Understanding Rural Broadband Technology Options

AN APA TECHNOLOGY DIVISION WEBINAR

PRESENTERS:

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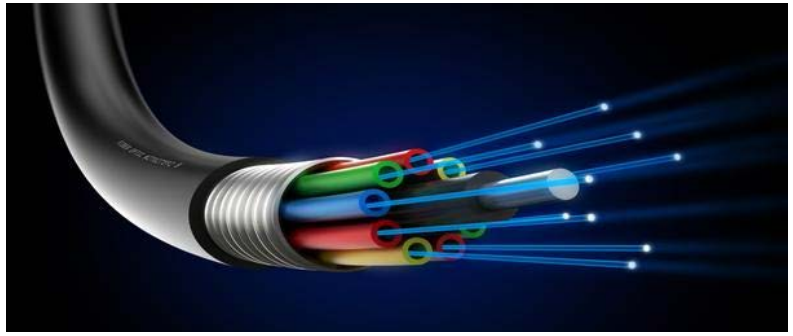
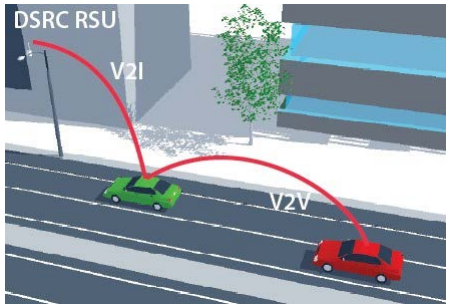
Bill Coleman, Community Technology Advisors

JUNE 15, 2018

Agenda

- Transformative Technology Trends Driving Digital Data Production
- What That Means for Small Town and Rural Communities
- Broadband, Small Cell and Other Technologies for STaR Communities
- Results from the APA STaR and Economic Development Survey



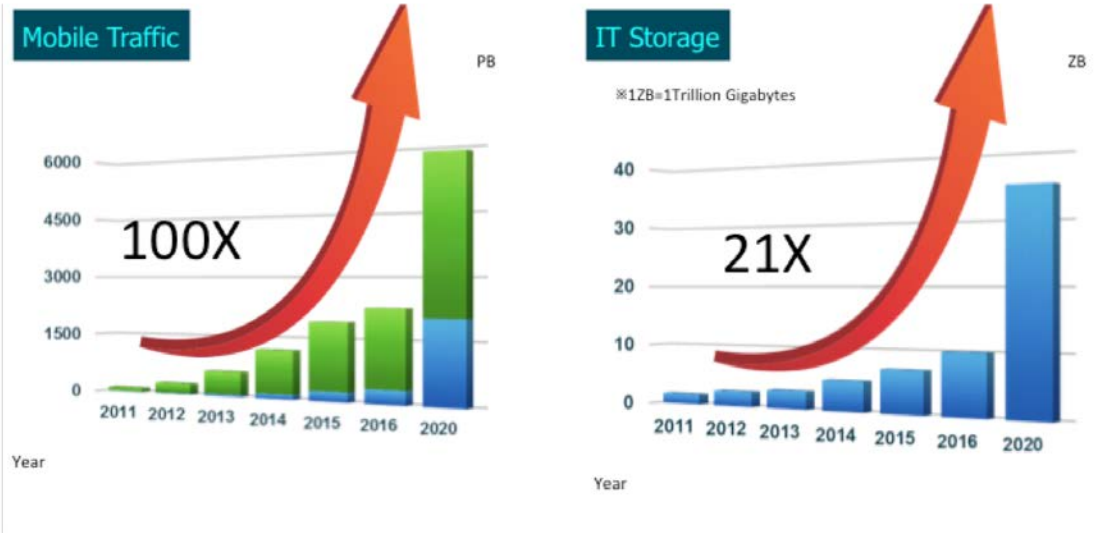


Four Big Technology Trends Driving Digital Data Production

www.mixturecloud.com

1. **Data Storage and the Private Cloud:** Biggest growth area in economy: one-third of overall IT infrastructure spending for the year

   - Amazon Web Services (between 3 and 5 million servers)
   - Apple iCloud (300 million people store files)
   - Dropbox (175 million)
   - Microsoft OneDrive (250 million)
   - Google Drive (120 million)



Source: Bain Analysis, Forrester, IDC, Gartner, Cisco

Data Storage and Cloud Business Applications

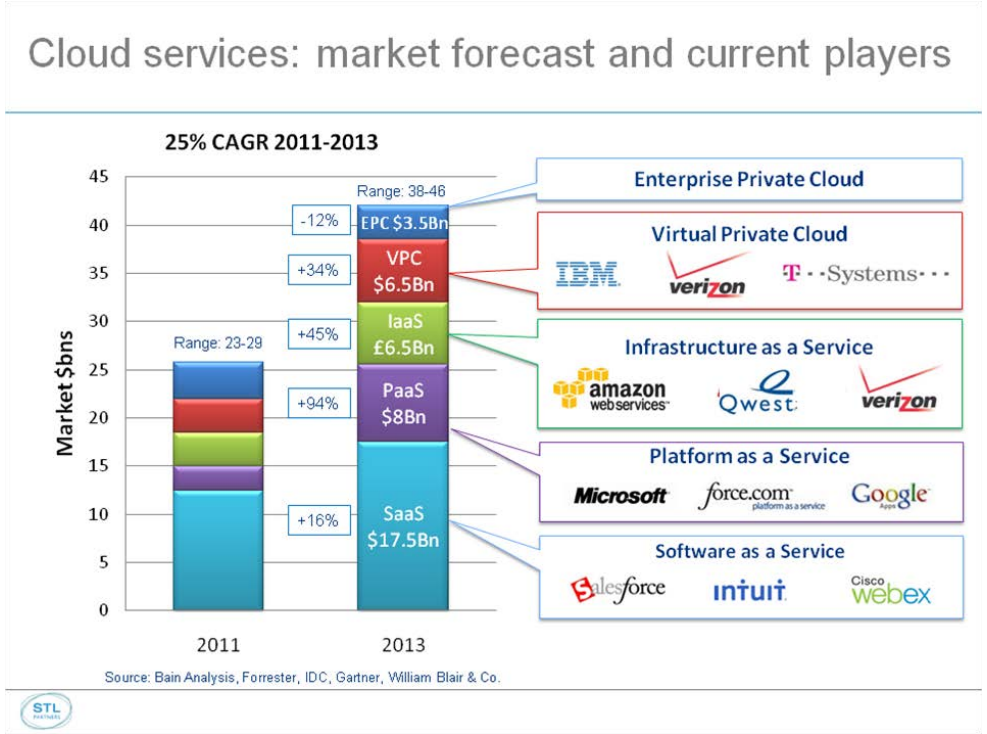
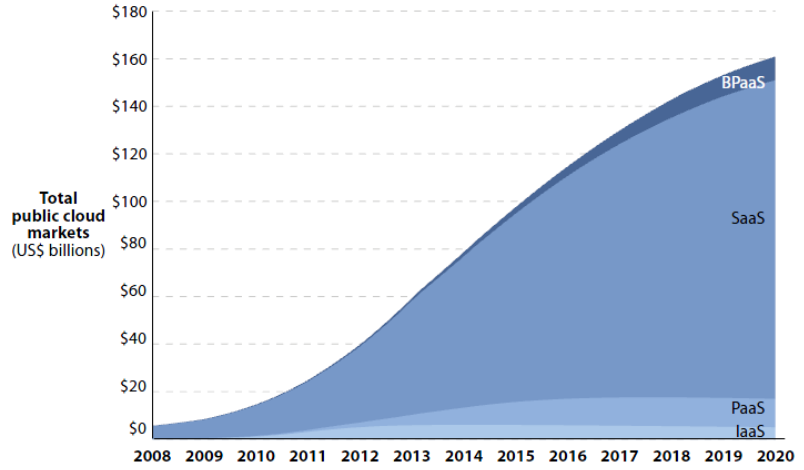


Figure 3 Forecast: Global Public Cloud Market Size, 2011 To 2020

The spreadsheet detailing this forecast is available online.



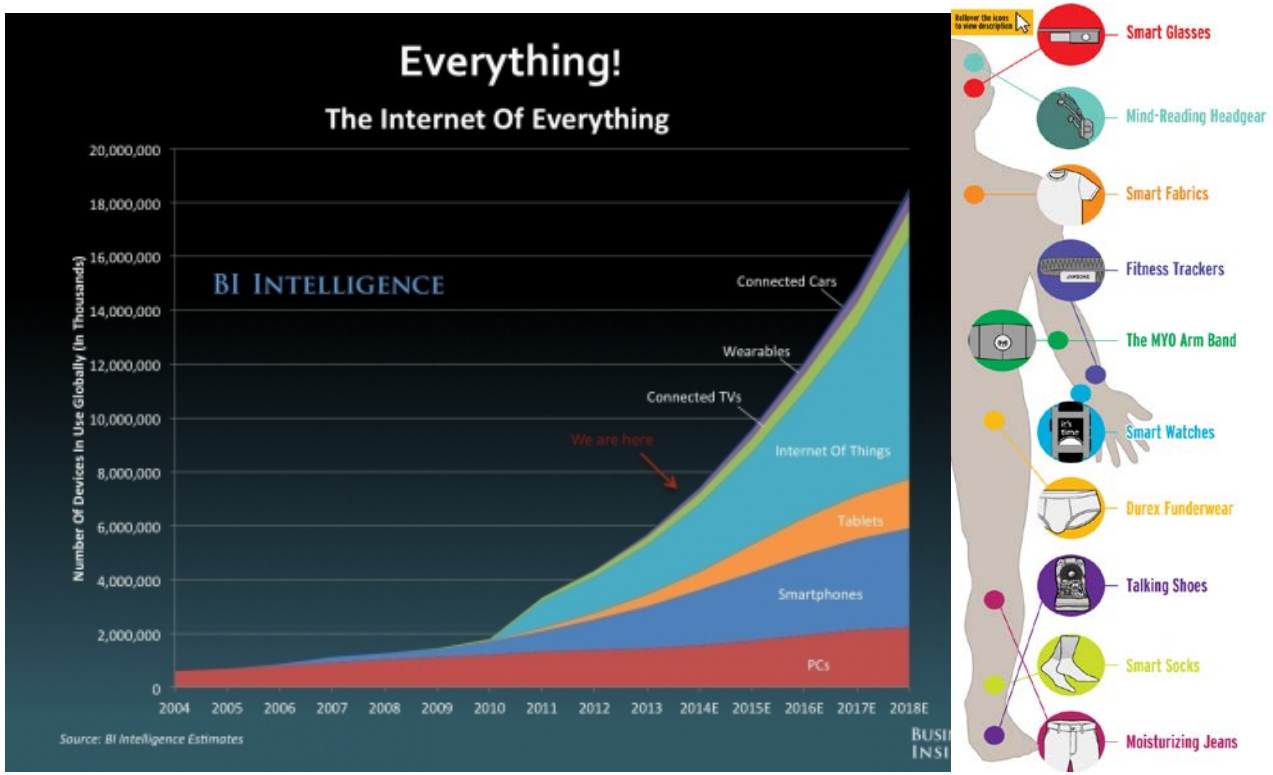
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BPaaS ($)	0.15	0.23	0.35	0.53	0.80	1.26	1.95	2.93	4.28	6.00	7.66	9.08	10.02
SaaS ($)	5.56	8.09	13.40	21.21	33.09	47.22	63.19	78.43	92.75	105.49	116.39	125.52	132.57
PaaS ($)	0.05	0.12	0.31	0.82	2.08	4.38	7.39	9.80	11.26	11.94	12.15	12.10	11.91
IaaS ($)	0.06	0.24	1.02	2.94	4.99	5.75	5.89	5.82	5.65	5.45	5.23	5.01	4.78

58161

Source: Forrester Research, Inc.

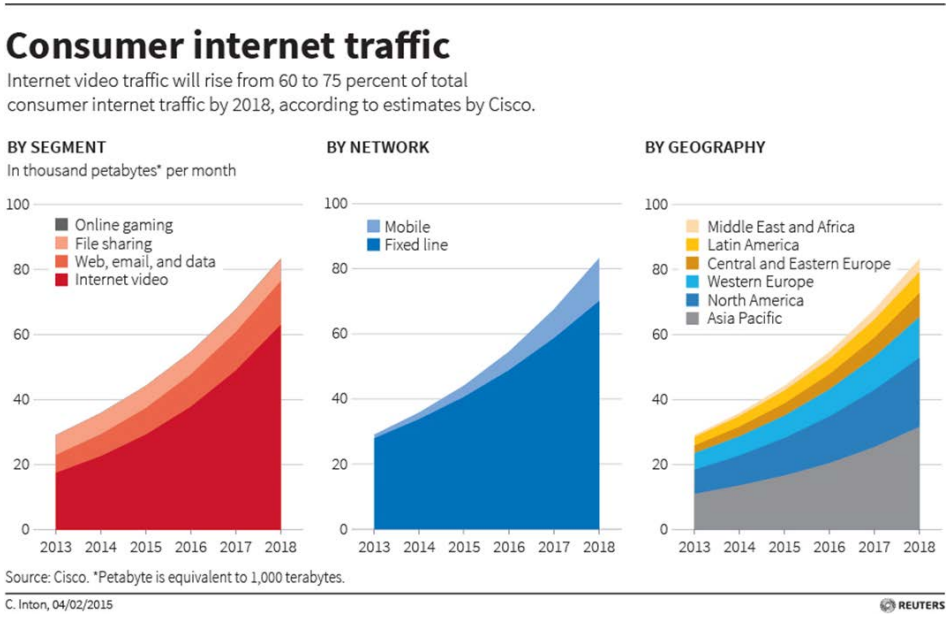
2. The Internet of Things: Home and Industrial…

- Wearables and health monitoring
- T-Commerce and Smart TV
- Smart Grids and Collaborative Supply Chains
- The connected phone/home/car/office



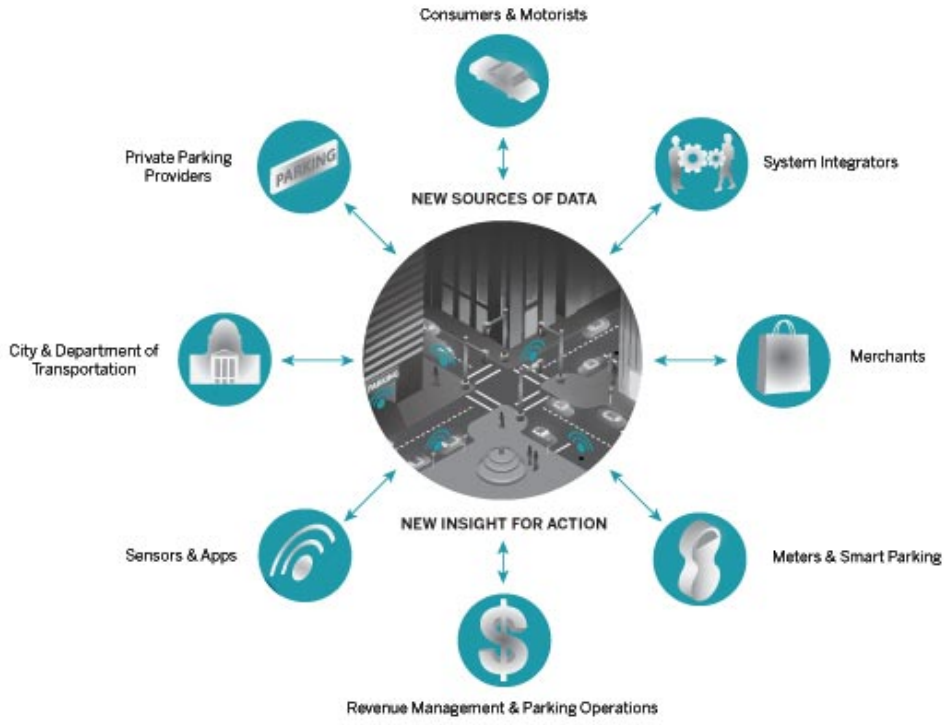
Changing Attitudes and Demographics Driving New Technologies

- Young committed to online technologies/schools
- Aging population and healthcare = Telemedicine
- Multiple Dwelling Homes (MDU) - 90% of seniors who own MDUs are demanding faster Internet
- Telecommuting
- Only at the beginning of Smart Phone technology



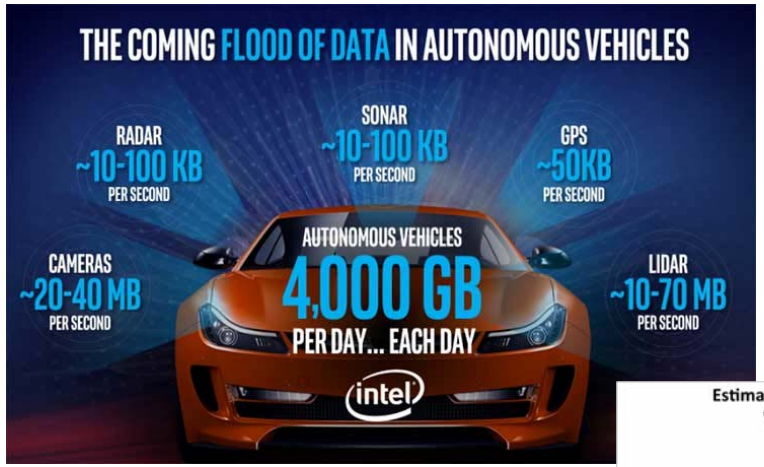
3. Smart City/Smart Government Services

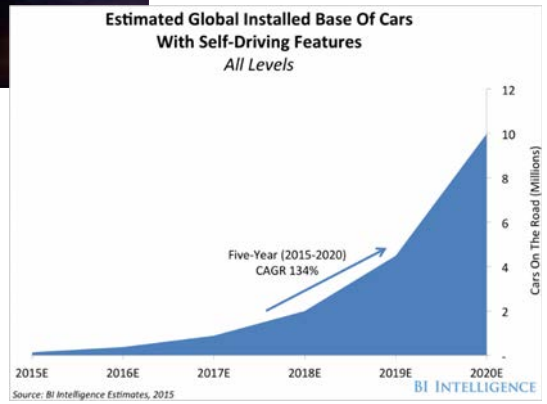
- Traffic management
- Large file transmission (e.g., building permits)
- Two-way video streaming:
  - Courts
  - Local government services
- Smart signs
- Public safety and resiliency
- Road repair reporting
- Booking/availability and paying for parking



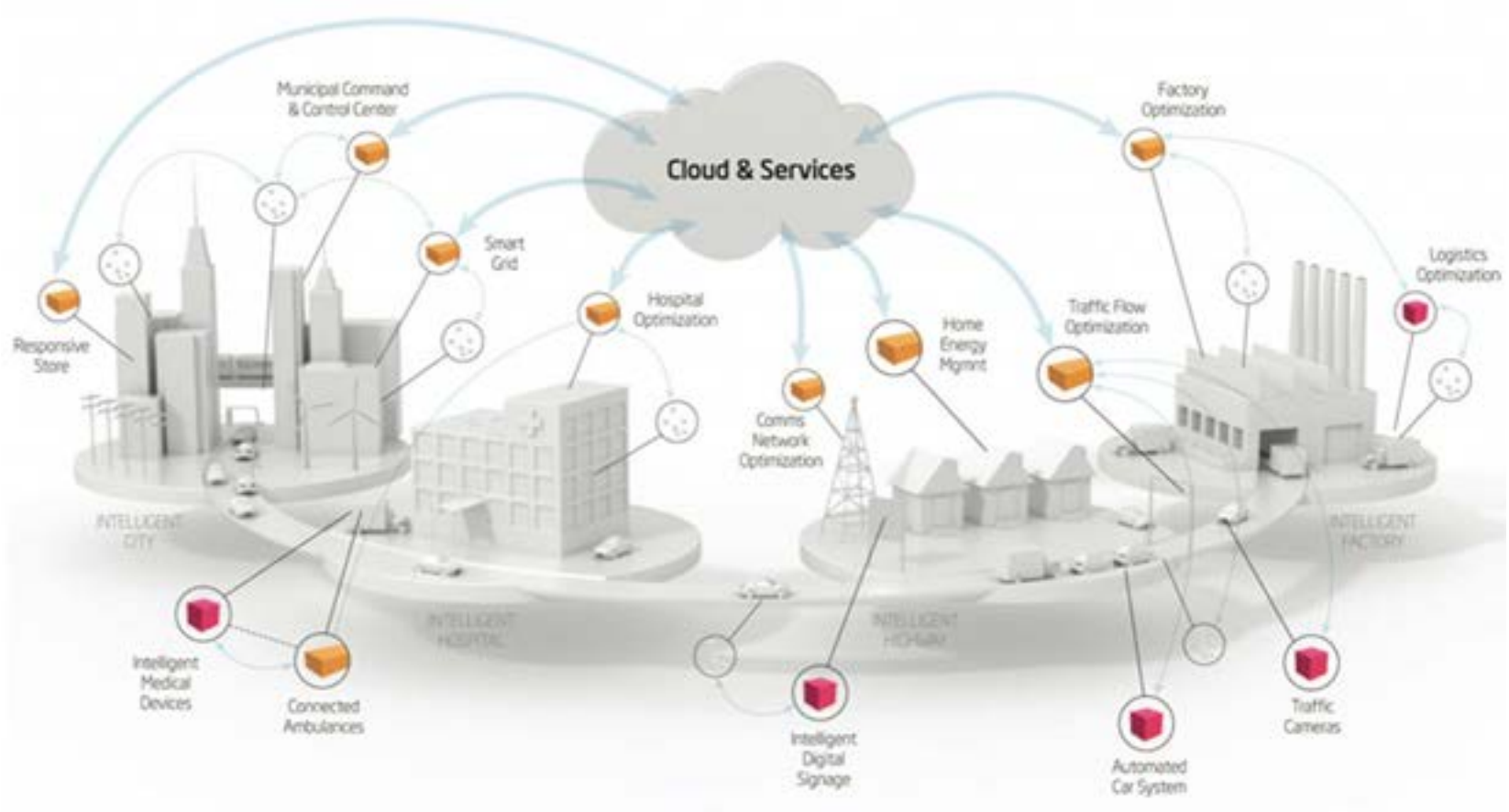
4. From the Gig Economy to the Autonomous Vehicle Economy

- Ride hailing and the rise of TNCs
- Electrification
- Self-driving AVs:
  - Private individuals
  - Fleets
- Robo Taxis and Micro-transit
- Trucks, Buses and Delivery
- Mobility-as-a-Service and Cross-functional Software Platforms
- Data transfer from car to “edge” and V2I
- DSRC (Dedicated Short Range Communications) and/or LTE and 5G





2020 Vision: The Gigabyte Economy…



Source: OpenText

Connectivity is Everything…

Smart city technology

- From LTE/4G and Small Cell to DSRC and/or 5G
- Shift in sensors from vehicle to infrastructure
- Data Management: Safety and performance
- **Fiber, fiber, fiber…**

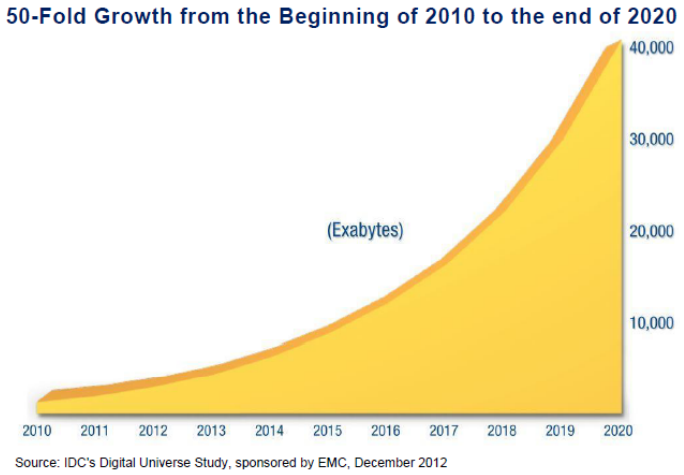
Physical Inventory and Built Infrastructure

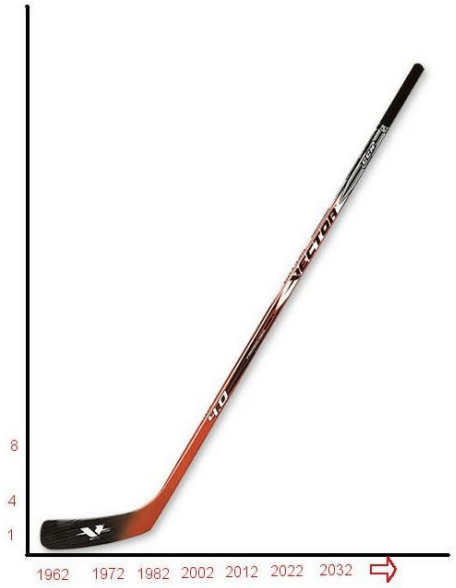
- Poles, towers, small cell
- Traffic and intersection management
- Road sensors
- Right of ways and dedicated zones for AVs and pedestrians

Requires public sector involvement: V2I infrastructure on the public right-of-ways, the private sector can't build, own, or control… …but mostly it requires **fiber, fiber, fiber**….

A change in approach to broadband provision in rural areas is on its way…

- Internet traffic in NA will grow 20% per year
- Shift *from download to upload*
- Cities and suburbs moving to symmetrical/Gigabyte level service within 5 years
- Developing “edge” computing
- Changing attitudes about rural broadband among providers and in DC
- AV Economy will break the deadlock…





Broadband 101

BROADBAND TECHNOLOGIES OVERVIEW

BILL COLEMAN

BILL@COMMUNITYTECHNOLOGYADVISORS.COM

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651-491-2551

Broadband Trends

Broadband at the FCC
- Recently reaffirmed by the FCC:
  - Anything less than 25 Mb/3 Mb is not broadband
  - Mobile cellular is not a substitute for a fixed connection
- The FCC standard increased 30-fold between 2008 and 2016
- There is no federal broadband goal, only a current standard

Broadband goals in Minnesota
- 25/3 by 2022
- 100/20 by 2026

Broadband in the marketplace
- Some ISPs increased speeds 100-fold between 2008 and 2016
- Comcast just raised all speed tiers by 50 Mb
- Gigabit service is increasingly available

Household use
- Use more than 250 GB of data/month and rising
- Have 13 connected devices; 50 devices by 2022
  - Computers, phones, fitness devices, home security, medical devices, thermostats, personal assistants, watches, home appliances, cars, farm animals, sensors, tractors

Assessing Broadband Technologies

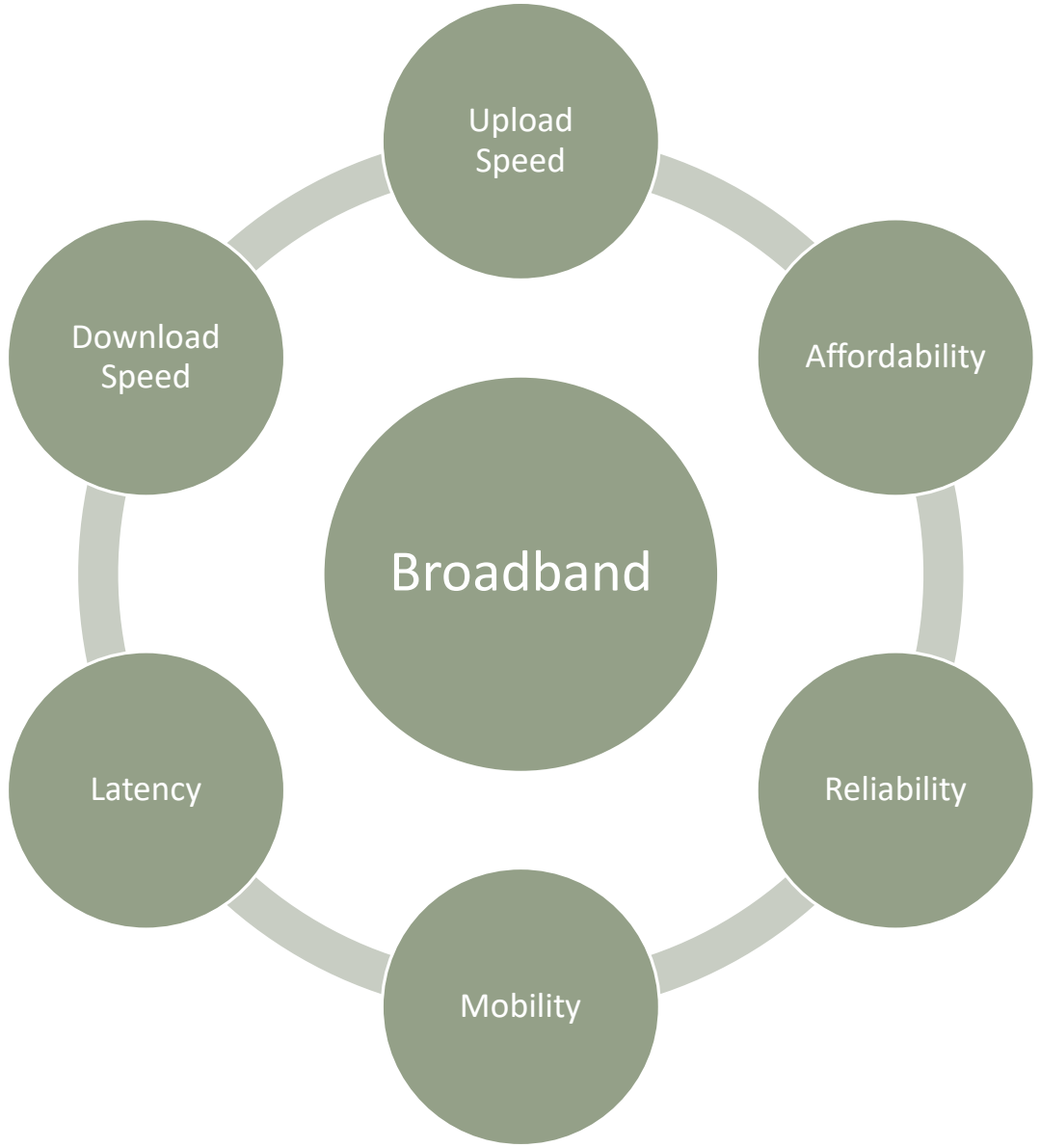
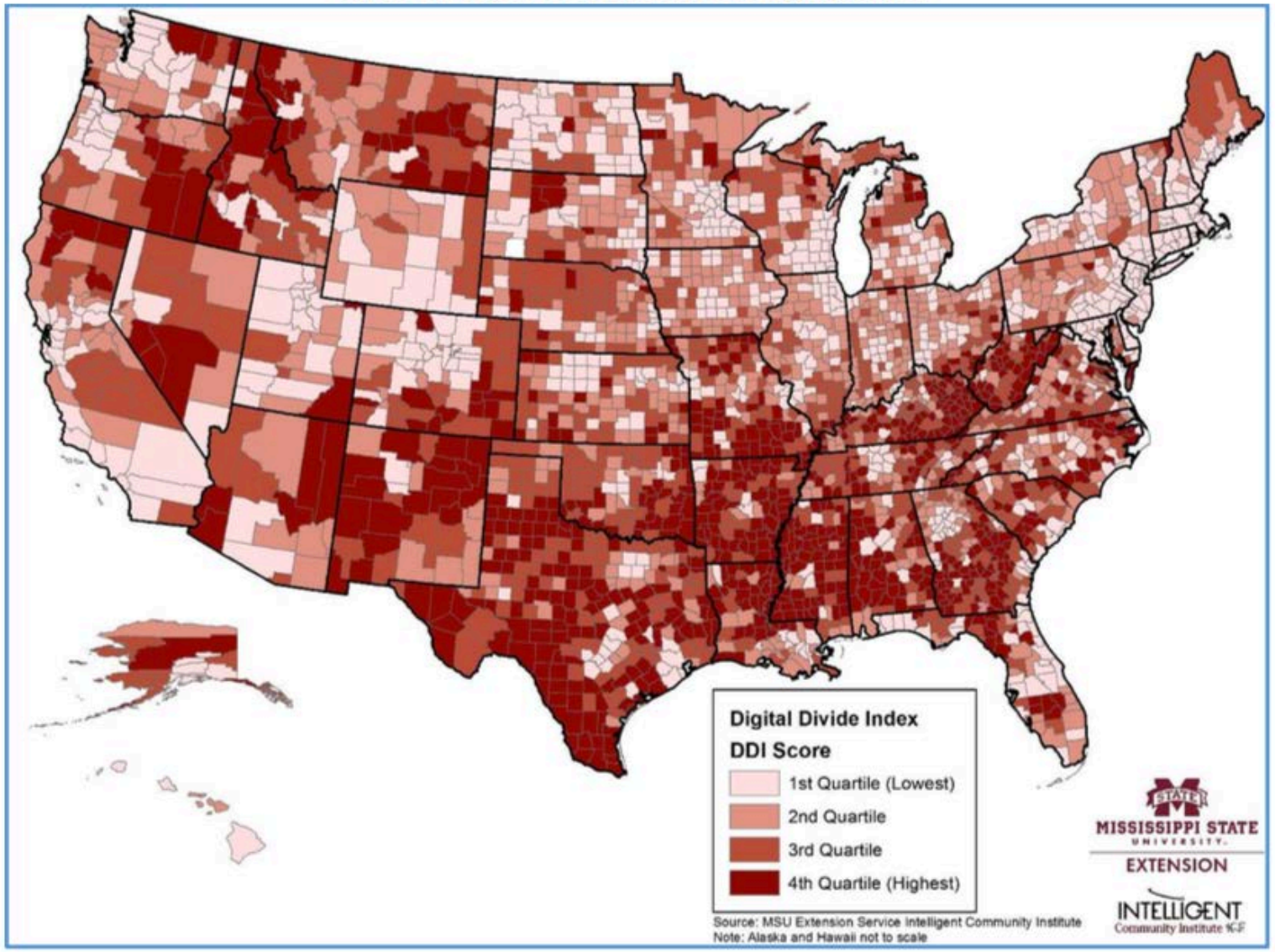


Figure 3. Digital Divide Index Score by Quartiles.

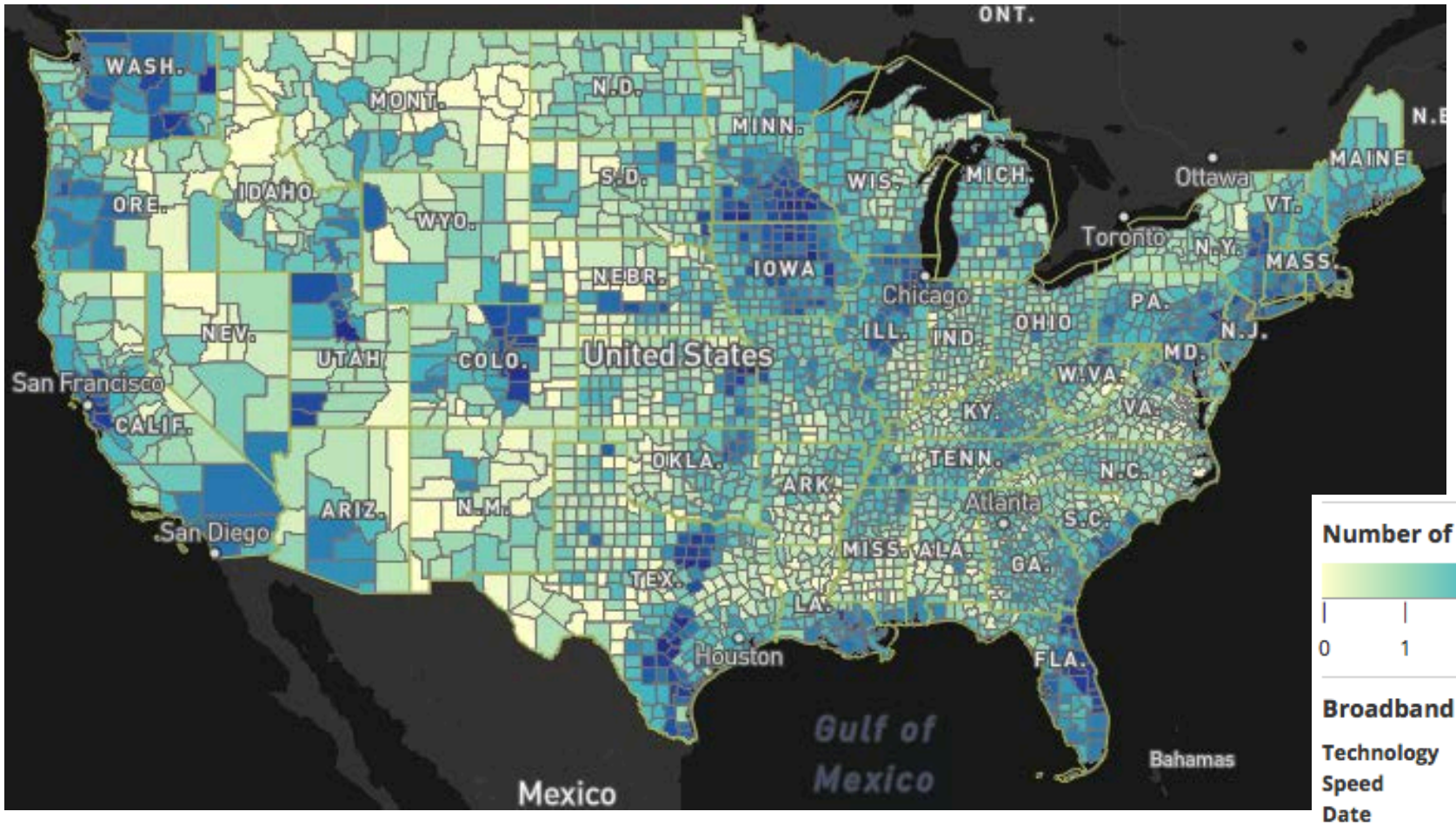


Why it matters!

How do we know what we have?

MAPS AND DATA

FCC National Broadband Map



Number of Fixed Residential Broadband Providers

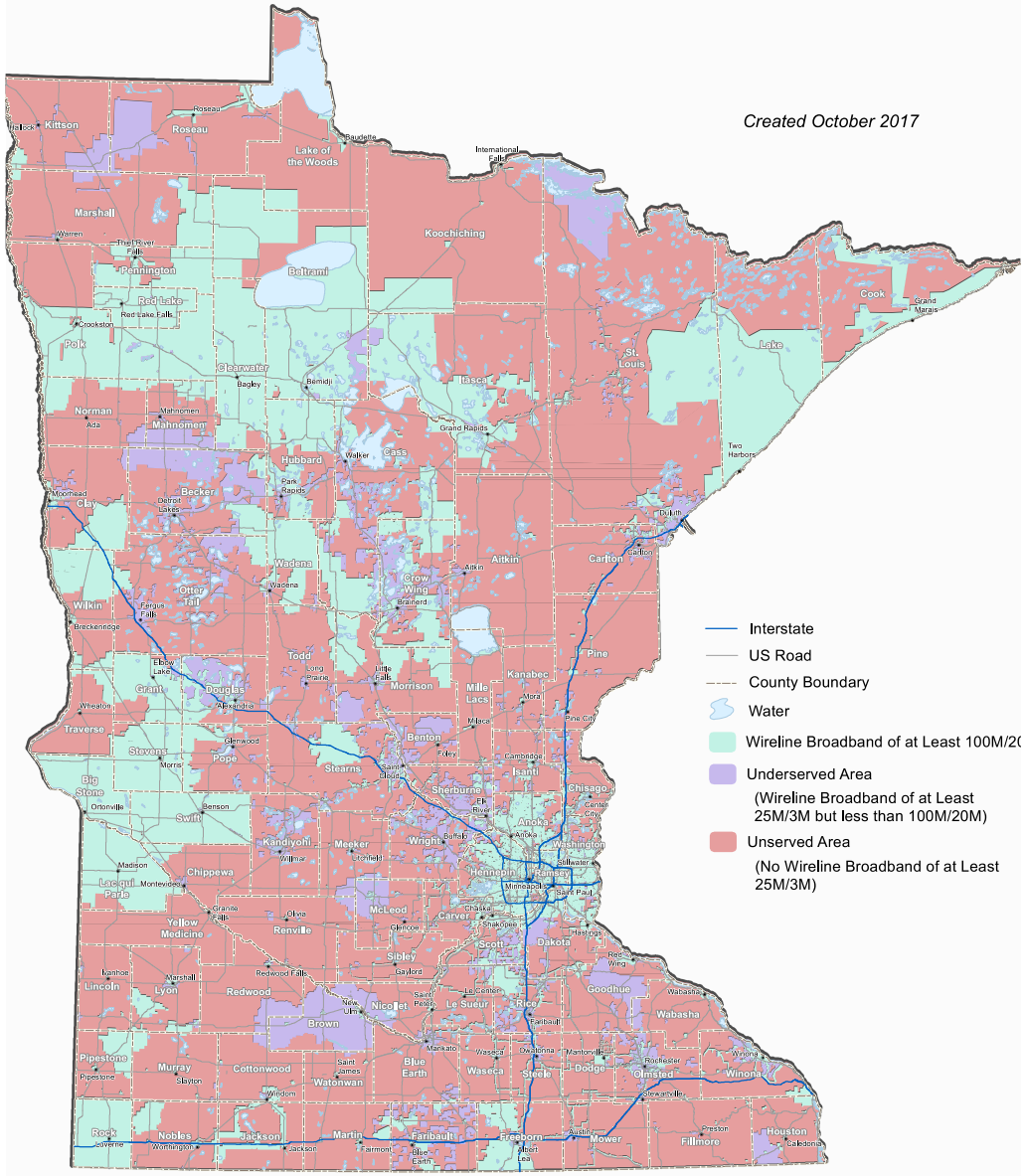
0 1 2 3 4 6 12 or more

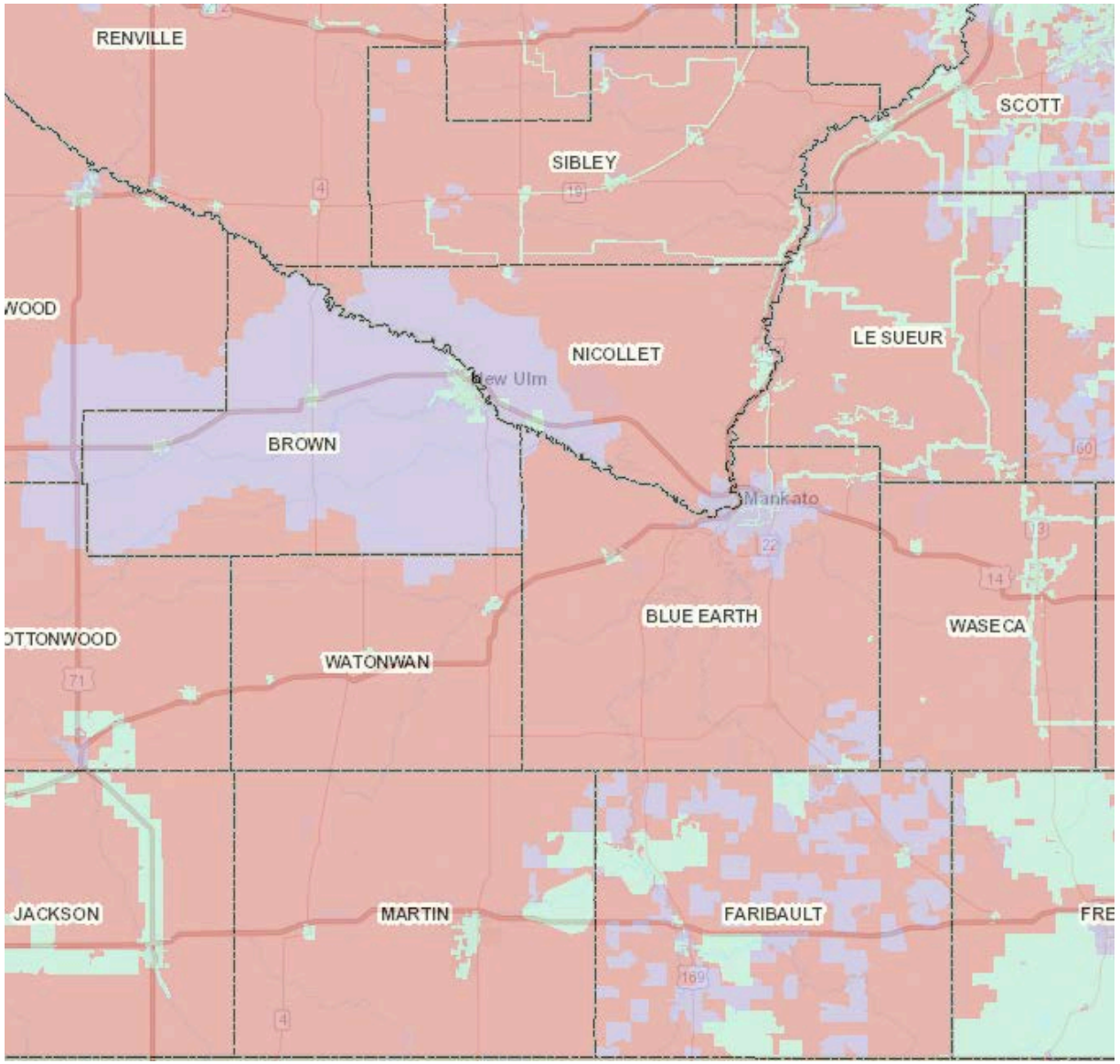
Broadband

Technology	ADSL, Cable, Fiber, Fixed Wireless, Satellite, Other
Speed	≥ 25/3 Mbps
Date	December 2016 *(latest public release)*

Border-to-Border Broadband Development Grant Program

Unserved, Underserved and Served Broadband Areas





South Central Minnesota Broadband Map

Pictures are nice, but what does it mean?

TECHNOLOGY OVERVIEW

Broadband Technologies Overview

WIRED

Fiber to the Premise
- Virtually unlimited capacity
- Symmetric capacity
- Low latency (delay)

Fiber to the Node
- Asymmetric capacity designed for download
- Fiber - Coax
  - Cable modem urban densities
- Fiber - Twisted Pair
  - DSL in urban, suburban & rural

Plain old Telephone Service
- Long loop DSL
- Rural

WIRELESS

Fixed
- Fiber to the Tower
- Copper to the Tower
- Wireless to the Tower

Cellular
- 4G
- 3G
- 5G (future)

Satellite

Fiber Infrastructure Investment

Fiber to the Home costs between $4,000 and $12,000 per home

Seventy percent of homebuyers will not buy a home without a good broadband connection

A fiber-connected home increases in value by $3,000 to $7,000

Well-connected residents and businesses save money in many ways, conservatively estimated at $1,500 per year

Customers switching from satellite/cellular packages to triple play FTTH report savings of $300 - $400 per month!

Wireless is on fiber for most of its path

What else costs about $10,000?

Anyone can decide to buy some 10 year-old stuff on Craigslist!

But one person cannot buy their own broadband network…we have to do that together!

New Hybrid Copper Networks via FCC CAF II and ACAM

CAF II

- Capital subsidies to large Price Cap Carriers - CenturyLink, Frontier,
- 10Mb /1 Mb minimum

ACAM

- Operating subsidies to mid-size Rate of Return Carriers
- Requires minimum of 25/3, 10 /1 or 4/1 depending on costs

No requirement to serve everyone

Within 3,000 feet > 25 Mb or greater possible

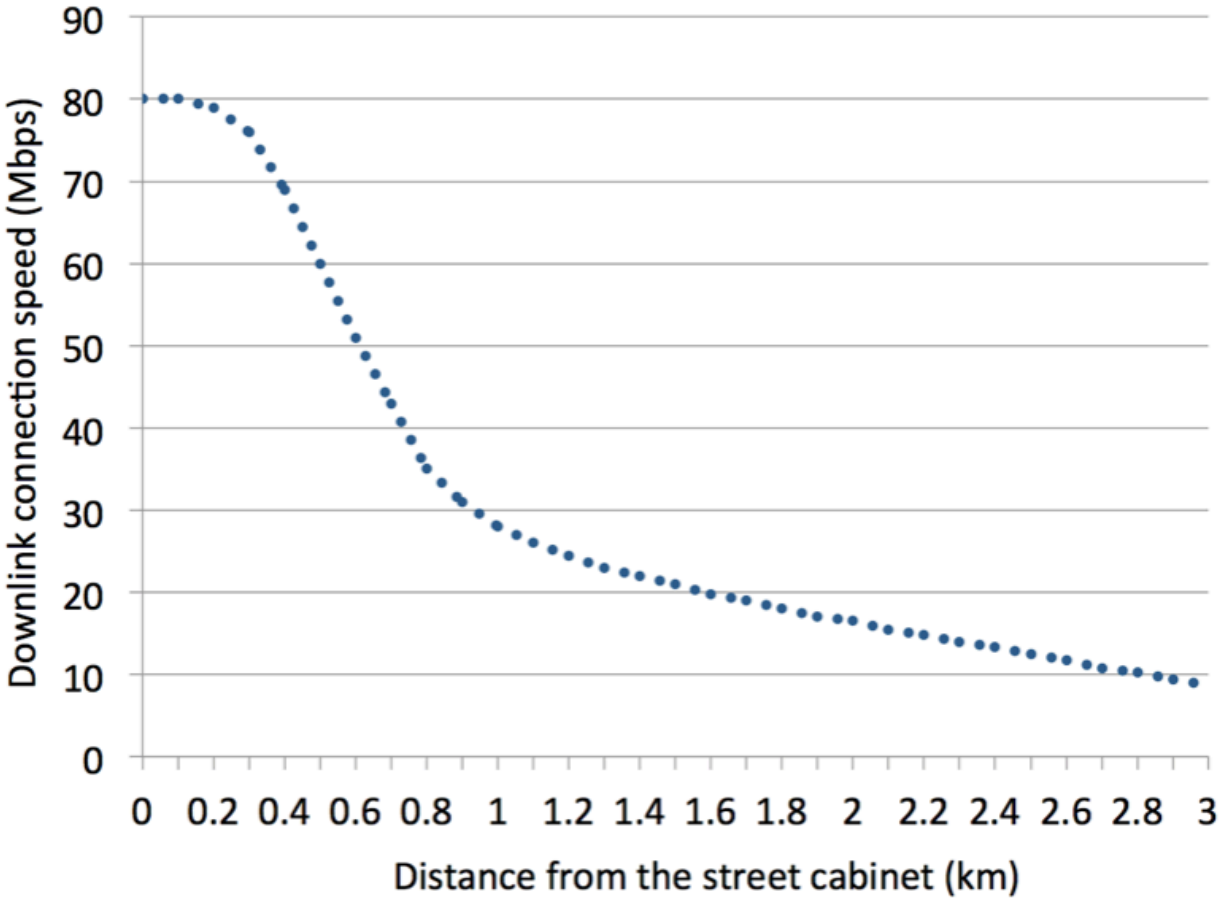
At 10,000 feet = ~ 10 Mb

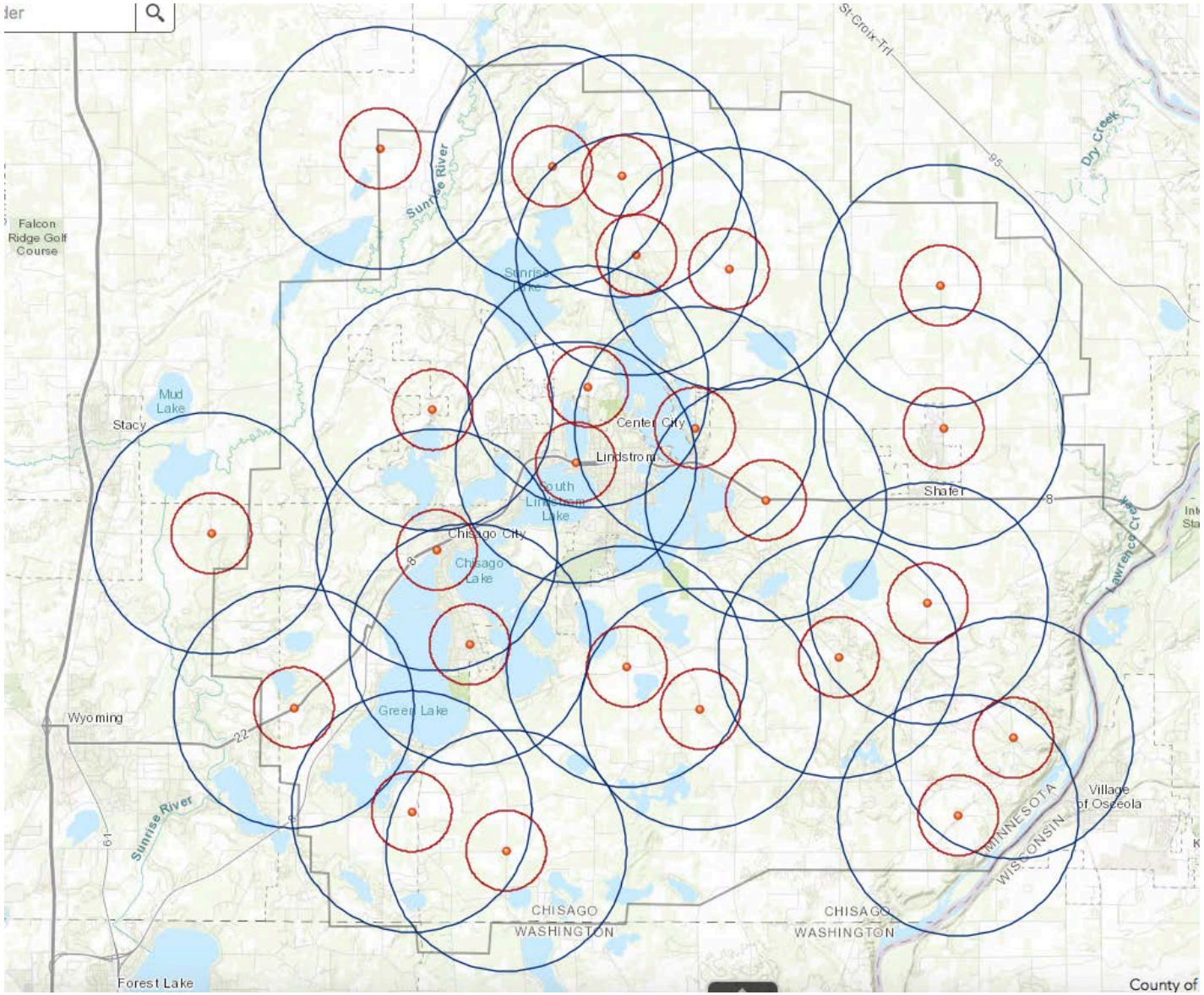
Copper condition affects carrying capacity over distance

CAFII/ACAM Acceptance

Service provider	Provider Type	Funding Amount	Locations	Markets
1. AT&T	Telco	$427M	2.2M	18 states
2. CenturyLink	Telco	$500M	1.2M	33 states
3. Frontier	Telco	$283M	650K	28 states
		$49M*	37K	2 states
4.Windstream	Telco	$175M	400K	17 states
5. Verizon	Telco	$106.6M**	15K	1 state
6. TDS	Telco	$75.1M***	160K	25 states
7. Consolidated	Telco	$51.4M****	130K	28 states
8. Hawaiian Telcom	Telco	$26M	11K	1 state
9. Cincinnati Bell	Telco	$2.23M	7K	2 states

DSL Speed over Distance

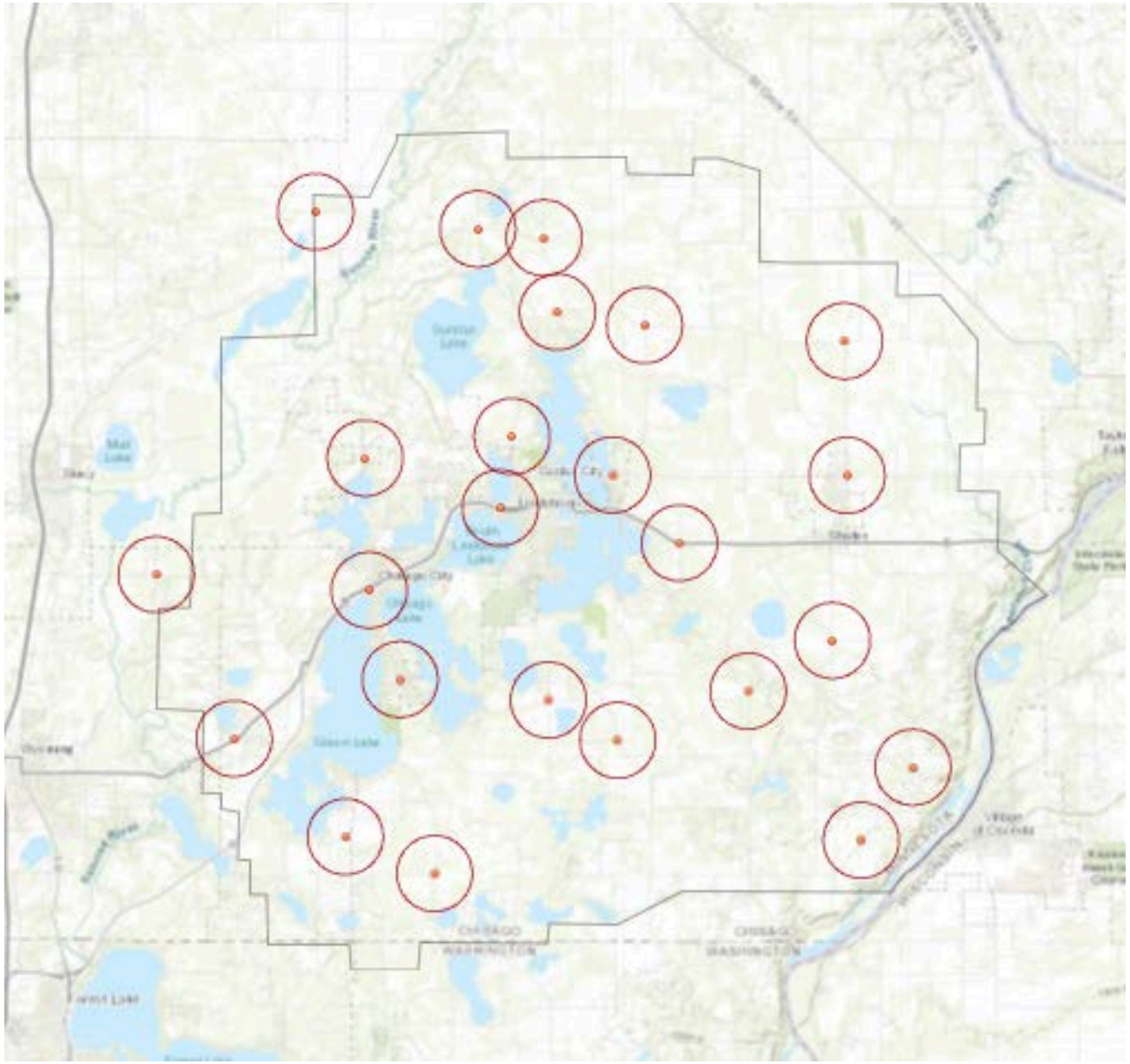




Frontier's Lindstrom Exchange

Red circles = 3,000 foot radius = 25 Mb/3 Mb and higher

Blue circles = 9,000 foot radius = between 25 Mb/3 Mb to 10 Mb/1 Mb



Frontier's Lindstrom Exchange

Those within the circles, about 10% of land area, would likely meet the 2022 state goal of 25 Mb/3Mb; no one would meet the 100 Mb/20 Mb 2026 state goal.

Wireless

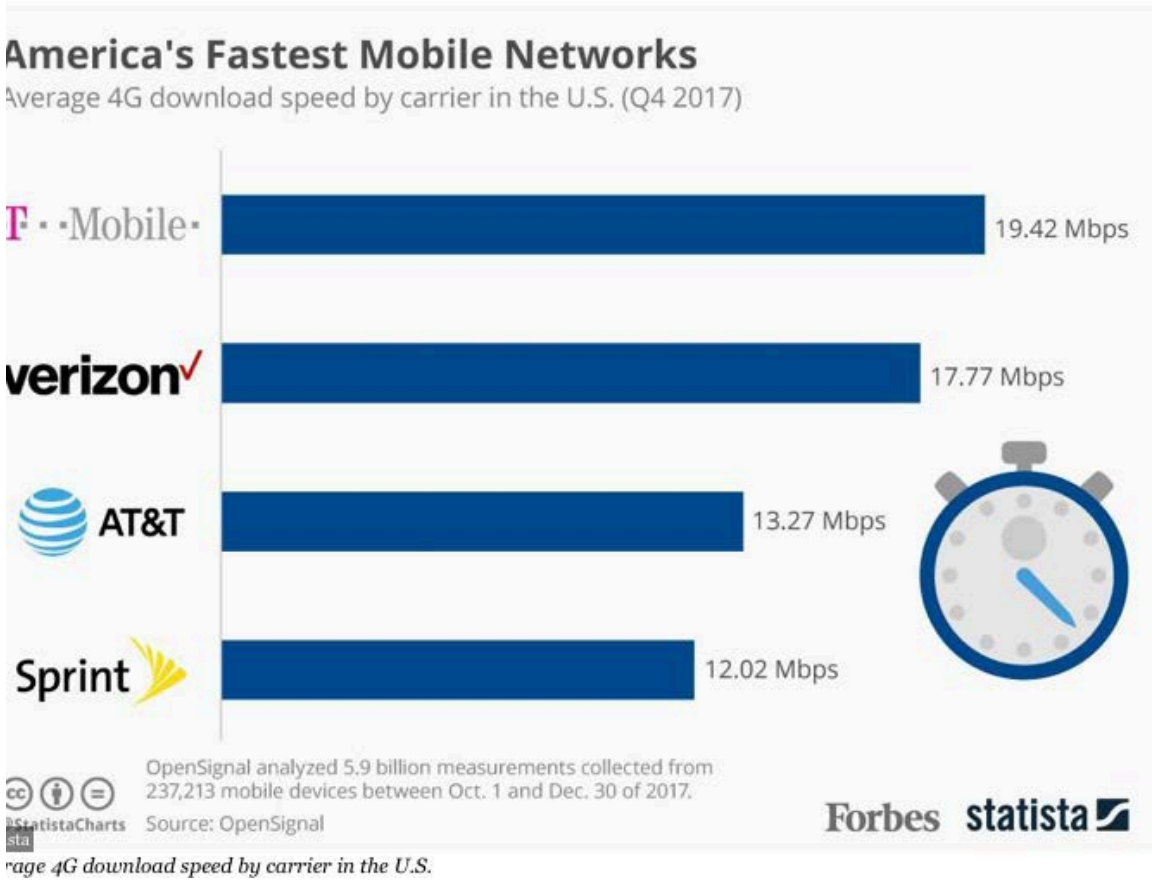
Fixed Wireless

Improvements

- Increasingly robust with fiber-fed towers, especially on the prairie
- Many combinations of technologies and spectrum
  - Balancing of power and bandwidth
  - Licensed, lightly licensed and unlicensed

Challenges

- Trees can eat wireless
- Hills can hide wireless
- Availability and cost of Internet backhaul



rage 4G download speed by carrier in the U.S.

Cellular Issues

4G/3G coverage can be spotty in rural away from highways

Bandwidth decreases with distance from tower

Beware of ** on “unlimited” data plans

5G will require fiber to within 1,000 feet of customer

Satellite

Improvements

- Increased speeds
- Increased affordability

Challenges

- Latency/delay affects advanced use
  - Virtual private networks
  - Teleworking
  - Skype/Facetime video apps
- Weather affects reliability
- Same unlimited** considerations as cellular

What’s good enough?

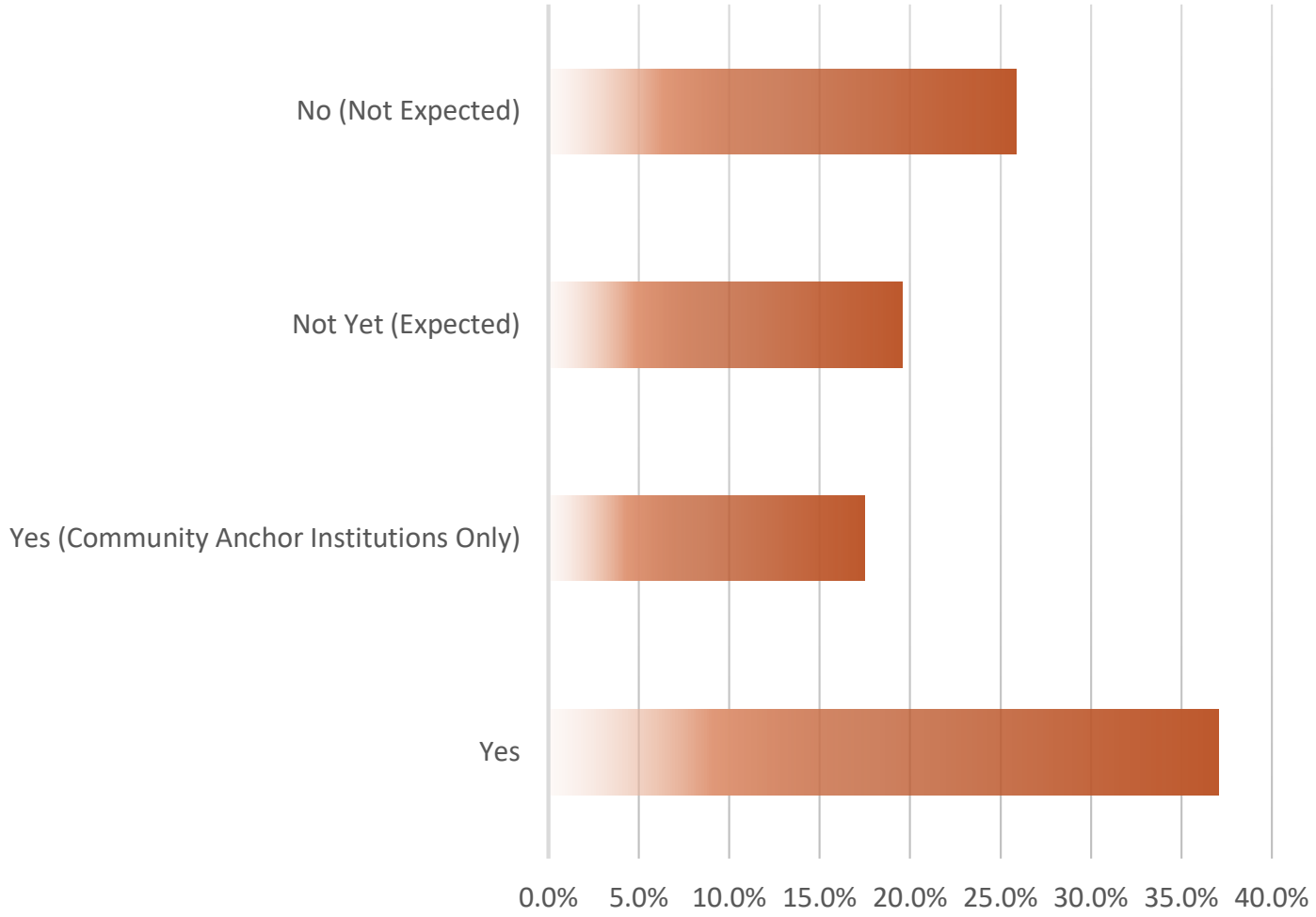
LOCAL LEADERSHIP DECIDES!!

Background

- Sent to Economic Development and STaR Division members
- Addressed access to gigabyte-level broadband, impact on economic development, role of planners, and need for educational resources

Economic Development and STaR Municipal Broadband Survey

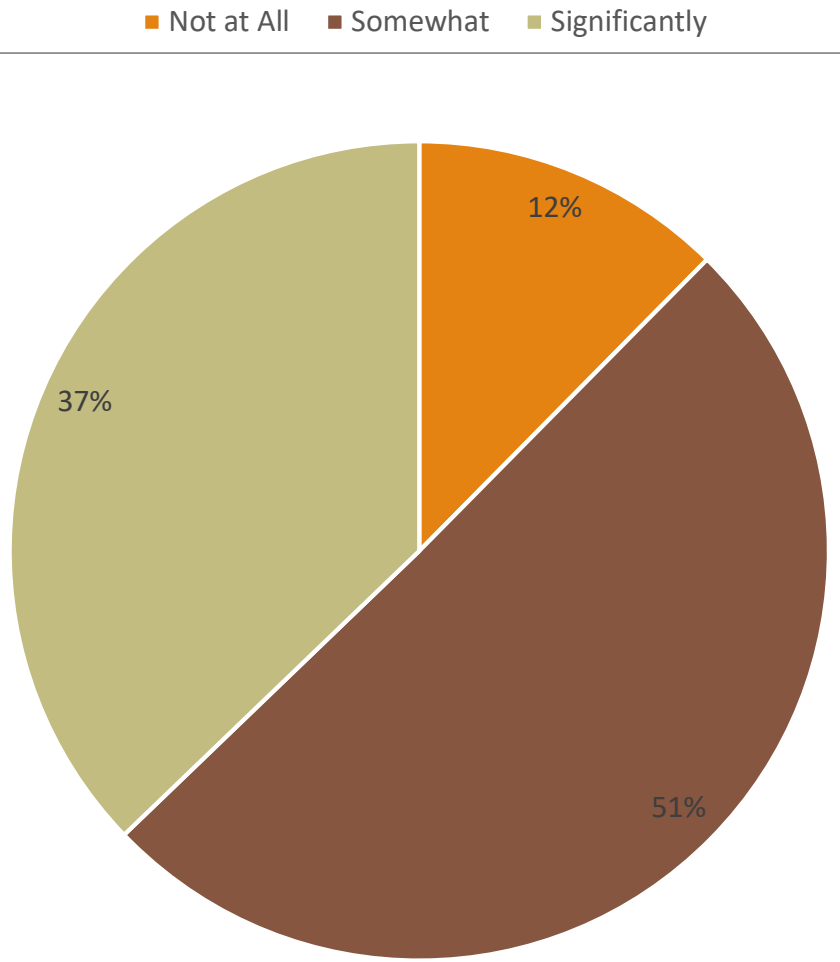
Does your city, town or community have access to Gigabyte-level broadband services?



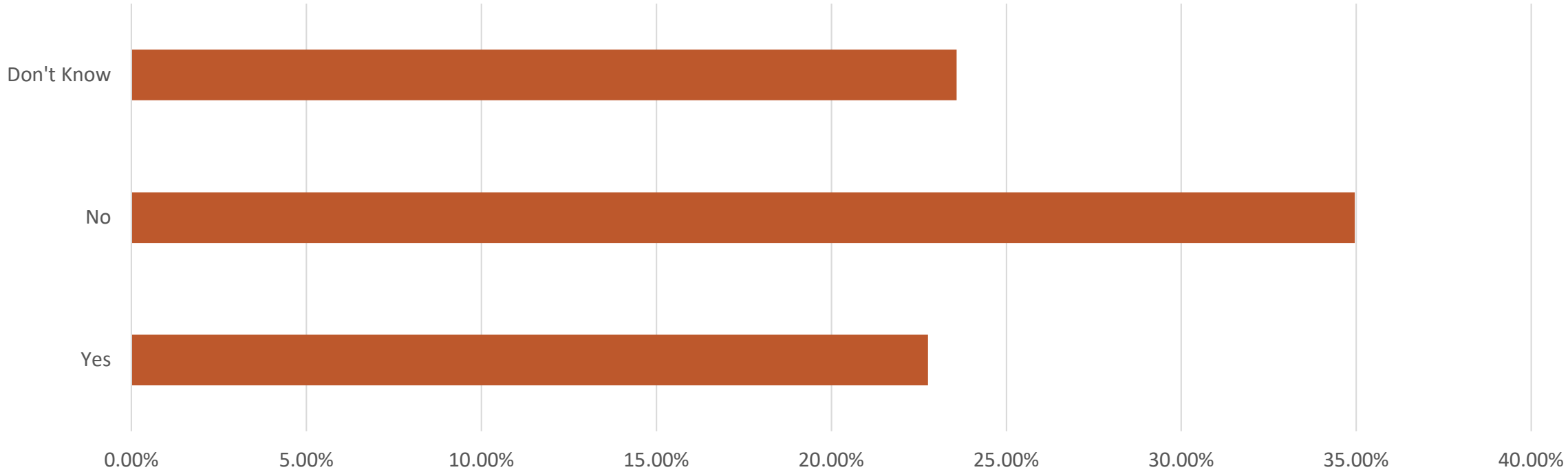
	Yes	Yes (Community Anchor Institutions Only)	Not Yet (Expected)	No (Not Expected)
%	37.06%	17.48%	19.58%	25.87%

Economic Development and STaR Municipal Broadband Survey

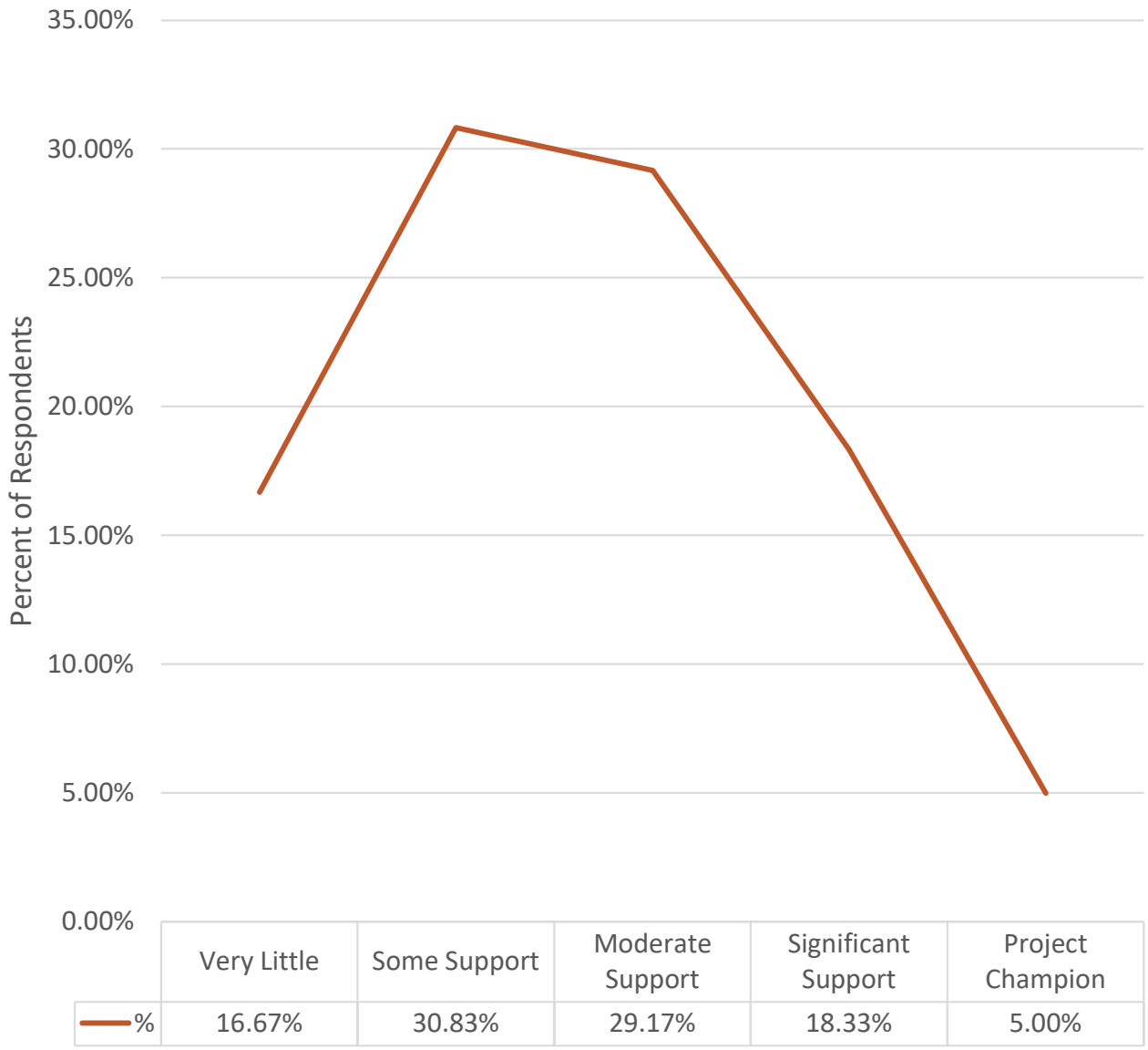
As a planner/economic development officer, to what extent do you believe the lack of high-speed broadband in your town or community is affecting local economic development?



Do you anticipate your town or community will be involved in a municipally-sponsored broadband project (fiber-to-the-premises or Wi-Fi) in the next three years?



	Yes	No	Don't Know
%	22.76%	34.96%	23.58%



As a planner, what level of participation and leadership do you expect to play in a municipal broadband project?

ECONOMIC DEVELOPMENT AND STAR MUNICIPAL BROADBAND SURVEY

What types of education, training, and resources would be helpful to you?

- Webinars (76.7%)
- Online Courses (46.6%)
- On-site education or seminars (45.7%)
- A best practices database (77.4%)

Interested in Participating in a Pilot “Connected Autonomous Vehicle 101” Education and Strategic Planning Workshop?

- Basic “101” level education/planning for towns and small cities on policy and infrastructure implications of Autonomous Vehicles
- Can be multi-town, regional
- Planners, Economic Development, City Managers, Elected Officials
- Looking for pilot volunteers

Q&A

Understanding Rural Broadband Technology Options

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