



FEBRUARY 2021

FISCAL NOTES

THE (GRADUAL) 5G REVOLUTION

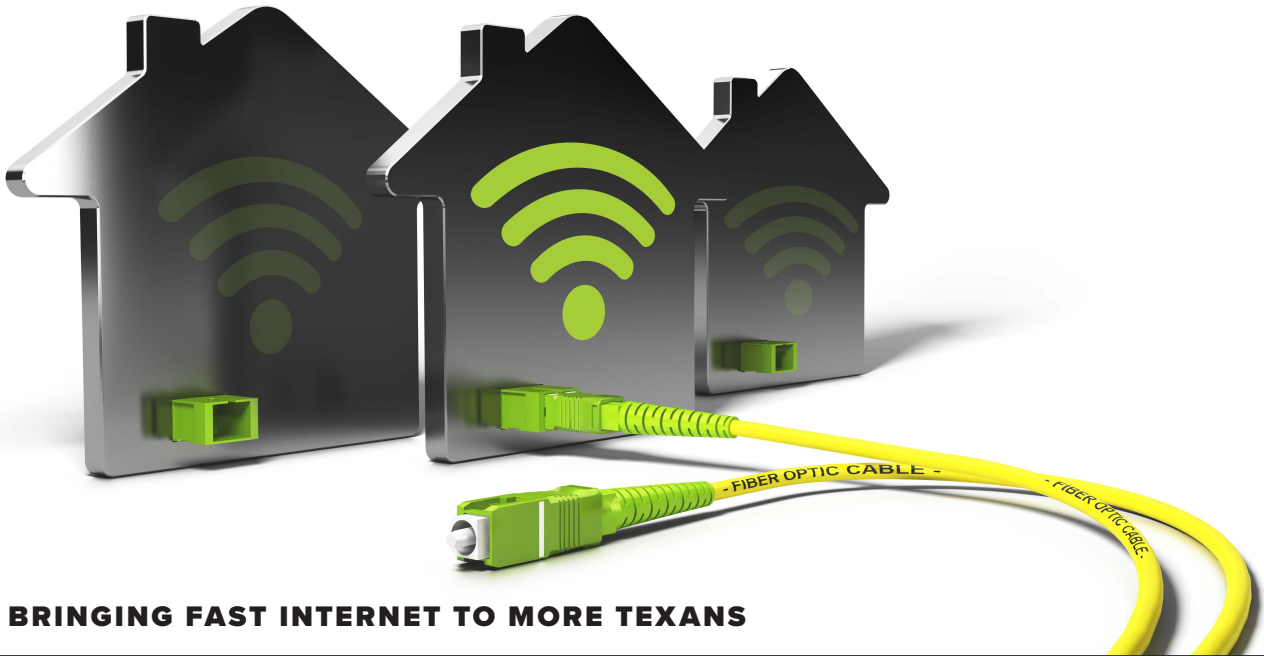
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STATE REVENUE WATCH

11

Broadband Expansion in Texas

By Spencer Grubbs and Shannon Halbrook



BRINGING FAST INTERNET TO MORE TEXANS

Broadband — an internet connection with sufficient speed to deliver online experiences including full-motion video without significant lag time — is increasingly seen as a requirement for modern life. In its 2010 National Broadband Plan, the Federal Communications Commission (FCC) stated that “like electricity a century ago, broadband is a foundation for economic growth, job creation, global competitiveness and a better way of life.”

In 2016, well before the pandemic, the Federal Reserve Bank of Dallas found that the gap between those with broadband access and those without (often called the “digital divide”) “leads to further economic, social and political disparities for low-income and underserved populations.” The COVID-19 pandemic likely has widened the economic gap between Texans who have broadband and those who don’t.

The Texas Utilities Code, mirroring the FCC, currently defines broadband as internet service capable of providing a download speed of at least 25 megabits per second (Mbps) and an upload speed of at least three Mbps. Six different types of broadband service are available in various areas (**Exhibit 1**).

BROADBAND IN TEXAS

In December 2020, Connected Nation Texas, a broadband advocacy group, estimated that 316,717 households in Texas were “unserved” by 25/3 Mbps broadband, about 89 percent of them in rural areas.

The issue isn’t limited to the countryside, however. According to the Census Bureau’s five-year estimates for 2015 through 2019, among U.S. metro areas with 500,000 households or more, the San Antonio-New Braunfels area ranked third-lowest in its share of households with broadband subscriptions of any kind, at 82.1 percent.

Even in urban areas with accessible broadband, many households still don’t subscribe to the service. “Cost is one of the main barriers to adoption,” says Jennifer Harris, state program director at Connected Nation Texas, “but some people don’t have digital literacy skills or access to a device, and others choose not to have the internet in their home due to privacy concerns; still others are denied broadband service because of missed payments.”

CONTINUED ON PAGE 3

A Message from the Comptroller

One of the many ways in which COVID-19 has changed society has been the way it shifted so many aspects of our lives online. Online shopping has grown enormously, of course, but so have telework, online job searches, telemedicine, distance learning and other applications. To participate fully in this online world, you need an internet connection capable of supporting video and other features, and that means broadband.



In 2021, broadband looks more like a necessity than a luxury. But census data indicate that nearly 20 percent of Texas households don't have it, particularly in our rural areas — and until they do, they're shut out of more and more of the modern economy.

In this issue of *Fiscal Notes*, we take a look at broadband in Texas: how it's used, who has it and who doesn't — and how the state plans to bring this service to as many Texans as possible. According to the state's Broadband Development Council, Texas is one of only six states without a detailed plan for the expansion of broadband, and also lacks an independent entity to promote and coordinate our initiatives. The Legislature is considering bills to change that, however, as the pandemic continues and the need for broadband only increases.

Bringing broadband to rural Texas could be a complex and expensive undertaking, since internet service providers generally can't make a profit expanding service to these far-flung areas. But state and federal funding may be available to help; we profile these sources as well.

In this issue, we also look at the next stage of the online evolution, the "fifth-generation" array of mobile communications technologies collectively called 5G. Increasing the performance of mobile devices is particularly important due to the worldwide adoption of smartphones and tablets for business, industry, commerce and leisure. But 5G isn't just about person-to-person communication — it's seen as an essential part of the so-called internet of things, or IoT, the web of interconnected devices and distributed processing power that promises to revolutionize many industrial processes.

5G has gotten off to a relatively slow start in the U.S., and even when available it tends to be slower here than in other nations. But the crowded condition of current networks and the increasing demand for data in business mean that most see its widespread adoption as inevitable.

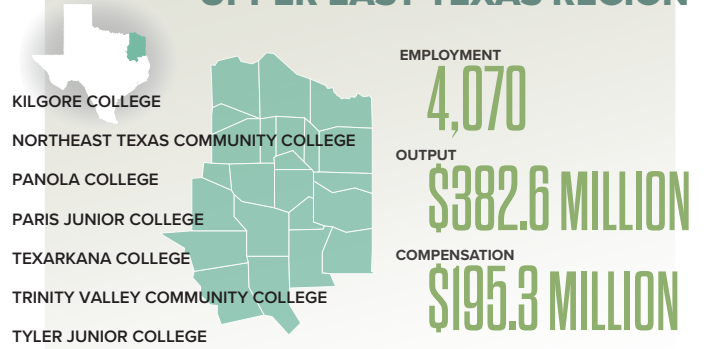
As always, I hope you enjoy this issue!

GLENN HEGAR

Texas Comptroller of Public Accounts

TEXAS COMMUNITY COLLEGES

UPPER EAST TEXAS REGION



Texas' community college districts serve a vital role in our state's economy by developing our workforce, preparing students for further academic study and meeting specific vocational needs. The 23 counties in the Upper East Texas region include seven community college districts.

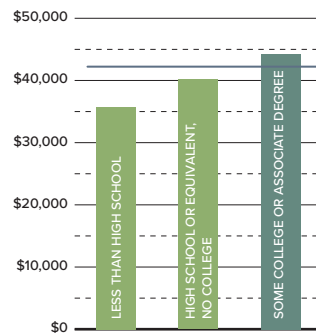
Note: Figures include direct, indirect and induced economic impacts.

Sources: JobsEQ, Texas Comptroller of Public Accounts, Texas Higher Education Coordinating Board and Texas community colleges.

NOTE: THESE ANALYSES PREDATED THE COVID-19 CRISIS AND THE ECONOMIC IMPACTS THAT FOLLOWED.

WAGES BY EDUCATIONAL ATTAINMENT

AVERAGE ANNUAL EARNINGS BY EDUCATIONAL ATTAINMENT, UPPER EAST TEXAS REGION, 2018



AVERAGE OF ALL EARNINGS

Community colleges provide their students with a good return on investment.

AVERAGE WAGE INCREASE OVER HIGH SCHOOL OR EQUIVALENT

\$4,092

NUMBER OF WORKERS, SOME COLLEGE OR ASSOCIATE DEGREE

118,258

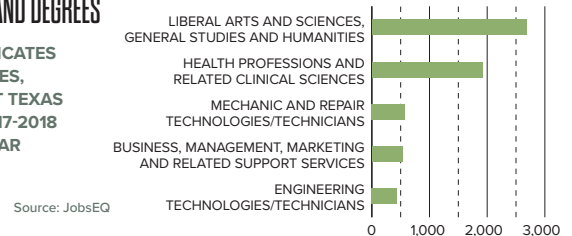
TOTAL REGIONAL ADDITIONAL WAGES

\$483.9 MILLION

Source: JobsEQ

CERTIFICATES AND DEGREES

TOP CERTIFICATES AND DEGREES, UPPER EAST TEXAS REGION, 2017-2018 SCHOOL YEAR



Source: JobsEQ

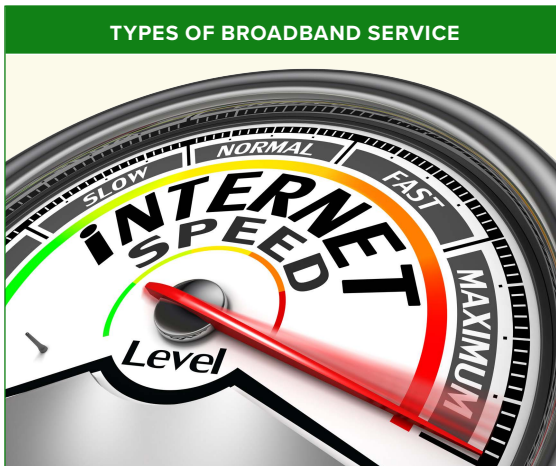
SUMMARY

The Upper East Texas region's seven community college districts address local skills gaps and meet the specific needs of area employers. They support more than 4,000 jobs and add almost \$383 million in economic output annually. The higher pay of those with some college or an associate degree helps raise total wages in the region by nearly \$484 million per year.

TO SEE INFORMATION ON COMMUNITY COLLEGES AND THE TEXAS ECONOMY: comptroller.texas.gov/economy/economic-data/colleges

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EXHIBIT 1



Cable internet is delivered via coaxial cable or a hybrid combining coaxial and fiber. Modern cable services can support speeds of up to 10 Gbps (10,000 Mbps), but generally offer slower service, such as 100 Mbps.

Digital subscriber line (DSL) access is provided through a local telephone network and offers speeds ranging from 1 Mbps up to 100 Mbps.

Fiber, a flexible, transparent conductor made of glass, permits transmission over long distances and at speeds of anywhere from 1 Mbps up to 10 Gbps.

Fixed wireless travels via radio broadcast from tall structures such as towers, water tanks and rooftops. Fixed wireless services generally support speeds of between 1 and 100 Mbps.

Mobile wireless internet typically is offered at speeds comparable to DSL but often carries a bandwidth “cap” that limits the amount of data that can be used during a billing cycle.

Satellite internet service requires a small-dish antenna and satellite modem. One recently launched service offers speeds of up to 12 Mbps across most of the U.S.

Source: Connected Nation

In the census estimates, Texans identifying as white alone were more likely to have broadband than those identifying as Black or Hispanic. Those with college degrees were more likely to have it than those with less education (**Exhibit 2**).

BROADBAND IN THE PANDEMIC

Broadband expansion was gaining political momentum well before COVID-19 struck (see October 2019 *Fiscal Notes*). The pandemic, which immediately boosted demand for broadband-enabled services, has pushed this expansion to the forefront of the legislative agenda. Gov. Greg Abbott prioritized it as one of his five emergency items for the 2021 session in his State of the State address on Feb. 1.

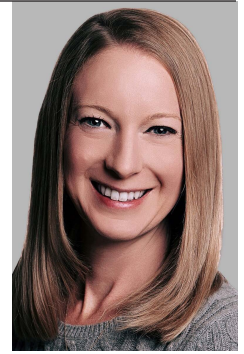
“The pandemic has shown everyone how important broadband is,” says Harris. “Ten years ago, we had to tell people why broadband would be good for the community. We don’t need to tell anyone that anymore.”

The upheaval caused by COVID-19 has made the importance of widespread high-speed internet access painfully obvious, particularly for purposes such as distance education, telehealth and telemedicine services and e-commerce.

Education: When Texas’ public schools first closed in March 2020, the Texas Education Agency (TEA) scrambled to help students connect to their virtual classrooms. Early in the pandemic, a survey of the state’s educators indicated that one in six Texas students lacked high-speed internet access, and 30 percent didn’t have a “dedicated and adequate learning device.”

To meet the sudden need, TEA and the Governor’s Office agreed in May to scale Dallas ISD’s Operation Connectivity, which aimed to supply devices and internet access to students who needed them, into a statewide operation.

The upheaval caused by COVID-19 has made the importance of widespread high-speed internet access painfully obvious.

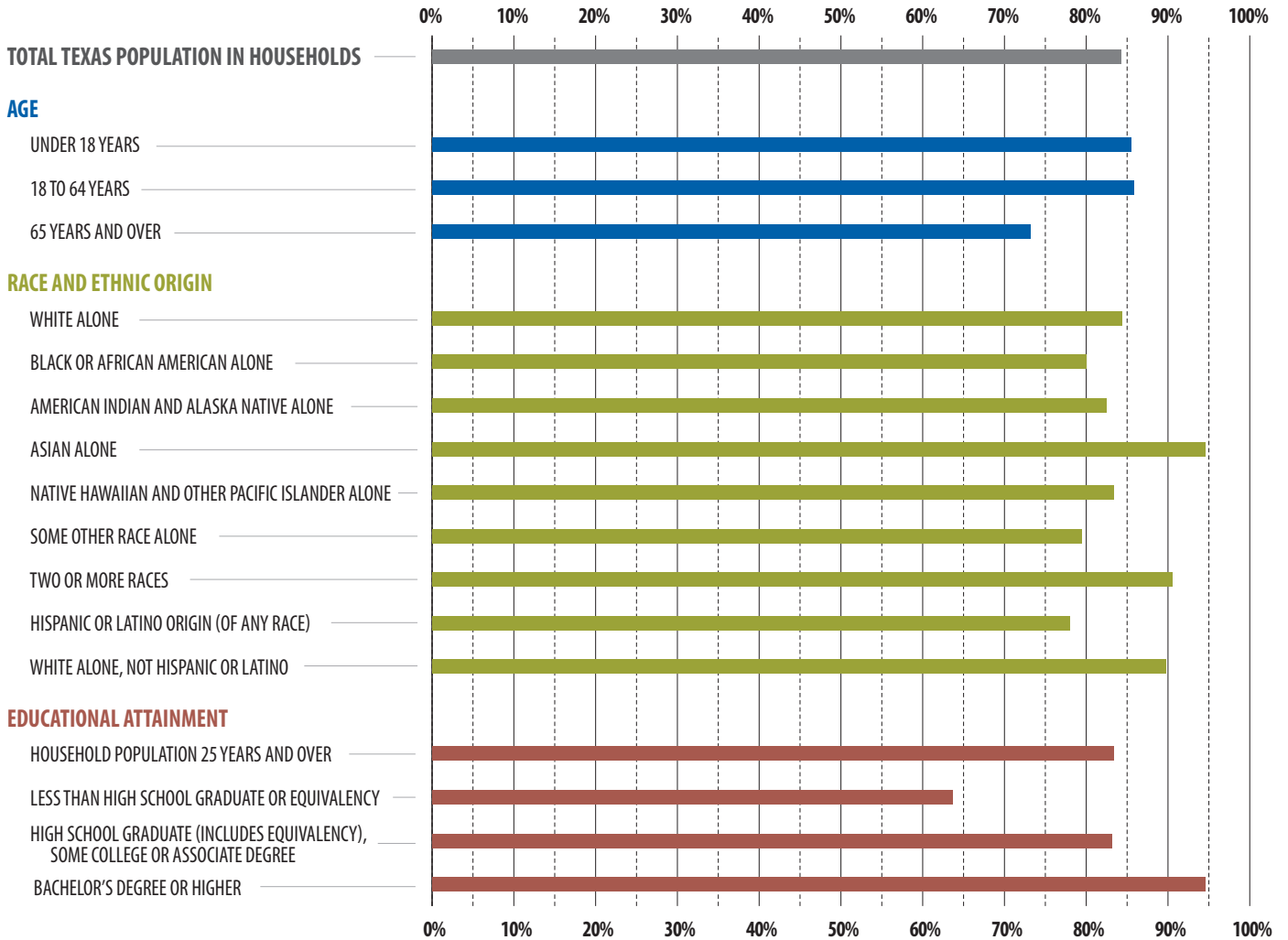


JENNIFER HARRIS
STATE PROGRAM
DIRECTOR,
CONNECTED NATION
TEXAS

Broadband Expansion in Texas

EXHIBIT 2

PROFILE OF TEXANS WITH BROADBAND SUBSCRIPTIONS, 2015-2019 CENSUS ESTIMATES



Source: U.S. Census Bureau



As of January 2021, education officials had purchased or reimbursed school districts for more than 4.5 million devices and Wi-Fi hotspots, with contributions from TEA, local districts and business partners and more than \$600 million of Coronavirus Aid, Relief, and Economic Security (CARES) Act funding. (A hotspot is a public site offering wireless internet.) The effort has included equipping some districts' school buses as mobile hotspots. Future project phases will include greater and more targeted assistance for economically disadvantaged students, bulk-pricing negotiations with internet service providers (ISPs) and the exploration of additional broadband technologies particularly useful for school districts.

Texas is one of only six states without a broadband plan.

Universities and colleges also shifted online and had to cope with many students' substandard internet access. Difficulties caused by the shift to online learning likely contributed to a 3 percent decrease in Texas higher educational enrollment for fall 2020. As of Nov. 20, moreover, federal college aid applications by high school seniors, an important indicator of their plans, were down 14.6 percent from the same period in the previous year. Educators are working to connect more closely with students so the pandemic doesn't further derail their education.

Health Care: The higher demand for health care during the pandemic, as well as the risk of contracting COVID-19 through in-person office visits, led to an enormous rise in telehealth services, including online clinical visits as well as patient and professional health-related education. According to the Texas Association of Health Plans, 4.5 million Texas residents began using telehealth services during the pandemic and 94 percent say they plan to continue using them after the crisis subsides.

In March 2020, Gov. Abbott issued a number of executive orders to make virtual doctor visits easier, including the suspension of copayments for telehealth, full insurance coverage for telehealth visits and expanded qualifying options. The governor and lawmakers, including current House Speaker Dade Phelan (R-Beaumont), consider telehealth among the top priorities for the 2021 legislative session.

E-commerce: The amount of retail commerce shifted online during the pandemic has been staggering. More than ever, customers and businesses rely on solid internet connections for online shopping and curbside pickup. According to census data, national retail e-commerce sales in the third quarter of 2020 totaled \$209.5 billion, a 36.7 percent increase from third-quarter 2019.

In Texas, year-over-year sales tax revenue from online shopping rose by 41.6 percent in November 2020 and 40.0 percent in December. Those figures include vendors specializing in online sales but not the e-commerce components of businesses with brick-and-mortar stores, many of which also have seen huge online sales increases.

BROADBAND PLANNING

All 50 states have recognized the importance of broadband by establishing authorities, task forces, advisory councils or similar entities to oversee expansion efforts.



Texas broadband planning began in earnest in 2019, when Gov. Abbott formed the Broadband Development Council. In September 2020, a bipartisan group of 88 Texas legislators sent a letter to the governor stressing the need for a state broadband plan. Two months later, the Broadband Development Council formally recommended that legislators create a state broadband plan and a state broadband office.

The council's report "did a great job framing what [lawmakers] can tackle this session," says Harris. "It gives them guide rails without being overly prescriptive."

According to Connected Nation Texas, broadband plans "define goals and objectives, identify steps to achieve them, help guide state investments, provide a baseline against which to measure progress, and provide a framework for local planning efforts." A state broadband plan also seeks to maximize federal funding for its implementation.

The Broadband Development Council reported that Texas is one of only six states without a broadband plan. As of May 2020, about three-quarters of U.S. states had created a broadband office to coordinate planning and implementation efforts. In Minnesota, for instance, the Office of Broadband Development, established in 2013 and housed in the state's Department of Employment and Economic Development, is responsible for promoting statewide broadband expansion to fulfill certain economic and accessibility goals.

Several Texas bills to accomplish some or all of the Broadband Development Council's goals have been filed in the current legislative session, including companion bills by Rep. Trent Ashby, R-Lufkin (House Bill 1446) and Sen. Robert Nichols, R-Jacksonville (Senate Bill 506), which would house the broadband office within the Comptroller's office.

Broadband Expansion in Texas



Many of the barriers to expansion in Texas concern the state's size, varying population densities and even its terrain.

Broadband service isn't currently eligible for this funding, but at least one bill introduced during the 2021 legislative session would expand uses of the TUSF to include broadband. According to the Pew Charitable Trusts, as of May 2020, 27 states had established funds to help expand broadband service, although not all of them were active.

The federal government also provides support for broadband expansion. In 2018, the U.S. Department of Agriculture initiated the

Rural Development Broadband ReConnect program, a pilot program providing eligible entities (including ISPs and state and local governments) with loans and grants to build rural broadband infrastructure.

In the following year, the FCC established the Rural Digital Opportunity Fund to provide \$20.4 billion to connect more rural households and small businesses to fixed broadband service. On Dec. 7, 2020, the FCC announced that Texas would receive \$362.7 million from the fund during the next 10 years to serve nearly 311,000 rural households and small businesses in the state.

In addition, both the March 2020 CARES Act and December's Coronavirus Response and Relief Supplemental Appropriations Act (CRRSAA) included funding for expanding broadband access. Among the provisions in the CRRSAA was \$3.2 billion for the Emergency Broadband Benefit Program, which would partially reimburse ISPs for the costs of expanding broadband service to low-income or underserved communities. **FN**

For more on Texas broadband issues, visit [Connected Nation Texas](https://connectednation.org/texas/) at connectednation.org/texas/.

FUNDING BROADBAND

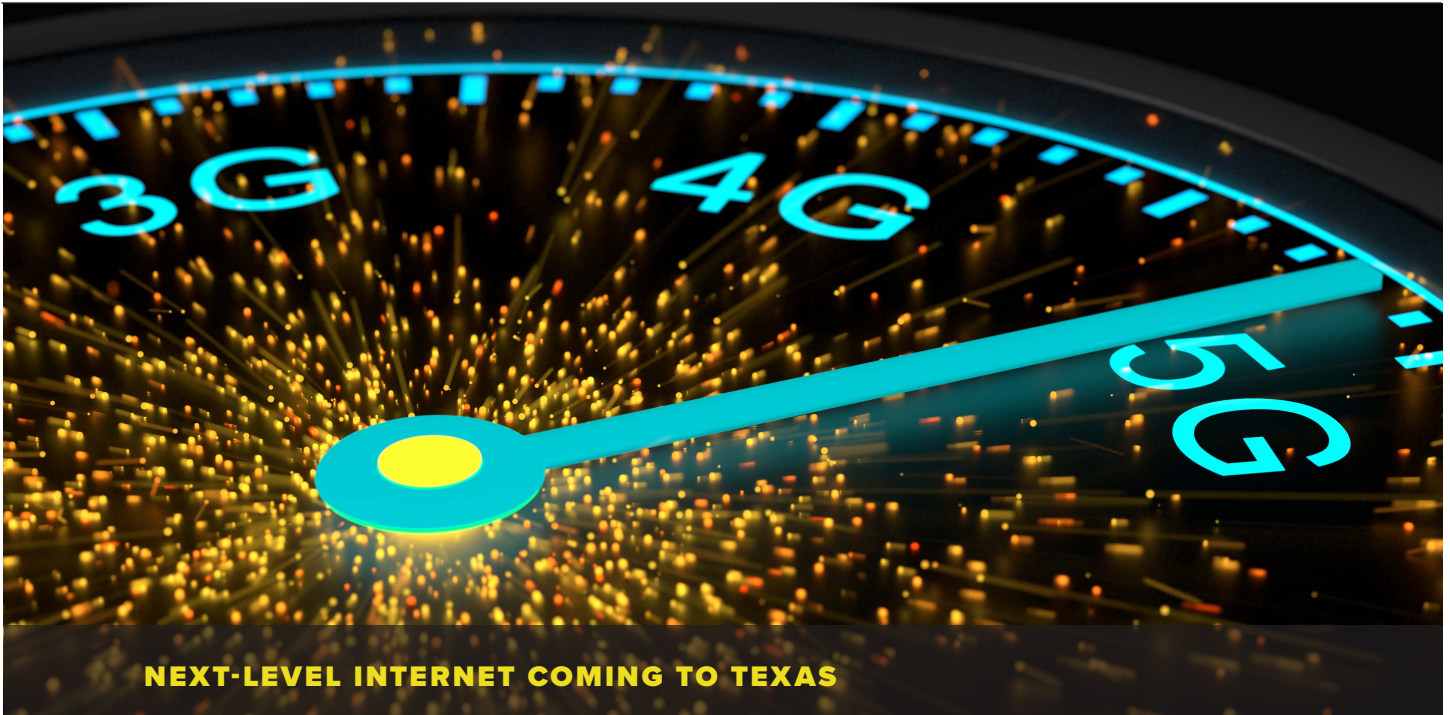
The costs of broadband infrastructure vary greatly by location, geography and type of connectivity. For instance, fiber-optic service costs much more than traditional cable or DSL connections offering lower broadband speeds.

Many of the barriers to expansion in Texas concern the state's size, varying population densities and even its terrain. Wireless service, for example, can be more effective in the plains of West Texas than in the forests of East Texas, which can interfere with signals. ISPs lack incentives to expand broadband service in many rural areas, simply because it isn't very profitable. The costs associated with connecting end users to the internet network generally are much higher in areas outside cities.

In 1987, the Texas Legislature created the Texas Universal Service Fund (TUSF) to support state programs that incentivize the development of telecommunications services in certain rural and low-income areas.

The (Gradual) 5G Revolution

By Patrick Graves



NEXT-LEVEL INTERNET COMING TO TEXAS

According to the Texas 5G Alliance, the U.S. today has more mobile devices than people. But the next stage of mobile connectivity, a series of innovations collectively dubbed “5G,” promises to be an upgrade bordering on another industrial revolution, fueling advances in areas ranging from autonomous vehicles to remote surgery and factory automation.

In 2019, Mike Wood, an official with the International Electrotechnical Commission (IEC), predicted that 5G and internet-of-things (IoT) applications — sensors and communications technologies embedded in physical objects ranging from refrigerators to pipelines and heavy industrial equipment — would be widespread by 2025. By then, the number of connected IoT devices is projected to be 75 billion worldwide, a 500 percent increase from 2015, according to Jamie Susskind, a vice president of the Consumer Technology Association.

There’s a pragmatic economic necessity driving 5G — the need for more bandwidth. According to Douglas Dawson, owner of telecommunications consulting firm CCG Consulting, mobile data volumes have risen by 25 percent in the last few years, swamping existing 4G networks.

But 5G isn’t widely available yet, and it hasn’t achieved anything like its full potential in the U.S. The Swedish technology company Ericsson estimates global 5G coverage at a billion people, or about 15 percent of the world’s population. Even so, the advent of “smart” technology and the constant business demand for more data are propelling 5G forward.

SO WHAT’S 5G?

Fifth-generation or 5G technologies represent the next step in the 40-plus-year evolution of mobile communications (**Exhibit 1**). Each of these five generations introduced new capabilities and services for consumers.

Perhaps the most distinguishing feature of 5G is the use of “small cells,” low-powered antennas that communicate wirelessly via radio waves, usually installed on existing public infrastructure such as street signs or utility poles (**Exhibit 2**), rather than the large towers used to transmit 4G signals.

Small cells allow wireless carriers to offer increased data capacity, faster connectivity speeds and a better wireless experience. The trade-offs are the small cells’ shorter range and weaker signal penetration, meaning they must be configured more densely and installed in much greater numbers. And they must be connected almost exclusively by underground fiber-optic cable — meaning “wireless internet” isn’t, really. In the current, transitional period, 4G cell towers and 5G small cells will continue to exist and work together.

Another factor differentiating 5G is the portion of the radio spectrum used to transmit it. According to analytics firm Open Signal, every nation with 5G other than the U.S. uses the 3.5GHz mid-band spectrum for it; in the U.S., carriers such as T-Mobile and AT&T often use lower bands that offer lower average speeds. That’s one explanation for average U.S. 5G download speeds that were slower than those of 14 other nations as of mid-2020. The U.S. average speed was 1.8 times faster than 4G, while Spain’s, for instance, was seven times faster.

The (Gradual) 5G Revolution

EXHIBIT 1

| THE EVOLUTION OF WIRELESS COMMUNICATIONS | | | | | |
|--|-----------------------------------|------------------------------------|---------------------------|--|--|
| RELEASE DATE | 1979-1982 | 1991 | 1998-2002 | 2009 | 2019-2020 |
| KEY DEVELOPMENT | 1G Analog voice calling | 2G Digital voice calling | 3G Mobile data | 4G Wireless broadband | 5G Ultra-high speed, mega-capacity |
| MAJOR PRODUCTS/SERVICES | Mobile phones | Cell phones, texting | Mobile, wireless internet | High-speed internet, HDTV, live streaming, cloud computing | Internet of Things, autonomous machines |

Sources: Texas 5G Alliance, Qualcomm, Brainbridge and Digi International

For wireless companies, the expensive, capital-intensive move to 5G hasn't yet generated the revenue streams needed to fund new applications and services, according to Grant Spellmeyer, a vice president with U.S. Cellular. Such revenue will be essential to making 5G cost-effective.

The IEC's Wood says initial 5G applications are likely to be for fixed wireless residential access and enhanced mobile broadband. But Chelsea Collier, editor-at-large

for Smart Cities Connect, sees a bigger picture emerging.

"The real application is IoT and processing data at the edge," Collier says. With 5G-enabled "edge computing," data from embedded sensors can be processed and used on site — a capability that would prove essential for the broader use of autonomous vehicles, for instance.

EXHIBIT 2

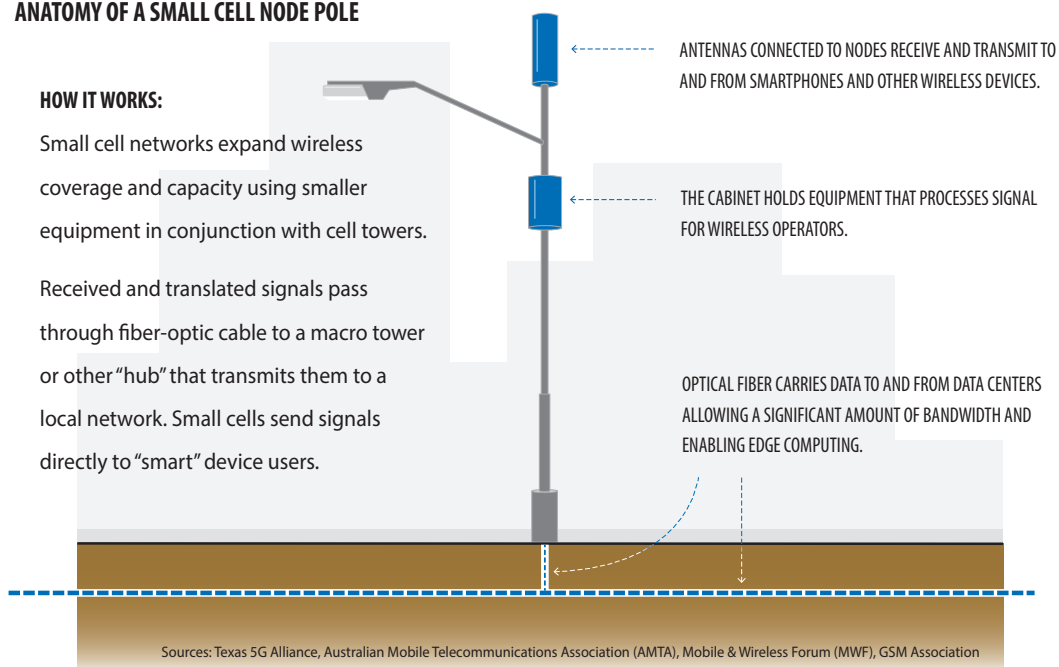
COMPONENTS OF SMALL CELLS

ANATOMY OF A SMALL CELL NODE POLE

HOW IT WORKS:

Small cell networks expand wireless coverage and capacity using smaller equipment in conjunction with cell towers.

Received and translated signals pass through fiber-optic cable to a macro tower or other "hub" that transmits them to a local network. Small cells send signals directly to "smart" device users.





CHELSEA COLLIER

SMART CITIES CONNECT

“When you can analyze and manipulate data where it’s collected, you can deliver insights and value more quickly,” Collier says.

FEDERAL ROLE

On Dec. 7, 2020, the Federal Communications Commission’s (FCC’s) Rural Digital Opportunity Fund allocated \$9.2 billion to 180 providers to deploy high-speed broadband in the next decade to 5.2 million homes and businesses nationwide. In Texas, 22 companies will receive \$362.3 million.

Texas’ share will be spent in 220 of its 254 counties; 85 Texas counties will receive at least \$1 million each, according to recent media reports.

The FCC also recently completed the latest in a years-long series of spectrum band auctions. On Dec. 8, it auctioned frequencies in the coveted C or mid-band, considered the 5G “sweet spot” due to its optimum ranges of coverage, speed and latency. The tally announced Jan. 15 reflects its value to providers: nearly \$81 billion, almost double the previous auction record.

Houston is in the vanguard of small cell permitting in Texas, and not just because it’s the state’s largest city; advocates have lauded its proactive approach to 5G. Other cities, particularly smaller ones, are lagging well behind (**Exhibit 3**).

Amandus “Mandy” Derr of the Texas 5G Alliance, a telecom industry trade and economic development group, credits 2017 state legislation (Senate Bill 1004) with streamlining and harmonizing municipal administrative procedures applicable to 5G. He singled out Houston and Dallas as moving quickly to greet the new technologies.

5G EVERYWHERE?

Due to its reliance on dense networks of small cells, Dawson describes 5G as primarily an urban technology, noting that Texas’ large number of metropolitan areas positions the state to take greater advantage of it. But the state’s expansive rural areas pose a much bigger challenge.

“Implementation [of 5G] doesn’t mean widespread access because it’s not economically feasible everywhere,” says Jennifer Harris, state program director of Connected Nation Texas.

And access doesn’t equal *adoption*. Harris says that 30 percent of Texans who live in areas where broadband is already accessible don’t subscribe, mainly due to affordability.

A 5G GLOSSARY

Bandwidth: the maximum amount of data that can be transmitted over an internet connection in a given amount of time; refers to *volume* of information, not internet speed.

Broadband: a catch-all term for high-speed internet access; technically, a wide band of radio frequencies providing minimum speeds of 25 megabits per second (Mbps) download and 3 Mbps upload, according to the FCC.

Edge computing: a distributed computing framework that processes data at the source, rather than at data centers or on cloud servers.

Internet of things (IoT): interconnected “smart” devices containing both sensors and data processing functions.

Internet speed: rate at which digital data are transferred, both for download and upload; measured in Mbps. The current high-speed internet standard is 25/3 Mbps, download/upload.

Latency: amount of elapsed time (delay) between accessing and receiving internet data or initiating and completing a function online; measured in milliseconds.

Spectrum: electromagnetic waves dedicated to specific uses, such as TV, radio and cellular service, divided into frequencies or bands, some of which are crucial to 5G.

Wi-Fi: technology used to connect computers and other electronics to each other, networks and the internet via a wireless signal.

Sources: Ken’s Tech Tips, AT&T, ZDNet, Boston Consulting Group, CNet, FCC, TechTerms, Verizon, Highspeedinternet.com, Digi International

Given Texas’ geographic diversity and sheer size, Harris says logistics will play an “outsized” role in getting everyone online. “We need different technological approaches for different parts of the state,” she says.

Derr, who’s also government affairs director for telecom infrastructure firm Crown Castle, believes rural residents may be served best by a combination of government funding and private partnerships with local wireless service providers.

This is the kind of issue state broadband offices are designed to address. Texas is one of six states without such an office, but that could change soon (see “Broadband Expansion in Texas” in this issue).

EXHIBIT 3

| SMALL CELL PERMITS BY SELECTED TEXAS CITIES* | | | |
|--|--------------------------|---------------------------------|----------------------|
| CITY | NUMBER OF APPROVED SITES | NUMBER OF PERMITS OUTSTANDING** | NUMBER OF APPLICANTS |
| HOUSTON | 5,455 | NA | NA |
| DALLAS | 1,948 | 248 | 6 |
| SAN ANTONIO | 1,760 | 89 | 5 |
| AUSTIN | 717 | 128 | 3 |
| FORT WORTH | 513 | 102 | 3 |
| EL PASO | 166 | 31 | 3 |
| CORPUS CHRISTI | 90 | 71 | 2 |
| BROWNSVILLE | 48 | NA | 7 |
| MIDLAND | 16 | NA | NA |
| LAREDO | 6 | 14 | 1 |
| AMARILLO | 1 | 27 | 2 |

NA: not available.

*As of November/December 2020.

**Pending either city staff review, carrier revisions or both.

Sources: Interviews with municipal government officials

5G IN INDUSTRY

Alok Shah, an executive with Samsung Electronics America, believes 5G may be even more important to industry than the consumer sector, especially as coverage increases and latency decreases.

"5G is not one thing to everybody," Shah observed during a recent podcast in *Broadband Breakfast Live Online's* ongoing series, "A No-Nonsense Guide to 5G." He recounted how 5G-related technology already is benefiting Samsung's Austin semiconductor factory. According to Shah, ethernet cables used to connect much of the plant's equipment have been replaced with mobile high-speed connections. 5G also provided workers with real-time chat capability, allowing them to provide timely input for troubleshooting.

Other current examples of commercial 5G/IoT applications include remote patient monitoring and diagnostic data collection (Rimidi), drone-enabled wildfire fighting and emergency situation management (Austin-based DroneSense) and even hog farm efficiency (SwineTech).

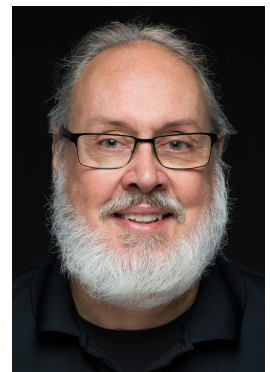
COMING SOON ... OR NOT?

Despite a sense of inevitability, some industry watchers don't expect the 5G revolution to be complete anytime soon. In the short term, wireless providers may take advantage of the additional frequencies opened up by the federal government — and call it 5G, whether or not small-cell networks are entirely functional.

"In 2021," Dawson predicts, "5G will continue to be 4G delivered on the new spectrum." He notes that the entire array of 4G benefits wasn't available until 2019, a decade after its introduction, so he doesn't expect a mature 5G in the near term. Moreover, some tech observers caution that the advent of full-blown 5G isn't a foregone conclusion. They emphasize the need to develop public-private partnerships, seek stakeholders' mutual interests and forge broad-based working relationships.

"If we don't collaborate both within and across sectors, we will miss out on the real opportunities," Collier says. **FN**

For more on 5G technology, visit the Texas 5G Alliance at Texas5GAlliance.com.



DOUGLAS DAWSON

CCG CONSULTING

This table presents data on net state revenue collections by source. It includes most recent monthly collections, year-to-date (YTD) totals for the current fiscal year and a comparison of current YTD totals with those in the equivalent period of the previous fiscal year.

These numbers were current at press time. For the most current data as well as downloadable files, visit comptroller.texas.gov/transparency.

Note: Texas' fiscal year begins on Sept. 1 and ends on Aug. 31.

NET STATE REVENUE — All Funds Excluding Trust

(AMOUNTS IN THOUSANDS)

Monthly and Year-to-Date Collections: Percent Change From Previous Year

| Tax Collections by Major Tax | JANUARY 2021 | YEAR TO DATE: TOTAL | YEAR TO DATE: CHANGE FROM PREVIOUS YEAR |
|--|---------------------|---------------------|---|
| SALES TAX | \$3,074,827 | 14,211,629 | -4.24% |
| PERCENT CHANGE FROM JANUARY 2020 | -0.32% | | |
| MOTOR VEHICLE SALES AND RENTAL TAXES | 408,088 | 2,170,521 | -3.12% |
| PERCENT CHANGE FROM JANUARY 2020 | -13.36% | | |
| MOTOR FUEL TAXES | 294,316 | 1,477,243 | -6.75% |
| PERCENT CHANGE FROM JANUARY 2020 | -4.72% | | |
| FRANCHISE TAX | -2,882 | -1,140 | -99.28% |
| PERCENT CHANGE FROM JANUARY 2020 | -84.71% | | |
| OIL PRODUCTION TAX | 254,569 | 1,078,598 | -39.51% |
| PERCENT CHANGE FROM JANUARY 2020 | -35.67% | | |
| INSURANCE TAXES | 15,954 | 124,675 | -9.78% |
| PERCENT CHANGE FROM JANUARY 2020 | -39.64% | | |
| CIGARETTE AND TOBACCO TAXES | 99,778 | 568,504 | 14.85% |
| PERCENT CHANGE FROM JANUARY 2020 | -5.03% | | |
| NATURAL GAS PRODUCTION TAX | 102,708 | 391,952 | -28.42% |
| PERCENT CHANGE FROM JANUARY 2020 | -21.58% | | |
| ALCOHOLIC BEVERAGES TAXES | 93,705 | 439,991 | -26.64% |
| PERCENT CHANGE FROM JANUARY 2020 | -27.62% | | |
| HOTEL OCCUPANCY TAX | 26,938 | 152,521 | -40.37% |
| PERCENT CHANGE FROM JANUARY 2020 | -35.14% | | |
| UTILITY TAXES¹ | 49,608 | 172,288 | -23.56% |
| PERCENT CHANGE FROM JANUARY 2020 | -47.58% | | |
| OTHER TAXES² | 10,006 | 49,992 | -50.48% |
| PERCENT CHANGE FROM JANUARY 2020 | -56.71% | | |
| TOTAL TAX COLLECTIONS | \$4,427,614 | 20,836,774 | -8.02% |
| PERCENT CHANGE FROM JANUARY 2020 | -7.61% | | |
| Revenue By Source | JANUARY 2021 | YEAR TO DATE: TOTAL | YEAR TO DATE: CHANGE FROM PREVIOUS YEAR |
| TOTAL TAX COLLECTIONS | \$4,427,614 | 20,836,774 | -8.02% |
| PERCENT CHANGE FROM JANUARY 2020 | -7.61% | | |
| FEDERAL INCOME | 5,960,430 | 25,533,924 | 41.89% |
| PERCENT CHANGE FROM JANUARY 2020 | 69.83% | | |
| LICENSES, FEES, FINES AND PENALTIES | 666,025 | 2,740,280 | -3.33% |
| PERCENT CHANGE FROM JANUARY 2020 | -6.77% | | |
| STATE HEALTH SERVICE FEES AND REBATES³ | 400,908 | 2,057,388 | -30.48% |
| PERCENT CHANGE FROM JANUARY 2020 | -42.36% | | |
| NET LOTTERY PROCEEDS⁴ | 381,379 | 1,278,868 | 34.60% |
| PERCENT CHANGE FROM JANUARY 2020 | 59.93% | | |
| LAND INCOME | 148,776 | 665,276 | -29.65% |
| PERCENT CHANGE FROM JANUARY 2020 | -13.80% | | |
| INTEREST AND INVESTMENT INCOME | 323,696 | 789,637 | -45.48% |
| PERCENT CHANGE FROM JANUARY 2020 | -11.70% | | |
| SETTLEMENTS OF CLAIMS | 5,764 | 458,306 | -18.69% |
| PERCENT CHANGE FROM JANUARY 2020 | -94.75% | | |
| ESCHEATED ESTATES | 14,703 | 124,338 | 18.24% |
| PERCENT CHANGE FROM JANUARY 2020 | 41.53% | | |
| SALES OF GOODS AND SERVICES | 35,500 | 131,002 | 18.94% |
| PERCENT CHANGE FROM JANUARY 2020 | 82.41% | | |
| OTHER REVENUE | 149,006 | 1,034,352 | 54.62% |
| PERCENT CHANGE FROM JANUARY 2020 | -40.00% | | |
| TOTAL NET REVENUE | \$12,513,800 | 55,650,145 | 8.62% |
| PERCENT CHANGE FROM JANUARY 2020 | 15.04% | | |

¹ Includes public utility gross receipts assessment, gas, electric and water utility tax and gas utility pipeline tax.

² Includes taxes not separately listed, such as taxes on oil well services, coin-operated amusement machines, cement and combative sports admissions as well as refunds to employers of certain welfare recipients.

³ Includes various health-related service fees and rebates that were previously in "license, fees, fines and penalties" or in other non-tax revenue categories.

⁴ Gross sales less retailer commission and the smaller prizes paid by retailers.

Notes: Totals may not add due to rounding. Excludes local funds and deposits by certain semi-independent agencies.

Includes certain state revenues that are deposited in the State Treasury but not appropriated.



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Texas Comptroller of Public Accounts
Publication #96-369,

February 2021