

Industry Overview

The broadcasting and telecommunications cluster includes companies that deliver voice, data, and video to end users. It includes landline and wireless telephone communications companies, radio and television communications services, and cable and Internet service providers.

The nine-county Metro Denver and Northern Colorado region¹ is home to a significant concentration of broadcasting and telecommunications companies including CenturyLink, Comcast, DISH Network, and others. Comcast's second-largest employment presence outside of Philadelphia is in Colorado. Five of *Forbes'* 2017 Global 2000 broadcasting and telecommunications companies and four *Fortune* 500 broadcasting and telecommunications companies have headquarters in the region.



The region ranks as having the fifth-highest employment concentration for the industry cluster out of the 50 largest metropolitan areas in 2017. It is the ninth-largest broadcasting and telecommunications employment center in the nation, with more than 42,430 workers at nearly 2,750 companies. In 2017, employment rose 0.8 percent, compared with a 3.8 percent decline nationwide. Major 2017 company expansions included growth by AT&T, Comcast, Charter Communications, and Google, slightly offsetting layoffs at other major companies. Since 2012, the cluster has grown 1.7 percent and added 730 jobs.

It was a landmark year for mergers and acquisitions that are changing the broadcasting and telecommunications industry landscape. Notable deals included CenturyLink's \$24 billion acquisition of Broomfield-based Level 3 Communications and Denver-based Liberty Global's merger with Netherlands-based Vodafone Group. Comcast, AT&T, and Verizon are offering more integrated services for businesses and consumers, largely as a result of mergers. Increased Internet speeds and rising competition has led customers to switch from traditional cable and satellite services to subscription video on-demand services. High-definition, on-demand, online, mobile, and multicasting services offered by local companies such as Douglas County-based Sling TV continue to rise in popularity. The region's economic growth, low unemployment rate, pro-business environment, and entrepreneurial culture have contributed to favorable conditions for acquisitions, particularly for middle-market mergers or those companies with \$5 million to \$500 million in revenue.

Several of the region's educational and research institutions focus their programs and training on all aspects of broadcasting and telecommunications. In 2017, the University of Colorado Denver announced a new media and technology facility created through a \$5 million gift from Comcast. The Comcast Media and Technology Center functions as a place where students, researchers, and professionals can generate, develop, and activate culturally-focused, action-oriented education, research, commercial enterprises, and community services. The Cable Center, located on the University of Denver campus, launched a partnership with AMP10x, a local workforce development organization to establish MediaAMP. The 4,700-square-foot coworking space is more than 90 percent full and provides meeting and educational space. Silicon Flatirons is a center for innovation at the University of Colorado Boulder that serves students, entrepreneurs, policymakers, and professionals at the intersection of law, policy, and technology.

The region has extensive broadband and wireless network coverage. According to BroadbandNow, 78 percent of the region's population has access to speeds of at least 100 megabits per second (Mbps). Across Colorado, 90 percent have access to broadband and nearly 10 percent have access to 1 gigabit broadband. Most of the state's population has access to mobile broadband service. Broadband deployment has a significant economic

¹ The nine-county region is comprised of two principal areas, Metro Denver and Northern Colorado. Metro Denver consists of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson counties. Northern Colorado consists of Larimer and Weld counties.

BROADCASTING AND TELECOMMUNICATIONS:

Metro Denver and Northern Colorado Industry Cluster Profile

impact. According to the Colorado Department of Local Affairs, a 1 percent increase in broadband penetration results in approximately 9,000 jobs. Expanding broadband access is a key focus of Colorado economic development, information technology, and local government capacity-building efforts. Colorado developed a program through the Department of Local Affairs that has awarded over \$20 million in matching grants for a statewide investment of \$34 million to numerous communities in the region.

Over the last several years, the region's major carriers have invested in infrastructure and network improvements. AT&T invested more than \$325 million since 2014 to enhance Denver's wireless networks and Sprint made ongoing improvements to its local network as part of its nationwide Network Vision program. All four of the region's major carriers—Sprint, T-Mobile, AT&T, and Verizon—nearly doubled their network speeds in the region in 2017, according to RootMetrics. The development of 5G networks is currently underway and carriers are proceeding with lab and field trials for at least the basic connectivity elements, which could be fully developed nationwide by 2020. In 2017, Verizon announced Denver as one of the 11 cities nationwide to pilot a new 5G network.

Regional Broadcasting and Telecommunications Assets

- **Data Centers** – The region is an attractive location for high-tech data centers, with low risk of natural disasters and a thriving economy. Centers for both private companies and government entities are located throughout the region including IBM's largest data center in the world.
- **Satellite** - Metro Denver's unique geographic location in the Mountain time zone makes it the largest city in the U.S. to offer one-bounce satellite uplinks. This provides real-time connections to six of the seven largest continents in a single business day. The region is home to two of the nation's largest satellite television providers
- **Subscription TV** - Metro Denver has a long history with the cable television industry and is home to a significant concentration of broadcasting and telecommunications companies.
- **Federal Laboratories and Research Centers** – The city of Boulder is home to the Institute for Telecommunication Sciences (ITS), which is the research and engineering laboratory of the National Telecommunications and Information Administration (NTIA). ITS performs basic research in radio science that provides the technical foundation for NTIA's policy development and spectrum management activities. The National Institute of Standards and Technology's Communications Technology Laboratory (CTL) in Boulder unites wireless communications efforts and develops instruments, creates protocols, models, and simulation tools to enable a range of emerging wireless technologies.
- **Voice and Data Services** - Metro Denver businesses and households can access numerous providers that offer landline and wireless phone services and high-speed Internet. The region includes more than 30 long-distance providers. Metro Denver's extensive fiber-optic network allows the flow of voice and data traffic at lower prices.
- **Wireless Networks** - The downtown Denver WiFi Zone was among the first in the nation to provide large-scale, public Internet access. Several locations throughout Denver offer free WiFi, including the 16th Street Mall, Skyline Park, the Denver Performing Arts Complex, and Denver International Airport (DEN). DEN has the fastest WiFi of any airport worldwide, according to Ookla.

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Broadcasting and Telecommunications Economic Profile

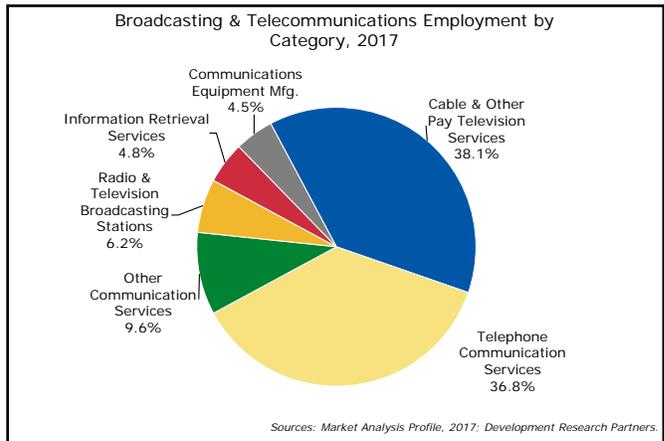
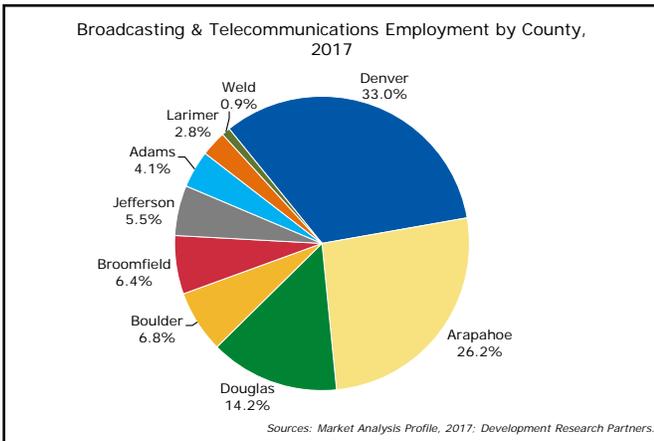
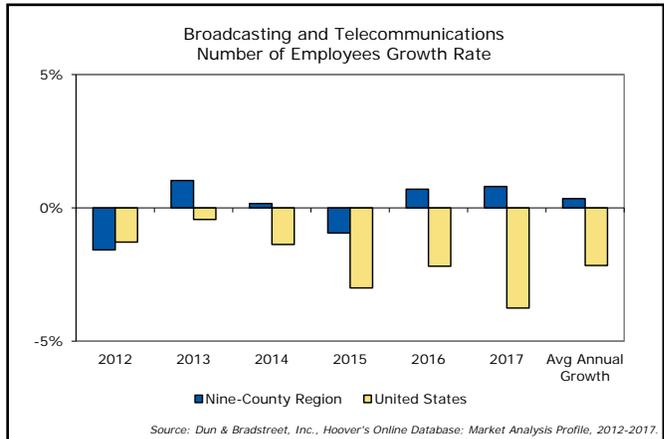
The broadcasting and telecommunications industry cluster consists of 16, six-digit North American Industry Classification System (NAICS) codes including radio and television communications equipment, telephone communications, and cable television services.

Nine-County Rankings²

Broadcasting & telecommunications direct employment concentration rank	5th
Broadcasting & telecommunications direct employment rank	9th

Broadcasting & Telecommunications Employment and Company Profile, 2017		
	Nine-County Region	United States
Direct employment, 2017	42,430	1,085,940
Number of direct companies, 2017	2,750	145,420
One-year direct employment growth, 2016-2017	0.8%	-3.8%
Five-year direct employment growth, 2012-2017	1.7%	-10.3%
Avg. annual direct employment growth, 2012-2017	0.3%	-2.2%
Direct employment concentration	1.8%	0.6%

Sources: Dun & Bradstreet, Inc., Hoover's Online Database; Market Analysis Profile, 2012-2017; Development Research Partners.



² Direct employment rank based on the number of employees in the industry cluster in a region. Employment concentration rank based on the direct cluster employment in a region expressed as a percent of total employment in all industries in the same region. Rankings are for the 50 largest metropolitan statistical areas (MSAs). No multiplier effects are included. 1st = highest for both rankings.



Major Broadcasting and Telecommunications Companies

- AT&T Inc.
www.att.com
- CenturyLink, Inc.
www.centurylink.com
- Charter Communications Inc.
www.charter.com
- Comcast Corp.
www.xfinity.com
- DISH Network
www.dish.com
- Google
www.google.com
- Sprint Corp.
www.sprint.com
- Starz
www.starz.com
- Verizon
www.verizon.com
- Zayo Group
www.zayo.com

2017 Industry Highlights

Key Company Announcements

- **Google** opened its new \$131 million Boulder campus that spans four acres near Pearl and 30th streets. The site could ultimately accommodate up to 1,500 employees and help the company consolidate its operations across several area office spaces. Google doubled its Colorado workforce in the last two years to more than 650 people that translates to a \$2.9 billion economic impact.
- **Peak 10 + ViaWest**, that merged in 2017, added 88,000 square feet to its Compark data center in northern Douglas County, bringing the facility's total data space to 138,000 square feet. The Compark facility is now one of the largest raised floor data halls in the world.
- Denver-based broadband and communications company **WideOpenWest, Inc. (WOW!)** completed an IPO going public on the New York Stock Exchange. WOW! provides services in 19 markets across the Midwest and Southeast. It serves over 3 million residential, business, and wholesale consumers.
- **Comcast** opened a new customer service center in Fort Collins that will employ 600 customer service agents. The 80,000-square-foot center supports residential customers across the country.
- **Lightwave Logic, Inc.** will consolidate all of its corporate and R&D operations into a new facility in Englewood. The new 13,420-square-foot facility's \$1.6 million infrastructure includes fully functional cleanrooms and analytic laboratories.
- **Sprint Corp.** will open five retail stores in former RadioShack locations across Metro Denver, and another four stores in former RadioShack sites elsewhere in Colorado. Sprint employs about 1,400 people at its retail stores across the state and its regional offices in Douglas County.
- Boulder-based **Zayo** purchased a colocation facility in Westminster, the fourth in Colorado, in response to strong customer demand in the area between Boulder, Denver, and the Northwest Corridor. Zayo plans to serve new and existing customers from the facility as well as the Front Range's startup and accelerator community.

Expanded Broadband and Network Improvements

- **Sprint Corp.** invested in its Metro Denver network, including replacing its old network equipment with new equipment. Denver is one of the best performing markets for the Sprint network nationwide.
- **CenturyLink** continues to invest in its local Colorado network, bringing broadband speeds up to 100 Mbps. In addition, speeds up to 1 gigabit per second (Gbps) will soon be available to about 700,000 homes and businesses in Metro Denver. CenturyLink also expanded its network into more rural communities including Cortez, Estes Park, Pueblo, and others.
- Denver is one of 12 cities where **Comcast** is launching a wireless network to handle data coming from "smart" utilities, hospital patient monitoring, and other Internet-connected devices. The machine network is expected to be established by mid-2018.
- **AT&T Inc.** won a contract to build and manage Boulder-based FirstNet's wireless broadband network for 25 years. FirstNet's goal is a national communications system that will allow all police, fire, and other emergency agencies to respond to large scale incidents. The network is expected to launch in the spring of 2018.
- **Charter Communications** reached an agreement with Comcast Corp. to collaborate on mobile virtual network operator reseller agreements geared at accelerating the companies' ability to participate in national wireless markets. Both companies have significant operations in Colorado and Charter plans on expanding by between 800 and 1,200 people at its new offices in Greenwood Village.

BROADCASTING AND TELECOMMUNICATIONS:

Metro Denver and Northern Colorado Industry Cluster Profile

- The **city of Centennial** partnered with Canadian-based **Ting Internet** to build fiber-optic lines to homes in some neighborhoods, with gigabit service planned to start in early 2018. The city is building a municipally-funded, fiber-optic network backbone and will begin the project in the Willow Creek neighborhood.
- **Layer3** launched its TV service in Longmont, accessing customers of the city-owned NextLight Gbps Internet service. Combining the cost of the service and Internet, Longmont customers can access nearly 300 channels of high-definition TV starting at \$125 a month.
- San Francisco-based high-speed Internet provider **Webpass** will debut its 1 Gbps Internet service at a condo tower in downtown Denver. Webpass will use the building as a foothold to expand its network to other apartment and condo buildings in the area.

Merger and Acquisition Activity

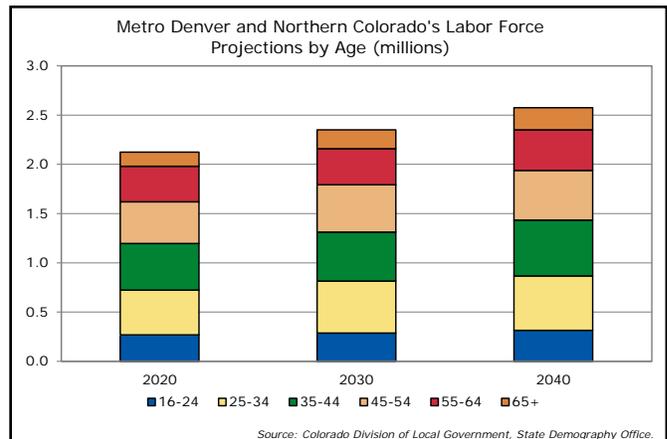
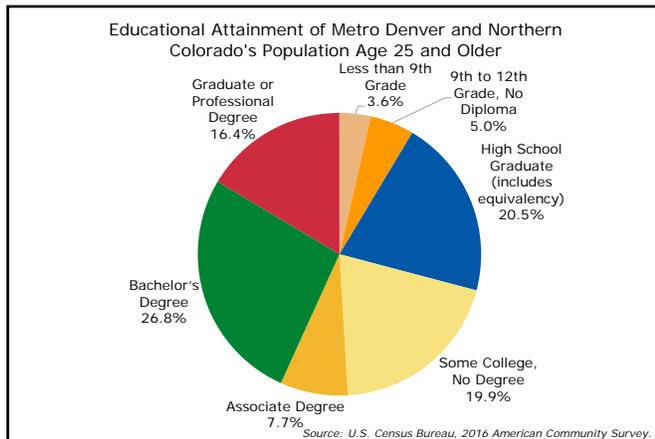
- **CenturyLink** completed its \$24 billion acquisition of Broomfield-based **Level 3 Communications**. The merger expands CenturyLink's data and network services. The company's fiber-optic network now stretches 450,000 miles on routes worldwide and directly connects to more than 100,000 office buildings.
- Denver-based **Liberty Global** merged with Netherlands-based **Vodafone Group**, a company that operates European mobile phone networks. The \$3.7 billion deal allows the joint-venture partners to offer bundles of cable television, broadband, and mobile services to 4.2 million video subscribers and 5.3 million wireless phone subscribers. Liberty Global is the largest multinational cable television and broadband provider worldwide.
- Charlotte, N.C.-based **Peak 10 Inc.** acquired Greenwood Village-based **ViaWest** from Shaw Communications in a \$1.7 billion sale. The deal creates North America's largest privately held data center company with 24 data centers.
- Denver-based cloud-services manager **Hosting.com Inc.** acquired Virginia-based **Stelligent Systems** to expand its offerings to users of Amazon Web Services cloud. Hosting.com currently serves more than 2,000 customers with its managed cloud services.
- Douglas County-based **EchoStar** and **DISH Network** reached an agreement to interchange certain business assets, giving DISH most of the video aspects held by EchoStar including Sling TV and the Slingbox. DISH will also receive a 10 percent equity interest in Sling TV and in return, DISH will relieve its 80 percent interest in Hughes Retail Group to Echostar.
- Boulder-based startup **Congruex** made its first acquisition as it begins plans to develop an engineering- and construction-management platform for broadband networks. The company acquired Georgia-based CCLD Technologies, a firm that engages in engineering and construction of large project work for broadband providers in the United States.
- Boulder-based **Zayo** entered into an agreement to acquire Spread Networks for \$127 million. Spread Networks owns and operates 825 miles of fiber-optic cable between New York and Chicago. The acquisition provides Zayo's customers better access between two major financial markets, and combines customers with Zayo's existing routes connecting Seattle, San Francisco, and Chicago.
- **Zayo** closed a \$1.4 billion acquisition of Washington-based Electric Lightwave in a deal that is expected to strengthen the company as the only nationwide independent provider of communications infrastructure. Electric Lightwave provides fiber networks that serve 35 western U.S. markets.

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Metro Denver and Northern Colorado Industry Cluster Profile

Nine-County Region Workforce

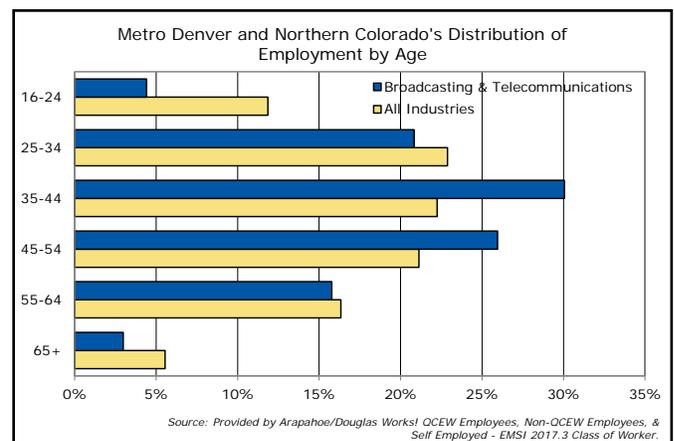
- Nearly half of the nine-county region's 3.8 million residents are under the age of 35. Employers can draw from a large, young, highly educated, and productive workforce.
- Of the region's adult population, 43.2 percent are college graduates and 91.4 percent have graduated from high school.
- The region's population is expected to grow 32.2 percent from 2020 to 2040, driving a 21.2 percent increase in the region's labor force over the same period.



Broadcasting and Telecommunications Workforce Profile

The cluster has a larger share of employees that are between the ages of 35 and 54 years and older (56 percent), compared with the age distribution of all industries across the nine-county region (43.4 percent).

The Occupation & Salary Profile below includes the 10 largest broadcasting and telecommunications occupations in the region. For these 10 largest occupations, the chart details the total number of workers employed in that occupation across all industries, the number of available applicants that would like to be working in that occupation, the number of recent graduates that are qualified for that occupation, and the median and sample percentile annual salaries.



Wages

- 2016 average annual salary was \$99,880, compared with \$86,930 nationwide.
- Total payroll exceeded \$4.2 billion in 2016.

BROADCASTING AND TELECOMMUNICATIONS:

Metro Denver and Northern Colorado Industry Cluster Profile

Metro Denver and Northern Colorado Broadcasting and Telecommunications Occupation & Salary Profile, 2017

10 Largest Broadcasting & Telecommunications Occupations in Metro Denver and Northern Colorado	Total Working Across All Industries (2017)	Number of Available Applicants (2017)	Number of Graduates (2016)	Median Salary	10th Percentile Salary	25th Percentile Salary	75th Percentile Salary	90th Percentile Salary
1. Telecommunications equipment installers & repairers, except line installers	3,940	96	0	\$66,267	\$41,348	\$52,674	\$74,226	\$80,017
2. Sales representatives, services, all other	21,578	525	21	\$56,574	\$26,542	\$38,572	\$84,237	\$122,791
3. Customer service representatives	34,879	848	0	\$34,245	\$22,588	\$27,079	\$43,508	\$53,566
4. Business operations specialists, all other	32,514	791	17	\$74,757	\$43,128	\$55,758	\$98,542	\$126,087
5. Electronics engineers, except computer	4,976	121	398	\$94,837	\$65,034	\$75,581	\$122,715	\$152,011
6. Telecommunications line installers & repairers	1,798	44	0	\$45,076	\$28,116	\$34,412	\$59,631	\$73,141
7. Software developers, applications	21,917	533	1036	\$102,873	\$64,460	\$80,273	\$127,026	\$152,551
8. Network & computer systems administrators	8,899	216	655	\$84,157	\$52,185	\$65,748	\$104,263	\$123,672
9. Software developers, systems software	11,131	271	1,191	\$112,619	\$77,723	\$91,555	\$137,778	\$170,634
10. Computer user support specialists	12,530	305	916	\$57,285	\$35,956	\$44,740	\$74,312	\$93,525

Notes: The number of available applicants is a point-in-time measurement of the number of people who have registered in Colorado's workforce development system's statewide database, Connecting Colorado, as being able and available to work in a particular occupation. Results should be interpreted with caution since registration in Connecting Colorado is self-reported. In addition, the skills rubric may assign up to four occupation codes for each registrant. Therefore, the number of available applicants could be inflated. *Source: Provided by Arapahoe/Douglas Works!; QCEW Employees, Non-QCEW Employees, & Self Employed - EMSI 2017.3 Class of Worker.*

Education & Training

Colorado's higher education system provides an excellent support system for businesses in the region. There are 28 public higher education institutions in Colorado, of which seven four-year and six two-year public institutions offering comprehensive curricula are located in the nine-county region. There are more than 100 private and religious accredited institutions and more than 350 private occupational and technical schools offering courses in dozens of program areas throughout the state. The state higher education system served about 255,510 students in FY 2015-16, while 86,070 students received a degree, diploma, certificate, or other formal award over the same period of time. Although not exhaustive, a list of the major, accredited educational institutions with the greatest number of graduates for each of the 10 largest broadcasting and telecommunications occupations in the nine-county region are included below. A directory of all higher education institutions with corresponding websites may be accessed via <http://higherred.colorado.gov>.

- Colorado State University www.colostate.edu
- Metropolitan State University of Denver www.msudenver.edu
- University of Colorado Denver www.ucdenver.edu
- Colorado State University Global Campus www.colostate.edu
- Red Rocks Community College www.rrcc.edu
- University of Denver www.du.edu
- Community College of Aurora www.ccaurora.edu
- Regis University www.regis.edu
- Front Range Community College www.frontrange.edu
- University of Colorado Boulder www.colorado.edu

Key Reasons for Broadcasting and Telecommunications Companies to Locate in the Nine-County Region

The region is a top broadcasting and telecommunications location offering:

1. A central location and easy global access

- Denver International Airport (DEN) was the sixth-busiest airport in the nation and 18th-busiest worldwide in terms of passenger traffic in 2016. (U.S. Bureau of Transportation Statistics, 2017; Airports Council International 2017; and Denver International Airport, 2017)
- DEN serves 25 international destinations in 11 countries, with eight international flights added in 2017 alone. (Denver International Airport, 2017)
- Metro Denver is the largest region in the U.S. to offer one-bounce satellite uplinks to six out of seven continents in one business day due to its unique geographic location in the Mountain time zone.
- Located on the 105th meridian, Metro Denver's central location at the exact midpoint between Tokyo and Frankfurt positions the region favorably to serve growing world markets.

DEN serves 25 international destinations in 11 countries.

—Denver International Airport, 2017

2. A large concentration of high-quality technology workers and entrepreneurial talent

- Nearly 40 percent of Coloradans have at least a bachelor's degree, the second-highest college attainment rate in the nation behind Massachusetts. (U.S. Census Bureau, 2016 American Community Survey)
- Telecommunications services and Internet services ranked among the top 5 leading tech industry sector by employment in Denver in 2017. Tech workers in Denver earn nearly double the average private-sector worker. (CompTIA, *Cyberstates 2017: The Definitive National, State, and City Analysis of the U.S. Tech Industry and Tech Workforce*, 2017)
- Denver ranked fourth in the nation for the best overall value for technology workers. About 50 percent of a Denver tech salary is allotted to cost of living, with 50 percent left as expendable income. (Paysa, 2017)
- Tech salaries in Denver are the second-highest of 10 ranked North American cities, adjusted for cost of living. (Hired, 2017)
- Denver ranked as the eighth-best market for entrepreneurs in 2017. (American City Business Journals, 2017)
- Boulder (first) and Metro Denver (third) ranked among the top 10 metro areas for female entrepreneurs in 2017. (Version 2.0 Communications, 2017)

Tech workers in Denver earn nearly double the average private-sector worker.

—Cyberstates, 2017

3. Low to moderate costs of doing business

- Colorado ranked No. 8 among *Forbes'* 2017 "Best States for Business" list. The state received its highest rankings for labor supply (first overall), economic climate (third overall), and growth prospects (fourth overall). (*Forbes*, 2017)
- Metro Denver office rental rates averaged \$30.16 per square foot in the fourth quarter of 2017, making the region's office market highly competitive with other major markets in the U.S. (CoStar Realty Information, The CoStar Office Report, 4Q 2017)

4. A pro-business environment and competitive tax structure

- Colorado ranked as the nation's easiest state for starting, operating, and growing an Internet business. (Internet Association, 2017)
- Colorado ranks as one of the nation's most favorable corporate income tax structures. The state's corporate income tax rate of 4.63 percent is one of the lowest in the nation and is based on single-factor apportionment, which allows companies to pay taxes based solely on their sales in the state. (State of Colorado; The Tax Foundation)
- Metro Denver ranked fourth among *Forbes'* 2017 "Best Places for Business and Careers." The Fort Collins metro area ranked 17th, Colorado Springs ranked 18th, Boulder ranked 45th, and Greeley ranked 51st. (*Forbes*, 2017)

Colorado ranked as the easiest state for starting, operating, & growing an Internet business.

—Internet Association, 2017

BROADCASTING AND TELECOMMUNICATIONS:

Metro Denver and Northern Colorado Industry Cluster Profile

- Colorado ranks as the nation's 10th-best tax system for entrepreneurs and small business. (Small Business & Entrepreneurship Council, 2017)

5. An overall better quality of life

- Colorado has the seventh-best infrastructure in the nation, measuring states' Internet, energy, and transportation. (*U.S. News & World Report*, 2017)
- Denver was named as the second-best place to live in the U.S. in 2017. The city's desirability, prominent research institutions, and growing job market contributed to its notable rank. (*U.S. News & World Report*, 2017)

Metro Denver ranked as the nation's seventh-fittest metro area in 2017.

—American College of Sports Medicine, 2017

- Metro Denver ranked as the nation's seventh-fittest metropolitan area in 2017. Low obesity, increased physical activity, and low prevalence of diabetes and heart disease contributed to its high rank. (American College of Sports Medicine, 2017)
- The city of Lone Tree ranked seventh in the "Best Places to Live" list. Superior (49th) and Louisville (50th) were named to the list's top-50 locations. (*MONEY Magazine*, 2017)
- Denver ranked ninth among the 2017 "Best Big Cities to Live In" and scored fourth for local economy. (WalletHub, 2017)

For additional information, contact us:



Metro Denver
Economic Development Corporation

1445 Market Street
Denver, CO 80202-1790
303.620.8092

email: info@metrodenv.org
www.metrodenver.org

Prepared by Development Research Partners, Inc., www.DevelopmentResearch.net