Window of Opportunity: How EBS SPECTRUM can Close the Digital Divide

A Briefing on the Educational Broadband Service Spectrum
March 7, 2019
Welcome!

John Windhausen
Executive Director, SHLB Coalition

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The SHLB Coalition is a 501(c)(3) nonprofit that supports affordable high-quality broadband for schools, libraries, hospitals, and all other community anchor institutions. Learn more at www.shlb.org.
Speakers

Katherine Messier, Director of Development, North American Catholic Educational Programming Foundation; Founder and Executive Director, Mobile Beacon

Gavin Leach, Vice President for Finance and Administration at Northern Michigan University

SuAnn Witt, State E-Rate/Tech Project Coordinator, Nebraska Department of Education

Mariel Triggs, Chief Executive Officer, Mural Net

Mitchell Koep, Chief Executive Officer, A Better Wireless

Moderator: John Windhausen, Executive Director, SHLB Coalition

@SHLBCoalition | #SaveEBS
WINDOW OF OPPORTUNITY: HOW EBS SPECTRUM CAN CLOSE THE DIGITAL DIVIDE

3.7.2019
About NACEPF

NACEPF is a Rhode Island-based 501(c)(3) nonprofit organization and the second largest Educational Broadband Service (EBS) licensee in the United States.

**NACEPF has licensed EBS spectrum in:**

- 51 markets across the U.S.
- 9 large metropolitan areas
- 18 mid-size markets
- 24 rural, under-served parts of our country

About Mobile Beacon

Mobile Beacon is the subsidiary of NACEPF that provides NACEPF’s $10/month, unlimited, high-speed broadband service to schools, libraries, nonprofits, healthcare, and other anchor institutions throughout the United States.

**Mobile Beacon currently serves:**

- 848 schools
- 950 libraries
- 4,759 nonprofits
- Serving more than 425,000 individuals nationwide
EBS Leasing Model Achieves Robust Commercial and Educational Benefits

Commercial Benefits

• Leased EBS spectrum delivers the same capacity and capabilities as commercial 2.5 GHz spectrum (BRS).
• Today, “most” of the capacity of Sprint’s LTE network comes from 2.5 GHz spectrum.
• Sprint plans to be the first to bring 5G to the U.S. in 9 cities in May using 2.5 GHz spectrum (including EBS).

Educational Benefits

• 72% of the time schools use MB’s service for off-campus connectivity (WiFi on school buses, hotspots for students to use at home, school events, and off-campus access for teachers).
• 86% of public library clients have started a hotspot lending program in their communities.
• 41% of nonprofits use MB’s internet service to close the digital divide and homework gap.
• 200+ commenters told the FCC without the service they receive from an EBS licensee, they would have no connectivity or insufficient data to meet their needs.
EBS is Crucial to Close the Digital Divide

Without a government subsidy, Mobile Beacon’s EBS service provides internet access to low-income individuals and families who were not reached by federal, state, or commercial offerings.

### Before

- **73%** Never had home internet service.
- **94%** of households w/ previous internet had access to **8 GB or less** a month.
- **48%** with previous internet had DSL speeds of 1-3 Mbps.
- **18%** had internet through a cell phone only.

### After

- **94%** now use the internet daily.
- **94%** of students spend 4 hours/week doing homework online at home.
- **95%** of parents increased communication with their child’s school.
- **24%** of adults began taking an online class.
THANK YOU!

Stay in Touch:

mobilebeacon.org • @MobileBeacon

nacepf.net • @Kat_Messier

#SaveEBS
Educational Access Network (EAN) Briefing
Rural Educational Broadband Initiative
March 2019

Gavin Leach
NMU Vice President for Finance and Administration
and Treasurer of the Board of Trustees
gleach@nmu.edu
Michigan’s Upper Peninsula – Approximately 30% of Michigan’s land mass (21,548 square miles) and 5% of the state’s population (361,000)
  o Geographic comparison: U.P. is greater than the footprint of New Hampshire, Rhode Island, Delaware, and Connecticut combined

City of Marquette (population: 22,000)
  o The U.P.’s largest city
  o Largest community in 150 mile radius

Campus overview
  Student body: Approximately 8,000 (5,400 off campus), many who are 1st generation college students.
  LTE capable laptop computers issued to all students as part of tuition
  Offers 160 academic programs from associate/certificate to baccalaureate, Master’s and Doctoral
  Respected as the “U.P.’s university”, providing education, technology leadership, and helping grow the regional economy
## A 20-year Rural University Technology Leader

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>Equal access to technology initiative - among first public universities to provide laptop computers to each student as part of tuition</td>
</tr>
<tr>
<td>2002</td>
<td>One of first U.S. campuses to provide campus-wide Wi-Fi coverage</td>
</tr>
<tr>
<td>2004</td>
<td>Piloted community Wi-Fi “hotspots” for off-campus students</td>
</tr>
<tr>
<td>2008</td>
<td>Received FCC Educational Broadband Service (EBS) license for initial WiMAX community broadband project for students, faculty and staff</td>
</tr>
<tr>
<td>2009</td>
<td>WiMAX service completed throughout Marquette County, including coverage to five neighboring, rural communities for students, faculty and staff</td>
</tr>
<tr>
<td>2014</td>
<td>Transitioned from WiMAX to LTE broadband service</td>
</tr>
<tr>
<td>2016</td>
<td>Received additional EBS licenses covering the Michigan’s entire U.P.</td>
</tr>
<tr>
<td>2017</td>
<td>Launched multiple LTE construction projects in targeted U.P. cities</td>
</tr>
<tr>
<td>2018</td>
<td>Upgraded NMU LTE core equipment to 5G</td>
</tr>
<tr>
<td>2019</td>
<td>Currently serving 51+ communities across the region with LTE broadband</td>
</tr>
</tbody>
</table>
Rural Community Need for Broadband

- 25% of U.P. households had little or no broadband
- Primary issue identified by Michigan’s 21st Century Infrastructure Commission
- Regional schools, cities, and towns requested NMU assistance in their areas

Demographic Factors

- 47% of U.P. K-12 students are on “free and reduced lunch programs
- Median incomes in U.P. are more than $14,000 (25%) below the national average – limited discretionary funds for purchase of internet access
- Affordable broadband access was critical to address the serious “homework gap” of U.P due to financial barriers – another digital divide
To make a difference in the lives of P-20 students and citizens of the rural Upper Peninsula by connecting them to critical broadband and build the foundation for educational, personal, and economic prosperity and access to essential services. More specifically, NMU’s EAN provides:

- High-speed broadband access that positively impact the U.P. economy
- Affordable broadband access to unserved and underserved U.P. communities where household incomes fall significantly below the state and national median
- Relief for rural U.P. students and families facing the “Homework Gap”
- Online personal and professional development along with workforce training and learning opportunities to U.P. citizens and businesses
- Use EAN to assist with Veteran education and training and rural health telemedicine services
EAN Project Plan and Funding Highlights

- Build an LTE broadband system to provide coverage for **64 rural communities across the U.P. using 2.5 GHz spectrum** and complete the project in **24 months**
  - **$6.5 million investment from the State of Michigan** (through Michigan Economic Development Corporation) and
  - **$3.2 million Northern Michigan University investment**
- Leverage existing university LTE technology infrastructure and support programs to maintain and deliver affordable access
- Expand on partnerships with local K-12 schools to improve student access to online learning systems
- Enter multi-town agreement with national tower provider
EAN Educational Highlights

- Expand regional access to online certificate, associate, baccalaureate, and graduate programs

- Complementary career and professional development courses are included for subscribers -- advance your career, fulfill personal development needs, explore new topics, and regularly exercise your brain.

- Complementary access to short “micro” or “nano” learning opportunities as part of subscriber fee

- Available to learners of any age

- Offers a Child Internet Protection Act (CIPA) compliant option for families who want content filtering found in K-12 schools
Key EAN Components

- A fixed wireless LTE service using Educational Broadband Service (EBS) spectrum to connect learners of all ages with internet-based education
- Product sourcing to meet project goal of the development of broadband access for 64 areas in 24-month period
- Allow local communities to partner with NMU in leveraging existing public infrastructure to deliver affordable community broadband
- Use off-the-shelf LTE consumer devices and is prepared for migration to 5G
- Provide NMU students opportunities to serve as paid technology, sales, and support specialists – hands-on experience in skilled jobs; faster entry into IT industry upon graduation
## EAN U.P. Rural Communities Served

<table>
<thead>
<tr>
<th>Period</th>
<th>Project Goal</th>
<th>Projected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Nov - 2018 Apr</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>2018 May - 2018 Oct</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>2018 Nov - 2019 Jan</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>2019 Feb - Nov 2019 (Projected)</td>
<td>64</td>
<td>114</td>
</tr>
</tbody>
</table>

NMU’s Upper Peninsula Rural Educational Broadband Initiative
EAN Project Progress - October 2017 through January 2019

NMU’s Upper Peninsula Rural Educational Broadband Initiative

51 Rural U.P. Communities with coverage

- Atlantic Mine
- Bad River
- Bark River
- Big Bay
- Brampton
- Brimley
- Champion
- Chocolay
- Cooks
- Cornell
- Crystal Falls
- Dollar Bay
- Ely Township
- Engadine
- Escanaba
- Felch
- Foster City
- Gladstone
- Gwinn
- Hancock
- Hardwood
- Harvey
- Hermansville
- Houghton
- Humboldt
- Ishpeming
- KI Sawyer
- Kingsford
- Manistique
- Marquette
- Maywood
- McFarland
- Metropolitan
- Michigamme
- Nadeau
- Negaunee
- Negaunee Township
- Nestoria
- Perkins
- Powers
- Rapid River
- Republic
- Rock
- Rockland
- Spalding
- Stonington
- Superior Central
- Three Lakes
- Ternary
- Watersmeet
- Wilson

51 Rural U.P. Communities with coverage

Google Earth
“50% of K-12 students couldn’t complete their homework due to lack of internet connection and 42% received a lower grade because of it.”


5-year EAN service projection for households with one or more students
EAN – Providing Broadband Access to Unserved and Underserved U.P. Rural Communities

EAN subscriber enrollment and projected growth based on new subscriber growth rate of 215 per month

5-Year Projected EAN Subscriber Count

<table>
<thead>
<tr>
<th>Year</th>
<th>Subscriber Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2018</td>
<td>3,305</td>
</tr>
<tr>
<td>2019</td>
<td>5,885</td>
</tr>
<tr>
<td>2020</td>
<td>8,465</td>
</tr>
<tr>
<td>2021</td>
<td>11,045</td>
</tr>
<tr>
<td>2022</td>
<td>13,625</td>
</tr>
<tr>
<td>2023</td>
<td>16,205</td>
</tr>
</tbody>
</table>
“Having a broadband connection gave households an estimated economic benefit of $1,850 per year.”


5-Year Cumulative Projected EAN Economic Impact on Rural U.P. Communities

Increases local job growth
# EAN Project Statistics

NMU’s Upper Peninsula Rural Educational Broadband Initiative

## Current and Projected Rural U.P. LTE Buildout Impact Statistics

<table>
<thead>
<tr>
<th>Current LTE Network</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting learners and community members</td>
<td>11,000+ NMU students, faculty, staff, and community families</td>
</tr>
<tr>
<td>Rural communities served</td>
<td>51 unserved or underserved rural U.P. communities</td>
</tr>
<tr>
<td>Broadband speeds</td>
<td>Up to 25 mbps down and 5 Mbps up</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When Fully Constructed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Last-mile broadband connectivity to:</td>
<td>114 unserved or underserved rural U.P. communities</td>
</tr>
<tr>
<td>Ability to connect rural learners</td>
<td>60,000 K-16 students and lifelong learners</td>
</tr>
<tr>
<td>Provide middle college links between</td>
<td>40,891 K-12 students and 6 colleges and universities</td>
</tr>
<tr>
<td>Connections for tribal communities</td>
<td>6 Native American tribal communities</td>
</tr>
</tbody>
</table>
Maintaining a State-Of-The-Art System:

- The University upgraded its LTE core to 5G in 2018 to accommodate future network growth and the need for enhanced speed.

- NMU has identified some community service areas where subscriber density and the demand for faster data transfer will drive the deployment of micro-cell technologies.
Planned expansion
Alcona, Alpena, Cheboygan, Montmorency, Otsego, and Presque Isle counties
- Geography: Rural
- Population: 126,229
- Households: 52,529
- Families: 35,814

Expansion overview:
- Construct 20 to 30 LTE sites across the region
- Requires EBS spectrum
- Partner with two intermediate school districts
- Target cities/townships with K-12 schools
- Funding from Michigan Economic Development Corporation and other state and federal resources
EBS and Education

NMU’s Upper Peninsula Rural Educational Broadband Initiative

Why should EBS remain available only to Education

- EBS intent is to support technology needs in delivery of education to the broad citizenry
- Education has the technical expertise and can leverage underlying infrastructure to deliver broadband to unserved and underserved communities
- Education already works collaboratively with communities and can partner to utilize public infrastructure assets to lower cost of delivery
- Role of education is access, economic development of communities, and sharing of resources vs. profit
- Rural communities are less attractive to private sector due to limited ROI opportunity – goal is profit vs. access
- The affordability and access to the necessary technology has been enhanced over the past 5 years to make it more conducive to long-term success.
Educational Access Network Briefing

More on the web @

nmu.edu/ean

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Director of Broadcast and Audio Visual Services
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208 / 244 Nebraska schools are One-to-One (devices per student)
An estimated 100,000 students take home a digital device
17% (~55,000) do not have home access to adequate broadband

Common in rural Nebraska, a line of poles traverses dirt roads and cross country towards an unseen home, miles from town.
Using the 35 Mile criteria, NET and state-owned or leased towers were identified to cover the state and distribute EBS spectrum.
What keeps educators up at night? There is a gap and it’s growing WIDER!

What can we do: with your help, provide broadband to every learner, whether at home, at a game, or on a school bus.

Growing challenge of the Homework Gap

Technology leaders predict high growth for:

- Cloud applications
- Blended learning models
- Flipped learning models

Ref: Project Tomorrow Speak Up

RESULT:
Increased dependency on digital tools for learning requires students have access outside of school that is:

- Safe for students
- Consistent access
- High quality speed and bandwidth
- Appropriate for schoolwork
2.5 GHz EBS Spectrum: Transforming Education

SuAnn Witt, Nebraska Department of Education
Bridging the Homework Gap on Tribal Lands

Mariel Triggs
CEO, MuralNet
Mural’s goal is to develop and execute a strategy for bringing broadband to under-connected people on tribal lands on a grand scale.

We provide legal help, equipment, installation and network management training for our tribal community partners to self-deploy their own high-speed Internet networks at no cost to them.
History of Mural - Founded March 2017

Martin Casado, Founder & CFO
Martin is a Silicon Valley entrepreneur, investor and technologist who was deeply involved in the development of software defined networking as a co-founder of Nicira Networks. Currently he is a GP at Andreessen Horowitz. He grew up near Four Corners and has a deep affinity for the region.

Brian Shih, Founder & President
Brian specializes in designing ICT infrastructure solutions and has built networks of all sizes across the globe. Now his focus is America’s rural underserved communities. Through his work with EducationSuperHighway, he helps K-12 schools optimize E-rate to upgrade their broadband.
### Why Self-deployed and Managed Networks Now

#### Reliable and Free Tech Stack
- Facebook’s MAGMA
- Open-source
- Distributed LTE core
- Can be run on AWS or their own servers
- Network operators need to be tech savvy but not highly skilled

#### Affordable Off-the-shelf Equipment

![Antenna](image)

#### Available Backhaul
- Government Subsidized Fiber
- Major Providers
- Local WISPs
- Vigilant tribally-affiliated people and organizations

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Tribal Partner’s Network Spectrum Choices

- LTE
- Unlicensed Spectrum
  - TV Whitespace
  - CBRS Spectrum
- Educational Broadband Service Spectrum

Backhaul

Homes with user end devices that convert LTE to Wi-Fi

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Situation 1: EBS Available Havasupai Deployment

- **9/27/2017** Tribal resolution approving proposal
- **11/2/2017** Emergency STA application submitted
- **11/17/2017** Cell mounted
- **2/28/2018** FCC temporary license granted to The Havasupai Tribal Council
- **3/5/2018** First end-to-end connection by Armando Marshall, Facilities & Maintenance Supervisor capable of broadband speeds

Permanent connection to 16 homes and offices and 24 more routers available for checkout from the tribal offices

**Future Expansion pending approval of permanent application**
Situation 2: All Spectrum Allocated But Not Used

C4 channel of NMPBS WHR756 available for lease and talks with SFIS already started

All other spectrum controlled by Sprint, but they are willing to negotiate
We need EBS for the public good

Tribal priority windows

Access to major telecoms’ licensed but unused spectrum on tribal lands

Mariel Triggs, mariel@muralnet.org

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THANK YOU

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