Microsoft

empowering rural America
connectivity + edge computing

NSF Workshop on
challenges & opportunities for bringing smart Services to underserved urban communities

Tuesday, Nov. 14, 2017

Victor Bahl
Distinguished Scientist
Microsoft Research

the information divide

34 million US citizens lack access to basic, fixed broadband Internet

i.e. ~10% of the US population

23.4 million of these people live in rural communities

i.e. ~40% of people living in rural America don't have basic, fixed broadband

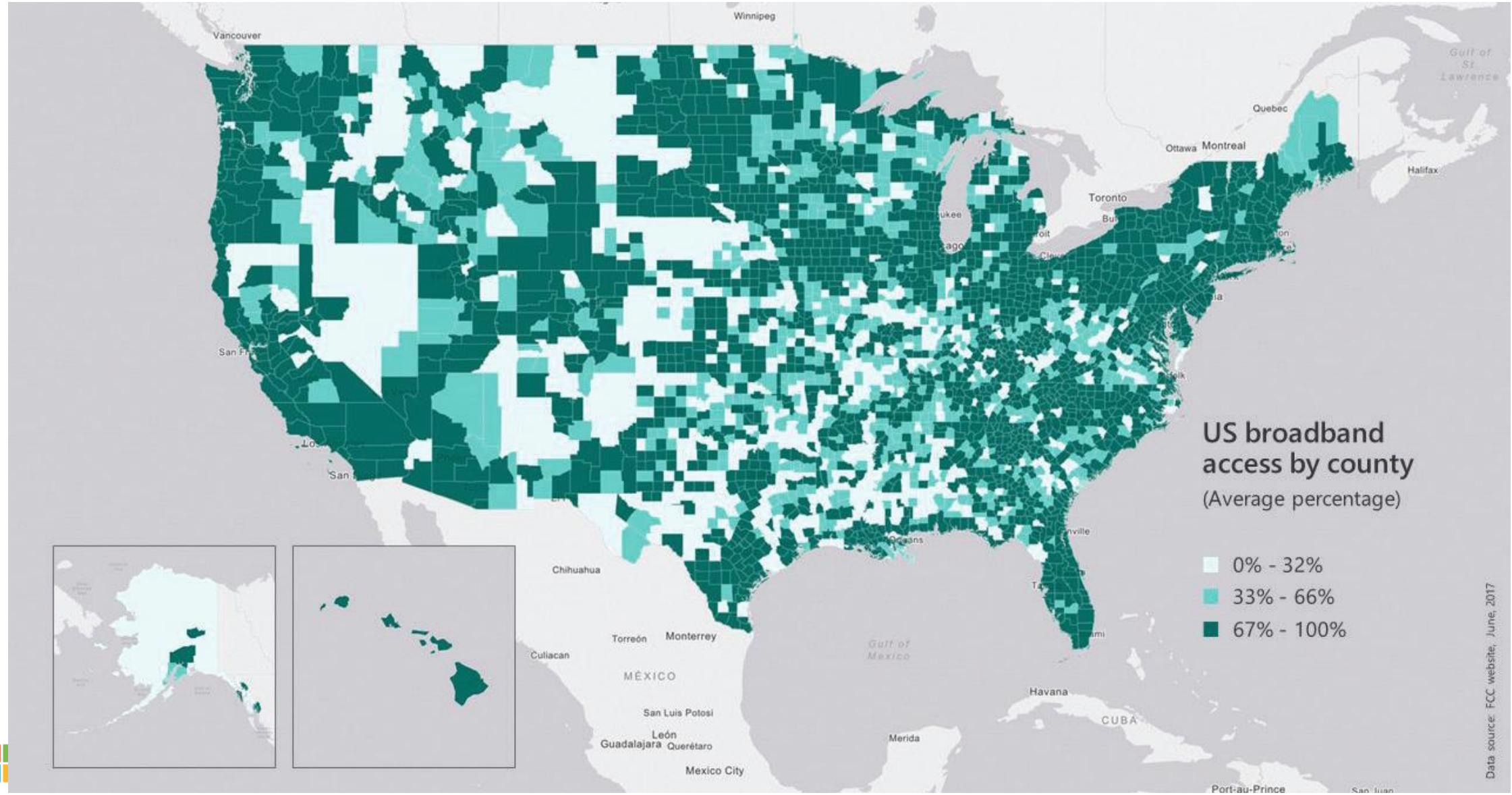
we (i.e. Microsoft) have been committed to providing affordable access:

- (organic) community mesh networks for connectivity in rural areas 2003 – 2006
- digital inclusion grants $1.5+ million funding to universities & NGOs
- technologies for unlicensed allocation - white space networking 2006 – 2010
- pilots & testing of white space networks (connecting 180,000+ people)
  - 4Africa initiative (https://www.microsoft.com/africa/4afrika/)
  - Airband imitative (https://news.microsoft.com/rural-broadband/)

call to arms: let's eliminate broadband gap within 5 years

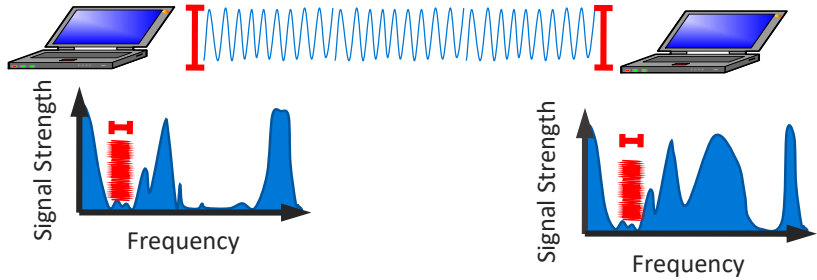
Microsoft

US broadband availability by county



white space networking – a quick primer

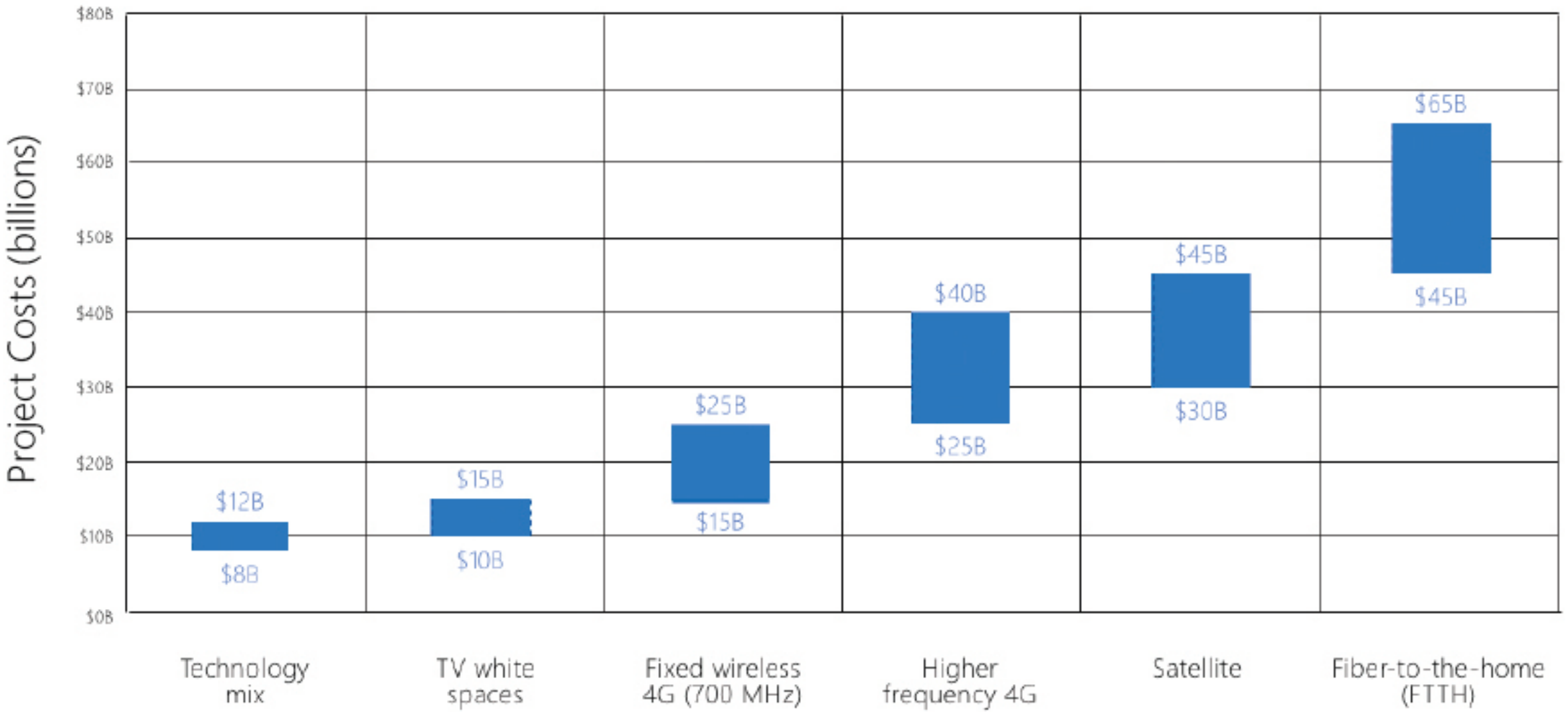
- first manifestation of an opportunistic spectrum access network
- upper UHF "700-megahertz" band
  - TV channels 52 - 69 (698 - 806 MHz)



- US companies led the way in developing WS spectrum technologies
- the FCC is the first regulator in the world to allow unlicensed access to WS spectrum & adopted regulations that provide interference protection to broadcasters
- TVWS tech. has been tested & used to address the needs of students, farmers, health care providers, & others stuck on the wrong side of the digital divide

Microsoft

cost comparison to connect rural America



more on mixed model

- TVWS can reach ~80 % of the underserved rural population particularly in areas with a population density between 2 & 200 people / sq. mile
- satellite coverage is most cost-effective solution for areas with a population density of < 2 people / sq. mile
- fixed wireless great for areas with a density > 200 people / sq. mile

mixed model will likely bring the total national cost of closing the rural broadband gap ~$10 billion

Microsoft

Airband: a rural broadband initiative

investing to serve as a catalyst for broader market adoption

committed to three elements on a 5-year basis

- direct projects with partners
- digital skills training for people of all ages
- stimulating investment by others through technology licensing

Microsoft

projects with partners

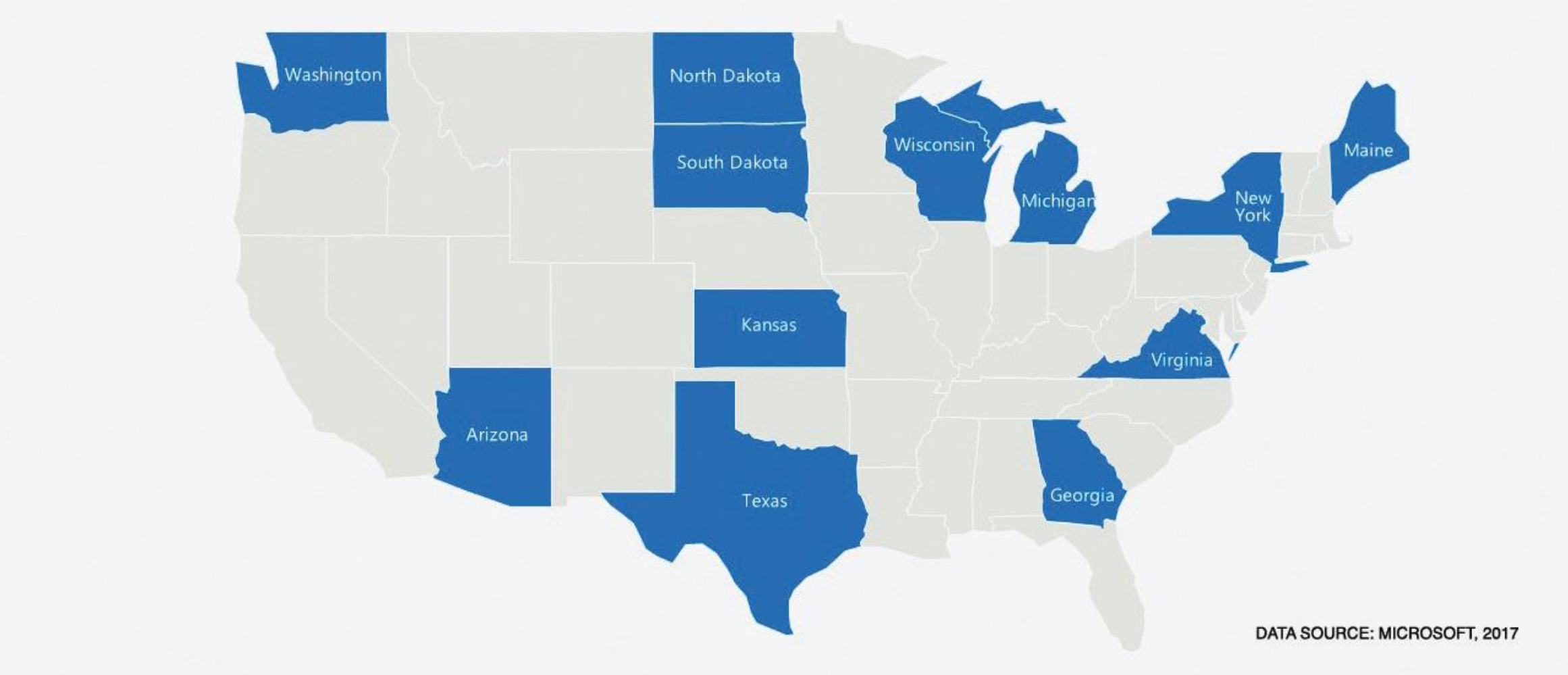
- invest in partnerships with telecommunications companies to bring broadband connectivity to two million people in rural America by July 4, 2022.

- 12/12/12: have 12 projects up & running in 12 states in the next 12 months

- do not intend to enter the telecom business / profit from these projects
  - upfront capital to expand broadband coverage; revenue sharing with operators to recoup investment, and use these revenues to invest in additional projects to expand coverage further

Microsoft

United States – 12/12/12



Microsoft

digital skills training

- working through Microsoft Philanthropies, will invest in training people of all ages in rural communities on the latest technology so they can use the new connectivity to improve education, healthcare, agriculture, & transform their businesses.

- first partnership: a multi-year partnership with National 4-H Council engaging America's largest youth development organization, 4-H, to provide digital literacy skills training to youth, as well as teen-led learning programs in rural communities.

stimulating investment by others

- ultimate goal is to help serve as a catalyst for market investments by others in order to reach additional rural communities

- launching a new technology program to stimulate investment through royalty-free access to over 3 dozen patents with source code for the use of TV white spaces spectrum

Microsoft

call to arms - public sector

governmental attention & measures (FCC, NSF, …) :

spectrum management

ensure continued use of the spectrum for mixed technology model. FCC should ensure that at least 3 channels below 700 MHz are available for unlicensed use in every market in the country

infrastructure investments

federal & state infrastructure investments should incl. targeted funds on a matching basis for the capital investments to expand coverage into rural areas. Funds should be for multiple technologies on the basis of which is most cost effective available

data collection

help accelerate data collection & reporting on the state of broadband coverage in rural counties, thereby aiding policy makers & the private sector in making targeted investments

NSF

see next slide.

Microsoft

call to arms - research community

develop applications / software (be creative)

- telemedicine: remote access to basic & specialized medical care
- education: help disconnected students access tools for the digital economy
- economics: connect small business to new customers around the globe, while better serving consumers in their own communities
- agriculture: increase farm productivity and reduces costs for American farmers
- …

develop & deploy edge computing infrastructure (bring the cloud closer)

- manage bandwidth & latency to the (mega) cloud
- develop programming models; handle disconnected operations; enable seamless computation offloads; virtualization, multi-tenancy, privacy …

extend coverage via community meshes (need self-managing networks)

thanks!

for more information on Microsoft's rural broadband initiative

https://msblob.blob.core.windows.net/ncmedia/2017/07/Rural-Broadband-Strategy-Microsoft-Whitepaper-FINAL-7-10-17.pdf

appendix

Microsoft TV White Spaces Pilot Projects

More than 20 projects connecting 185,000 people

Botswana	Jamaica	Nigeria	Tanzania
Colombia	Kenya	Philippines	United Kingdom
DR Congo	Malawi	Singapore	United States
Ghana	Nambia	South Africa	Zambia
India	Nepal	Taiwan	