

# **A Combined Report for Broadband and Information Technology, Colorado Central Planning Region**

Prepared by

## **Arapahoe/Douglas Workforce Development Board**

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## Background

“Of all the technology trends that are taking place right now, perhaps the biggest one is the internet of things; it’s the one that’s going to give us the most disruption as well as the most opportunity over the next five years. This is a huge and fundamental shift. When we start making things intelligent, it’s going to be a major engine for creating new products and new services. By 2020, there will be well over 50 billion “things” talking to each other, performing tasks, and making decisions based on predefined guidelines using artificial intelligence.”

Daniel Burrus, Burrus Research, 2015

By 2020, there will be well over 50 billion “things” talking to each other, performing tasks, and making decisions based on predefined guidelines using artificial intelligence. Daniel Burrus, Burrus Research

The traditional industry classification system we use in workforce development was created in 2002. It classifies all the industries that make up the groups, or sectors that we call broadband and information technology as being separate, discreet entities.

As time has gone by, however, we see that the same companies that provide wired telecommunications are now also providing high speed internet access, wireless information streaming, and use satellites to deliver broadcast cable television and streaming videos to a variety of devices, including televisions, electronic notebooks and even cell telephones, which are now called ‘smart devices.’ Because of this trend, the Arapahoe/Douglas Workforce Development Board (Board) now identifies this cluster as the **broadband** sector.

Another group of supposedly discreet industries make up what the Board now identifies as the **information technology** sector. This includes software publishing, data hosting and related services, internet publishing and web hosting, and computer systems design and related services.

Computing and the free and fast flow of information have changed our social and economic fabric; these services are now ubiquitous across all industry sectors, local governments and households. This is the huge and fundamental shift to which Burrus refers in the quotation above. Where is the demarcation between these industries in an age of smart homes, smart buildings, smart bridges and roads? When we have “50 billion ‘things’ talking to each other,” who do we call? Who ‘does’ the cloud? Who sets it all up? Who maintains it? For this reason, **these two sectors, broadband and information technology (IT) have been combined for purposes of this report.**

Last fall, more than two dozen town governments, city councils and school boards in Colorado asked voters for approval to explore creating Internet networks of their own. Every ballot question won, most of them handily.

A handful of bigger metro-area communities — Centennial, Cherry Hills Village, Boulder, Thornton — have won voter approval of municipal broadband as well. But no community other than Longmont has proceeded on from a vote to launch residential high-speed Internet service yet.

“Both payoffs, perils loom for Colorado community Internet,”  
Greg Avery, Denver Business Journal, March 4, 2016

## Is Broadband Becoming a Utility?

What are the ramifications of pervasive smart technology? Technology that touches all aspects of our personal, work and public lives? Has broadband/IT service become a utility comparable to the power grid and water treatment in terms of our quality of life? If so, what are the ramifications to the companies that now deliver these services? How will the increasingly substantial expenditures necessary to drive upgrades in these services be made if not by these companies?

Coloradans are now squarely facing this issue at the ballot box. According to a March 4, 2016 article in the Denver Business Journal, the City of Longmont recently launched a \$40.3 million project to provide high speed internet downloads to residents and businesses. This has resulted in the ability to offer more data capacity (1 gigabit-per-second) at roughly a third of the cost of the 250 megabits-per-second business service that was provided by a large broadband company. Within the year, according to Greg Avery, the author of the article, this service will be available citywide within a year for any Longmont resident to order.

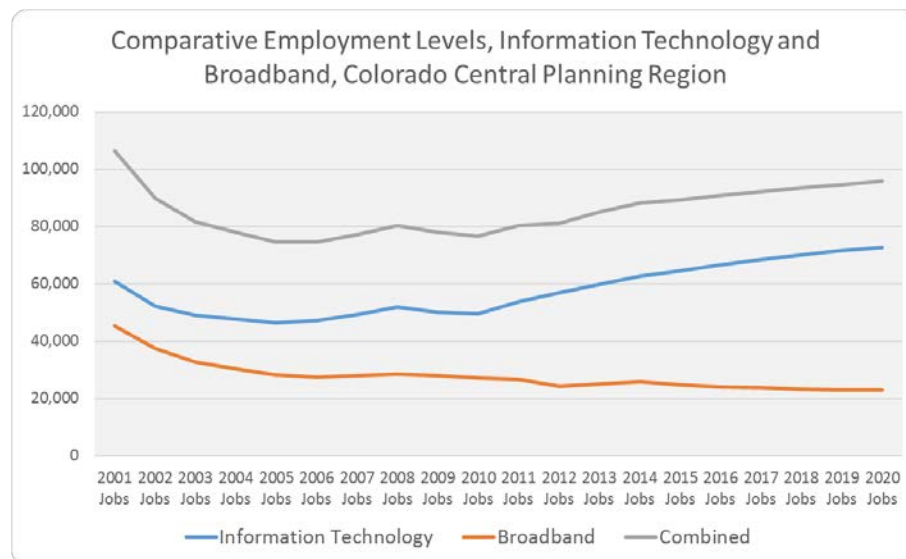
The Colorado Legislature is expected to see a bill in coming weeks that would repeal or modify the 2005 state law requiring voter approval before communities can pursue municipal broadband projects. This has sparked concern that communities could be led to jump into broadband too soon, without the brake of a public vote, and make expensive mistakes.

### Stance of Broadband/IT Companies

While broadband companies support public investment that provides high speed internet access to rural areas that would be unprofitable to reach otherwise. However, there is concern that municipalities that plan for, fund and attempt to execute high-speed broadband ‘without the brake of a public vote’ will make expensive mistakes. They cite the failed ‘Utopia Network’ project in Utah, which left 11 communities \$475 million in debt for a network that still isn’t functional and Colorado’s stimulus-funded Eagle Net project, which failed to deliver high speed broadband services to a group of rural school districts and cost \$110 million.

According to the article, the companies also worry about “the substantial investments they have made in bringing higher speeds to Front Range cities — investments that might not be worth it if they face growing competition.” Comcast has been circumspect about its own stance, saying that it wants to “work with broadband providers to promote private investment,” and that locally owned and operated networks could prove to be a “disincentive to investing the hundreds of millions of dollars it takes to provide services.”

### Broadband/IT in the Colorado Central Planning Region



In 2001, before the dot-com bust, there were 106,000 people employed in the combined broadband/IT sector. This made up just under 6.5% of total employment in the region.

This year, according to Economic Modeling Specialists, Inc. (EMSI), the combined sector employs just under 91,000 people, and makes up 4.8% of the region’s total employment.

While technological leverage has in a real sense kept

employment down while at the same time dramatically growing productivity, the excess capacity that existed through the previous decade now seems to be gone. **What this means is ever greater demand for people with the specific skills needed by the industry.** Employment is expected to grow 12.9% through 2020 (2.6% annually).

## The Combined Industry Group

Combined Broadband/IT Sector, Colorado Central Planning Region										
NAICS	Description	Sub-Sector	2016 Jobs	2017 Jobs	2018 Jobs	2019 Jobs	2020 Jobs	2016 - 2020 Change	2016 - 2020 % Change	2015 Location Quotient
541512	Computer Systems Design Services	IT	23,246	24,341	25,330	26,238	26,937	3,691	16%	1.94
541511	Custom Computer Programming Services	IT	20,279	21,197	22,026	22,790	23,383	3,104	15%	1.80
517110	Wired Telecommunications Carriers	Broadband	17,058	16,792	16,589	16,431	16,394	(664)	(4%)	2.39
511210	Software Publishers	IT	10,175	9,934	9,741	9,582	9,515	(660)	(6%)	2.73
518210	Data Processing, Hosting, and Related Services	IT	7,560	7,650	7,702	7,726	7,674	114	2%	2.10
515210	Cable and Other Subscription Programming	Broadband	3,020	3,055	3,093	3,134	3,184	164	5%	3.93
519130	Internet Publishing and Broadcasting and Web Search Portals	IT	2,766	2,843	2,895	2,930	2,918	152	5%	1.22
541519	Other Computer Related Services	IT	1,829	1,771	1,726	1,689	1,675	(154)	(8%)	1.31
515120	Television Broadcasting	Broadband	1,463	1,471	1,475	1,478	1,475	12	1%	0.91
517210	Wireless Telecommunications Carriers (except Satellite)	Broadband	1,414	1,267	1,145	1,043	987	(427)	(30%)	0.88
541513	Computer Facilities Management Services	IT	737	708	685	666	656	(81)	(11%)	0.93
517911	Telecommunications Resellers	Broadband	561	445	354	284	247	(314)	(56%)	1.05
517410	Satellite Telecommunications	Broadband	373	393	410	424	440	67	18%	3.12
517919	All Other Telecommunications	Broadband	234	230	231	235	244	10	4%	0.69
Totals			90,716	92,098	93,401	94,648	95,728	5,012	6%	

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

The broadband and IT sectors have been addressed separately in prior years, but the Arapahoe/Douglas Workforce Development Board has lately noted that technological advances in all aspects of computing have led to similarities in sector staffing needs. The Board now believes that addressing the workforce development needs in these two sectors together is justified.

## Employment Concentration by County

Regional Concentration by County, Broadband				Regional Concentration by County, Information Technology			
County Name	2015 Jobs	Current Wages, Salaries, & Proprietor Earnings	2015 Location Quotient	County Name	2015 Jobs	Current Wages, Salaries, & Proprietor Earnings	2015 Location Quotient
Arapahoe County, CO	9,876	\$111,267	4.24	Denver County, CO	15,531	\$105,077	1.65
Denver County, CO	4,801	\$92,760	1.38	Arapahoe County, CO	14,691	\$104,165	2.34
Douglas County, CO	3,216	\$110,030	3.77	Boulder County, CO	13,375	\$114,779	3.80
Broomfield County, CO	2,514	\$152,976	9.65	Jefferson County, CO	7,229	\$89,266	1.55
Adams County, CO	1,446	\$78,169	1.01	Douglas County, CO	5,159	\$109,379	2.25
Boulder County, CO	1,368	\$77,438	1.04	Larimer County, CO	3,541	\$79,111	1.17
Jefferson County, CO	903	\$70,739	0.52	Broomfield County, CO	3,424	\$112,800	4.89
Larimer County, CO	627	\$56,339	0.56	Adams County, CO	1,476	\$94,607	0.38
Gilpin County, CO	<10	Insf. Data	0.02	Gilpin County, CO	24	\$70,334	0.27
Clear Creek County, CO	<10	Insf. Data	0.05	Clear Creek County, CO	18	\$62,983	0.26

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

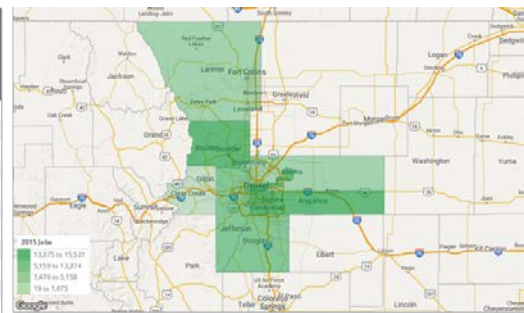
The strength of an industry sector in a given geography is measured in two ways: by number of people employed, and by employment concentration (location quotient). Location quotient is simply a comparison of the concentration of employment in a geographic area in relation to the national average. So, in the case of the combined broadband/IT sector shown in the table above, we would say, "Employment concentration in Arapahoe County in this sector is 2.34

times higher than the national average."

- Over 13,000 people are employed in the **broadband** sector in the Arapahoe/Douglas area, with employment concentrations 4 times the national average
- In the **information technology** sector, Denver County employs the most people (over 15,500), followed closely by Arapahoe (14,700) and Boulder (13,400). Aside from Broomfield, Boulder has the highest concentration of employment in the IT sector at 3.80 times the national average.
- **When the two sectors are combined,** the Arapahoe/Douglas area employs the most people (nearly

Regional Concentration by County, Broadband/IT Sector			
County Name	2015 Jobs	Current Wages, Salaries, & Proprietor Earnings	2015 Location Quotient
Denver County, CO	15,531	\$105,077	1.65
Arapahoe County, CO	14,691	\$104,165	2.34
Boulder County, CO	13,375	\$114,779	3.80
Jefferson County, CO	7,229	\$89,266	1.55
Douglas County, CO	5,159	\$109,379	2.25
Larimer County, CO	3,541	\$79,111	1.17
Broomfield County, CO	3,424	\$112,800	4.89
Adams County, CO	1,476	\$94,607	0.38
Gilpin County, CO	24	\$70,334	0.27
Clear Creek County, CO	18	\$62,983	0.26

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker



20,000) in broadband/IT, with an employment concentration around 2.3 times the national average.

### Broadband/IT Staffing Pattern

This table shows the top 20 jobs in the combined broadband/IT sector by percent of total employment within the sector. Projections of change in employment by occupation on this table are ONLY within the combined broadband/IT sector, not across all sectors in the region.

Staffing Pattern, Broadband/IT Sector, Denver-Aurora-Lakewood MSA, Boulder and Larimer Counties									
SOC	Description	Employed in Industry Group (2015)	Employed in Industry Group (2020)	Change (2015 - 2020)	% Change (2015 - 2020)	% of Total Jobs in Industry Group (2015)	Median Hourly Earnings	Typical Entry Level Education	Typical On-The-Job Training
15-1132	Software Developers, Applications	12,151	13,524	1,373	11%	13.6%	\$47.45	Bachelor's degree	None
15-1133	Software Developers, Systems Software	5,195	5,863	668	13%	5.8%	\$49.89	Bachelor's degree	None
41-3099	Sales Representatives, Services, All Other	4,689	4,783	94	2%	5.3%	\$25.92	High school diploma or equivalent	Short-term
15-1151	Computer User Support Specialists	4,412	5,078	666	15%	4.9%	\$25.51	Some college, no degree	Moderate-term
43-4051	Customer Service Representatives	4,057	4,029	(28)	(1%)	4.5%	\$15.79	High school diploma or equivalent	Short-term
15-1121	Computer Systems Analysts	3,950	4,568	618	16%	4.4%	\$40.09	Bachelor's degree	None
13-1199	Business Operations Specialists, All Other	3,802	3,712	(90)	(2%)	4.3%	\$34.79	High school diploma or equivalent	None
15-1142	Network and Computer Systems Administrators	3,097	3,291	194	6%	3.5%	\$39.39	Bachelor's degree	None
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	2,794	2,806	12	0%	3.1%	\$32.43	Postsecondary non-degree award	Moderate-term
15-1131	Computer Programmers	2,451	2,771	320	13%	2.7%	\$40.54	Bachelor's degree	None
11-3021	Computer and Information Systems Managers	2,138	2,402	264	12%	2.4%	\$67.37	Bachelor's degree	None
15-1199	Computer Occupations, All Other	2,068	2,159	91	4%	2.3%	\$44.19	Bachelor's degree	None
15-1143	Computer Network Architects	1,916	2,010	94	5%	2.1%	\$49.25	Bachelor's degree	None
15-1134	Web Developers	1,781	2,083	302	17%	2.0%	\$25.97	Associate's degree	None
11-1021	General and Operations Managers	1,758	1,919	161	9%	2.0%	\$52.07	Bachelor's degree	None
13-1161	Market Research Analysts and Marketing Specialists	1,569	1,750	181	12%	1.8%	\$32.85	Bachelor's degree	None
15-1152	Computer Network Support Specialists	1,555	1,640	85	5%	1.7%	\$31.87	Associate's degree	None
13-2011	Accountants and Auditors	1,508	1,553	45	3%	1.7%	\$33.37	Bachelor's degree	None
17-2072	Electronics Engineers, Except Computer	1,435	1,363	(72)	(5%)	1.6%	\$46.50	Bachelor's degree	None
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	1,343	1,427	84	6%	1.5%	\$40.03	Bachelor's degree	Moderate-term

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

### Competitive Wage Analysis

This table gauges labor supply by the relationship between the number of people registered in Connecting Colorado, the workforce development system's statewide database, and projected annual openings for each occupation. Note the table represents employment in these occupations across all industries in the region.

Competitive Wage Analysis, Top Broadband/IT Occupations, Denver-Aurora-Lakewood MSA, Boulder and Larimer Counties											
SOC	Description	2015 Jobs	Annual Openings	Available Applicants	Applicants per Opening	Median Hourly Earnings	Pct. 10 Hourly Earnings	Pct. 25 Hourly Earnings	Avg. Hourly Earnings	Pct. 75 Hourly Earnings	Pct. 90 Hourly Earnings
13-2011	Accountants and Auditors	27,960	1,407	180	0.1	\$33.37	\$20.35	\$25.34	\$36.31	\$43.54	\$55.69
13-1161	Market Research Analysts and Marketing Specialists	10,451	537	244	0.5	\$32.85	\$18.88	\$24.41	\$38.41	\$45.41	\$64.59
15-1132	Software Developers, Applications	19,643	644	407	0.6	\$47.45	\$29.94	\$37.95	\$48.51	\$58.03	\$70.05
17-2072	Electronics Engineers, Except Computer	4,094	125	82	0.7	\$46.50	\$29.91	\$36.40	\$48.19	\$59.42	\$71.71
15-1133	Software Developers, Systems Software	9,971	313	218	0.7	\$49.89	\$32.38	\$40.51	\$50.73	\$60.46	\$72.50
13-1199	Business Operations Specialists, All Other	32,438	850	785	0.9	\$34.79	\$18.64	\$25.02	\$37.35	\$46.15	\$59.85
15-1121	Computer Systems Analysts	8,328	439	407	0.9	\$40.09	\$27.25	\$32.49	\$45.02	\$51.79	\$66.83
15-1143	Computer Network Architects	3,435	108	116	1.1	\$49.25	\$27.72	\$37.48	\$48.69	\$58.80	\$70.86
15-1134	Web Developers	3,094	140	160	1.1	\$25.97	\$17.85	\$20.46	\$28.44	\$34.40	\$43.92
11-1021	General and Operations Managers	28,621	1,128	1,635	1.4	\$52.07	\$24.66	\$34.91	\$62.41	\$82.09	\$118.78
41-3099	Sales Representatives, Services, All Other	17,675	794	1,180	1.5	\$25.92	\$11.65	\$17.07	\$31.13	\$38.53	\$56.81
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	3,400	111	192	1.7	\$32.43	\$18.98	\$26.80	\$30.48	\$35.60	\$37.53
15-1131	Computer Programmers	3,786	202	370	1.8	\$40.54	\$26.30	\$32.33	\$44.66	\$53.92	\$75.32
15-1152	Computer Network Support Specialists	3,129	88	168	1.9	\$31.87	\$20.00	\$24.21	\$33.47	\$41.67	\$51.10
15-1142	Network and Computer Systems Administrators	8,154	271	539	2.0	\$39.39	\$24.73	\$31.23	\$39.54	\$47.31	\$56.24
15-1151	Computer User Support Specialists	10,900	478	951	2.0	\$25.51	\$16.76	\$20.33	\$27.22	\$32.80	\$41.33
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	5,473	195	403	2.1	\$40.03	\$18.17	\$25.81	\$45.03	\$54.35	\$79.96
15-1199	Computer Occupations, All Other	6,541	176	405	2.3	\$44.19	\$25.37	\$33.72	\$44.95	\$54.81	\$65.59
11-3021	Computer and Information Systems Managers	5,257	209	524	2.5	\$67.37	\$45.70	\$55.37	\$71.87	\$83.09	\$136.04
43-4051	Customer Service Representatives	32,037	1,826	5,928	3.2	\$15.79	\$11.00	\$13.03	\$16.89	\$19.84	\$24.31

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

### Structural Issues in Broadband/IT Staffing

The broadband/IT labor force, particularly on the broadband side, has a serious structural flaw that exacerbates expansion challenges. Its workforce is aging, and there are not enough younger workers to replace more mature workers as they retire.

The rapid growth of new technology and the burgeoning demand for high speed, smart technology in more and more things has removed any excess capacity that existed in the broadband/IT sector. This means that new workers must be recruited and trained in new skills and new technology in order to meet demand.

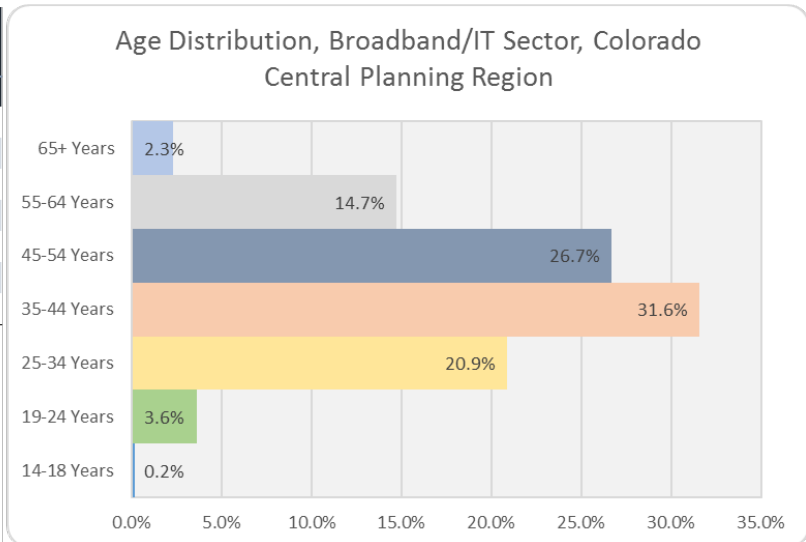
At the same time, the industry’s labor force, particularly on the broadband side, has a serious structural deficit that exacerbates expansion challenges. Its workforce is aging, and

there are not enough younger workers to replace more mature workers as they retire.

Age Distribution, Combined Broadband/IT Sector, Colorado Central Planning Region		
Age Band	Count	Percent
14-18 Years	141	0.2%
19-24 Years	3,186	3.6%
25-34 Years	18,660	20.9%
35-44 Years	28,212	31.6%
45-54 Years	23,831	26.7%
55-64 Years	13,121	14.7%
65+ Years	2,071	2.3%

Age Gap Analysis	
Age Grouping	Percent
Age 34 and Under	24.7%
Age 45 and Older	43.7%
Industry Age Gap	19.0%
Worker Shortfall (count)	(17,036)

Source: EMSI 2016.1 Data



This table and bar chart clearly illustrate this structural issue. Using the EMSI data, we can calculate that the broadband/IT sector faces an annual shortfall of over 800 skilled workers due to retirements. In the broadband sector by itself, the problem is very serious with an estimated annual shortfall of 250 skilled workers.

Using this EMSI data, we can calculate that the broadband/IT sector faces an annual shortfall of over 800 skilled workers due to retirements. In the broadband sector by itself, the problem is very serious, with an estimated annual shortfall of 250 critically skilled workers due to the aging of its labor force.



### Increased Difficulty in Hiring

EMSI, which is owned by Career Builder, is now able to measure the mathematical relationship between job postings and hires. This allows us to reasonably gauge how difficult it is to hire people in these top occupations within the region.

Difficulty to Hire, Top Broadband/IT Occupations, Denver-Aurora-Lakewood MSA, Boulder and Larimer Counties				
Avg. Monthly Postings (Jan 2013 - Feb 2015)	Avg. Monthly Hires (Jan 2013 - Feb 2015)			
Occupation	Avg Monthly Postings (Jan 2013 - Feb 2015)	Avg Monthly Hires (Jan 2013 - Feb 2015)	Hires per Posting	Difficulty to Hire
Web Developers	714	122	0.2	Very Difficult
Computer Occupations, All Other	1,706	293	0.2	Very Difficult
Network and Computer Systems Administrators	1,226	400	0.3	Very Difficult
Computer Systems Analysts	970	353	0.4	Very Difficult
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	461	197	0.4	Very Difficult
Computer and Information Systems Managers	447	214	0.5	Very Difficult
Software Developers, Applications	1,584	804	0.5	Difficult
Computer Programmers	289	160	0.6	Difficult
Computer User Support Specialists	934	539	0.6	Difficult
Electronics Engineers, Except Computer	138	130	0.9	Difficult
Telecommunications Equipment Installers and Repairers, Except Line Installers	100	100	1.0	Difficult
Software Developers, Systems Software	353	383	1.1	Medium
Computer Network Architects	128	140	1.1	Medium
Customer Service Representatives	1,628	1,942	1.2	Medium
Sales Representatives, Services, All Other	873	1,102	1.3	Medium
Market Research Analysts and Marketing Specialists	401	522	1.3	Medium
Accountants and Auditors	1,024	1,412	1.4	Medium
General and Operations Managers	709	1,763	2.5	Medium
Business Operations Specialists, All Other	474	1,541	3.3	Easy
Computer Network Support Specialists	29	129	4.4	Easy

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

Data presented in the preceding table generally reflects what sector leaders have told regional workforce development boards about their most difficult-to-hire occupations. However, when the strength of the training pipeline is shown using the Integrated Postsecondary Education Data System (IPEDS) generated through EMSI, the results seem to belie what sector leaders are saying.

### Measuring the Sufficiency of Training Pipeline in Technical Occupations

From a policy perspective, ***this is the most compelling finding in this report.*** To generate the table below:

1. The list of top occupations in broadband/IT was reduced to the 17 occupations that require some postsecondary training.
2. Projected annual openings were generated from EMSI for each occupation across all sectors in the region (since all sectors compete for people with these skill sets).
3. EMSI's aggregation of IPEDS data was used to determine the number of completions.
4. The IPEDS data was further analyzed and the number of completions reduced based on typical entry level education (for example, the number of completions for Accountants and Auditors was reduced by all programs not at the baccalaureate level – a 'less than one-year certificate' is not adequate to produce an accountant).
5. The number of completions was also reduced by culling programs that were counted, but arguably do not give graduates the specific skills needed for the occupation (for example, people earning degrees in General Computer Science are unlikely to have the specific skills needed for software engineering and development, either applications or systems).
6. This reduced list was then set in a column titled 'Actual Completions,' and sufficiency in the regional training pipeline was determined based on the number of Actual Completions divided by the number of Projected Annual Openings. ***This gives a better picture of the training pipeline for the broadband/IT sector.***

Training Pipeline, Broadband/IT Sector, Denver-Aurora-Lakewood MSA, Boulder and Larimer Counties							
SOC	Description	Projected Annual Openings	Completions (Traditional Cross-Walk, CIP to SOC)	Actual Completions	Actual Completions per Annual Opening	Typical Entry Level Education	Strength of Training Pipeline
15-1151	Computer User Support Specialists	478	768	2	0.0	Some college, no degree	Insufficient
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	111	6	6	0.1	Postsecondary non-degree award	Insufficient
15-1132	Software Developers, Applications	644	724	35	0.1	Bachelor's degree	Insufficient
15-1133	Software Developers, Systems Software	313	795	35	0.1	Bachelor's degree	Insufficient
15-1121	Computer Systems Analysts	439	1,244	59	0.1	Bachelor's degree	Insufficient
15-1199	Computer Occupations, All Other	176	1,194	25	0.1	Bachelor's degree	Insufficient
15-1131	Computer Programmers	202	529	30	0.1	Bachelor's degree	Insufficient
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	195	42	32	0.2	Bachelor's degree	Insufficient
15-1142	Network and Computer Systems Administrators	271	818	78	0.3	Bachelor's degree	Insufficient
13-1161	Market Research Analysts and Marketing Specialists	537	272	233	0.4	Bachelor's degree	Insufficient
13-2011	Accountants and Auditors	1,407	707	686	0.5	Bachelor's degree	Insufficient
15-1134	Web Developers	140	1,908	73	0.5	Associate's degree	Insufficient
15-1143	Computer Network Architects	108	1,908	64	0.6	Bachelor's degree	Insufficient
17-2072	Electronics Engineers, Except Computer	125	128	128	1.0	Bachelor's degree	Sufficient
15-1152	Computer Network Support Specialists	88	562	287	3.3	Associate's degree	Surplus
11-1021	General and Operations Managers	1,128	5,598	5,246	4.6	Bachelor's degree	Surplus
11-3021	Computer and Information Systems Managers	209	1,313	989	4.7	Bachelor's degree	Surplus

Source: EMSI 2016.1 QCEW, Non-QCEW & Self-Employed Class of Worker

Note: CIP stands for (U.S.) Classification of Instructional Program, SOC stands for Standard Occupational Code. A 'Cross-Walk' compares the two.

'Actual Completions' means programs that match the specific occupation and typical entry level education.

## Conclusion

The reader will note that the table depicting insufficiencies in the training pipeline is based only on the judgement of the Arapahoe/Douglas Workforce Development Board's Workforce Economist. ***For this reason, it is vital that the region's workforce development leaders and boards further vet this information with sector subject matter experts.***

This way, an accurate picture of the region's training pipeline can be formed and acted upon moving forward, which will be vital to the region's long-term economic strength.

The most important task facing regional workforce development leaders moving forward is to correctly gauge the strength of the region's training pipeline in the broadband/IT sector and other key industry groups.