Sustainable Wireless Strategies for Keeping Students Connected and Learning

JUNE 9, 2021

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Educational Technology

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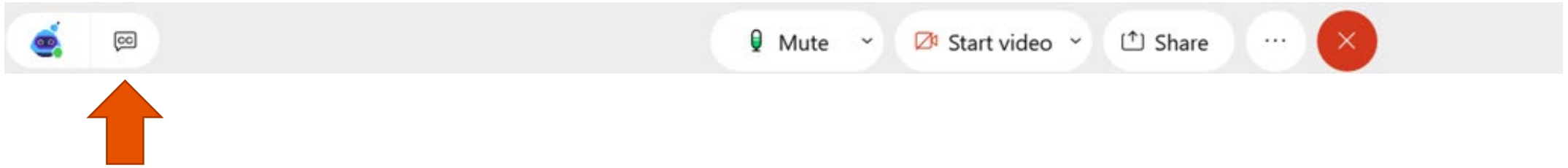

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Agenda

1. Introduction

Highlight sustainable, long-term strategies for deploying off-campus wireless networks to students at home

2. Case Studies

Present six examples of states/districts implementing off-campus networks

3. Panel Discussion

Participate in a Q&A panel discussion to discuss these strategies

Introductions

Sara Trettin– Policy Advisor

U.S. Department of Education, Office of Educational Technology

Lisa Palacios— Director of Technical Assistance for Broadband

Manhattan Strategy Group

Christopher Mitchell– Director of the Community Broadband Networks

Institute for Local Self-Reliance

Technology Leads

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State Office of the Chief Information Officer, Northeast Nebraska

Luis Wong – Chief Technology Officer

Imperial County Office of Education, California

Peter Sonksen - Network Administrator

Lindsay Unified School District, California

Dr. Philip Neufeld, Executive Officer, Information Technology

Fresno Unified School District, California

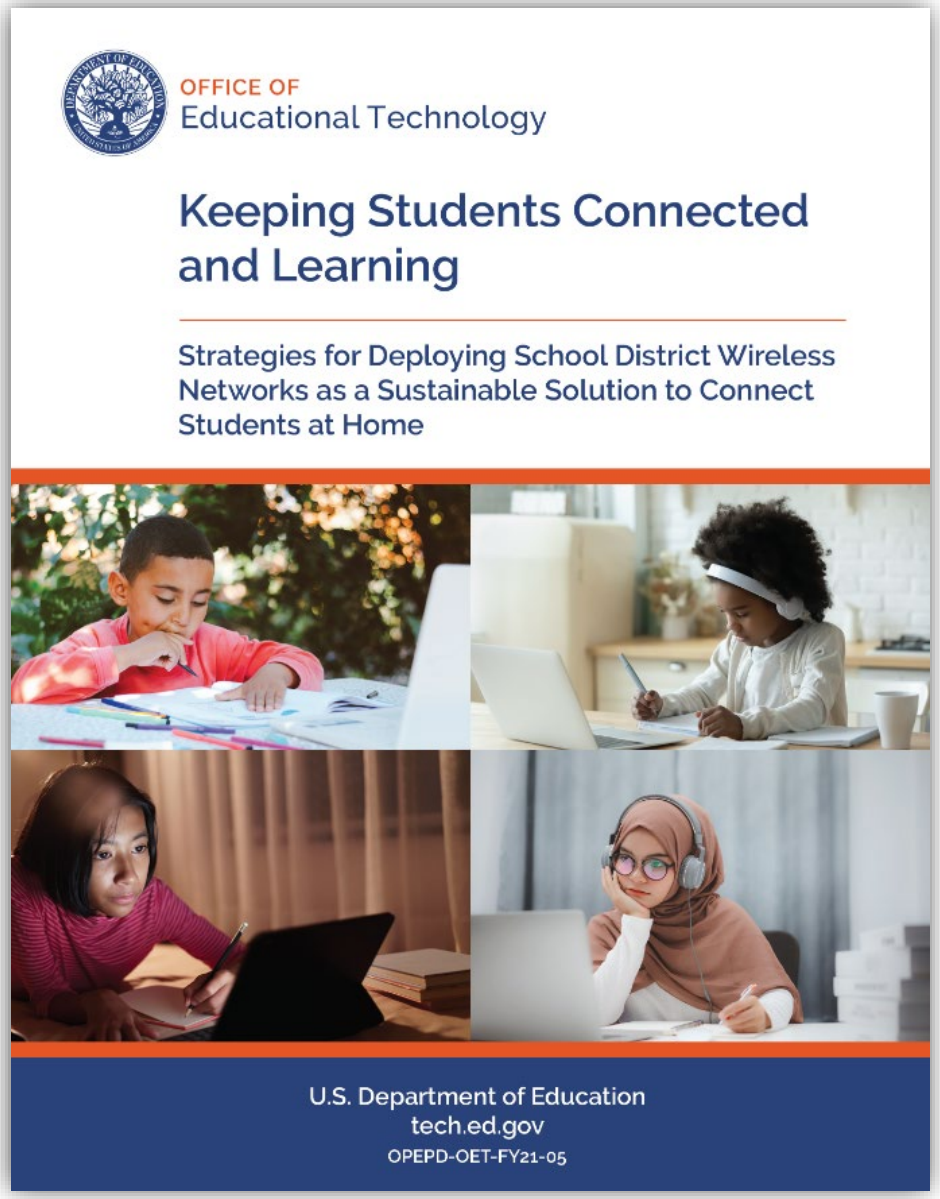
Andrew Moore – Chief Information Officer

Boulder Valley School District, Colorado

New Wireless Network Brief

1. Ask Me Anything
Q&A on Twitter **#EDWirelessBrief** and **YouTube Video**

2. Podcast Series
Discussions on Off-Campus Wireless Network Strategies



Available at: https://tech.ed.gov/wireless-brief/

Wireless Network Strategies

- Mobile Hotspots: MiFi or Wi-Fi
- Walk Up/Drive Up School/Community Hotspots
- Wi-Fi Buses/Smart Buses

- 2.5 GHz Spectrum— Private LTE over Educational Broadband Service (EBS)
- Private LTE over Citizens Broadband Radio Service—General Authorized Access (CBRS-GAA)
- Fixed Wireless
- Mobile Broadband

- White Space
- Low Earth Orbiting Internet (LEO)

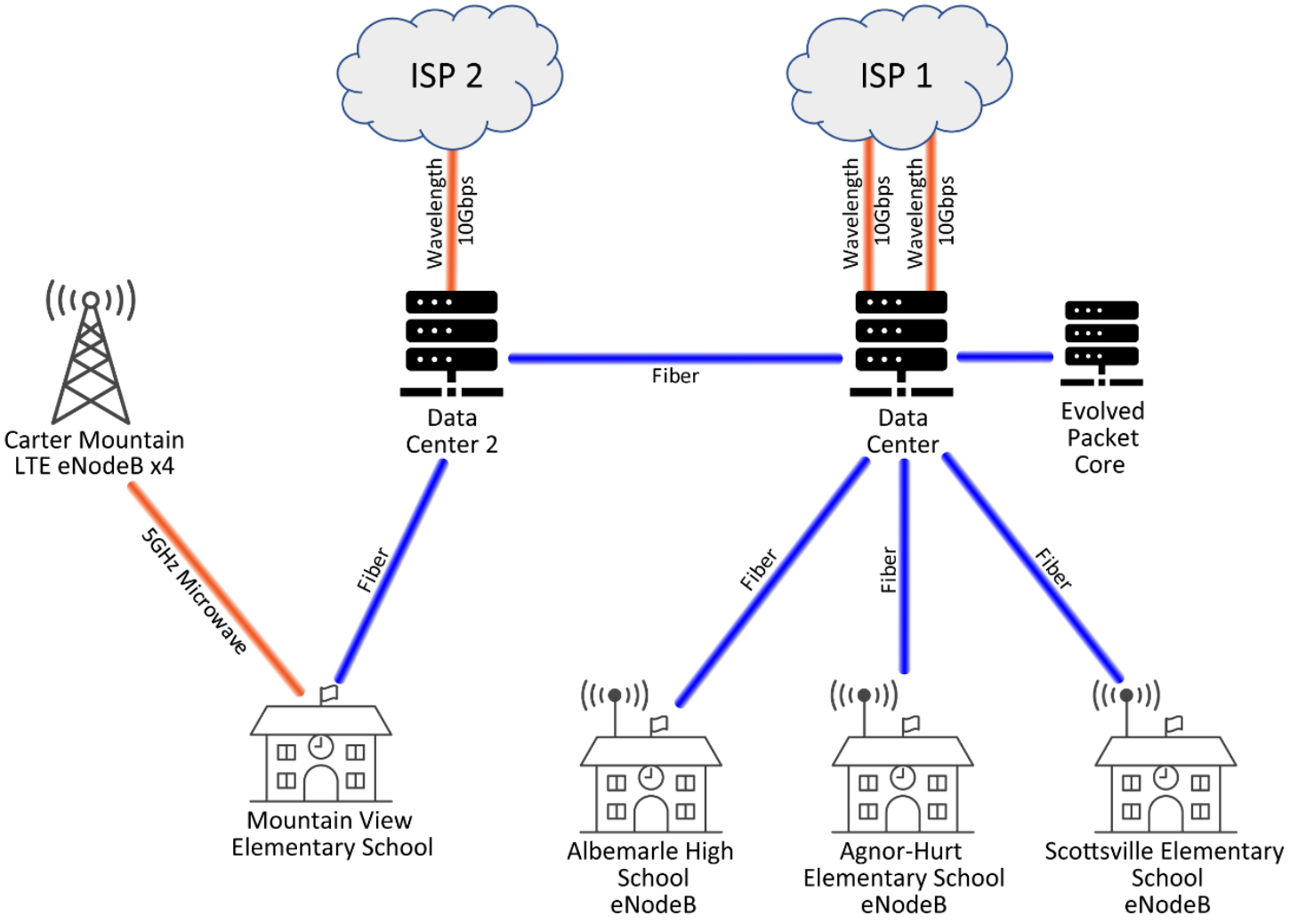
Case Studies

Model 1: Leasing 2.5 GHz Spectrum to Connect Students at Home – Albemarle County, VA

- Through the ACPS@Home initiative, the **Albemarle County Public School** district:
  - Issues hotspots to students
  - Partners with local government to expand broadband throughout the county
  - Serves as the financial sponsor for providing broadband service to students in areas where it is available from the partner ISP
- Public-private partnership, agreement with a commercial ISP
- Local government IT Department partnership
- Albemarle Broadband Authority, Virginia Telecommunications Initiative

Albemarle County LTE Topography Map

- Uses ACPS EBS spectrum, a private LTE network covering an area exceeding 100 square miles, to provide wireless data services
- Utilized network infrastructure that was already available to the school district, including facility rooftops, radio towers, and leased and school district-owned fiber-optics for data transport to minimize recurring costs
- E-Rate funds were not used to support this initiative



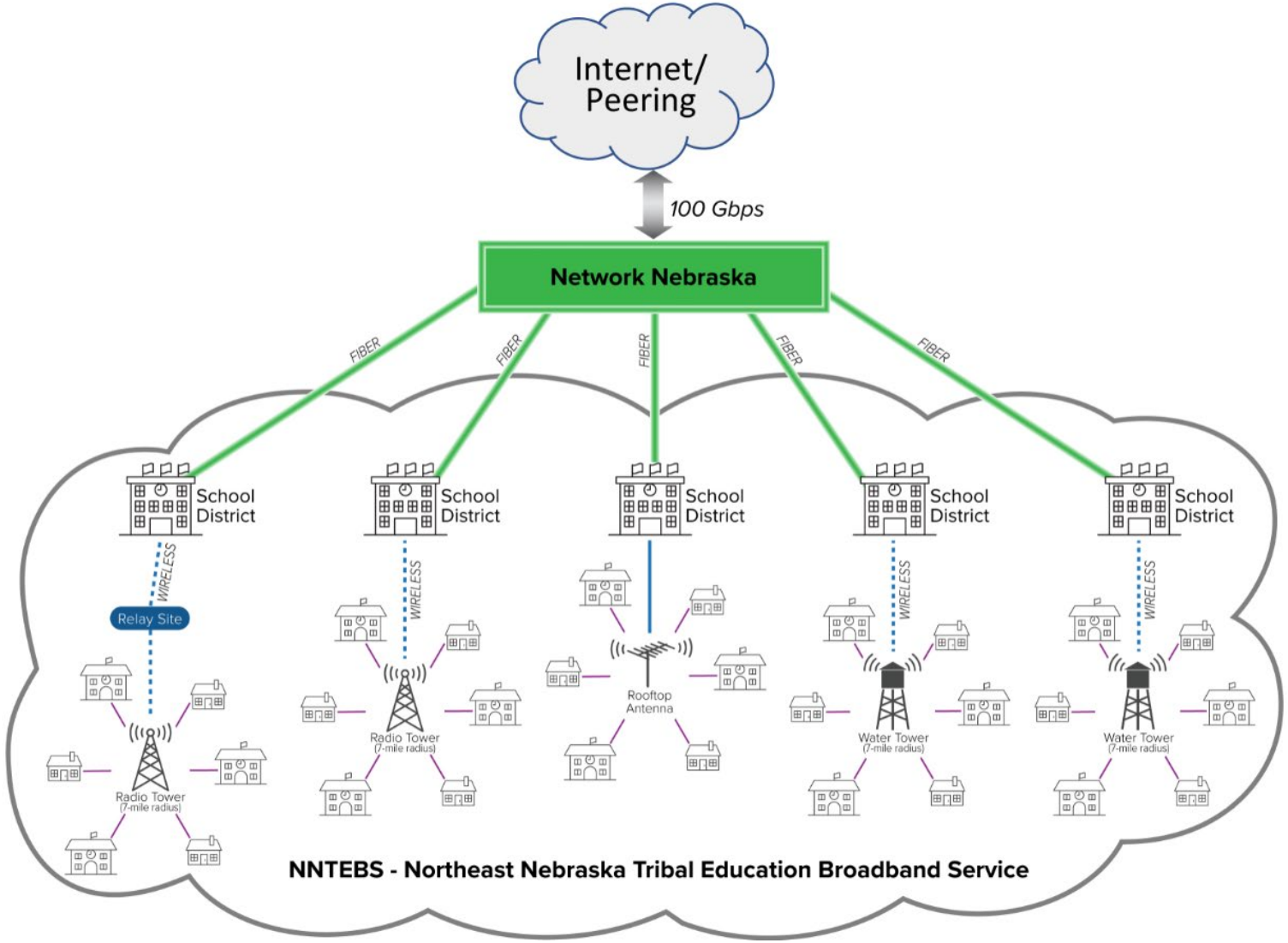
Model 2: Using New 2.5 GHz Licenses to Bring Low-Cost Wireless Access to Tribal Homes – Northeast Nebraska

The Nebraska Indian Community College is working with five public school districts on the Santee and Omaha reservation land to implement a mobile/fixed private LTE wireless network using EBS (2.5 GHz) Spectrum.

- The new wireless network will serve approximately 2,100 students in grades K–14 across 580 square miles
- Leverages public funds to implement a private LTE wireless network carried over the newly licenses EBS spectrum for tribal entities
- 10 new or existing towers or vertical assets on public property
- Regional EBS network is best option due to rural topography

Northeast Nebraska LTE Topography Map

- Private LTE base stations installed on vertical “assets” or towers, extend a wireless coverage area of 360 degrees and operate in the 2.5 GHz EBS spectrum
- Base stations connected via point-to-point wireless to its own high bandwidth Internet source, which originates at the school
- The Evolved Packet Core handles incoming call transactions from student devices



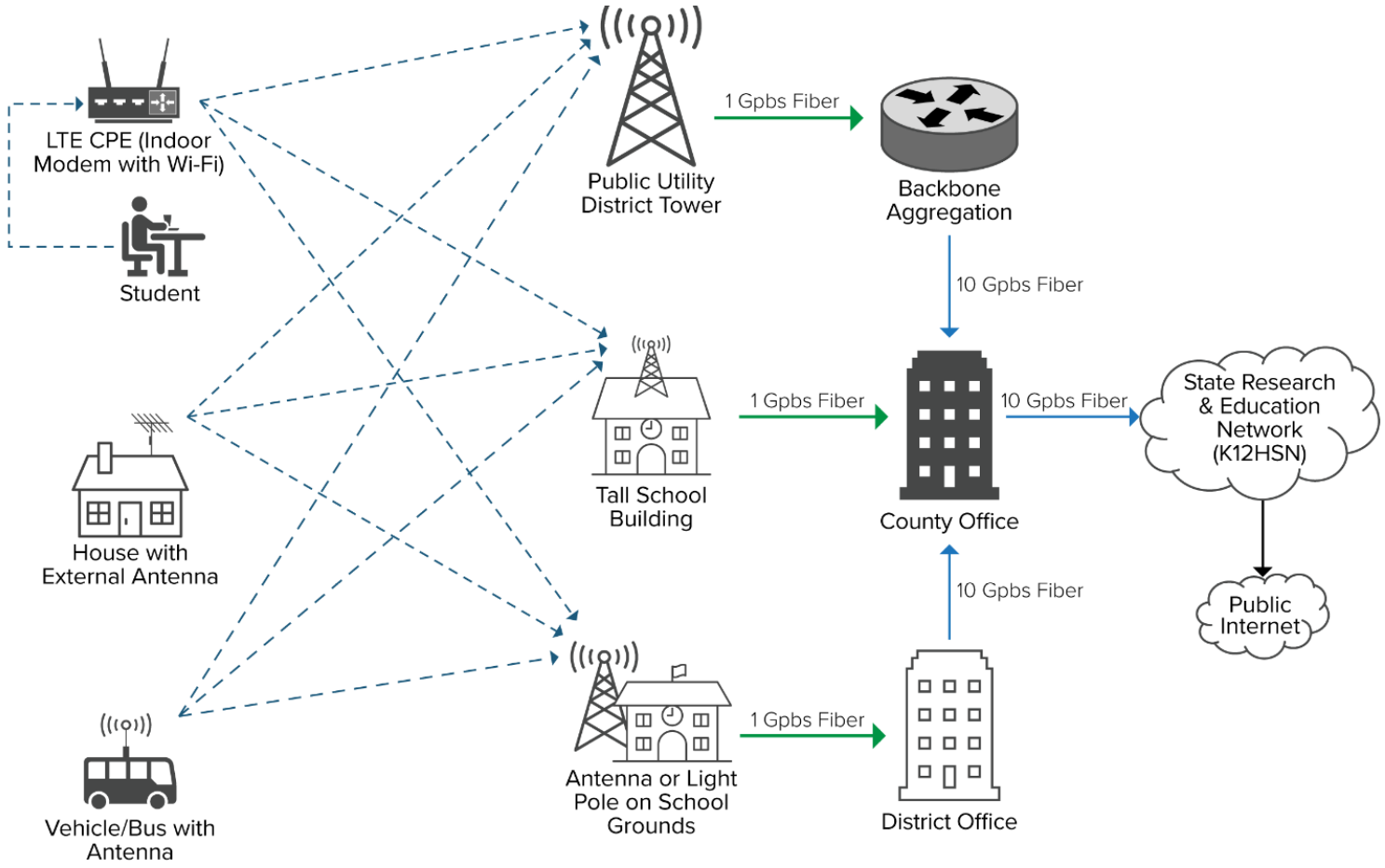
Model 3: Using 2.5 GHz Licenses to Provide Home Access Across a Vast Geographic Area – Imperial County, CA

- **Imperial County Office of Education (ICOE)** used its EBS Licenses and an established fiber-optic communications network to expand its terrestrial fiber-optic network off-campus.
- Adopted a proven consortium model, Imperial Valley Telecommunications Authority, a collaborative of Imperial County school districts, city and county agencies, Imperial Community College, San Diego University-IVC, and the Imperial Irrigation District.
  - Connects all communities
  - Leverages the ICOE network staff and community assets (e.g., poles, communications towers, and power-protected facilities)
  - Offers economies of scale and a consortium cost recovery model that yields low costs per connection

Imperial County, CA LTE Topography Map

BorderLink, consists of 19 towers providing more than 1,400 square miles of coverage

- Each tower is connected via a 1 gigabit fiber-optic connection fed by a 10-gigabit backbone that is also owned, operated, and maintained by IVTA.
- Students and families can connect to this LTE network via Mi-Fi devices, LTE enabled equipment, indoor modems and outdoor LTE antennas.

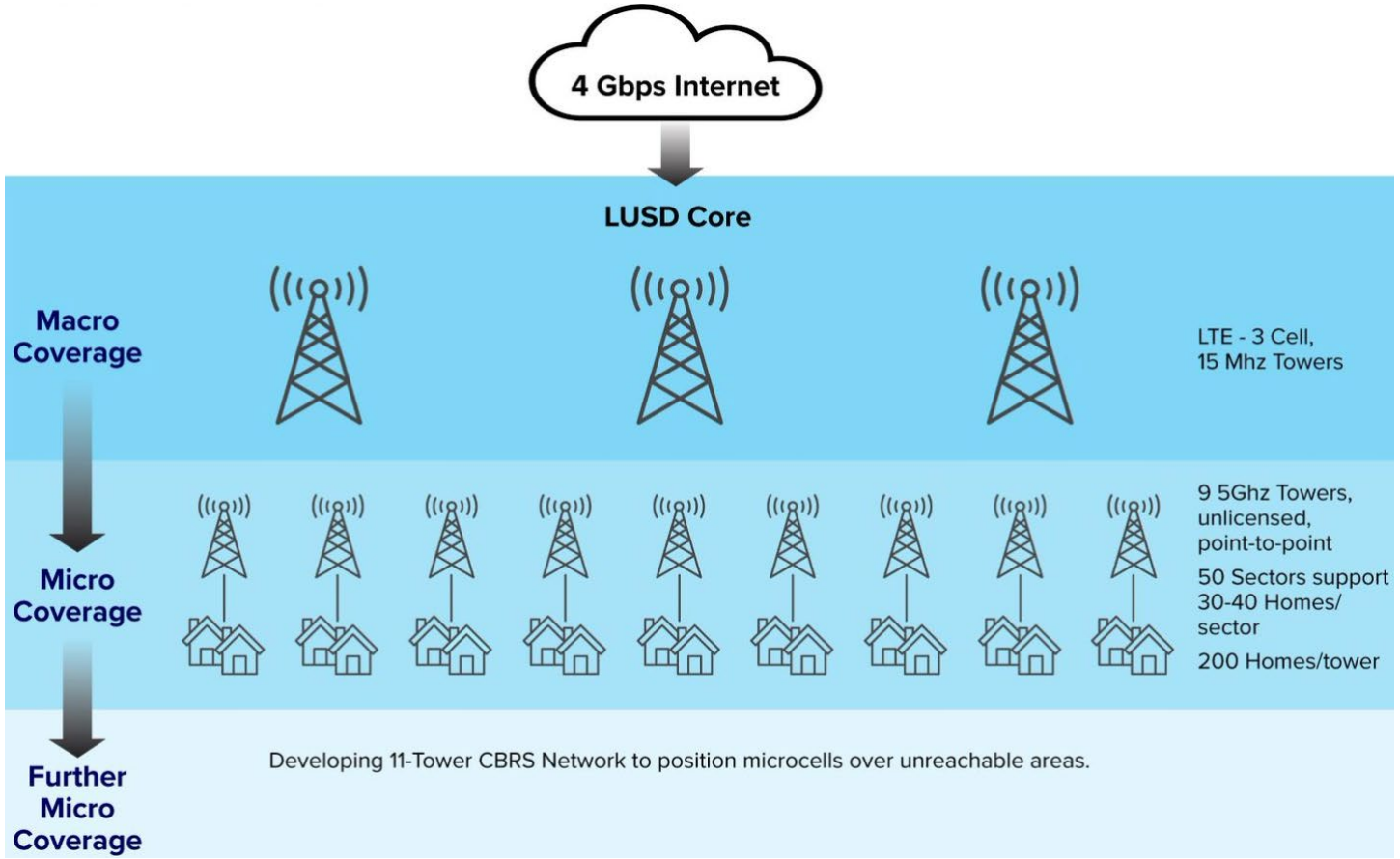


Model 4: Harnessing Multiple Solutions to Bring Access to Students & Families – Lindsay, CA

- **Lindsay Unified School District (LUSD)** initially provided devices to students, online curriculum, and online instruction.
  - Sixty Percent of student homes had no Internet service.
  - Homes with one Internet service option received inadequate broadband access (below 1.5 Mbps)
  - LUSD's goal is to provide high-speed broadband (15-25 Mbps) at no cost to ensure access to high-quality instructional materials.
- After researching services provided by existing telecommunication providers, the district determined that it could deliver faster, more cost-effective services.
- LUSD opted for a lower-cost option: providing individual Mi-Fi units for the LTE network and conducting physical residential installations for the highest performing CPE.

Lindsay, CA Community LTE Topography Map

- **LTE**: Three LTE towers consisting of three cells for each tower running 15 MHz bands servicing max capabilities of 60-70 Mbps per cell
- **Unlicensed 5 GHz Point-to-Point Spectrum**: Towers with 50+ sectors using traditional unlicensed 5 GHz spectrum that reside on LUSD school property, city/public property, and businesses with tall structures
- **CBRS, *in development*:** Position microcells to cover densely populated areas that cannot be reached with 5 GHz or enough LTE density to support bandwidth needs



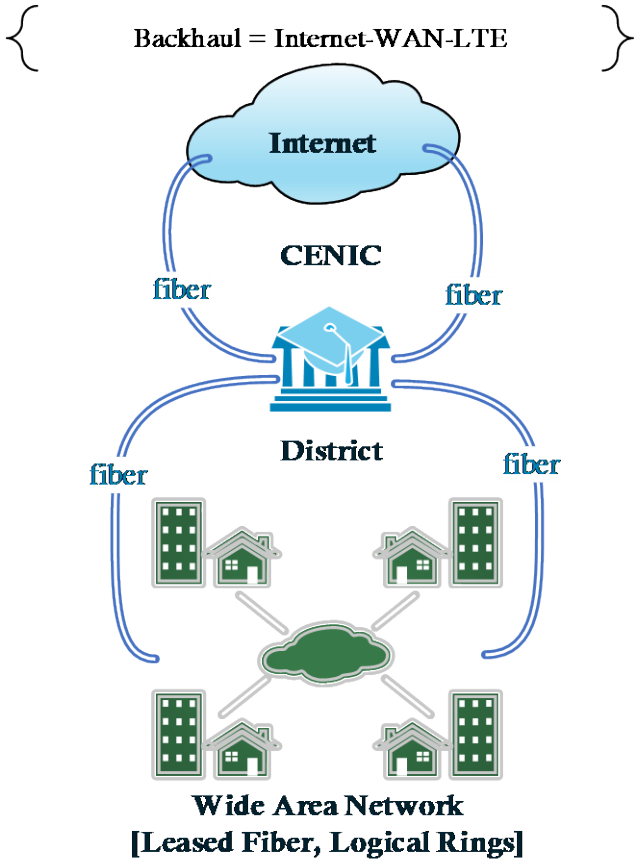
Model 5: Leveraging Partnerships to Bring Fiber Optics and Private LTE to Underserved Students – Fresno, CA

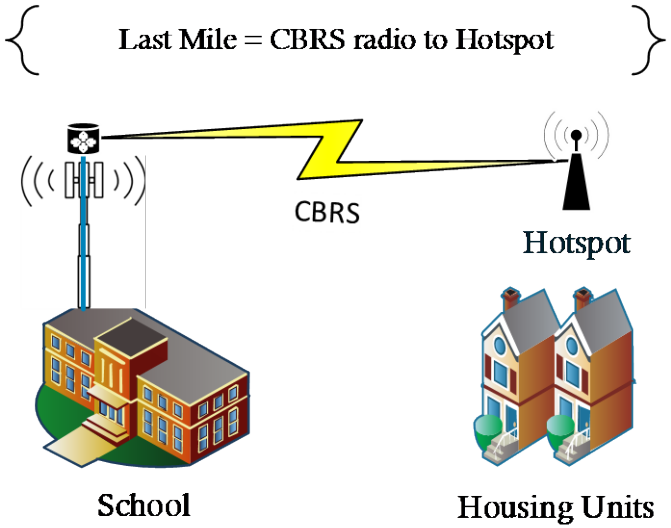
- **Fresno Unified School District (FUSD)** initially provided hotspots to students.
  - Students disconnected from class when local cellular service was inadequate or when students exceeded monthly usage limits
  - Cellular carriers have far fewer cell towers in low-income neighborhoods
  - Families cannot afford cable broadband services, or it did not have sufficient bandwidth.

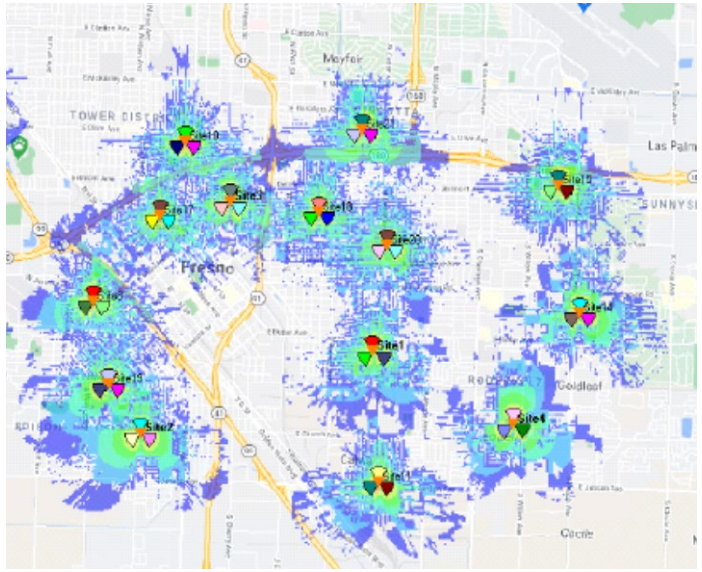
- FUSD is deploying private LTE services for students in serviceable areas around the schools in the southern region of Fresno using a multi-layered approach.
  - Build out a private LTE service
  - Provide hotspots to students where needed
  - Collaborate with anchor institutions to improve fiber infrastructure
  - Advocate for more affordable broadband

Fresno, CA
LTE Topography Map

- The district is leveraging existing backhaul, including the district-wide area network that connects 111 sites to the district HQ and Internet fiber paths that connect to CENIC's K-12 High Speed Network
- FUSD is using district facilities as elevated platforms at 15 sites. This reduces permitting requirements and time to deployment of LTE radios/antennas
- Students connect to the LTE network via Mi-Fi devices







Model 6: Building Public-Private Partnerships to Connect Low-Income Students at No Cost – Boulder, CO

- **Boulder Valley School District (BVSD)** established a public/private partnership with Livewire Networks (Livewire) called ConnectME.
  - BVSD provides real estate (schools), power, and access to dark fiber-optic lines in exchange for free Internet services to all Free or Reduced-Price Lunch (FRPL) qualifying students and their families
- BVSD receives 25 percent of Livewire's revenue generated from any necessary equipment installed on BVSD sites.
  - If Livewire sells its service to the non-FRPL school community in which they have installed equipment, BVSD receives 25 percent of that revenue

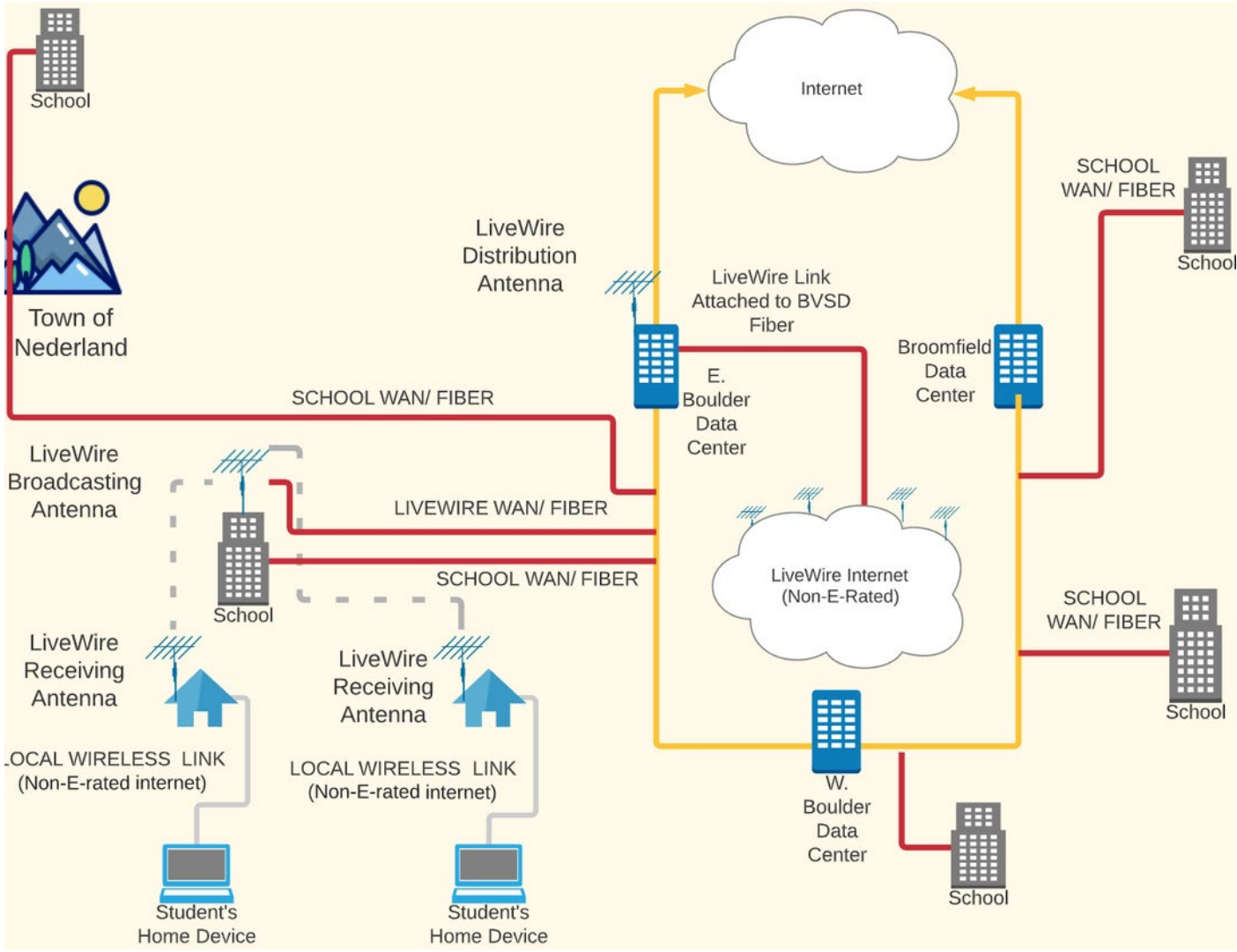
Boulder Valley, CO
LTE Topography Map

Livewire Assets

- School-based transmitting/receiving equipment, including antennas
- Student home-based equipment, including wireless routers

BVSD Assets

- Backhaul using a single strand of BVSD bond-funded dark fiber-optic line per school that is free and clear of E-Rate restrictions
- Homerun (dedicated line) of the dark fiber-optic line Livewire uses to a central facility where non-school Internet access can be obtained



Panel Discussion

Questions for the Panelists

1. Twitter: **#EDWirelessBrief**
2. WebEx: Post a questions in the comment box
3. YouTube Live: Sign-In to post a question in the comment box

- **Model 1:** Dr. Christine Diggs – Chief Technology Officer, **Albemarle County Public School District, Virginia**
- **Model 2:** Tom Rolfes – Education IT Manager, **State Office of the Chief Information Officer, Northeast Nebraska**
- **Model 3:** Luis Wong – Chief Technology Officer, **Imperial County Office of Education, California**
- **Model 4:** Peter Sonksen - Network Administrator, **Lindsay Unified School District, California**
- **Model 5:** Dr. Philip Neufeld, Executive Officer, Information Technology, **Fresno Unified School District, California**
- **Model 6:** Andrew Moore – Chief Information Officer, **Boulder Valley School District, Colorado**

Share Your Thoughts

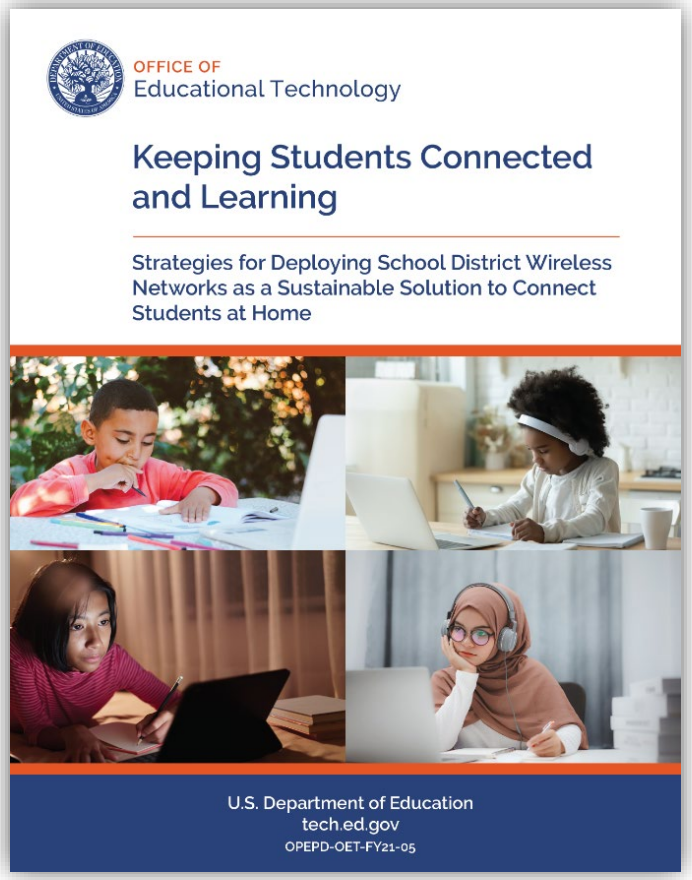
Twitter: **#EDWirelessBrief**

WebEx: Post a questions in the comment box

YouTube Live: Sign-In to post a question in the comment box

1) **What did you take away from this event?**
2) **What do you plan to do with the information from this event?**

Ongoing Support



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1. Ask Me Anything Until June 16, 2021

- Send Questions on Twitter at **#EDWirelessBrief**
- Answers to your questions will be available in a blog post on the OET website at the end of June

2. Podcast Series Coming End of June 2021

- One-on-One with Nebraska- Bringing Broadband Access to Tribal Homes
- One-on-One with Boulder- Building Off-Campus Wireless Networks Using Public/Private Partnerships
- Reflections- Developing Wireless Network Plans with Challenging Topographies
- Reflections- Lessons Learned from Deploying Off-Campus Wireless Networks