegas 94.0
Reno 94.0

NEW HAMPSHIRE

Manchester/Nashua 112.0

NEW JERSEY

Mount Laurel 115.0
Paramus 130.0
Princeton 126.0
Woodbridge 126.0

NEW MEXICO

Albuquerque 89.7

NEW YORK

Albany 97.0
Buffalo 95.0
Long Island 135.0
New York 141.0
Rochester 91.7
Syracuse 90.3

NORTH CAROLINA

Charlotte 101.0
Greensboro 99.0
Raleigh 104.0

OHIO

Akron 89.0
Canton 82.0
Cincinnati 97.5
Cleveland 95.0
Columbus 96.5
Dayton 87.0
Toledo 84.5
Youngstown 76.0

Source: U.S. Department of Labor's Bureau of Labor Statistics and Robert Half Technology. City index figures are reflective of all industries and are not specific to the information technology field.

Note: Please contact a Robert Half Technology account executive for salary information regarding cities not listed above.



LOCAL VARIANCES

OKLAHOMA

Oklahoma City	89.7
Tulsa	92.0

OREGON

Portland	103.0
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PENNSYLVANIA

Harrisburg	95.0
Philadelphia	115.0
Pittsburgh	96.2

RHODE ISLAND

Providence	97.0
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SOUTH CAROLINA

Charleston	92.0
Columbia	93.0
Greenville	90.0

TENNESSEE

Chattanooga	87.0
Cool Springs	98.0
Knoxville	86.0
Memphis	95.0
Nashville	97.5

TEXAS

Austin	103.5
Dallas	105.5
El Paso	70.0
Fort Worth	105.5
Houston	106.0
Midland/Odessa	96.0
San Antonio	95.0

UTAH

Salt Lake City	100.0
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VIRGINIA

Norfolk/Hampton Roads	92.0
Richmond	98.0
Tysons Corner	130.0

WASHINGTON

Seattle	118.9
Spokane	82.0

WISCONSIN

Appleton	85.0
Green Bay	86.5
Madison	96.0
Milwaukee	99.0
Waukesha	98.5

CANADA

ALBERTA

Calgary	104.1
Edmonton	102.1

BRITISH COLUMBIA

Fraser Valley	98.1
Vancouver	103.5
Victoria	95.2

MANITOBA

Winnipeg	90.5
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ONTARIO

Kitchener-Waterloo	95.5
Ottawa	100.2
Toronto	104.9

QUÉBEC

Montréal	102.9
Québec City	89.2

SASKATCHEWAN

Regina	93.9
Saskatoon	95.6

Source: U.S. Department of Labor's Bureau of Labor Statistics and Robert Half Technology. City index figures are reflective of all industries and are not specific to the information technology field.

Note: Please contact a Robert Half Technology account executive for salary information regarding cities not listed above.



GLOSSARY OF JOB DESCRIPTIONS

Our Glossary of Job Descriptions can help you better target the professionals you need. Use the descriptions on the following pages as a starting point, and tailor them to match your specific requirements.

ADMINISTRATION

CHIEF INFORMATION OFFICER (CIO)

CIOs need broad knowledge of all aspects of IT. They must have strong analytical, strategic planning and communication skills. The ability to collaborate effectively with other senior managers in order to define, articulate and champion the ways in which technology requirements relate to the firm's business is critical. A bachelor's degree in computer science, information systems or a related area is expected, and a master's degree is often required by employers. CIOs typically have at least 10 years of managerial experience in IT, though larger firms may require more.

Typical duties include:

- Developing and directing the firm's overall IT strategy
- Working closely with other senior management, including the chief executive officer, chief technology officer, chief operations officer and chief financial officer, to coordinate data systems policies and procedures
- Providing vision and leadership in all aspects of IT management and operations
- Approving all major system hardware and software purchasing decisions

CHIEF TECHNOLOGY OFFICER (CTO)

CTO candidates require in-depth knowledge of all aspects of a firm's data technology infrastructure. They also need the tactical managerial skills to lead the IT department in attaining the company's current and future technology goals. They typically have a degree in computer science or a related field and at least seven to 10 years of experience in IT management. In larger companies, the CTO may report

to a chief information officer or a chief operating officer. Candidates need excellent interpersonal and problem-solving skills, as well as the ability to plan and execute projects within time and budget constraints.

Typical duties include:

- Setting the firm's overall technology standards and practices
- Making recommendations, as well as explaining technology solutions, to senior management through presentations and advocacy
- Managing the implementation of data systems and monitoring their effectiveness in meeting business unit needs
- Providing leadership and managing a staff of direct reports in functional areas such as systems operations, LAN/WAN architecture, and hardware and software support

CHIEF SECURITY OFFICER (CSO)

CSOs need extensive experience in the field of information security, as well as in-depth knowledge of this rapidly evolving and critical business function. Employers look for a minimum of a bachelor's degree in information systems or a related field, as well as 10 or more years' experience with a focus on information security, compliance and privacy. The position requires excellent judgment and outstanding planning abilities in order to create and maintain complex security systems. Compliance- and security-related certifications are required.

Typical duties include:

- Managing enterprisewide security policies and systems
- Developing, implementing and monitoring long-term information security and privacy strategy
- Ensuring the firm meets all mandated security and compliance standards
- Coordinating work with all vendors, contractors and consultants to maintain and enhance data security



GLOSSARY OF JOB DESCRIPTIONS

VICE PRESIDENT OF INFORMATION TECHNOLOGY

The vice president of information technology position requires a proven track record of leadership in technology management, including excellent communication, analytical and organizational skills. A bachelor's degree in computer science or a related field and five to 10 years of increasing responsibility are typical requirements for the job. Strategic planning and tactical implementation are important attributes for this position as well.

Typical duties include:

- Managing the tactical, overall operations of the IT department
- Working with the firm's senior IT team to help plan and coordinate both short- and long-term systems strategy and implementation
- Serving as a liaison between nontechnical business units and IT, communicating technical information and plans
- Overseeing the department's hiring, promotion and review processes

INFORMATION TECHNOLOGY MANAGER

Information technology managers need a technical background, as well as business acumen and people management skills. Because they direct the work of other employees, these individuals require strong interpersonal and communication abilities. Analytical thinking also is very important, as this position often involves problem resolution and process development. In addition, a strong customer service orientation is a must because information technology managers often serve as the final escalation point for high-visibility troubleshooting. Employers look for a bachelor's degree in an IT-related field, plus at least five years of experience with the specific types of business systems, hardware and networking services utilized by the firm. Demonstrated leadership also is required.

Typical duties include:

- Analyzing workflow, delegating projects and meeting departmental goals
- Developing and monitoring performance standards
- Providing input on hiring decisions for technical staff

- Implementing and monitoring new projects
- Managing performance of and delegating projects to team members

APPLICATIONS DEVELOPMENT

MANAGER

Candidates seeking a manager of applications development position need a thorough technical background combined with outstanding managerial and leadership talents. They must have strong oral and written communication skills, project management experience, and proven abilities to facilitate multidisciplinary project teams in accomplishing strategic goals. Employers look for a bachelor's degree in computer science, information systems, engineering or a related field. Depending on the size of the department, the company may seek five to 10 or more years of combined development and managerial experience.

Typical duties include:

- Assuming overall management responsibility for all aspects of the applications development department and its staff
- Planning, coordinating and monitoring the progress of development projects to ensure their ongoing alignment with business goals
- Hiring, training, motivating and evaluating staff
- Serving as a liaison to senior IT management, reporting on the status of current projects, identifying issues and assessing their impact, and proactively recommending solutions

PROJECT MANAGER

Project managers must have demonstrated knowledge and experience with project management methodologies in order to work with intricate, multifaceted projects. They need superb communication and interpersonal skills to collaborate with the development team and make project presentations. Employers look for a bachelor's degree in an IT- or business-related field, as well as a background in applications development, and five or more years of experience managing complex projects. Project management certifications, such as those from PMI



GLOSSARY OF JOB DESCRIPTIONS

(Project Management Institute), also are highly recommended.

Typical duties include:

- Managing overall coordination of IT applications development projects, from planning through implementation
- Setting project scope, priorities, deadlines and deliverable schedules
- Facilitating discussions and consensus among various project stakeholders such as analysts, applications programmers and clients
- Managing and monitoring project budgets and expenditures

SYSTEMS ANALYST

Candidates for a systems analyst position must be excellent analytical thinkers and problem solvers, as well as effective communicators. They need a broad understanding of, and experience working with, hardware and software systems, including their installation, maintenance and life cycles. Employers look for a minimum of a bachelor's degree in information systems, computer science or a similar field, along with five or more years of experience working with specific applications and/or operating systems.

Typical duties include:

- Analyzing systems hardware and software problems and developing technical solutions
- Translating user and/or systems requirements into functional technical specifications
- Writing and maintaining detailed systems documentation, including user manuals and technical manuals
- Acting as a liaison between developers and end users to ensure technical compatibility and satisfaction

APPLICATIONS ARCHITECT

Applications architects require a high level of technical expertise combined with excellent planning, coordination and communication skills, as well as the ability to work on teams. Practitioners must have experience with relevant development tools and specific application and system architecture, in addition to a strong understanding of object-oriented design. A bachelor's degree in computer science or information systems is normally required, and a master's degree is highly desirable.

Employers seek a minimum of five to eight years of related work experience and often look for software skill sets such as AJAX, C#/C++ and LAMP. Expertise in the design, development and deployment of enterprise-level N-tier architecture in a Microsoft .NET Framework or Java Enterprise Edition platform may be required.

Typical duties include:

- Designing major aspects of the architecture of an application, including components such as user interface, middleware and infrastructure
- Providing technical leadership to the applications development team
- Performing design and code reviews
- Ensuring that uniform enterprisewide application design standards are maintained
- Collaborating with other stakeholders to ensure architecture is aligned with business requirements

BUSINESS SYSTEMS ANALYST

Business systems analysts should have a solid understanding of business functional areas, business management issues and data analysis. Exceptional written and oral communication abilities are required. Leadership, initiative and advanced computer skills, including programming experience, also are integral. Employers often seek at least a bachelor's degree and several years of computer applications and business experience. For more technically challenging positions involving complex business systems, a master's degree with a concentration in information systems may be required.

Typical duties include:

- Analyzing complex business problems and assessing how automated systems can be implemented to solve them
- Formulating and defining the objectives and scope of business systems
- Gathering data and analyzing business and user needs in consultation with both business managers and end users
- Providing IT support for regulatory and compliance activities
- Making recommendations on hardware and software procurement to support business goals



GLOSSARY OF JOB DESCRIPTIONS

CUSTOMER RELATIONSHIP MANAGEMENT (CRM) BUSINESS ANALYST

Employers seek CRM business analysts with proven analytical and problem-solving capabilities, as well as extensive technical and functional experience with specific CRM systems. Because CRM business analysts serve as liaisons between IT and business groups, strong interpersonal and communication skills are essential. Employers also may require a demonstrated understanding of sales, marketing and other business processes. CRM business analysts must be able to anticipate the organizational impact of process changes. A bachelor's degree in a computer- or business-related discipline is typically required, as is thorough knowledge of the employer's existing CRM applications.

Typical duties include:

- Translating business requirements into user and functional requirements
- Conducting root cause analysis in support of process improvements
- Planning, conducting and directing the analysis of complex business issues to be solved with process changes and information systems
- Working closely with business users to resolve ongoing functional issues

CUSTOMER RELATIONSHIP MANAGEMENT (CRM) TECHNICAL DEVELOPER

Candidates for CRM technical developer positions must be able to work creatively and analytically in a problem-solving environment to develop, enhance and maintain CRM solutions. They also need strong interpersonal and communication skills in order to collaborate effectively with business analysts, developers and other stakeholders. A bachelor's degree in a computer-related field is typically required. Specific programming and technical requirements vary widely by position, but generally emphasize multiple years of development experience with the employer's existing CRM solutions (e.g., Oracle, Microsoft, SAP).

Typical duties include:

- Programming and documenting CRM solutions
- Preparing code reviews and documenting development and testing
- Working with other IT teams to ensure that appropriate infrastructure, policies and procedures are in place to support the custom application environment
- Providing technical application support to business, quality assurance and end-user support teams

DEVELOPER/PROGRAMMER ANALYST

Developer/programmer analysts must have strong analytical and problem-solving abilities. They must understand and conceptualize applications from both a technical/programming perspective and a business point of view. Because they deal with both technical personnel and business managers/administrators, as well as participate on project teams, they need strong interpersonal and communication skills. Excellent programming abilities in common languages and frameworks such as C#/C++, Java Enterprise Edition/AJAX and Microsoft .NET are needed for the coding aspects of the position. Most employers look for at least a bachelor's degree in computer science, information science or management information systems, as well as relevant job experience.

Typical duties include:

- Analyzing business application requirements for functional areas such as finance, manufacturing, marketing or human resources
- Writing code, testing and debugging software applications
- Recommending system changes and enhancements
- Documenting software specifications and training users





GLOSSARY OF JOB DESCRIPTIONS

ENTERPRISE RESOURCE PLANNING (ERP) BUSINESS ANALYST

For ERP business analyst positions, employers seek candidates with a demonstrated ability to translate business requirements into ERP solutions. Because ERP business analysts work closely with colleagues in technical and business departments, strong interpersonal and communication skills are essential. Project management experience also may be required. Specific technical requirements vary by employer, but strong technical and functional knowledge of the employer's preferred ERP solutions is a must. Candidates also should have a thorough understanding of business processes, as well as an IT- or business-related bachelor's degree.

Typical duties include:

- Analyzing and defining ERP systems, functions, and business process and user needs
- Performing functional configuration and maintenance for ERP systems based on changing operational and business needs
- Researching transactional issues, identifying root causes and driving resolutions
- Creating documentation such as policies, procedures, workflows and user guides

ENTERPRISE RESOURCE PLANNING (ERP) TECHNICAL/FUNCTIONAL ANALYST

Candidates for ERP technical/functional analyst positions must be able to analyze complex processes, identify areas for improvement and recommend solutions. In addition to technical and functional ERP expertise, employers seek strong written and verbal communication skills and the ability to interact productively with business users. A bachelor's degree in a computer-related field is typically required. Additional technical requirements vary by position but often include multiple years of experience working closely with the employer's preferred ERP solutions.

Typical duties include:

- Completing technical service requests and providing continuous business application support for ERP software and legacy systems

- Helping to define, analyze, develop, implement and document new systems, customized programs and databases to meet business needs
- Helping to upgrade and implement ERP software
- Assisting application owners in the development of test scripts, policies and procedures

ENTERPRISE RESOURCE PLANNING (ERP) TECHNICAL DEVELOPER

ERP technical developers must be able to quickly identify and analyze technical problems in ERP applications, assess their potential impacts, and help design solutions. Employers typically seek candidates with experience implementing ERP systems over multiple life cycles, as well as the ability to work with business teams to support their requirements. A bachelor's degree in a technical or business-related field, or equivalent experience, is generally required. Technical requirements vary but often include in-depth knowledge of the employer's existing ERP solutions and related applications.

Typical duties include:

- Performing analysis, design, coding, data migration and testing for ERP production and development environments
- Implementing ERP enhancements to support changes in business processes
- Providing ERP application support
- Working with various business teams to gather requirements and support business processes

LEAD APPLICATIONS DEVELOPER

Candidates for lead applications developer positions need a solid background in applications programming and experience leading a technical team. Employers look for a bachelor's degree in computer science or a related field, along with at least three years of experience in technologies such as Visual Basic .NET, PHP, C#/C++ and Microsoft .NET Framework development. In addition, individuals need several years of proven success as a team leader, as this role requires directing and motivating coworkers and working closely with other managers while multitasking and prioritizing resource needs.



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Typical duties include:

- Leading a development team in the design, development, coding, testing and debugging of applications
- Coordinating the effective use of the development team's time and ensuring efficient communication between team members and other IT functional areas
- Providing feedback and suggestions for process and product improvement
- Acting as a technical mentor and adviser for the development team

TECHNICAL WRITER

Technical writers must possess the ability to communicate complex information clearly and concisely. They need excellent interpersonal skills in order to elicit detailed information from subject-matter experts (for example, applications developers), in addition to advanced writing and editing skills. Technical writers also need to be adept in document creation using applications such as Adobe FrameMaker, RoboHelp and Acrobat, and Microsoft Word and PowerPoint. Employers' requirements vary depending on the complexity of documentation needed but usually include a bachelor's degree in English, journalism or information sciences, plus several years of experience in a technical setting. Typical duties include:

- Documenting the specifications, design, features and operation of applications
- Writing and editing user manuals, help systems and other technical documents
- Designing and formatting documents using document-creation software
- Interviewing applications developers and other technical resource personnel to ensure the accuracy of all information presented

MOBILE APPLICATIONS DEVELOPER

Mobile applications developers need strong analytical and problem-solving capabilities. Employers require previous experience building mobile applications and mobile websites for Android, BlackBerry, iOS, Symbian, Windows Mobile or Windows Phone 7. Commonly specified languages and platforms include Java, Java

EE, Java ME, JavaScript, JSON, Objective-C, .NET and HTML. A degree in computer science or computer engineering is typically required, though work samples of completed applications may soften that requirement. The combination of highly team-oriented work and short release cycles makes strong interpersonal and communication skills essential.

Typical duties include:

- Coding, testing, debugging, documenting and monitoring mobile applications
- Interacting with different departments within the organization regarding new deployments
- Contributing to the development of project schedules and workflow
- Recommending changes and enhancements to applications

CONSULTING & SYSTEMS INTEGRATION

DIRECTOR

A director-level position, typically found in a consulting services environment, is a senior-level management role. As a result, this position requires a seasoned professional with outstanding judgment, as well as leadership, interpersonal and communication skills. It also calls for strategic thinking, the use of decision-making authority and the assumption of formal responsibility for meeting business-unit goals. Candidates need strong project management experience and the ability to monitor and manage multiple initiatives concurrently, as well as excellent staff management skills. Employers often seek a master's degree, such as an MBA, or other relevant graduate degree. In addition, 10 to 15 years of significant business experience, including leadership positions in consulting and project management, are typically required.

Typical duties include:

- Establishing and maintaining relations with clients' senior-level managers
- Developing overall practice strategy, tactics and goals
- Managing the consulting staff, including headcount, final hiring and firing decisions, and staff development and mentoring



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- Performing engagement analysis, and making recommendations and presentations to the consulting firm's senior management on new business opportunities and expansion of the firm's consulting practice and client base
- Working with third-party vendors

PRACTICE MANAGER

The practice manager position requires extensive IT experience combined with outstanding leadership, communication, presentation, customer service, analytical and project management skills. Individuals must possess excellent business and financial savvy, as well as experience with resource allocation and profit-and-loss management. At a minimum, a bachelor's degree in business or an IT-related field is required, while an advanced degree may be preferred. Employers typically look for 10 years of IT industry experience with at least five years in a technical consulting management role. Candidates also must be willing to travel.

Typical duties include:

- Developing project scope, goals and strategic plans for delivering company products and services to clients
- Managing, recruiting, evaluating and mentoring a team of project managers and consultants
- Managing and meeting engagement booking and revenue targets
- Identifying, developing and managing client relations, in addition to meeting with client management for project support and presentations
- Working with third-party vendors

PROJECT MANAGER/SENIOR CONSULTANT

Project managers/senior consultants need a combination of subject-matter expertise and project management skills. They must possess excellent communication, interpersonal and team leadership abilities, as well as the capacity to work with cross-functional teams to accomplish overall project goals. Employers seek at least a bachelor's degree (a master's may be preferred) in computer science, management or an IT-related discipline; specific consulting subject-matter expertise; and at least five

years of experience managing projects from inception to completion. A project management certification is strongly preferred.

Typical duties include:

- Developing and managing project specifications, technical design and requirements
- Setting project timelines, milestones and deadlines
- Coordinating work with cross-functional team leaders and monitoring and reporting on project status
- Assigning tasks to staff consultants and supervising work

STAFF CONSULTANT

Candidates for a staff consultant position need excellent analytical, problem-solving, customer relations and communication skills, along with the ability to work well in a team environment. They must have industry-specific expertise, as well as project-oriented IT experience. A minimum of a bachelor's degree in computer science, business or a field related to the area of consulting is expected. Several years of business experience, plus two or more years of consulting experience – including full-cycle project implementation – also are typical requirements. Extensive travel may be required.

Typical duties include:

- Assisting with project planning and requirement specifications
- Developing prototypes and alternatives in coordination with other team members
- Executing and delivering projects within time and budget constraints
- Understanding client needs and developing and maintaining excellent client relations

SENIOR IT AUDITOR

Senior IT auditors are responsible for developing and managing complex audits of an organization's information systems. They must have in-depth knowledge of business processes, as well as process controls and risks, and understand how these relate to relevant IT audit procedures. These professionals have experience working with a variety of technology platforms and must be familiar with performing network, web, database and



GLOSSARY OF JOB DESCRIPTIONS

technical audits. These positions commonly require a bachelor's degree (a master's degree may be preferred) in computer science, information systems, business or a related field and an average of five years' relevant experience in IT auditing. A Certified Information Systems Auditor (CISA), Certified Information Security Manager (CISM) or similar designation is strongly preferred.

Typical duties include:

- Establishing objectives and procedures for audit review of computer systems
- Developing and implementing testing and evaluation plans for IT systems and controls to gauge conformity with industry standards of efficiency, accuracy and security
- Presenting written findings and recommendations to senior management
- Providing independent verification in connection with applicable U.S. Sarbanes-Oxley Act or Canadian Multilateral Instrument 52-109 compliance and similar regulations

IT AUDITOR

IT auditors must have broad knowledge of the technical infrastructure and architecture of computer systems, as well as exposure to a variety of platforms such as operating systems, networks, databases and enterprise resource planning (ERP) systems. These professionals must possess excellent interpersonal skills, including communication, presentation and leadership abilities. Employers typically seek at least a bachelor's degree (a master's degree may be preferred) in computer science, information systems, business administration, finance or a similar field. A Certified Information Systems Auditor (CISA) accreditation also may be required.

Typical duties include:

- Testing and evaluating IT systems and controls for conformity with industry standards of efficiency, accuracy and security
- Providing independent verification of compliance with statutory requirements and similar regulations
- Making recommendations for systems operations and process improvement
- Developing risk-based audit plans

DATA/DATABASE ADMINISTRATION

DATABASE MANAGER

Database managers must have an in-depth understanding of all aspects of database technology. Employers generally look for applicants with at least a bachelor's degree and five years of experience in an Oracle, Microsoft SQL Server, IBM DB2 or similar environment, along with multiyear experience in a technical management position. Database managers need to be creative, analytical thinkers who can not only lead a team of database professionals but also effectively communicate, plan information system strategy and make presentations to senior IT managers.

Typical duties include:

- Maintaining and supporting a company's database environment
- Providing input to a chief technology officer or chief information officer regarding company data standards and practices
- Developing and managing departmental budgets
- Making personnel decisions and work assignments
- Managing capacity planning, disaster recovery and performance analysis

DATABASE DEVELOPER

Database developers need a thorough understanding of relational database theory and practice. They must be analytical and adept at problem solving. They also should be good communicators.

A bachelor's degree in computer science or a related field often is sought, although database experience can be substituted with some employers. Familiarity and experience with major enterprise database programs such as

Microsoft SQL Server, Oracle or IBM DB2 are essential, and professional certification (Microsoft Certified Database Administrator or Oracle Database Administrator Certified Professional, for example) in these programs is a plus. Since many web applications now interface with databases, experience in Internet technologies also is valuable.





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Typical duties include:

- Developing database objects and structures for data storage, retrieval and reporting according to project specifications
- Implementing and testing database design and functionality, and tuning for performance
- Providing support to database administrators and interfacing with business users to ensure the database is satisfying business requirements
- Designing and developing back-end database interfaces to web and e-commerce applications

DATABASE ADMINISTRATOR

Candidates for the database administrator role need a strong technical foundation in database structure, configuration, installation and practice. Employers seek individuals with knowledge and experience in major relational database languages and applications such as Microsoft SQL Server, Oracle and IBM DB2. At least two years of postsecondary education is typically required. Professional certifications from Microsoft, Oracle and others also are valuable. Effective database administrators must have keen attention to detail, a strong customer service orientation and the ability to work as part of a team.

Typical duties include:

- Managing, monitoring and maintaining company databases
- Making requested changes, updates and modifications to database structure and data
- Ensuring database integrity, stability and system availability
- Maintaining database backup and recovery infrastructure

DATA ANALYST/REPORT WRITER

Strong analytical, quantitative and problem-solving abilities are required for this position, along with thorough knowledge of relational database theory and practice. Employers look for a bachelor's degree in computer science, information systems or a related field, plus several years of experience working with major database platforms such as Microsoft SQL Server, Oracle and IBM

DB2. In addition, excellent communication skills and the ability to work both independently and collaboratively with data systems teams are required.

Typical duties include:

- Analyzing complex data systems and documenting data elements, data flow, relationships and dependencies
- Developing automated and reusable routines for extracting requested information from database systems
- Compiling detailed reports using data reporting tools such as Crystal Reports, and making recommendations based on their findings
- Working in partnership with business analysts, data architects and database developers to build data transactional and warehousing systems

DATA ARCHITECT

Candidates for data architect positions require a high level of analytical and creative skills, along with in-depth knowledge of data systems and database methodology, design and modeling. They must be able to communicate effectively in order to plan and coordinate data resources. Working knowledge of network management, distributed databases and processing, application architecture, and performance management is highly valued. Employers generally seek a bachelor's degree in computer science or a related field, as well as experience with Oracle, Microsoft SQL Server or other databases in various operating system environments such as Unix, Linux, Solaris and Microsoft Windows.

Typical duties include:

- Understanding and evaluating business requirements and translating them into specific database solutions
- Creating data design models, database architecture and data repository design
- Working with the systems and database administration staff to implement, coordinate and maintain enterprisewide data architecture
- Providing leadership in establishing and documenting data standards
- Creating and testing database prototypes



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DATA MODELER

Data modelers must possess excellent data analysis and problem-solving skills, and be able to both communicate effectively and work as part of a team. Employers normally request a bachelor's degree in computer science, IT or mathematics in addition to several years of relevant data management experience. Candidates should be familiar with data modeling tools and methodologies, and be knowledgeable in database system applications, stored procedures and data warehousing.

Typical duties include:

- Analyzing organizational data requirements and creating logical and physical models of data flow
- Interviewing key project stakeholders, documenting findings and making detailed recommendations
- Working with database administrators and reporting teams to ensure the availability of standard and ad hoc data reporting in a production environment
- Addressing data quality issues with clients and management

DATA WAREHOUSE MANAGER

The data warehouse manager role requires an in-depth background in database theory and practice combined with hands-on experience in data warehousing technology. Managers should have excellent analytical abilities, as well as project management experience. Proficiency in warehousing tools and architecture is a must, as is technical proficiency in database languages and applications such as Oracle, Microsoft SQL Server and IBM DB2. A bachelor's degree in computer science or the equivalent, along with five or more years of experience in a data warehousing environment and three or more years in technical personnel management, are typical prerequisites.

Typical duties include:

- Designing, developing and maintaining data warehouses and data mart systems
- Working with database developers, administrators and managers to ensure that data systems conform to enterprise data architecture and strategy

- Developing and implementing strategies for gathering data from operational databases and third-party vendors for inclusion in the warehouse
- Providing leadership in managing technical resources and staff

DATA WAREHOUSE ANALYST

Data warehouse analysts must have excellent research, analysis and problem-solving skills, as well as good oral and written communication abilities. A bachelor's degree in computer science or a related field, along with extensive knowledge of relational database theory and three to five years of work experience in database systems, are typical prerequisites. Employers also seek candidates who possess experience with data modeling and architecture. A professional certification in a database application such as Microsoft SQL Server or Oracle also is valuable.

Typical duties include:

- Collecting, analyzing, mining and leveraging data stored in data warehouses
- Researching and recommending technology solutions related to data storage, reporting, importing and other areas
- Working with business analysts to translate data requirements into logical data models
- Defining user interfaces for interacting with data warehouses and data marts

BUSINESS INTELLIGENCE ANALYST

Candidates for business intelligence analyst positions need a strong background in all aspects of database technology, with an emphasis on the use of analytical and reporting tools. Employers seek a bachelor's degree in computer science, information systems or engineering, as well as several years of experience with database queries, stored procedure writing, Online Analytical Processing (OLAP) and data cube technology. Excellent written and oral communication skills are a must.

Typical duties include:

- Designing and developing enterprisewide data analysis and reporting solutions
- Reviewing and analyzing data from multiple internal and external sources



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- Communicating analysis results and making recommendations to senior management
- Developing data cleansing rules

PORTAL ADMINISTRATOR

Portal administrators must have the ability to analyze and solve complex problems, as well as extensive knowledge of enterprise web applications, services, systems and supporting technologies. Portal administrators may interact with a wide range of technical and nontechnical colleagues, so candidates should have excellent written and verbal communication skills. Three to five years of systems administration experience may be required. Many portal administrator positions require experience installing and configuring IBM WebSphere Application Server and related products.

Typical duties include:

- Integrating functional requirements into portal applications development
- Managing user access to portal resources
- Deploying and managing portlet applications
- Ensuring reliability and availability of enterprise web environments

INTERNET & E-COMMERCE

SENIOR WEB DEVELOPER

Companies hiring senior web developers seek individuals with extensive experience in all phases of the web application development life cycle, as well as an excellent understanding of customer needs and business strategy. Candidates should have expertise in the development of multiplatform, distributed applications and object-oriented programming. In addition, they should be adept at working in a team environment and mentoring junior colleagues. Sample code and web links to sample work are often requested. Employers normally seek a bachelor's degree in computer science, electrical engineering or a related field, plus a minimum of five years of experience working with a mix of web technologies such as AJAX, Adobe Flash, JavaScript, SOAP and HTML/DHTML.



Typical duties include:

- Providing creative vision and managing the planning and implementation of web-based applications
- Coordinating and communicating cross-functional activities among product development, marketing, product management and other teams in bringing new applications online
- Diagnosing and fixing bugs found by quality assurance testers
- Overseeing application coding and providing technical expertise and mentoring to other developers
- Increasing online exposure through search engine optimization best practices

WEB DEVELOPER

Web developers should have in-depth knowledge of Internet protocols and applications in addition to a solid understanding of business strategy. They need strong communication skills and the ability to work both individually and as part of a team. Employers typically seek individuals with a bachelor's degree in computer science or a related field, plus several years of web-related experience. Work experience can sometimes be substituted for the educational requirement. Sample code and web links to sample work are often requested. Candidates should be well-versed in web technologies and tools such as AJAX, ColdFusion, JavaScript, SOAP, HTML/DHTML, LAMP and others.

Typical duties include:

- Gathering business requirements and developing specifications for web-based applications
- Providing technical assistance to web administrators
- Integrating websites with back-end systems such as databases
- Writing test plans and test results

WEB ADMINISTRATOR

Candidates for web administrator positions need a thorough understanding of web technology and the Internet. They should be experienced in working with firewalls, intranets, domain name services, servers, and the related hardware and software required to administer a website. Familiarity with web services, TCP/IP, FTP, HTTP and HTTPS, LDAP and similar Internet



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protocols also is required. A bachelor's degree in a computer-related field and at least two to three years of experience in a web administration role are standard requirements, although additional experience in web-related positions may sometimes be substituted for formal education. In addition, web administrators should have excellent communication and customer service skills and the ability to work well in a team environment. Typical duties include:

- Installing, customizing, updating and maintaining corporate internal and external web pages and sites
- Creating and analyzing reports on web activity, number of hits, traffic patterns and similar performance metrics
- Monitoring customer feedback and responding to inquiries
- Recommending network, server and related equipment, and software upgrades and improvements

WEB DESIGNER

Web designers must be creative and possess excellent design and conceptual skills in combination with in-depth knowledge of the technology and software used to create web pages. They need to be familiar with HTML, XML, JSP, CSS, PHP, AJAX, and similar web languages and platforms, as well as the following Adobe web page and design software: Photoshop, Illustrator, Acrobat, Dreamweaver and Flash. The ability to multitask and adapt to changing priorities and new technologies also is essential. Employers may require a bachelor's degree in fine arts, graphic design or communications but often are more interested in three or more years of design and production experience and a strong portfolio of web designs.

Typical duties include:

- Working with design teams, marketing staff and developers to create a consistent and compelling visual style for a company's website
- Designing and formatting web pages
- Testing and troubleshooting web page features
- Creating artwork to appear on web pages

ELECTRONIC DATA INTERCHANGE (EDI) SPECIALIST

EDI specialists should have a solid background in information systems technology and working knowledge of data communication protocols. They must be detail-oriented, have excellent problem-solving skills and have the ability to work independently. A bachelor's degree in computer science or a related discipline is normally required. In addition, employers typically look for several years of IT-related experience, plus three or more years with EDI systems administration, design, analysis and development.

Typical duties include:

- Implementing and monitoring EDI systems, including data mapping, translation and interface
- Coordinating relations with and serving as a liaison to internal users, vendors and other external partners with respect to data interchange standards
- Performing system testing and quality control checks
- Developing and maintaining EDI documentation

E-COMMERCE ANALYST

E-commerce analysts must possess a strong background in Internet technologies, along with excellent communication, interpersonal, analytical and problem-solving skills. They also should be familiar with business and marketing concepts and be comfortable making recommendations based on strong attention to detail and strategic thinking. Employers typically seek a bachelor's degree in business, computer science, marketing, economics or a related field of study, plus a minimum of three years of professional IT experience, including work in web-related functions.

Typical duties include:

- Analyzing business and user requirements and making recommendations regarding the design and development of web-based e-commerce solutions
- Coordinating work with web designers and other technical specialists for the implementation of e-commerce websites
- Training and mentoring colleagues on Internet strategy and best practices
- Testing and evaluating e-commerce site performance and monitoring site analytics



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MESSAGING ADMINISTRATOR

Messaging administrators must be detail-oriented with excellent problem-solving, communication and documentation skills. They should have hands-on experience working with the hardware and software components of messaging systems such as Microsoft Exchange, Outlook, Active Directory and Lotus Notes, plus BlackBerry and other handheld devices, and a strong understanding of malware protection. Messaging administrators must be comfortable in a fast-paced environment with rapidly changing technology. A bachelor's degree in computer science, computer information systems or a related field, plus at least two years of experience working with the messaging systems used by the employer, are standard requirements.



Typical duties include:

- Implementing, administering and maintaining email and groupware systems, including associated servers, operating systems, and backup and recovery programs
- Troubleshooting and fixing system problems and service requests, and providing high-level technical support for unresolved help desk issues
- Formulating and documenting standard procedures for messaging system administration
- Identifying areas for enterprisewide system improvements and upgrades, including trending analysis and capacity planning
- Planning, documenting and testing appropriate messaging-related disaster recovery and/or business continuity systems

NETWORKING/ TELECOMMUNICATIONS

NETWORK ARCHITECT

Individuals pursuing this position need an extensive background in all aspects of networking technology. They must possess excellent written and oral communication skills, along with strong interpersonal and leadership abilities. Employers generally seek a

bachelor's degree in a computer-related field, along with at least seven years of experience with network operating systems such as Cisco, Novell and Windows Server. Network architects also should have experience working with routers, switches, cabling and other essential network hardware. A networking certification from sources such as Cisco, Microsoft or Novell also is highly valued.

Typical duties include:

- Assessing business and applications requirements for corporate data and voice networks
- Planning, designing and upgrading network installation projects
- Establishing and maintaining backup, version-control and viral defense systems
- Troubleshooting network architecture and making recommendations for system fixes and enhancements
- Making recommendations for leveraging network installations and reducing operational costs

NETWORK MANAGER

Companies hiring network managers seek candidates who have experience working with data and voice networking, along with excellent operational knowledge of network hardware and software. In addition, network managers need outstanding interpersonal, management, and oral and written communication skills, as well as the ability to multitask. Employers look for 10 or more years of experience in a networking environment combined with several years of experience managing technical personnel. A Microsoft, Cisco or similar professional certification also is valuable.

Typical duties include:

- Directing day-to-day operations and maintenance of the firm's networking technology
- Collaborating with network engineers, architects and other team members on the implementation, testing, deployment and integration of network systems
- Providing reports to IT management regarding network system performance, utilization and compliance
- Managing and mentoring a staff of network technicians



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NETWORK ENGINEER

Network engineers must be detail-oriented and have in-depth knowledge of networking hardware and software. A bachelor's degree in computer science or electrical engineering and five or more years of experience in areas such as network design and implementation, LAN/WAN interfacing, security, Internet protocols and TCP/IP, and server and network infrastructure are typical job requirements. A professional certification, such as the Cisco Certified Internetwork Expert (CCIE), also is highly desirable.

Typical duties include:

- Engineering enterprise data, voice and video networks
- Establishing and operating network test facilities
- Maintaining a secure transfer of data to multiple locations via internal and external networks
- Working with vendors, clients, carriers and technical staff on network implementation, optimization and ongoing management
- Providing high-level support and technical expertise in networking technology, including LAN/WAN hardware, hubs, bridges and routers

WIRELESS NETWORK ENGINEER

Candidates for the position of wireless network engineer need strong analytical and problem-solving skills, and must be knowledgeable about all aspects of network technology. A background in wireless equipment, standards, protocols and WLAN design is considered ideal. Candidates also must be effective communicators in order to collaborate successfully with network technicians, vendors and managers. Employers typically look for a bachelor's degree in computer science, engineering or a related field (or equivalent work experience), plus five or more years in LAN/WAN engineering and design work, including several years specializing in wireless technologies such as Wi-Fi, WiMax and WAP. Professional certifications such as the Certified Wireless Network Professional (CWNP) also are valuable.

Typical duties include:

- Researching, designing and implementing wireless networks, including all engineering specifications and resource requirements for network hardware and software

- Making recommendations for wireless network optimization, additions and upgrades to meet business requirements
- Conducting and documenting RF (radio frequency) coverage and site surveys
- Documenting network infrastructure and design

NETWORK ADMINISTRATOR

Network administrators need solid technical skills and experience with a variety of network protocols, software and hardware involved in LAN and WAN operations. The position requires strong troubleshooting, analytic and diagnostic skills, along with good communication abilities. In addition, firms may require the individual to be on call 24/7 in case of network failures or emergencies. While some employers prefer a bachelor's degree in computer science or information systems, five or more years of work experience, as well as professional certifications offered by Microsoft, Cisco and others, often can be substituted.

Typical duties include:

- Administering the operation of all LAN/WAN-related network services according to company policies and procedures
- Coordinating and implementing network software and hardware upgrades
- Troubleshooting and resolving LAN/WAN performance, connectivity and related network problems
- Administering LAN/WAN security, antivirus and spam control measures

PRE-SALES ENGINEER/ TECHNICAL ENGINEER

Candidates seeking a position as a pre-sales/technical sales engineer need proven technology skills, combined with outstanding interpersonal and teamwork abilities. They should possess strong written and verbal communication skills, attention to detail, and analytical and problem-solving capabilities. A positive, service-oriented personality is required as these individuals will often meet with clients or potential clients as part of the sales team. Many positions require a substantial amount of travel. Employers generally seek a bachelor's



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degree or equivalent combination of education and work experience in engineering, information systems or business administration, depending on the product or service being sold. Five years of industry experience, including two or more years in sales engineering or consulting work, are typically required.

Typical duties include:

- Collaborating as a member of a sales support or account team by participating in customer presentations as the technical expert
- Determining technical requirements to meet client goals and acting as the liaison between the firm's sales/business development and engineering groups
- Responding to RFIs (requests for information) or RFPs (requests for proposals) from current or potential customers with technical details of proposed solutions
- Coordinating the transition between pre-sales specifications and implementation engineering upon the awarding of contracts

TELECOMMUNICATIONS MANAGER

Telecommunications managers should have an extensive background in telecommunications practice, including hands-on experience with associated hardware and software. They should have excellent communication, staff management, problem-solving and organizational abilities. Employers generally seek a bachelor's degree in a related field, along with a minimum of five years of telecommunications experience, plus two or more years as a supervisor or manager.

Typical duties include:

- Overseeing a team of analysts and technicians who support a firm's telecommunications infrastructure
- Managing the telecommunications budget and analyzing expenditures for cost containment
- Evaluating equipment vendors; building relationships with service providers; and coordinating equipment installation, relocation and removal
- Researching and making recommendations to IT management related to telecommunications systems upgrades, improvements and long-range strategy

TELECOMMUNICATIONS SPECIALIST

Telecommunications specialists need a detailed understanding of telecommunications theory and practice. They should have solid technical skills, as well as interpersonal and organizational abilities. Employers may seek an associate's degree in electronics or a related field but are equally interested in several years of hands-on experience with communications equipment. Experience working with the specific hardware used in the company's telecommunications system, as well as with cabling and transmission test equipment, is highly valued.

Typical duties include:

- Installing, configuring and maintaining voice, data and video equipment
- Installing and testing cabling
- Investigating and resolving trouble ticket items and making necessary equipment repairs
- Resolving circuit issues
- Maintaining system logs and records

OPERATIONS MANAGER

An in-depth background in computer operations combined with supervisory experience is required for the position of operations manager. Managers should have excellent planning, project management and problem-solving skills, along with superior communication and interpersonal abilities. A bachelor's degree in a computer-related field or equivalent work experience is a standard requirement. Firms normally seek a minimum of five years of operations experience in combination with three or more years of managing technical personnel.

Typical duties include:

- Directing and managing the daily activities of the computer operations department
- Supervising a staff of computer operators and other technicians, assigning their duties and preparing performance reviews
- Analyzing system malfunctions or technical problems and directing appropriate resolution to ensure uninterrupted operations
- Coordinating operations information and activities with other IT managers



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COMPUTER OPERATOR

Computer operators need to be detail-oriented team players with good analytical and troubleshooting skills. Candidates also must possess the ability to multitask. They should have a strong service orientation and be able to maintain a flexible work schedule. Employers seek candidates with good working knowledge of the hardware and operating system environment used by their firm. A formal postsecondary education often is less critical than several years of related work experience, although system certification is a valuable asset. Typical duties include:

- Operating and monitoring mainframe computer equipment and peripherals
- Performing system backups
- Identifying equipment problems and initiating corrective action
- Keeping required logs and system records according to departmental procedures

MAINFRAME SYSTEMS PROGRAMMER

Systems programmers must possess experience with mainframe computer programming languages and applications development. They should be analytical problem solvers with good communication and organizational skills and have the ability to work individually and as part of a technical team. Typical requirements include a bachelor's degree in computer science or a related field, plus three to five years of work experience in the development of complex systems in a mainframe environment. Additional work experience can sometimes be substituted for the educational requirement.

Typical duties include:

- Designing logic, writing code, and testing and debugging mainframe computer applications
- Installing and implementing programs and upgrades
- Diagnosing and resolving system problems in coordination with other technical team members
- Documenting procedures for mainframe configuration and operation

QUALITY ASSURANCE (QA) & TESTING

QA/TESTING MANAGER

QA/testing managers have an extensive background in assurance methodologies and procedures, along with excellent written and oral communication, problem-solving, organizational and presentation skills. Employers typically look for six or more years of experience in QA, along with several years of technical managerial experience and a bachelor's degree in information systems, computer science or a related field.

Typical duties include:

- Managing a group of quality assurance analysts/testers and directing their work
- Establishing quality assurance and/or quality control policies in accordance with best practices and defining benchmarks and measures
- Preparing budget and staffing plans and recommendations
- Ensuring proper coordination and collaboration with technical teams

QA ANALYST/TESTER

Candidates for QA analyst/tester positions must have excellent problem-solving skills, along with keen attention to detail and outstanding written and oral communication abilities. A bachelor's degree in computer science or a related discipline teamed with several years of experience in a QA environment are typical requirements, although work experience can sometimes be substituted for formal education.

Typical duties include:

- Developing and executing software test plans
- Identifying and facilitating issue resolution with functional and technical groups
- Managing software beta test programs
- Documenting test results





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SECURITY

DATA SECURITY ANALYST

Data security analysts must possess a thorough understanding of all aspects of computer and network security, including such areas as firewall administration, encryption technologies and network protocols. Analysts need strong oral and written communication, analytical, and problem-solving skills, as well as excellent judgment and self-motivation. They should be able to multitask and work well under pressure. It is important that candidates keep abreast of industry security trends and developments, as well as applicable government regulations. Employers generally seek a bachelor's degree in a computer-related field, along with at least three years of practical data security experience. A professional certification such as the Certified Information Systems Security Professional (CISSP) designation also is a valuable asset.

Typical duties include:

- Performing security audits, risk assessments and analysis
- Making recommendations for enhancing data systems security
- Researching attempted breaches of data security and rectifying security weaknesses
- Formulating security policies and procedures

SYSTEMS SECURITY ADMINISTRATOR

Systems security administrators must demonstrate technical knowledge of data systems security procedures and familiarity with systems hardware and software. They should have good communication skills and the ability to work well in a team setting. It is important that candidates keep abreast of industry security trends and developments, as well as applicable government regulations. A bachelor's degree in computer science or a related field, plus several years of computer systems and security-related experience, are typical requirements for the job, although relevant work experience can sometimes be substituted for a four-year degree.

Typical duties include:

- Creating, modifying and deleting user accounts
- Monitoring systems security and responding to security incidents
- Participating in security systems testing

- Ensuring integrity and confidentiality of sensitive data
- Preventing and detecting intrusion

NETWORK SECURITY ADMINISTRATOR

Individuals interested in a network security administrator position need a strong technical background, including working knowledge of network management protocols, networking architecture, authentication practices and security administration. It is important that candidates keep abreast of industry security trends and developments, as well as applicable government regulations. They also should have excellent troubleshooting and communication skills. Employers typically seek a bachelor's degree in a technical field, along with three to six years of relevant experience.

Typical duties include:

- Implementing network security policies and procedures
- Administering and maintaining firewalls
- Managing, monitoring and updating malware prevention systems
- Monitoring security advisory groups to ensure all necessary network security updates, patches and preventive measures are in place
- Performing intrusion detection analysis
- Preventing and detecting intrusion

NETWORK SECURITY ENGINEER

Network security engineers must be able to translate security policies and procedures into technical architectures. Employers seek strong working knowledge of data and network security technologies, as well as at least five years of experience installing, monitoring and maintaining network security solutions. Candidates should have excellent organizational, multitasking and communication skills. A four-year college degree in a technical field and a Cisco or other security-related certification may also be required.

Typical duties include:

- Analyzing performance, identifying areas of concern and formulating action plans
- Creating and maintaining documentation of network configurations and processes
- Post-deployment monitoring and testing
- Planning, testing and executing upgrades as necessary



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INFORMATION SYSTEMS SECURITY MANAGER

The position of information systems security manager requires an individual with a strong technical background in systems and network security, along with excellent interpersonal and leadership abilities. Superior analytical and problem-solving skills, as well as exceptional written and verbal communication skills, also are essential. It is important that candidates keep abreast of industry security trends and developments, as well as applicable government regulations. Employers normally seek a bachelor's degree in information systems, computer science or a related discipline (or an equivalent combination of education and experience), along with five or more years of systems and network security experience. One or more years of managerial experience may also be required. Industry certifications such as the Certified Information Systems Security Professional (CISSP) or the CompTIA Security+ also are commonly sought by employers.

Typical duties include:

- Providing leadership, guidance and training to information systems security personnel
- Reviewing, implementing, updating and documenting companywide information security policies and procedures
- Managing security audits, vulnerability and threat assessments and directing responses to network or system intrusions
- Ensuring fulfillment of legal and contractual information security and privacy mandates, including providing executive management with compliance reports and audit findings
- Preventing and detecting intrusion

SOFTWARE DEVELOPMENT PRODUCT MANAGER

Product managers need a blend of business and marketing talent combined with technical knowledge. They should have excellent communication skills, including the ability to deal effectively with both technical staff and business/sales professionals, as well as a

capacity for seeing the big picture in terms of product life cycle. Requirements include a bachelor's degree in computer science or business, plus five or more years of experience in software product management. For some positions, an MBA is highly desirable.

Typical duties include:

- Coordinating work with software engineers and developers to define product requirements
- Working with sales and marketing to define customer needs, market potential, competitive analysis and marketing strategy
- Writing product information materials to brief sales personnel on product features and benefits
- Assisting with trade show presentations of the product

SOFTWARE ENGINEER

Candidates for a software engineer position should have broad information systems experience. They should be adept at working in a team environment and possess excellent communication and problem-solving skills. Most jobs require a minimum of a bachelor's degree in computer science, electrical engineering, computer engineering or a related discipline. Several years' experience in specific programming languages, such as C#/C++, Java or Visual Basic .NET, depending on what the employer is using, also is valuable.

Typical duties include:

- Designing and creating engineering specifications for software programs and applications
- Working with quality assurance to develop software test plans
- Collaborating with hardware engineers to assess and test hardware and software interaction
- Implementing a specific development methodology
- Documenting software specifications

SOFTWARE DEVELOPER

Software developers need to be detail-oriented and have excellent problem-solving and analytical abilities. They should have good communication skills and be able to work independently and as part of a development team. Employers normally require a bachelor's



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degree in computer science or a similar field but may accept a two-year technical degree if combined with several years of practical experience. Equally important are programming skills in languages and frameworks such as C#/C++, HTML, Java/Java Enterprise Edition, Microsoft .NET and SQL Server. A minimum of two to three years of programming experience is a typical requirement. Complex projects may call for additional years of demonstrated achievement.

Typical duties include:

- Coding, testing and debugging programs according to computer engineering specifications
- Modifying, expanding and updating applications
- Communicating with a team that includes analysts, engineers and quality assurance testers in order to coordinate and document application development and testing
- Developing software prototypes

TECHNICAL SERVICES, HELP DESK & TECHNICAL SUPPORT

MANAGER

Managers of technical support services need extensive experience with supported software and hardware, as well as excellent interpersonal, business management and customer service skills. The position also requires strong leadership skills. Employers typically seek a bachelor's degree in information systems or a related discipline with at least five years of operations and support experience, plus three or more years in a managerial role. Professional certifications such as the Microsoft Certified Systems Engineer (MCSE), HDI's Support Center Manager certification or experience with the Information Technology Infrastructure Library (ITIL) also are valuable.

Typical duties include:

- Managing the daily operations of a firm's help desk and support services
- Managing staff, including hiring, training, scheduling work assignments and conducting evaluations
- Monitoring response times, evaluating user satisfaction levels and making recommendations for improvement

- Evaluating and managing technical support systems hardware and software and making recommendations regarding upgrades or changes
- Negotiating, writing and reporting on internal and external service level agreements

DESKTOP SUPPORT ANALYST

Candidates for a desktop support analyst position should have extensive experience with desktop hardware, software applications, operating systems and network connectivity. They must be customer service-oriented and proactive in anticipating and resolving problems while maximizing efficient use of computing resources. A bachelor's degree in a computer-related field and three to five years of experience installing and supporting PC and laptop hardware and software are standard requirements, although some employers are willing to substitute work experience for formal education. Additional requirements may include professional certifications from entities such as HDI (Desktop Support Technician or Support Center Analyst), CompTIA or Microsoft (Microsoft Certified IT Professional or Microsoft Certified Systems Administrator).

Typical duties include:

- Maintaining an inventory of installed software, managing software licensing, and creating policies and procedures for upgrades
- Working with hardware and software vendors to verify timely product delivery and ensuring that new equipment is installed and ready to operate on schedule
- Analyzing and making recommendations for hardware and software standardization
- Creating user accounts and managing access control based on company policies

SYSTEMS ADMINISTRATOR

Systems administrators should possess strong problem-solving, analytical and communication skills in addition to in-depth technical knowledge of the employer's systems hardware and software. Employer requirements vary depending on system complexity, the types of operating and network systems being supported, and the size of the organization. While some employers require a



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bachelor's degree in computer science or a related field, others may accept an associate's degree or technical training certificate. Three to five years of experience working with the specific types of hardware and software systems used by the company are generally required. Professional certifications such as the Microsoft Certified Systems Administrator (MCSA), Microsoft Certified Systems Engineer (MCSE) or Sun Certified System Administrator (SCSA) may be commonly sought by employers. Typical duties include:

- Installing operating system software, patches and upgrades
- Analyzing, troubleshooting and resolving system hardware, software and networking issues
- Configuring, optimizing, fine-tuning and monitoring operating system software and servers
- Performing system backups and recovery
- Conducting server builds

SYSTEMS ENGINEER

In addition to in-depth technical knowledge of the employer's software and hardware, systems engineers need advanced analytical, troubleshooting and design skills. The ability to communicate with technical and nontechnical users also is essential. Employers may require extensive knowledge of the development process, including specification, documentation and quality assurance. Because of the broad range of demands systems engineers must meet, candidates who have demonstrated strong project planning skills often hold an advantage. Employers generally prefer candidates with five or more years of experience working with the specific hardware and software systems, as well as a bachelor's degree or equivalent experience.

Typical duties include:

- Developing, maintaining and supporting technical infrastructure, hardware and system software components
- Performing installation, maintenance and support of system software/hardware and user support
- Configuring, debugging and supporting multiple infrastructure platforms
- Performing high-level root cause analysis for service interruption recovery and creating preventive measures

HELP DESK (TIERS 1, 2 & 3)

All help desk personnel need excellent problem-solving, communication and interpersonal skills, along with patience, a customer-friendly attitude and the ability to work in a team environment. In addition, they should have a strong technical understanding of the various hardware, software and networking systems being supported. Employer requirements depend on the help desk position level. Tier 1, an entry-level position, normally requires less than two years of work experience and may require an associate's degree or completion of coursework at a technical school. Tier 2 positions typically require two to four years of work experience and may require a bachelor's degree or a two-year degree and additional, equivalent work experience in a help desk setting. Tier 3 positions often require four or more years of help desk experience, a bachelor's degree in computer science or a related field and/or professional certification, such as HDI's Customer Service Representative or Support Center Analyst or the Microsoft Certified Systems Engineer (MCSE) designation.

Typical duties include:

Tier 3

- Researching and resolving the most difficult and complex problems that other help desk levels have been unable to resolve
- Analyzing and identifying trends in issue reporting and devising preventive solutions
- Mentoring other help desk personnel on hardware and software problem analysis and resolution

Tier 2

- Resolving more complex issues requiring detailed systems and applications knowledge; these issues have been escalated from Tier 1
- Making the decision to generate a trouble or work order ticket for issues that will require a visit to the user's PC or workstation

Tier 1

- Taking initial telephone or email inquiries and troubleshooting and managing relatively simple hardware, software or network problems
- Recognizing and escalating more difficult problems to Tier 2 support
- Logging call activity



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INSTRUCTOR/TRAINER

Candidates for an instructor/trainer position require a combination of in-depth subject-matter expertise and excellent communication and presentation skills. They must be able to explain sometimes difficult technical material clearly and patiently to students with varying levels of proficiency. Candidates should be outgoing and comfortable working with diverse groups of people while maintaining professionalism at all times. A bachelor's degree in a related subject area may be preferred by some employers. Breadth of technical knowledge and at least one year of training experience also are required. Certification, such as a Microsoft Certified Trainer (MCT) designation, also can be useful.

Typical duties include:

- Determining training objectives and developing a course curriculum
- Creating course materials, handouts, instructional aids, audio/visual materials and similar teaching aids
- Conducting classroom training
- Testing and evaluating student performance

PC TECHNICIAN

PC technicians need excellent problem-solving and customer service skills, as well as thorough knowledge of PC hardware, software and network connections. Employers look for relevant training, which may include an associate's degree or completion of coursework through a technical school, as well as hands-on experience working with PC hardware and software. One to five years of previous experience may be required, depending on the complexity of the position. Professional certifications, such as the CompTIA IT Technician or Microsoft Certified IT Professional designation, also provide important skills validation and may be a requisite.

Typical duties include:

- Installing, configuring and maintaining desktop and laptop PCs and peripherals such as printers
- Installing and configuring application and operating system software and upgrades

- Troubleshooting and repairing hardware and network connectivity issues
- Removing old equipment and performing data migration to new machines

BUSINESS CONTINUITY ANALYST

Individuals interested in a business continuity analyst position need excellent analytical, organizational, communication and documentation skills. A background in project management and/or business or systems analysis, and in-depth knowledge of a business sector such as finance or securities, is considered ideal. Employers typically seek five or more years of experience in IT-related positions, along with several years of business continuity planning experience. A minimum of a bachelor's degree in computer science or a related field is a standard educational requirement.

Typical duties include:

- Analyzing critical business functions and defining the scope and impact of disaster scenarios
- Designing, planning and implementing an enterprise-wide business continuity plan
- Analyzing existing systems and recommending redundant, fault-tolerant solutions to ensure business continuity and duplication of all critical data
- Devising, scheduling and implementing business continuity tests and analyzing results
- Documenting business continuity and business continuity procedures, and making presentations and recommendations to senior management
- Ensuring that the firm and its data systems are in compliance with regulations such as the Sarbanes-Oxley Act, Gramm-Leach-Bliley Act and Health Insurance Portability and Accountability Act in the United States or Multilateral Instrument 52-109 in Canada





TAMING BIG DATA

When you consider that more than 2.7 billion likes and comments are generated on Facebook every day³ — and that 15 out of 17 U.S. business sectors have more data stored per company than the U.S. Library of Congress⁴ — it's easy to understand why companies are seeking technology professionals who can crack the big data "code."

Until recently, information collected and stored by companies was a mish/mash waiting to be synthesized. This was because most companies didn't have an effective way to aggregate it.

Now, more powerful and cost-effective computing solutions are allowing companies of all sizes to extract the value of their data quickly and efficiently. And when companies have the ability to tap a gold mine of knowledge locked in data warehouses, or quickly uncover relevant patterns in data coming from dynamic sources such as the Web, it helps them create more personalized online experiences for customers,

develop highly targeted marketing campaigns, optimize business processes and more.

Capturing the full potential of big data requires skilled technology talent. Here are some code-cracking, big-data positions that are already in high demand and are likely to remain so in the coming year, according to research conducted for the *Robert Half Technology 2013 Salary Guide*:

- Database administrators
- Data mining engineers
- Data modelers
- Data warehouse experts
- Business intelligence developers

Filling these positions is proving to be a challenge for many employers. One reason is the overall shortage of skilled IT talent available for hire.

³"Facebook generates \$1.21 per user on average worldwide in Q1," Brittany Darwell, Inside Facebook, April 23, 2012, <http://www.insidefacebook.com/2012/04/23/facebook-generates-1-21-per-user-on-average-worldwide/>.

⁴*Big Data: The next frontier for innovation, competition, and productivity*, Brad Brown, Jacques Bughin, Michael Chui, Richard Dobbs, Angela Hung Byers, James Manyika and Charles Roxburgh, McKinsey Global Institute, May 2011, http://www.mckinsey.com/insights/mgi/research/technology_and_innovation/big_data_the_next_frontier_for_innovation.



Another factor is that many companies building big-data teams, from online retailers to financial institutions to marketing agencies, are looking specifically for candidates who possess that ideal union of business knowledge, technology expertise and analytics skills. This mix of talents is valuable because companies that want to leverage big data need team members who know how to gather data from disparate sources, quickly extract relevant information, and distill it into digestible reports and dashboards for use by decision makers. Many firms also want technology personnel to explore and experiment with big data to help them uncover new insights and develop products and services.

Companies that are able to hire technology professionals with that perfect combination of business and **technical** acumen, and an eye for innovation, can harness the power of big data, giving them a significant edge.





BYOD UNLOCKS NEW OPPORTUNITIES



What do you get when you combine employees' personal devices with office network access? The "bring your own device" (BYOD) trend. It's

a sequence of events that's become so big that businesses can no longer ignore it. Yet only one in three employers (33 percent) interviewed for a Robert Half Technology survey said they currently allow their workers to access corporate networks using personal smartphones, tablets and other devices.⁵

Leading organizations are working to match their own needs with the needs of employees through BYOD policies. What many are discovering is that to make these arrangements successful for both the business and employees, the practice must be a union of formal policy and technical expertise. Both are needed to help ensure enterprise security, regulatory compliance and prevention of data loss. However, as Robert Half Technology's BYOD survey revealed, only 28 percent of firms that allow workers to access the corporate network using their own equipment offer full technical support; 66 percent provide limited support. For busy IT departments, especially

those that are resource-constrained, the vigilance required to monitor BYOD effectively is difficult to deliver.

While BYOD is challenging technology departments, it is also creating new roles and opportunities within the field. For instance, more firms are assembling mobile device management teams to "own" BYOD — from enforcing passwords to locking down lost or missing devices. Some employers have implemented mobile help desk services with representatives who provide BYOD-related technical support 24/7. And while sophisticated technology is making it easier for IT to control employees' network access when using personal devices, expertise is still required to fully maximize these solutions and apply settings appropriate to the organization's specific business needs and culture.

Companies that wait too long to embrace BYOD may be missing the "secret code" enabling them to recruit the best talent in the future — especially Millennial workers. In a global survey, about half of college students polled said they expect to be able to use their personal mobile devices to access corporate networks when they enter the workforce.⁶ This attitude underscores why proactively managing BYOD, and assembling the right technology talent to support these efforts, can position the company as an employer of choice.

⁵"No 'All-Access' Pass: Robert Half Technology Survey: Only One in Three Firms Allows Employees to Access Company Networks Using Personal Smartphones or Other Devices," Robert Half Technology, May 8, 2012, <http://rht.mediaroom.com/BYOD>.

⁶*Cisco Connected World Technology Report*, Cisco, Sept. 21, 2011, <http://www.cisco.com/en/US/netsol/ns1120/index.html>.



THE KEY TO IT STAFFING: A FLEXIBLE APPROACH

There's a change taking place in the way businesses staff their technology departments. Firms are increasingly attracted to the flexibility they can gain by using a combination of full-time staff and technology consultants. When asked in what ways their workforce would change in the next five years, 58 percent of employers polled in a report by the McKinsey Global Institute said they will hire more temporary and part-time workers.⁷

This approach gives firms greater control over their human resources budgets and access to skilled talent when, and for as long as, they need it. In fact, as companies continually rebalance their workforces in good and difficult times, many are discovering that a year-round mix of core employees and interim workers is the best way to stay nimble.

Here are the advantages of using temporary and project workers as part of your workforce mix:

- Enables the organization to adjust staffing levels to the ebb and flow of business demands, thus helping keep costs under control.
- Eases the burden on employees who may already be spread too thin because of business demands.
- Offers a way to handle special projects that are beyond the expertise of current staff members. More and more professionals are drawn to interim work because of the flexibility and opportunities it provides, giving companies access to a deep talent pool.
- Increases job stability for full-time workers. Otherwise, these professionals may be subject to nerve-racking cycles of hiring and layoffs as business needs fluctuate.
- Provides what amounts to a trial period for potential new employees. If you wish to convert a temporary worker to full time, you have the advantage of already knowing the person's strengths firsthand.

⁷*An economy that works: Job creation and America's future*, Byron Auguste, Susan Lund, James Manyika, Lenny Mendonca, Sreenivas Ramaswamy and Tim Welsh, McKinsey Global Institute, June 2011, http://www.mckinsey.com/Insights/MGI/Research/Labor_Markets/An_economy_that_works_for_US_job_creation.



ROBERT HALF TECHNOLOGY: YOUR KEY TO FINDING TALENT

Robert Half Technology is much more than just a resource for compensation data. We are the leading provider of highly skilled technology professionals on a full-time and temporary basis. In 2012, our parent company, Robert Half, was again named to FORTUNE® magazine's "World's Most Admired Companies" list, ranking first in the staffing industry (March 19, 2012).

We offer a valuable combination of services for your business that includes:

The right match — We can help you locate even the most hard-to-find professionals. We have hundreds of thousands of pre-evaluated, skills-tested individuals who are available to work right away.

Quick results — When you have a job opening, chances are you need immediate help. Our staffing experts use leading-edge technology to help shorten the search process. In addition, many have prior experience in information technology. They understand your business's unique needs.

Options to fit your needs — We offer a choice of candidates with varying levels of experience. So, no matter what your budget or requirements, we can identify a skilled professional for your firm.

Exceptional service — The hiring process is more complex than ever. We can guide you every step of the way and handle the most challenging aspects of finding skilled professionals for your business. Communication is our specialty.

Reliability — Few firms can match our experience and reputation for excellence. In fact, nine out of 10 of our clients and candidates would recommend our service to a colleague.

Contact Robert Half Technology at rht.com or **1.800.793.5533** to learn more about how we can assist with your staffing needs.



54

Average number of minutes CIOs spend conducting phone interviews for an open technology position.



106

Average number of minutes CIOs spend conducting in-person interviews for an open technology position.



36

Average number of minutes CIOs spend checking references for an open technology position.



34

Average number of minutes CIOs spend reaching out to their networks while trying to fill an open technology position.



\$1,300

Average amount CIOs spend on advertising an open technology position.



39

Average number of resumes CIOs receive for an open technology position.

WORLDWIDE LOCATIONS

United States

Arizona

Phoenix

California

City of Industry
Irvine
La Jolla
Los Angeles
Oakland
Ontario
Sacramento
San Francisco
San Jose
San Mateo
Stockton
Torrance
Westwood

Colorado

Colorado Springs
Denver

Connecticut

Hartford
Stamford

District of Columbia

Washington

Florida

Coral Gables
Fort Lauderdale
Jacksonville
Orlando
Tampa

Georgia

Atlanta – Buckhead

Illinois

Chicago
Hoffman Estates
Northbrook
Oakbrook Terrace

Indiana

Indianapolis – Downtown

Iowa

Cedar Rapids
Des Moines

Kansas

Overland Park

Kentucky

Louisville

Louisiana

New Orleans

Maryland

Baltimore
Bethesda

Massachusetts

Boston
Burlington
Westborough

Michigan

Grand Rapids
Southfield

Minnesota

Bloomington
Minneapolis

Missouri

St. Louis

Nevada

Las Vegas

New Hampshire

Manchester

New Jersey

Mount Laurel
Paramus
Parsippany
Princeton
Woodbridge

New Mexico

Albuquerque

New York

New York – Midtown
New York – Wall Street
Uniondale

North Carolina

Charlotte
Raleigh

Ohio

Akron
Cincinnati
Cleveland
Columbus
Dayton
Dublin

Oklahoma

Oklahoma City
Tulsa

Oregon

Portland



Pennsylvania

King of Prussia
Philadelphia
Pittsburgh

Rhode Island

Providence

South Carolina

Greenville

Tennessee

Memphis – East
Nashville – Downtown

Texas

Austin
Dallas – Downtown
Dallas – Galleria
Fort Worth
Houston – Galleria
Houston – Westchase
Houston – The Woodlands
San Antonio – Colonnade

Utah

Salt Lake City

Virginia

Richmond – West
Tysons Corner

Washington

Bellevue
Seattle

Wisconsin

Madison
Milwaukee

Australia

Brisbane
Melbourne
Perth
Sydney

Brazil

Belo Horizonte
Campinas
Rio de Janeiro
São Paulo

Canada

Alberta

Calgary – Downtown
Edmonton

British Columbia

Vancouver

Manitoba

Winnipeg

Ontario

Mississauga
North York
Ottawa
Toronto

Québec

Montréal

Chile

Santiago

China

Hong Kong (SAR)

Czech Republic

Prague

France

Aix-en-Provence
Paris – La Défense
Lyon

Germany

Berlin
Cologne
Düsseldorf
Essen
Frankfurt
Hamburg
Munich
Stuttgart

Japan

Osaka
Tokyo

New Zealand

Auckland

Singapore

Singapore

United Arab Emirates

Abu Dhabi
Dubai

United Kingdom

Birmingham
Bristol
London City
London West End
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