MAISA | MICHIGAN ASSOCIATION OF INTERMEDIATE SCHOOL ADMINISTRATORS
SUPPORTING REGIONAL EDUCATION SERVICE AGENCIES

MiConnect

MiConnect Plan | Phase 1

July 2021

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Purpose

Equitable, affordable, high-speed internet access for all residents, communities, businesses, anchor institutions, and nonprofit organizations is critical in the 21st century global economy. The pandemic exposed the criticality of sufficient high-speed internet access for education, health and wellness, and work.

Until early June 2021, Michigan didn't have a centralized organization to facilitate the activities needed to provide universal connectivity to residents, communities, and businesses. As it relates to high-speed internet within Michigan, government is decentralized and fosters experimentation and customization, which has resulted in redundant efforts. In the education community, multiple collaborative initiatives are already envisioning, creating, and coordinating activities to increase the build-out of broadband solutions, particularly in the under- and unserved rural areas, and to assist lower-income families afford connectivity.

Michigan educators like the Michigan Education Technology Leaders (METL) group at the Michigan Association of Intermediate School Administrators (MAISA) have long recognized the lack of residential broadband access as a key impediment for teaching and learning. However, the pandemic and remote learning exacerbated the impact of the lack of high-speed internet connectivity, and, in March 2020, the METL MiConnect Task Force quickly gathered information on access levels for students across the state. They found that nearly one-third of students lacked sufficient broadband access for remote learning; the same survey indicated that close to 25% of district staff lacked internet connectivity.

MAISA has long held a leadership role in facilitating collaboration across Michigan's 56 intermediate school districts (ISDs) and, thus, the local districts that they serve. As a result of the survey and other discussions, MAISA and the METL group launched a planning initiative as the first step in addressing the broadband gaps within the state. This project seeks to further the MiConnect initiative to provide digital inclusion by connecting Michigan residents without broadband, making the internet accessible for residents, communities, and business entities. The Charles Stewart Mott Foundation provided grant support for MAISA's assessment of the status of internet connectivity and potential ways to leverage public and private partnerships to connect all Michigan residents to broadband service.

Digital divide

Nationally, approximately 15–17 million students can't afford or access a home internet connection[1]. Within Michigan, approximately 500,000 students don't have or have insufficient internet connectivity.

The implications are significant for students. Per the Michigan State University (MSU) Quello Center report, students without home internet access perform lower on a range of metrics and are less likely to intend to pursue postsecondary education. Additionally, the report notes that rural and low-income students are less likely to have high-speed internet access at home, furthering the digital divide and placing these students at a disadvantage compared to their peers.

Scope

The scope of this project included research on the current broadband internet environment, minimum bandwidth requirements, challenges in obtaining connectivity, current and upcoming infrastructure funding initiatives, as well as possible connectivity solutions. Additionally, numerous discussions were held with potential partners and collaborators to identify the initiatives underway across the state.

What is the state of Michigan's broadband infrastructure?

Approach

We used a collaborative and iterative approach involving significant discovery and analysis. Specifically, we:

1. Researched & reviewed the internet connectivity inventory at the local ISD level.
2. Researched other available sources of internet connectivity, including exploratory discussions & online resources.
3. Defined minimum broadband requirements for residential use.
4. Researched potential funding sources for both broadband build-out & support for economically disadvantaged.
5. Researched public-private partnerships, including any potential barriers.
6. Researched available potential connectivity solutions.
7. Researched statewide initiatives in progress and best practices from other states.
8. Met with organizations exploring broadband initiatives to share information & increase collaboration.
9. Analyzed & aggregated information (including mapping) to identify potential gaps in internet connectivity & affordability.
10. Held ongoing discussions with the METL MiConnect Task Force to discuss findings & refine recommendations.
11. Met with legislators regarding connectivity needs & potential solutions.
12. Developed this draft report.

We used a collaborative and iterative approach involving significant discovery and analysis.

Partners

Recognizing the importance of partnerships, the METL MiConnect Task Force (the Task Force) actively engaged partners in varying degrees through proactive outreach. The intent was to assist in the evaluation of the current state broadband environment, identification of planned/current broadband-related initiatives, and promote greater collaboration. The Task Force's partner outreach efforts included multiassociation meetings, individual partner discussions, and working sessions with key partners. The following organizations and people were identified and engaged during the discovery effort based on their stated mutual interest:

- Connected Nation Michigan
- EducationSuperHighway
- Executive Office of the Governor
- Launch Michigan
- Merit Network, Inc.
- Michigan Association of Intermediate School Administrators (MAISA)
- Michigan Association of Regions (MAR)
- Michigan Department of Education (MDE)
- Michigan Department of Technology, Management & Budget (DTMB)
- Michigan Economic Development Corporation (MEDC)
- Oakland Schools
- Office of Lt. Governor Gilchrist
- State Education Network (SEN)
- State Senator Rosemary Bayer
- U.S. Senator Debbie Stabenow

Key observations

Based on our analysis of research, meetings, and other discovery activities, we made the following key observations:

- Availability of accurate broadband-related data is limited; data is provided at the census-block level rather than the street-address level.
- A large geographic portion of Michigan lacks adequate broadband bandwidth.
- Approximately 50% of K-12 public school students are economically disadvantaged based on eligibility for the free and reduced-price lunch program, as determined by the National School Lunch Program (NSLP). As a result, affordability of access may be a barrier, even in areas where broadband is available.
- There are numerous planned and active broadband initiatives underway without statewide coordination.
- Significant funding through federal, state, and education initiatives is available for broadband infrastructure build-out.
- The lack of broadband access negatively impacts workforce development, learning opportunities, and health and wellness.

The lack of broadband access negatively impacts workforce development, learning opportunities, and health and wellness.

The path forward is as varied as the problem itself, requiring a diversity of partners, technologies, legislation, funding, and coordination for success. The solution path is not singular or "one size fits all;" rather, it's based on the collective needs and unique circumstances of a region, community, or organization. Using prescriptive approaches will empower and enable leaders to identify and implement the best path for addressing the broadband needs of their constituents. The potential solutions are as diverse as public wireless or electric cooperatives. This level of autonomy allows for different paths statewide, locally, and even in subsets of geographies. That said, it is imperative that the collective and individual paths are founded on a common set of principles, strategies, and goals while being properly coordinated across the state.

Recommendations

Establish a Project Management Office (PMO) *to coordinate the following recommended statewide activities:*

- Align efforts to foster broadband build-out, including municipal networks.
- Address the lack of accurate and real-time statewide mapping of broadband availability, down to the address level; add an economically disadvantaged layer to identify where additional financial support may be necessary.
- Facilitate and encourage the use of public and private networks and assets (e.g., towers), as well as public/private partnerships.
- Promote minimum bandwidth of **100/10 megabits per second (Mbps)** to each household across the state.
- Coordinate infrastructure and access limitations. Remove barriers to enable communities and service providers to increase broadband coverage areas.
- Provide resources (financial and staff) to support local communities and public-private partnerships.
- Work with foundations and legislators to establish additional support for families that are economically disadvantaged to obtain high-speed internet access.
- Continue the collaboration with the multiple associations (e.g., MAR, EducationSuperHighway, Connected Nation Michigan, MDE, etc.) established during this initiative.
- Work with foundations and partners to establish additional support for families that are economically disadvantaged to obtain high-speed internet access..

Michigan announced the creation of the Michigan High-Speed Internet Office (MI-HI) within the Department of Labor and Economic Opportunity in early June 2021. The MI-HI Office should **consider** partnering with **existing collaborative groups,** like the Michigan Collaboration Hub (MiCH) at the Michigan Association of Intermediate School Administrators (MAISA), to support the wide range of current and emerging broadband efforts across sectors in Michigan, including the recommendations above. The objectives include the coordination of safe, secure, affordable broadband initiatives to serve every community, home, anchor institution, and business in Michigan.

Note: Appendix A contains a glossary of terms used within this document and Appendix B lists the project resources.

Findings/Current Environmental Scan

Current broadband environment

Minimum bandwidth requirements

Challenges

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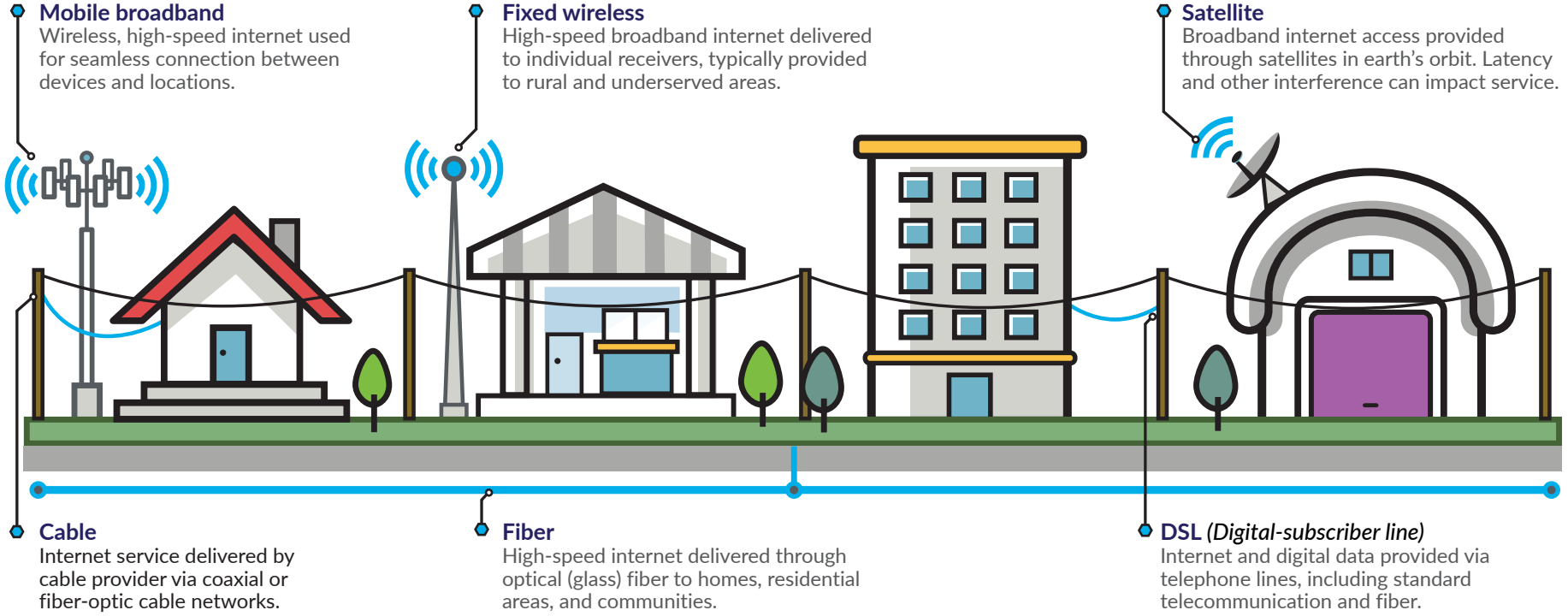
Current broadband environment

The present-day broadband environment in the state of Michigan is largely composed of commercially provided services (e.g., cable, fiber, etc.) focused primarily on densely populated communities, resulting in a lack of rural connectivity coupled with affordability challenges. The COVID-19 pandemic highlighted the inadequacies and underscored the principle that every citizen, community, anchor institution, and business should have high-speed internet access that's accessible, secure, reliable, and affordable. Today, the state has a diversity of connectivity choices largely based upon geographic location, service provider(s), and other service delivery factors, such as the distance from the provider facilities. The diagram below depicts the various broadband models commonly available today.

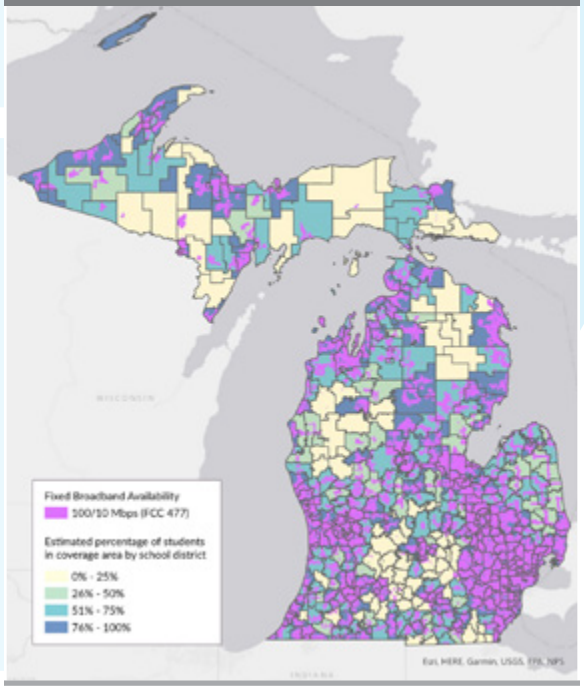


Source: Connected Nation

In practice, not all broadband models are created equal, and their successful application varies. There is great variance in the capability, effectiveness, and affordability of each model; therefore, from community to community and even house to house, significant inconsistencies exist. Operating within the current broadband environment is a collection of approaches, including public, private, and collaborative efforts that provide varying degrees of connectivity to Michiganders. Many have recognized that terrestrial broadband technologies alone aren't the solution to the high-speed internet inadequacies and that it's necessary to combine with other technologies, such as mobile broadband (LTE, 5G) and satellite services. Historically, commercial (private) providers have been essential to the expansion of broadband across the state. However, this for-profit model, combined with the geography and population distribution of the state, has furthered a broadband digital divide. Despite these efforts, there remains a clear need for greater connectivity in the state.

Furthermore, the definition of broadband itself hasn't kept pace with changing needs and technologies. In 2015, the Federal Communications Commission (FCC) had determined that 25 Mbps download and 3 Mbps upload was an appropriate definition of broadband. Since that time, this definition has been widely adopted as the standard being used for planning, deployment, and affordability of broadband internet. Despite the ubiquitous use of this standard, large portions of the state remain with either no service or delivered service that falls significantly below the FCC standard. The broadband inadequacies become even more prominent as the definition of broadband evolves. Many experts reviewed and support the increase of the minimum broadband speeds beyond 25/3 Mbps to a more modern standard. For purposes of this report, a target of 100/10 Mbpsbps was used in the analysis and recommendations.

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



Sources:
Connected Nation (CN) - 09/2020
Federal Communications Commission (FCC) - 09/2020

The Task Force evaluated the broadband challenges through the lens of supporting education and students. Using this perspective, the Task Force was able to discern that there are large student populations within the state that lack adequate bandwidth to effectively support remote learning in a post-pandemic household environment. The data confirmed this issue was more prominent in rural communities (including tribal lands), with the northern lower, Upper Peninsula, and the Thumb area being most impacted. See Appendix C for additional maps depicting broadband availability. Many local school districts, intermediate school districts, and educational agencies have recognized this issue, with some taking action in their own communities.

Lastly, the state has a variety of underutilized assets (e.g., towers, existing networks) that could help to expand the capabilities and availability of broadband statewide. The use of these assets has been largely hindered by legislation, usage/ownership rights, and ineffective collaboration. Recently, a series of funding mechanisms have sought to address some of the challenges but have fallen short due to various factors, such as inadequate collaboration, ineffective coordination, and prohibitive legislation.

Data availability

Data is at the crux of understanding the high-speed internet challenges for Michiganders and identifying the path forward. Presently, there is no consolidated, accurate, and comprehensive data source that identifies the broadband infrastructure available to residents and the relative degree of access/affordability. Rather there is a patchwork of disjointed sources that provides varying degrees of broadband-related data. Many of the existing data sources lack the specificity to determine the individual bandwidth available for households and the associated cost of service. At the same time, there is very little data available to cross-reference students who are economically disadvantaged with broadband availability. These data sources vary greatly in their intended purpose and scope; thus, their utility also varies as well. We identified and reviewed a number of key data sources for the purpose of the current state broadband environment assessment, including the following:

FCC Form 477 filing data: All facilities-based broadband providers are required to file data with the FCC twice a year (Form 477) indicating where they offer internet access service at speeds exceeding 200 Kbps in at least one direction. The filing is required for providers that offer either fixed broadband (cable, fiber) or mobile broadband services (LTE, 5G). Each provider's Form 477 identifies the census blocks in which they can or do offer service to **at least one location,** with additional information about the service. Historically, this has been used as the *de facto* source for determining broadband coverage/availability.

There is no consolidated, accurate, and comprehensive data source that identifies the broadband infrastructure available to residents

Merit Network, Inc., Michigan Moonshot: The Michigan Moonshot data collection process provides accurate, granular connectivity and resident sentiment data, which can be leveraged by municipalities, broadband task forces, county governments, and those working to expand connectivity for the purposes of broadband planning and to support grant applications. This effort aims to provide address-level information pertaining to the subscribed service of the household.

Connected Nation Michigan: Connected Nation Michigan is a subsidiary of Connected Nation and operates as a nonprofit in the state of Michigan. Connected Nation Michigan partnered with the Michigan Public Service Commission to engage in a comprehensive broadband planning and technology initiative as part of a national effort to map and expand broadband. The program began by gathering provider data to form a statewide broadband map and performing statewide business and residential technology assessments but has since progressed to working with communities on local plans.

BroadbandNow: BroadbandNow is a consumer-focused organization with the mission of helping consumers find the best broadband as easily as possible. The organization focuses on bringing transparency in government data and research, aggregating IP-verified customer reviews and ratings, and fostering competition through better awareness of local providers. BroadbandNow serves primarily as a broadband marketplace for consumers.

Southeast Michigan Council of Governments (SEMCOG), Southeast Michigan Broadband Availability and Usage: This interactive tool provides information regarding broadband service availability in the SEMCOG region. Broadband availability shows estimated residential fixed, nonmobile terrestrial service areas with varying internet speeds. Households by broadband availability and speed are estimated by intersecting building points with the internet service areas and applying speed distributions to household counts for the selected geography.

United States Census Bureau, American Community Survey: The American Community Survey (ACS) is an ongoing survey that provides vital information on a yearly basis about the United States and its residents. One important fact to remember about the ACS is that the forms aren't mailed to specific people but rather to specific addresses. The ACS can produce a good picture of the community's people and housing by surveying a representative sample of the population. ACS asks about computer and internet use to help state and local agencies evaluate access to broadband in their communities.

MI School Data: Affordability of high-speed internet access is critical, particularly for students who are economically disadvantaged. MI School Data includes information on the number of students who qualify for the federal free and reduced-price lunch program by district. However, we were unable to find a dataset that included the location of these students (beyond the school district boundaries) to overlay with the broadband coverage areas in order to identify affordability concerns.

Partners

Partners are a cornerstone of the broadband solution, which is multidimensional and requires effective collaboration and shared interest. Presently, there are many groups actively pursuing solutions to the state's broadband challenges (both infrastructure and access) using differing approaches, objectives, and intended outcomes. Recognizing the importance of partnerships, the METL MiConnect Task Force actively engaged partners in varying degrees through proactive outreach.

In addition to the partners identified in the Executive Summary, a number of other potential future and expanded partnerships was identified. We believe the following organizations are uniquely poised to play a key role in a long-term unified solution:

Michigan electric cooperatives

These cooperatives presently operate within many of the geographies that are under- or unserved today. The cooperatives maintain a portfolio of infrastructure assets across a large portion of the state. Nationally, there has been traction among cooperatives to pursue alternate service offerings and modernize their electrical grids. As these cooperatives pursue investments in electrical infrastructure, the opportunity exists to leverage such infrastructure assets (e.g., poles, towers) for the purpose of broadband service delivery.

Backbone network providers

These providers operate large and geographically dispersed "backbone" networks that are capable of providing high bandwidth connectivity between locations within the state. Presently, there is a State Education Network (SEN) deployed in close partnership with Merit Network, Inc. that aims to connect school districts across the state. The opportunity could exist, with legislative changes, for such providers (both public and private) to engage in either "middle mile" connectivity, bridging the gap between two otherwise disconnected locations, and working closely with "last mile" partners to deliver broadband to households.

MICHIGAN ELECTRIC COOPERATIVES

Source: Michigan Electric Cooperative Association

MERIT BACKBONE NETWORK

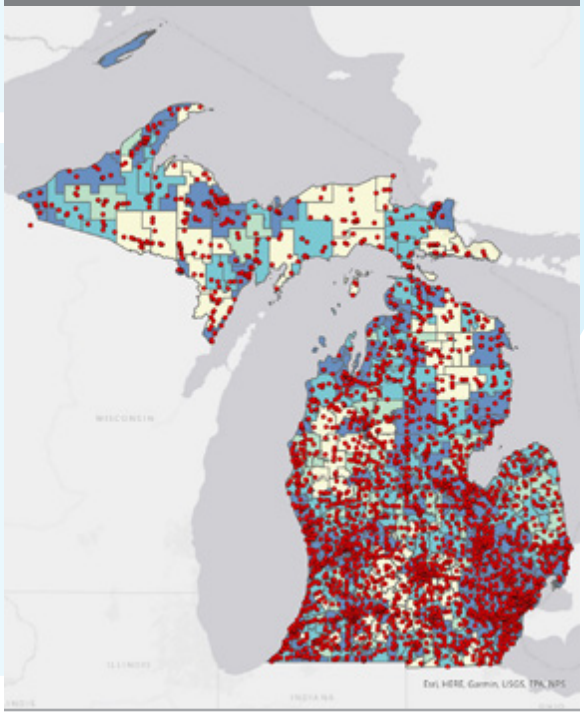
Source: Merit Network, Inc.

Local government (including tribal) and educational institutions

These entities frequently include a diverse inventory of public assets (e.g., towers, buildings, network connectivity) that could be leveraged for the purpose of advancing broadband connectivity. Seeking creative and collaborative uses while maximizing taxpayer investments is a key tenet of such partnerships. Many city, county, and school districtwide networks exist that could serve to help bring broadband to residents in those communities. Furthermore, the location of the existing vertical assets could prove to be a vital component of serving rural areas of the state. For a larger view of the map, please see Appendix D.

Appendix D includes maps that identify educational institutions, healthcare institutions, and libraries.

LOCAL GOVERNMENT (INCLUDING TRIBAL) AND EDUCATIONAL INSTITUTIONS



Primary Data Source: F.A.A. Obstacle Data – Towers over 100 ft.

State-level resources

There is significant interest from various levels of the state legislature and the governor's office to support solutions for addressing broadband gaps. Historically, the state lacked a broadband internet legislative office (or similar) that purposely focused on the strategy, advancement of infrastructure, and coordination of related funding. While not all 50 states currently have such governmental involvement, many of them do. The degree of state-level involvement varies nationwide, having various forms, including boards, institutes, councils, committees, task forces, and offices. Until June 2021, Michigan was an outlying state until Governor Gretchen Whitmer established the Michigan High-Speed Internet Office, which will be housed inside the Department of Labor and Economic Opportunity. In addition to the aforementioned MI-HI, there are several state-level broadband programs and efforts:

State Government Broadband Awareness Project: This is the state's website to collate and update information on broadband.

Connected Nation Michigan: Under the funding of Connected Nation, Connected Nation Michigan seeks to accelerate the growth of technology in support of community and economic development, improved healthcare, enhanced education, and more effective government.

Michigan Department of Education: The department oversees the E-Rate Enhancement Special Construction Matching Fund through the federal E-Rate program for special construction builds upgrading district, ISD, public school academy (PSA), and library broadband connections.

DTMB: In conjunction with the Office of Technology Partnerships (OTP), this is a state organization focused on bringing faster broadband to larger populations in Michigan.

Michigan Public Service Commission: The mission of the Michigan Public Service Commission is to grow Michigan's economy and enhance the quality of life of its communities by assuring safe and reliable energy, telecommunications, and transportation services at reasonable rates.

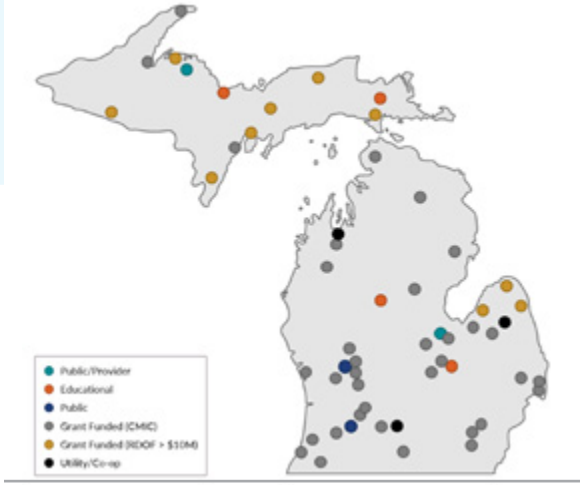
Michigan Economic Development Corporation: This public-private partnership serves as the State's marketing arm and lead agency for business, talent and jobs, tourism, film and digital incentives, arts and cultural grants, and overall economic growth.

See Appendix E for a listing of known statewide commissions, offices, councils, and initiatives.

Planned and in-progress broadband initiatives

There are several broadband initiatives, which are planned or in progress, aimed at closing the digital broadband divide. These initiatives vary in their scope, approach, and funding, with many aimed to address broadband infrastructure improvements in predominantly rural areas. Many federal and state funding mechanisms (further described in **Broadband Funding**) have served as a catalyst for vendors seeking to address the broadband issues within the state. In addition to the federally funded initiatives, several "grassroots" efforts are either planned or currently underway. These grassroots efforts have commonly resulted from the necessity for local community and educational leaders to address their local broadband inadequacies. To that end, the state's educational community has proactively sought to address the broadband gaps through a series of projects at a district and intermediate school district level.

IDENTIFIED BROADBAND INITIATIVES



Primary Sources:
Michigan Education Technology Leaders
Rural Digital Opportunity Fund
Connecting Michigan Communities Grant Program

Several notable education-focused initiatives are being actively pursued by the Michigan Association of Intermediate School Administrators; Eastern U.P. Intermediate School District; and Merit Network, Inc. to name a few. These initiatives have proven to be successful in increasing connectivity for students.

In addition to the educational initiatives, there are local, grassroots efforts at the individual community level. Several local governments and public-private partnerships are working collaboratively to establish, expand, and enhance broadband for their local communities. Notable examples include Traverse City Light & Power TCLPfiber and Marshall FiberNet. To foster collaboration and optimize resources, the State of Michigan's Infrastructure Council (MIC) also maintains a "Dig Once" Project Portal. This Project Portal is intended to assist authorized infrastructure asset owners and managers with cross-asset collaboration and coordination, providing the opportunity for broadband-related infrastructure to be included alongside traditional infrastructure assets such as water and electricity. Since there is nothing compelling such cooperation and participation, this approach varies significantly among communities within the state.

Additionally, there are many grant-funded, public, and commercial projects either underway or planned to begin soon. These include several projects resulting from both the Connecting Michigan Communities (CMIC) Grant Program and the Rural Digital Opportunity Fund (RDOF). These two programs have resulted in vendor-driven planned expansion of broadband infrastructure to largely rural and under- or unserved geographies of the state. The awarded vendors have committed to providing various levels of broadband connectivity to specific communities over several years. Many of the awardees are terrestrial service providers; thus, by their very nature, their solutions are marginalized by the local service area they cover. Some nonterrestrial providers (e.g., SpaceX Starlink) have also been awarded funding to deploy satellite-based broadband services over the coming years with the intent of filling the voids of broadband coverage otherwise unserviceable with terrestrial-based services.

To foster collaboration and optimize resources, the State of Michigan's Infrastructure Council (MIC) also maintains a "Dig Once" Project Portal.

Minimum bandwidth requirements

The FCC's definition of broadband internet dates back to 2015 and was set at the level deemed appropriate at that time. The COVID-19 pandemic fundamentally accelerated the change in how residential broadband is consumed and highlighted the inadequacies of the current broadband infrastructure. In an effort to more appropriately characterize broadband internet, the MiConnect Task Force undertook an exercise to determine the minimum bandwidth requirements for a modern household that assumes two adult workers and two students attending at least a portion of the school week remotely. Though the analysis is largely driven by students' needs for remote or hybrid education, it also considers other aspects that impact household bandwidth requirements, including the increased prevalence of remote work and other typical noneducation internet services consumed concurrently in a household.

The analysis encompasses the type, use, and bandwidth requirements of different internet services found in a typical household. It considers the different means by which students access stored content, share information, consume online services, and communicate in real-time with teachers and students alike. The Task Force's bandwidth calculation recognizes that the main drivers are real-time video services (1-to-1 conferencing, group conferencing, and video streaming) that require a high-speed and constant stream of data to be **uploaded** for a quality experience. Concurrent use of this service increases the overall household bandwidth requirements linearly (i.e., more people using the service, the more bandwidth needed). The overall bandwidth calculation also considers other services deliberately used in a typical household, either by working adults or for typical leisure activities, as well as services occurring naturally in the background, such as updates and synchronization activities required by connected/smart devices.

Based on the objectives and assumptions detailed above, the Task Force identified the minimal bandwidth required by a typical household consisting of two adults and two student children should be 50 Mbps download and 10 Mbps upload. This revised broadband definition mostly closely aligns with the 100/10 Mbpsbps broadband service tier categorized by the providers and published in the FCC's 477 broadband filing data. **Therefore, the 100 Mbps download and 10 Mbps upload profile was used in the analysis and recommendations herein.**

Please refer to Appendix F for additional details and considerations regarding the bandwidth calculation model.

CoSN — Student Home Connectivity Study

The Student Home Connectivity Study conducted by the Consortium for School Networking (CoSN), released in May 2021, analyzed the technology requirements for students learning in a remote or hybrid environment as necessary to address digital equity and close the "homework gap." The CoSN study shared many of the observations and conclusions determined by the MiConnect Task Force. This study also found that the current FCC definition of broadband is inadequate to support even a single student in a household, let alone multiple students; CoSN recommends a per-student minimum bandwidth standard of a download speed of 25 Mbps and upload speed of 12 Mbps to support concurrent activity and usage.

Disconnect between FCC definition of broadband and our defined minimum requirements

In 2015, the FCC updated its broadband benchmark speeds to 25 Mbps for downloads and 3 Mbps for uploads. This considered the type, nature, and usage of internet services at the time it was defined and was largely driven by the needs for high-quality voice, data, graphics, and video offerings. The FCC's 2015 Broadband Progress Report includes some key assumptions that impact its applicability, including providing a single fixed benchmark that is independent of household size and fails to consider the requirements of real-time two-way audio and video communication requirements of a typical household. Since 2015, technology has evolved at a revolutionary pace, increasing the reliance and importance of capable broadband services.

The FCC's definition of broadband is largely considered by many organizations and industry analysts as inadequate by today's standards and, thus, is not a good baseline for determining the technology and investment requirements required for digital-equity initiatives intended to close the student-home connectivity gap.

The CoSN study shared many of the observations and conclusions determined by the MiConnect Task Force.

Challenges

The path to solving the broadband digital divide has many challenges, which vary in their severity and impact, ranging from the lack of availability of comprehensive and accurate broadband related data to laws and regulations that inhibit the expansion of broadband services to the cost of service. Some of the challenges are broadly known and are actively being addressed, whereas others are obfuscated and currently lack an available remedy.

Data accuracy and availability

FCC Form 477: Local telephone competition and broadband reporting

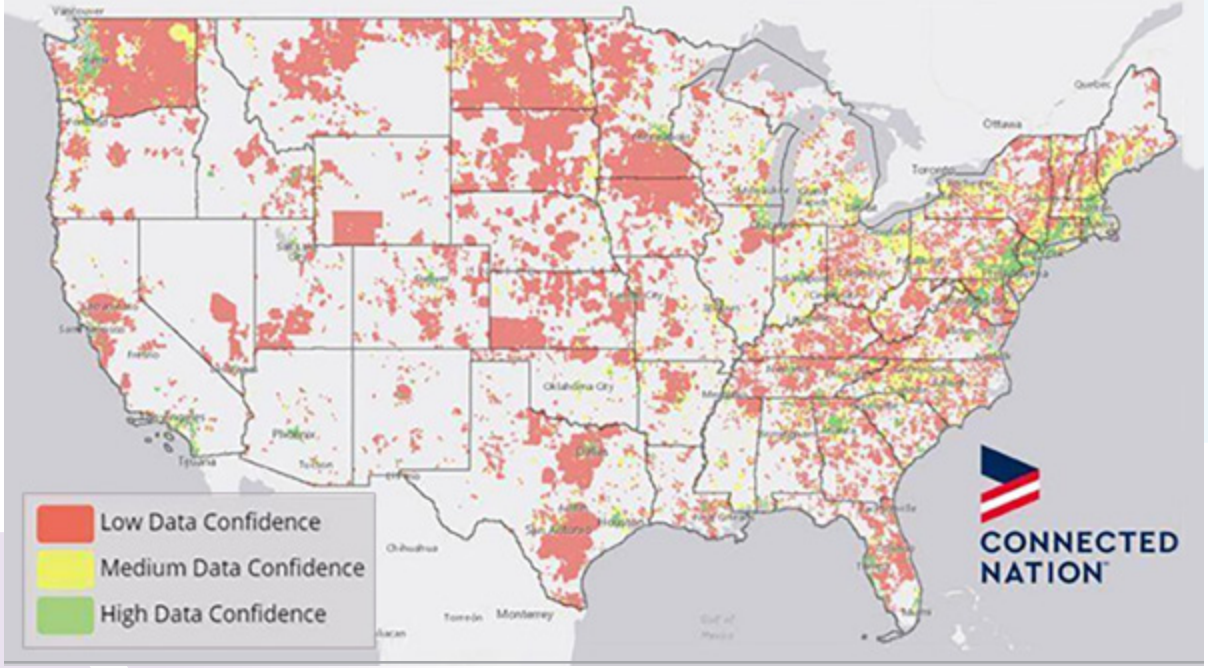
The current knowledge of broadband availability (both terrestrial and nonterrestrial) is largely based on information published by the FCC through a data collection process using Form 477 (Local Telephone Competition and Broadband Reporting). In general, this form requires that "an entity that is a facilities-based provider of broadband connections to end users must complete and file the applicable portions of [the 477] form if it has one or more broadband connections in service to an end user" twice per calendar year. The information provided in the 477 filing indicates the service level (i.e., upload/download speed) and the geography served.

There are some inherent challenges with accuracy of the FCC 477-related data, the most impactful being the data (filing) is opportunistic in nature. There is uncertainty around the availability of services at a particular address stemming from the use of census block data for terrestrial broadband and "service area" for mobile broadband. **A service provider that reports deployment of a particular technology and bandwidth within a census block may not necessarily offer that particular service everywhere in the census block or at the advertised speed.**

Data Accuracy?

Additionally, a list of providers deployed within a census block doesn't necessarily reflect the number of choices available to any particular household or business location in that block. This means that it may appear an individual has broadband coverage when, in fact, they do not. Frequently, providers overstate their coverage areas and service availability for a variety of reasons. Connected Nation has illustrated this through an FCC 477 data confidence map:

FCC 477 DATA CONFIDENCE MAP



It may appear an individual has broadband coverage when, in fact, they do not.

Quantitative broadband service data

Compounding the FCC 477 data challenges previously described, there is a general lack of measured broadband availability and capacity at a household level. **Absent a universal way to quantitatively measure broadband services, the actual upload and download speeds at a given street address are largely unknown.** This makes it difficult to know the specific broadband services being delivered to a particular service area or to validate the accuracy of the 477-related broadband data and ascertain a quantitative determination of need for individuals. This is a known challenge, and there are disparate efforts to collect such data but not at a universal or coordinated level. In Michigan, some organizations have undertaken efforts to help address this issue within the state, such as the Merit Network, Inc.'s Michigan Moonshot data collection project. The Michigan Moonshot project uses an online bandwidth measurement tool to granularly measure and catalog the current broadband capabilities of a particular geographic location at the street-address level.

There are other projects underway statewide and nationally to collect this data through efforts by commercial businesses, the FCC, and local communities. However, all of these approaches rely on the voluntary action of residents to measure and report their current broadband capabilities, which results in incomplete data. Additionally, this measurement doesn't address those who don't have internet access, either due to affordability or accessibility constraints. Absent empirical data, it has become increasingly difficult to make informed broadband-related strategies, regulations, laws, and investments.

United States Census Bureau 2020 data

At the time of this report, the complete United States 2020 Census dataset wasn't available, thus requiring the use of the 2010 data for the purpose of the current state assessment and recommendations. The Census Bureau has released a partial census dataset to support congressional redistricting and estimates the remainder of the data will be made publicly available starting in December 2021 through June 2022. The Bureau has also estimated the 2020 American Community Survey one-year estimates will be released on Sept. 23, 2021. As previously noted, the ACS survey provides key information regarding internet and computer use. The ACS survey and the 2010 Census Bureau data were critical sources of information for the MiConnect Task Force's efforts.

It's important to highlight that census data constraints result in discrepancies in the FCC's data pertaining to fixed and terrestrial broadband, as it is predicated on the notion of census "blocks." According to the Census Bureau, census blocks are "statistical areas bounded by visible features such as roads, streams, and railroad tracks, and by nonvisible boundaries." These blocks aren't delineated by population; rather, they identify the population within the block and are reevaluated every 10 years in conjunction with the decennial census. The use of outdated census block data results in population inaccuracies (within the block) and lacks granularity in reporting broadband services (lacks household-level data).

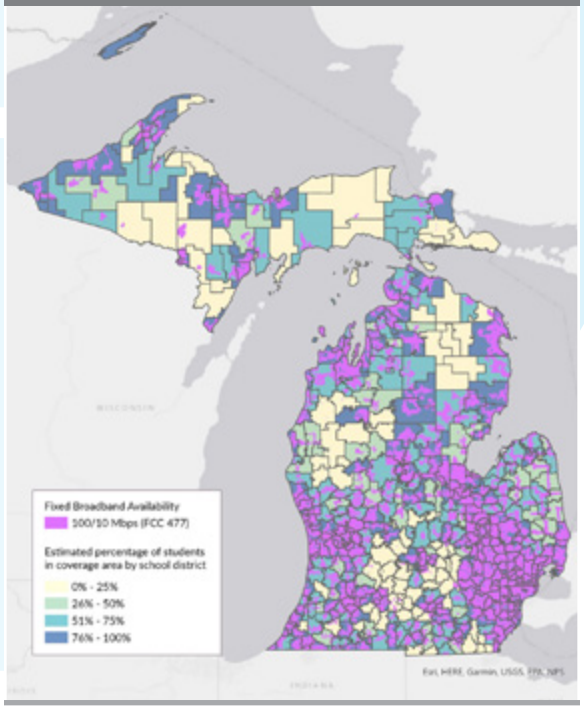
Gaps in broadband infrastructure

Broadband infrastructure is the foundation for addressing the digital divide, and its proliferation is a key tenet of the long-term solution. Presently, significant gaps exist within the state relative to the infrastructure needed to deliver broadband services, particularly in rural geographies. Historically, the building of new and expansion of existing broadband infrastructure focused primarily on the densely populated communities, resulting in limited to no rural connectivity options.

The for-profit approach used by service providers frequently results in broadband infrastructure being deployed in areas with a positive financial return rather than based on a collective need. The state's broadband infrastructure has evolved incrementally over time, relying on the provider-built telecommunications networks, leading to disparate pockets of connectivity, duplication, and inconsistencies. In some areas of the state, terrestrial-based services aren't feasible due to natural barriers and/or are cost-prohibitive.

However, there is disparate infrastructure (e.g., private and public backbone networks) that remain largely underutilized. Providers such as Merit Network, Inc.; ACD Net; US Signal; and Peninsula Fiber Network operate high-bandwidth networks that traverse the entire state. Some of this infrastructure aligns with the areas of greatest need and has the potential to play a role in addressing the broadband gaps.

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



Sources:
Connected Nation (CN) - 09/2020
Federal Communications Commission (FCC) - 09/2020

Access

While much of the effort and funding today is focused on building out high-speed internet access, particularly in rural communities, it's imperative that affordable solutions are available to lower-income households across the country and within Michigan. Nationally, approximately 15–17 million students can't afford or access a home internet connection[1].

If we focus on Michigan, according to the U.S. Census Bureau ACS survey, approximately 14% of households didn't have any type of broadband internet subscription in 2019. When considering cable, fiber or DSL broadband only, the number without service was close to one-third (32%)[2]. The Future Ready Schools website indicates that 24% of households in Michigan don't have high-speed internet.[3]

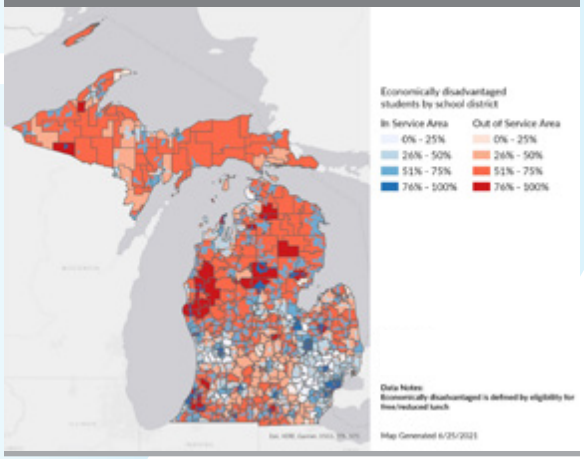
The MAISA Michigan Education Technology Leaders survey conducted in April 2020 reflects similar numbers — approximately **27% of Michigan students did not have sufficient internet access at home to support some form of virtual learning.** Additionally, the same survey indicated that close to one-quarter of staff respondents (23.2%) didn't have internet connectivity at home[4].

While availability of broadband internet is a critical factor, so too is affordability. Based on a sampling of seven ZIP codes across the state of Michigan on BroadbandNow.com, monthly broadband plans begin at approximately $30–$70, with the average monthly plan price ranging from **$48.14 in Lansing to $85.35 in Bad Axe;** initial setup costs are additional.

Using data from Connected Nation, the FCC, and the Center for Educational Performance and Information (CEPI) MI School Data site, we compared availability of 100/10 Mbps broadband services with students who were economically disadvantaged by district. As discussed earlier, a large geographic portion of the state does not have 100/10 Mbps access.

- A significant portion of the state has at least 51% of the student body qualifying for the free or reduced-price lunch program. (Note: Students qualify for the program if their family has income at or less than 185% of the federal poverty level.)
- In areas that do have 100/10 Mbps service, affordability is likely a critical challenge for many students.

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



Sources:
Connected Nation (CN) - 09/2020
Federal Communications Commission (FCC) - 09/2020
MI School Data (CEPI) - Fall 2020

We then looked at the data by MAISA region; as illustrated in the table at right, approximately 13% of public school students may live in an area without broadband availability. This number is likely higher, however, given the constraints with the data and assumptions made (see **Key data assumptions** on page 26). Equally concerning is the significant number of students who are economically disadvantaged (in excess of 707,000 students or 50% of the public school population) that may have difficulty affording broadband access, regardless of whether it is available.

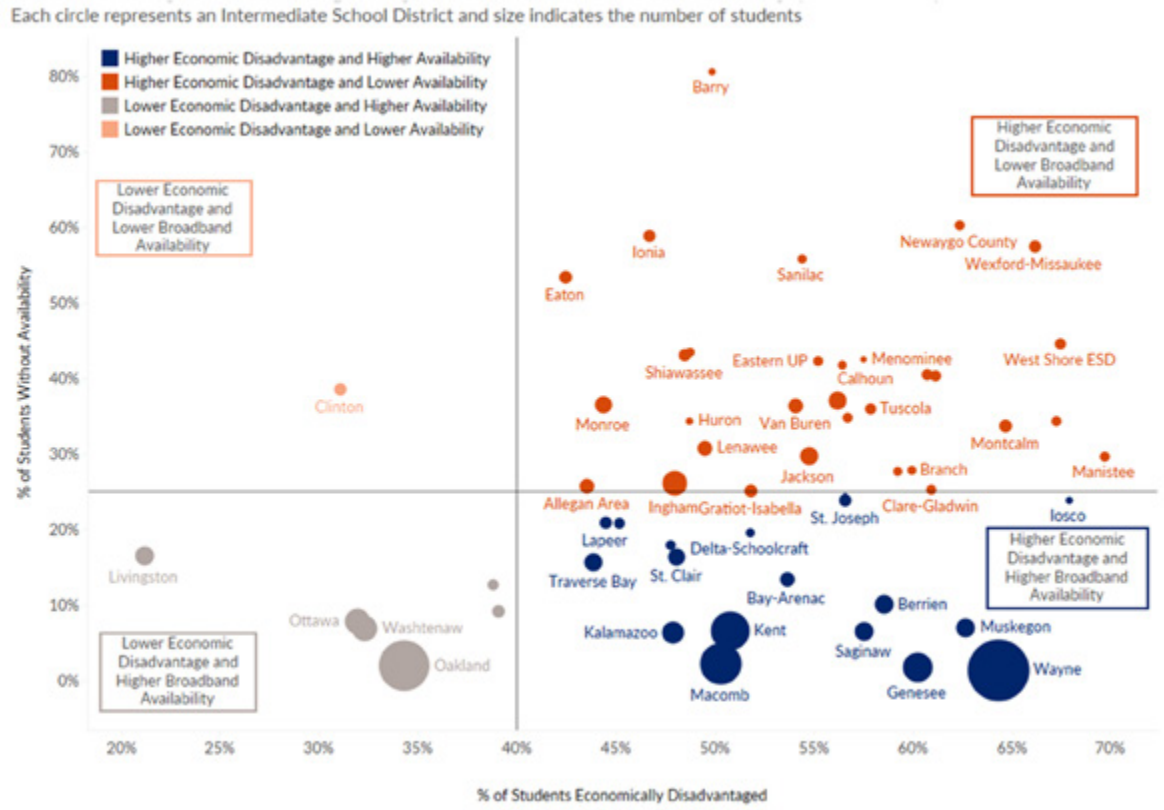
See Appendix G for maps depicting broadband access by economically disadvantaged percentages, broken down by MAISA region.

	Not Economically Disadvantaged		Economically Disadvantaged		
REGION	**With Availability**	**Without Availability**	**With Availability**	**Without Availability**	**GRAND TOTAL**
Region 1	14,319	4,467	12,608	5,432	**36,826**
Region 2	22,438	7,469	25,630	12,964	**68,501**
Region 3	102,088	18,427	97,753	20,689	**238,957**
Region 4	28,923	4,376	32,691	4,999	**70,989**
Region 5	41,582	6,901	53,511	7,050	**109,044**
Region 6	26,123	15,892	23,595	10,460	**76,070**
Region 7	42,645	10,827	50,005	13,438	**116,915**
Region 8	63,452	17,096	40,289	10,744	**131,581**
Region 9	170,741	4,001	118,040	2,082	**294,864**
Region 19	92,034	1,419	166,174	2,241	**261,868**
GRAND TOTAL	**604,345**	**90,875**	**620,296**	**90,099**	**1,405,615**

DATA NOTES:
- Broadband availability is defined as being within the FCC service area for 100/10 Mbps speeds. Based on data released in September 2020.
- Economically disadvantaged is defined as eligibility for free and reduced lunch. Based on data released in fall 2020.

The bubble chart at right depicts the data at an ISD-level, with the upper-right quadrant depicting the ISDs (typically one or more counties) that have a higher population of students who are disadvantaged and lower availability of broadband service. The right half of the diagram depicts ISDs with higher numbers of students who are economically disadvantaged. As can be seen, the lower left quadrant depicting a lower number of students who are economically disadvantaged and higher broadband availability has a small number of ISDs.

ECONOMICALLY DISADVANTAGED BY FIXED BROADBAND AVAILABILITY (100/10 MBPSBPS)



DATA NOTES:
- Broadband availability is defined as being within the FCC service area for 100/10 Mbps speeds. Based on data released in September 2020.
- Economically disadvantaged is defined as eligibility for free and reduced lunch. Based on data released in fall 2020.

Key data assumptions

Our analysis is based on the granularity of data sources available and required the following assumptions in consideration of the broadband availability and economic status of the student population:

- To represent availability of service, we used FCC 477 data. As discussed earlier, the 477 data indicates service availability for an entire census block, regardless of whether all residences within the block have access; thus, the availability of service is likely overstated. Census blocks are the most granular geographic division used by the census; these blocks usually contain 600–3,000 people.
- To estimate the number of students within each census block, we used the school enrollment base from the American Community Survey. Using these student counts and the FCC 477 data, we applied geoprocessing tools to estimate the percentage of students in each school district with and without fixed broadband availability.
- While eligibility for the free and reduced-lunch program is provided on a districtwide basis, the data doesn't reflect where, within the district boundaries, a student resides. We assumed the proportion of students without availability across the district was applied proportionately to students of both economic statuses.
- For public school academy students, we applied the proportion of students without availability across the associated ISDs.

Educational impact

The impact of a lack of sufficient internet access can be dire for students. MSU Today published an article in March 2020 indicating that "Slow Internet connections or limited access from homes in rural areas can contribute to students falling behind academically, according to a new report from Michigan State University's Quello Center. The educational setbacks can have significant impacts on academic success, college admissions and career opportunities."[5] The report also notes that students without home internet access **perform lower on a range of metrics** and are less likely to plan to pursue postsecondary education.

The educational setbacks can have significant impacts on academic success, college admissions, and career opportunities.

Risks and barriers to success

There are intrinsic risks and barriers to addressing the broadband digital divide within Michigan. These risks and barriers encompass a broad range of interests, from financial to legal to regulatory. The mitigation approach is not insurmountable; rather, it requires cooperation and collaboration at all levels, geographies, and shared interests. The MiConnect Task Force identified the following barriers:

Broadband Expansion Act of Michigan

The State of Michigan Broadband Expansion Act (Public Act 224 of 2020 or PA224) specifically addressed the ineligibility of a governmental entity (civic or educational) for receiving broadband grant funding, stating:

> *"The department [of technology, management, and budget] shall not, directly or indirectly, award grant money to a governmental entity or educational institution or an affiliate, to own, purchase, construct, operate, or maintain a communications network, or to provide service to any residential or commercial premises." (Section 484.3254)*

This legislation is **a significant impediment for broadband solutions that encompass the use of governmental assets in the delivery of broadband services to constituents** and may inhibit essential public-private partnerships long term. Maximizing taxpayer investment is a key fiduciary responsibility of governmental entities; PA224 limits the self-reliance of governmental entities to build and operate broadband networks to serve constituents, thereby requiring such services to be obtained solely through commercial providers, resulting in redundant spending.

E-Rate: Schools and Libraries Universal Service Fund Program

The schools and libraries universal service fund program (USF), commonly known as the E-Rate Program, helps schools and libraries obtain affordable broadband internet services. The E-Rate program is administered by the Universal Service Administrative Company under the direction of the FCC. Under this program, eligible schools, school districts, ISDs/RESAs, and libraries/library cooperatives may apply for supporting discounts related to broadband internet services to a school or library, also for access within schools and libraries (internal connections, basic maintenance of internal connections, and managed internal broadband services).

This legislation is a impediment for broadband solutions that encompass the use of governmental assets in the delivery of broadband services to constituents and may inhibit essential public-private partnerships long term. Maximizing taxpayer investment is a key fiduciary responsibility of governmental entities; PA224 limits the self-reliance of governmental entities to build and operate broadband networks to serve constituents, thereby requiring such services to be obtained solely through commercial providers, resulting in redundant spending. Even after the E-Rate Modernization Order of 2016 encouraged applicants to cost-allocate additional fiber strands from their approved builds, allowing service providers ancillary infrastructure to serve homes and businesses in communities as part of a “dig once” philosophy, the option was seldom used. The inability of E-Rated infrastructure and broadband service to serve off-campus locations has precluded many educational institutions from providing connectivity to support remote learning. In light of these circumstances, there has recently been efforts to provide alternative funding for remote learning, such as the Emergency Connectivity Fund. This shift in funding approaches provides some additional flexibility for schools and libraries to connect students,
but E-Rated broadband service and transport remains unavailable to support efforts to serve off-campus locations.

Broadband Funding

Federal infrastructure initiatives

State (initiatives, grants, other state examples, etc.)

Academic

Access resources

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Federal infrastructure initiatives

1 Rural Development Broadband ReConnect Program

The Broadband ReConnect Program, administered by the United States Department of Agriculture (USDA), furnishes loans and grants to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas. Eligible applicants include governmental bodies, for-profit companies, cooperatives or mutual associations, or an Indian tribe. To be eligible, at least 90% of the proposed funded service area must lack sufficient access to broadband service, it must be in a rural area, and the proposed network must be capable of providing broadband service to every premises within the service area.

2 Rural Digital Opportunity Fund

The Rural Digital Opportunity Fund is an FCC program designed to close the digital divide in the United States by providing up to $20.4 billion over 10 years for investment in the construction of rural broadband networks. This is a two-phase program, with the first phase targeting census blocks that are wholly unserved with broadband speeds of 25/3 Mbps. Phase 2 will address census blocks that are partially served. Funding will be awarded to internet providers over a 10-year period; Phase 1 auction results were announced in December 2020.

3 NTIA Broadband Infrastructure Deployment Grants

Per the National Telecommunications and Information Administration (NTIA) website, NTIA manages three broadband grant programs that are funded by the Consolidated Appropriations Act of 2021, including the Tribal Broadband Connectivity Program, the Broadband Infrastructure Program, and the Connecting Minority Communities Pilot Program.

- **Tribal Broadband Connectivity Program**: Announced in June 2021, this is a $980 million program for tribal governments to be used for broadband deployment on tribal lands, as well as for telehealth, distance learning, broadband affordability, and digital inclusion.
- **Broadband Infrastructure Program:** Announced in May 2021, this is a $288 million broadband deployment program directed to partnerships between a state, or one or more political subdivisions of a state, and providers of fixed broadband service to support deployment to areas lacking service, especially rural areas.
- **Connecting Minority Communities Pilot Program:** Announced in June 2021, this is a $268 million grant program to historically black colleges and universities (HBCUs), tribal colleges and universities, and minority-serving institutions for the purchase of broadband internet access service and eligible equipment or to hire and train IT personnel.

State
(initiatives, grants, other state examples, etc.)

1 Connecting Michigan Communities Grant Program

Administered by the Michigan Department of Technology, Management & Budget, CMIC is a grant program to extend broadband service into unserved areas in Michigan. Initiated in 2018, the grants from the initial phase must be completed by September 2023. CMIC 2.0 opened for applications in November 2020; projects must be completed by September 2025.

The program is a competitive grant process focused on extending broadband service into unserved areas in Michigan. Broadband is defined as at least 25/3 Mbps. Unserved means either a census block lacking access from at least one internet service provider or an area delineated through the process established in the legislation without at least one service provider.

The CMIC program is a competitive grant process focused on extending broadband service into unserved areas in Michigan.

Academic

1 Education Stabilization Fund

A. ESSER — CARES

The Coronavirus Aid, Relief, and Economic Security (CARES) Act was passed on March 27, 2020, and provided $13.5 billion to the Elementary and Secondary School Emergency Relief (ESSER) fund. States received funding based on the same proportion as they receive under the ESEA Title I-A. The purpose was to provide local education agencies (including charter schools that are local educational agencies (LEAs)) with emergency relief funds to address the impact of COVID-19.

B. ESSER II — CRRSA

The Coronavirus Response and Relief Supplemental Appropriations Act of 2021 (CRRSA) was passed on Dec. 27, 2020, providing $54.3 billion to State Education Agencies (SEAs), which then subgrant the funds to the school districts (LEAs). Allowable uses of funds include preventing, preparing for, and responding to COVID-19. Home connectivity solutions are included (hardware, software, and internet access costs).

C. ESSER III — American Rescue Plan (ARP)

On March 11, 2021, the American Rescue Plan Act was passed to provide an additional $122 billion in ESSER funding. The State of Michigan received a total of $3.7 billion in fund allocation. This funding will provide LEAs with emergency relief funds to address the impact that COVID-19 has had, and continues to have, on elementary and secondary schools across the nation.

D. GEER and II — CRRSA

The CRRSA Act included $4 billion for the Governor's Emergency Education Relief (GEER) Fund. Of this, approximately $2.75 billion is reserved for the Emergency Assistance to Non-Public Schools Program (EANS). The balance is to be used to supplement the GEER fund awarded to each state (referred to as GEER II). Allowable uses of funds include preventing, preparing for, and responding to COVID-19.

2 Emergency Connectivity Fund

Authorized through the American Rescue Plan Act of 2021, the Emergency Connectivity Fund is a $7 billion program to help schools and libraries provide funding for laptop and tablet computers (up to $400), as well as hotspots (up to $250), for off-campus use by students, school staff, and library patrons. Routers, modems, and other broadband connectivity purchases may also be eligible. This program is being administered through the Universal Service Administrative Company (USAC), which also administers the federal E-Rate program. While this pertains to access, we have listed it as academic since schools, libraries, and consortia of the same are eligible to request funding; individuals cannot.

Access resources

There are several programs available for defraying the cost of broadband access for consumers who are low income, including the following:

1 Emergency Broadband Benefit Program (EBBP)

This is a FCC program that provides a temporary discount on monthly broadband bills for qualifying low-income households. Sec. 904 of the COVID Relief Act established a $3.2 billion fund for an Emergency Broadband Benefit Program, administered by the FCC through USAC to provide a reimbursement subsidy in the form of "a monthly discount for an eligible household applied to the actual amount charged to such household, which shall be no more than the standard rate for an internet service offering and associated equipment," not to exceed $50 ($75 for an eligible household on tribal land). The program also provides a one-time discount of up to $100 on a computer or tablet for qualifying households.

Enrollment began on May 12, 2021. This is a temporary program and will end when funds are depleted or six months after the COVID-19 health emergency is declared over.

2 Lifeline

This is a federal program through the FCC, administered by the Universal Service Administrative Company that lowers the monthly cost of phone and internet. Eligible customers will get up to a $9.25 monthly discount (up to $34.25 monthly for those on tribal lands) on either a wireline or wireless service, but not both.

3 Michigan Home Internet Options for the Economically Disadvantaged

The Michigan Department of Education website lists low-cost internet services from a handful of providers, including Spectrum, Comcast, CenturyLink, and AT&T. The price ranges from $5–$14.99 per month depending on the plan and service provider. Bandwidth varies as well.

The Path Forward

Broadband infrastructure solution models

Recommendations

Next steps

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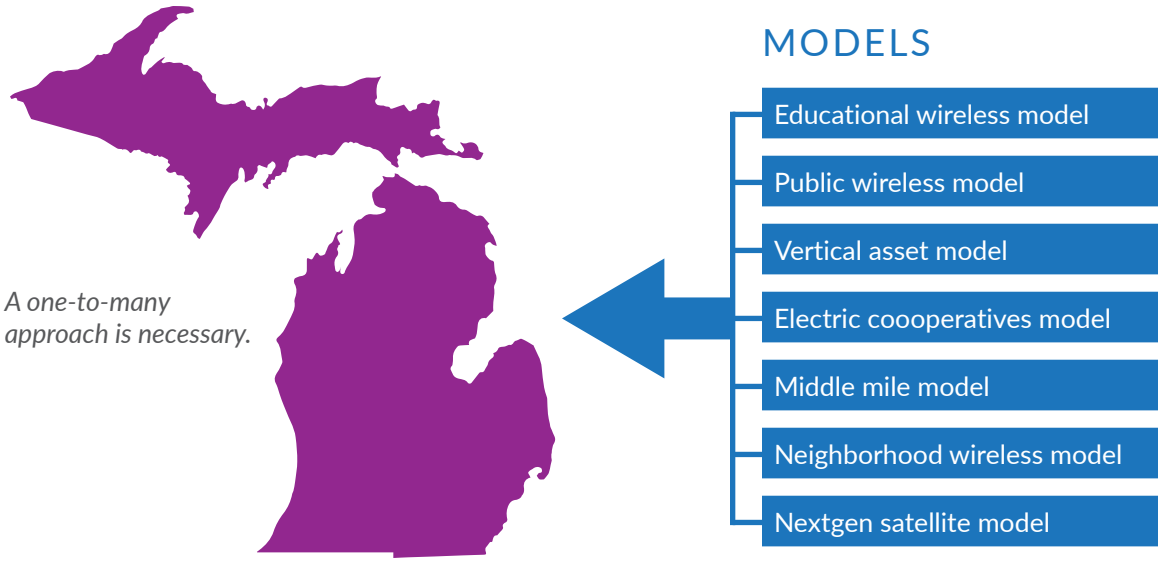
The Path Forward

The path forward is as varied as the problem itself, requiring a diversity of partners, technologies, legislation, funding, and coordination of effort. The path is not singular or "one size fits all;" rather, it's based on the collective needs and unique circumstances of a region, community, or organization. Using prescriptive approaches will empower and enable societal leaders to identify and implement the best path for addressing the broadband needs of their constituents. This level of autonomy allows for divergent paths statewide, locally, and even in subsets of geographies. That said, it's imperative that the collective and individual paths are founded on a common set of principles, strategies, and goals while being properly coordinated across the state. This section identifies the various broadband solution models and recommended action steps.

Broadband infrastructure solution models

*The broadband infrastructure solution is multidimensional and requires **a one-to-many approach**. Understanding the collective need and capabilities within regions of the state and local geographies is essential, and combining the various broadband infrastructure technologies along with broadband access and affordability approaches yields the highest probability of success. The MiConnect Task Force envisioned various broadband solution paths with the goal of supporting a broadband playbook that could be used by local and regional leaders to identify the paths that are most impactful to them and the information necessary to successfully plan and implement solutions. The following potential solution models were identified (not prioritized):*



Educational wireless model

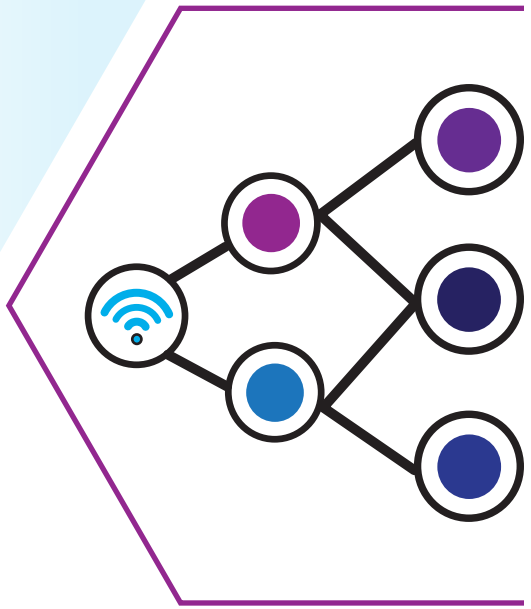
Establish wireless access networks using available internet bandwidth, interconnectivity, and infrastructure at educational buildings (K-12 and higher education). Leverage existing infrastructure, where allowable, such as the State Education Network combined with private mobile broadband and/or other long-range wireless technologies to provide access to homes geographically close to educational buildings. A regional example is the Northern Michigan University Educational Access Network.

Public wireless model

Establish wireless networks using available internet bandwidth and infrastructure at governmental buildings (e.g., offices, libraries, etc.) using private mobile broadband and/or other long-range wireless technologies to provide access to homes geographically close to governmental buildings. Regional examples include Kalamazoo Public Library — Digital Access for All (LTE hotspots) and the Kent County Essential Needs Task Force (public Wi-Fi hotspots).

Vertical asset model

Use existing privately and publicly owned vertical assets (e.g., towers and similar) to create a “backbone” broadband transport network using a combination of short- and long-range wireless technologies for delivery of broadband to the home. This model builds upon the use of existing vertical assets optimizing their use and maximizing value, particularly in rural areas where traditional means of terrestrial broadband infrastructure is not feasible.



Electric cooperatives model

Partner with electric cooperatives or municipal utilities to establish broadband infrastructure to the home (or curb), using fiber or wireless where necessary for "last mile" connections. This model aims to leverage existing infrastructure assets (e.g., utility poles) and efforts associated with electrical grid improvements/expansion to support the proliferation of broadband services. Regional examples include the Thumb Electric Cooperative — TEC Fiber and the Cloverland Electric Cooperative.

Middle mile model

Build new and/or expand broadband fiber to households within municipalities, leveraging partners to provide the upstream internet access services at the "middle mile." In this model, homes and communities are connected using noncommercial fiber infrastructure, bridging the gap where commercial services are unavailable. Regional examples include Northern Michigan Broadband, EUP Connect, Marshall FiberNet, Lyndon Township Broadband, and U.P. Wide Broadband (fiber backbone only).

Neighborhood wireless model

Establish neighborhood-based wireless mesh networks through one or a few well-connected households using point-to-point and mesh wireless technologies. This model relies on commercially available services to the curb for specific housing communities (e.g., subdivisions, mobile home parks), which is then extended to the remainder of the community using wireless technologies.

Nextgen satellite model

Use low-earth orbit (LEO) satellite technologies for households where terrestrial-broadband infrastructure build-out is not feasible but sky visibility exists. There is continued advancement and planned wide-scale deployment of this technology over the next several years. A national example includes the SpaceX Company, which received $888 million over 10 years (via the RDOF Phase 1 auction) to provide broadband internet service via its Starlink service to more than 640,000 homes and businesses in rural parts of the United States.

Each solution path encompasses broadband infrastructure technology, potential partners, key considerations, and cost components; see Appendix H for additional details.

Recommendations

Establish a Project Management Office (PMO) to coordinate the following recommended statewide activities:

- Align efforts to foster broadband build-out, including municipal networks.
- Address the lack of accurate and real-time statewide mapping of broadband availability, down to the address level; add an economically disadvantaged layer to identify where additional support may be necessary.
- Facilitate and encourage the use of public and private networks and assets (e.g., towers), as well as public/private partnerships.
- Promote minimum bandwidth of **100/10 Mbps** to each household across the state.
- Coordinate infrastructure and access limitations, removing barriers to enable communities and service providers to increase broadband coverage areas.
- Provide staff resources to support local communities and public-private partnerships.
- Work with foundations and legislators to establish additional support for families that are economically disadvantaged to obtain high-speed internet access.
- Continue the collaboration with the multiple associations (e.g., MAR, Education SuperHighway, Connected Nation Michigan, MDE, etc.) that began with this initiative.
- Work with foundations and partners to establish additional support for families that are economically disadvantaged to obtain high-speed internet access.

Michigan announced the creation of the Michigan High-Speed Internet Office within the Department of Labor and Economic Opportunity in early June 2021. The MI-HI Office should **consider** partnering with **existing collaborative groups,** like the Michigan Collaboration Hub at the Michigan Association of Intermediate School Administrators, to support the wide range of current and emerging broadband efforts across sectors in Michigan, including the recommendations above. The objectives include the coordination of safe, secure, affordable broadband initiatives to serve every community, home, anchor institution, and business in Michigan.

There are a number of states that have some type of centralized broadband commission, council, or agency in place to coordinate activities like the ones we've recommended above. Reference Appendix E for a list of representative state commissions, offices, councils, and initiatives.

Grassroots and local communities will continue to play a critical role in broadband infrastructure build-out across the state. Appendix I contains broadband playbook resources for local communities.

Next Steps

This will require collaboration at the highest levels, to coordinate use of public assets; sharing of data; leveraging existing investments; and expansion of public, private, and nonprofit resources, with a focus on ensuring access equity for all citizens.

We recommend the following near-term next steps:

- Use the Michigan High-Speed Internet Office to serve as a coordinating body between broadband and cybersecurity efforts across all stakeholder groups within the state.
- Establish a universally accepted minimum internet bandwidth of 100/10 Mbps to every household across the state to support continued broadband planning and deployment efforts.
- Address the lack of accurate and real-time statewide mapping of broadband availability down to the address level through ubiquitous and inclusive data collection methods.
- Address local, state, and federal barriers that impede broadband expansion.
- Formalize key partnerships among public, private, and philanthropic organizations and actively engage them in support of short- and long-term solutions.

Appendices

A. *Glossary*
B. *Project resources*
C. *Maps: Broadband availability*
D. *Maps: Towers, education, healthcare, and libraries*
E. *Statewide commissions, offices, councils, and initiatives*[6]
F. *Bandwidth analysis*
G. *Maps: Broadband availability by economically disadvantaged status*
H. *Solution paths*
I. *Example community broadband playbook resources*
J. *Data sources*

A. Glossary

5G
The fifth-generation technology standard for broadband cellular networks. It uses multiple-input multiple-output (MIMO) antennas that have many antenna connections or elements to send and receive more data simultaneously.

Asynchronous
Of or requiring a form of computer control timing protocol in which a specific operation begins upon receipt of an indication that the preceding operation has been completed. Two or more objects/events not existing or happening at the same time.

Bandwidth
A range of frequencies within a given band that's used for transmitting a signal. The transmission capacity of a computer network and the maximum rate of data transfer across a given path.

Broadband
A high-capacity transmission technique using a wide range of frequencies that enables a large number of messages to be communicated simultaneously. A wide bandwidth data transmission that transports multiple signals and traffic types.

DSL
Digital subscriber line is a family of technologies that are used to transmit digital data over telephone lines. In telecommuting marketing, DSL is widely understood to mean asymmetric digital subscriber line, which is the most commonly installed DSL technology for internet access.

E-Rate
The commonly used name for schools and libraries universal service fund program. This is administered by the Universal Service Administrative Company under the direction of the Federal Communications Commission. It helps schools and libraries obtain affordable broadband.

ESSER
Elementary and Secondary School Emergency Relief Fund established as part of the Education Stabilization Fund in the CARES Act, State Educational Agencies will award subgrants to local education agencies to address the impact of the COVID-19 pandemic.

Fixed wireless
The operation of wireless communication devices or systems used to connect two fixed locations with a radio or other wireless link. Usually, fixed wireless is part of a wireless local area network (LAN) infrastructure.

GEER
In 2020, Congress passed a stimulus bill that provided nearly $4.3 billion in flexible education relief aid for states through the Governor's Emergency Education Relief Fund. The Coronavirus Aid, Relief, and Economic Security Act passed on March 27, 2020, provided $3 billion to the GEER Fund.

ISDs
Michigan has 56 intermediate school districts that provide and coordinate essential services to their constituent school districts to facilitate teaching and learning. ISDs serve both local education agencies and public school academies.

LTE

Long Term Evolution is used to describe the particular type of 4G that delivers fast mobile internet experience. It's a standard for wireless broadband communication for mobile devices and data terminals based on GSM/EDGE and UMTS/HSPA technologies. It increases the capacity and speed using a different radio interface together with core network improvements.

MAISA and MAISA Regions

The Michigan Association of Intermediate School Administrators is composed of superintendents and administrators representing the 56 intermediate school districts in Michigan. There are 10 governance regions.

Middle Mile

In the broadband internet industry, the "middle mile" is the segment of a telecommunications network linking a network operator's core network to the local network plant.

NTIA

The National Telecommunications and Information Administration is an agency of the United States Department of Commerce that serves as the president's principal advisor on telecommunications and information policies issues.

Synchronous

Existing or occurring at the same time; this type of learning refers to an event in which groups of students are engaging in learning at the same time.

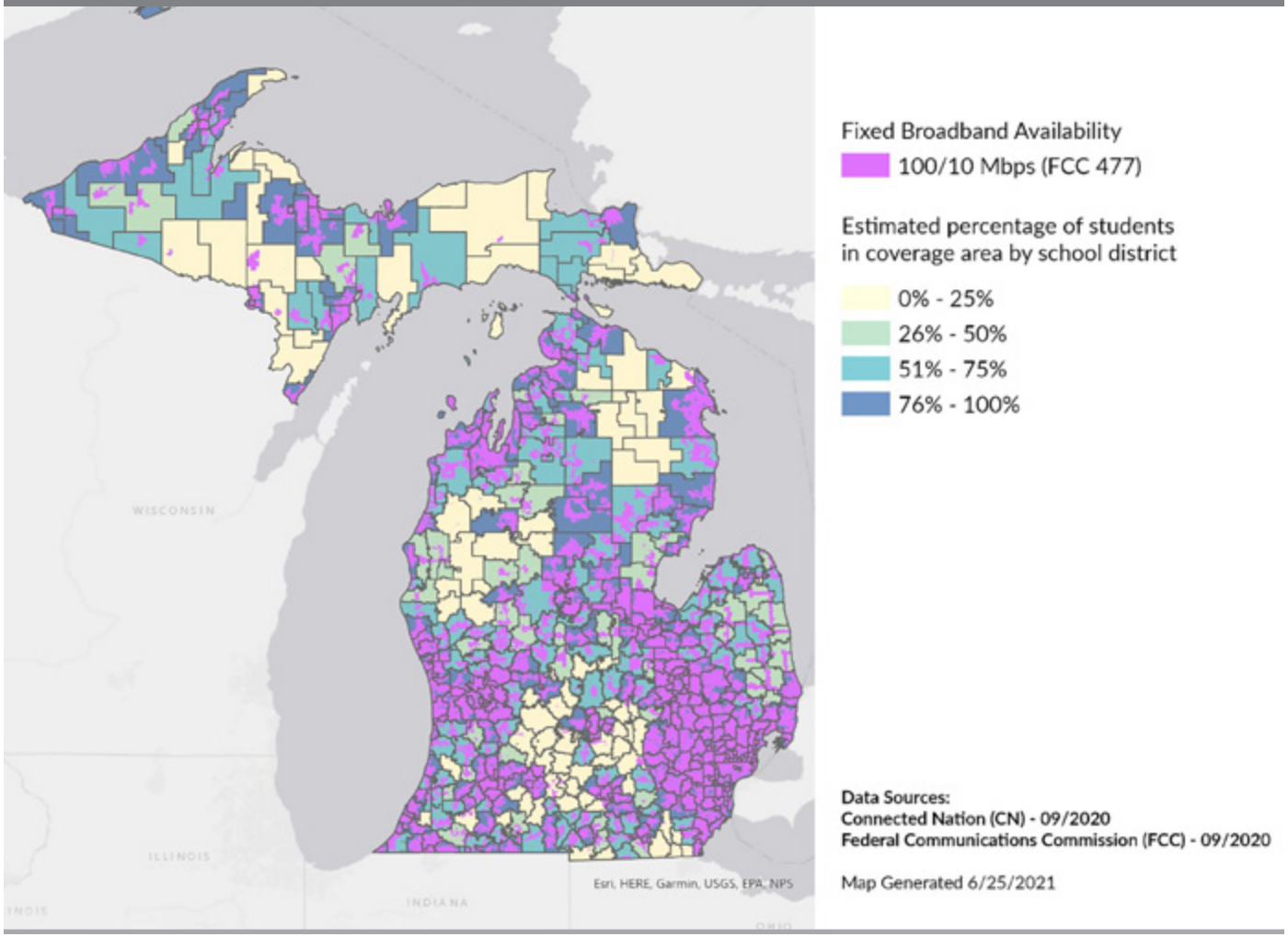
B. Project resources

NAME	ROLE
Dr. Michael Rice, State Superintendent Dr. Bill Miller, Executive Director, MAISA Senator Rosemary Bayer Lt. Governor Garlin Gilchrist	Project Sponsors
Dave Cairy, MAISA Tammy Evans, Oakland Schools Taylor Hoag, MAISA	Project Coordinators
Dan Allen, Lapeer ISD Dennis Buckmaster, St. Clair County RESA Dave Cairy, MAISA Merri Lynn Colligan, Washtenaw ISD Tammy Evans, Oakland Schools Glen Finkel, Kent ISD Trae Forgette, Marquette-Alger RESA Robert Frost, Tuscola ISD Tom Johnson, Kalamazoo RESA Jason Kronemeyer, Eastern UP ISD Joe Polasek, Michigan Department of Education Jim Rarus, Wayne County RESA Kurt Rheaume, Wayne County RESA Michael Richardson, REMC-1	Project Advisors — Michigan Education Technology Leaders MiConnect Task Force

NAME	ROLE
Marv Sauer, Plante & Moran, PLLC Judy Wright, Plante & Moran, PLLC Kyle Macyda, Plante & Moran, PLLC	Project Consultants
Charlotte Bewersdorff, Merit Network, Inc. Eric Frederick, Connected Nation Michigan David Judd, Michigan Department of Education Erin Kuhn, Michigan Association of Regions Jessica Randall, Office of Michigan Lt. Governor Evan Shea, EducationSuperHighway Matt Stark, Michigan State Education Network Eric Swanson, Michigan Department of Technology, Management & Budget Joe Swasky, Merit Network, Inc. Sarah Tennant, Michigan Economic Development Corporation	Partners and Collaborators

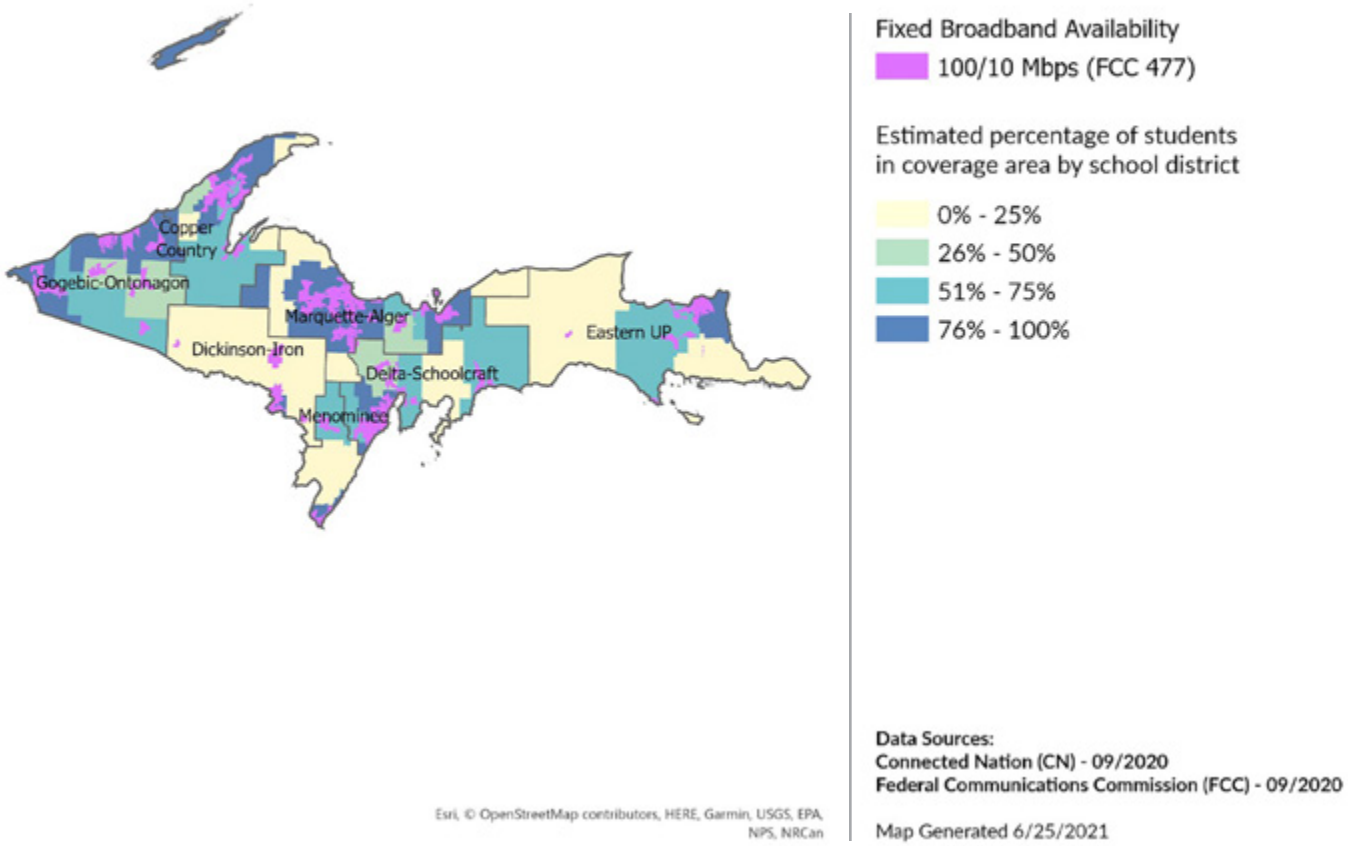
C. Maps: Broadband availability

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



MAISA Region 1

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

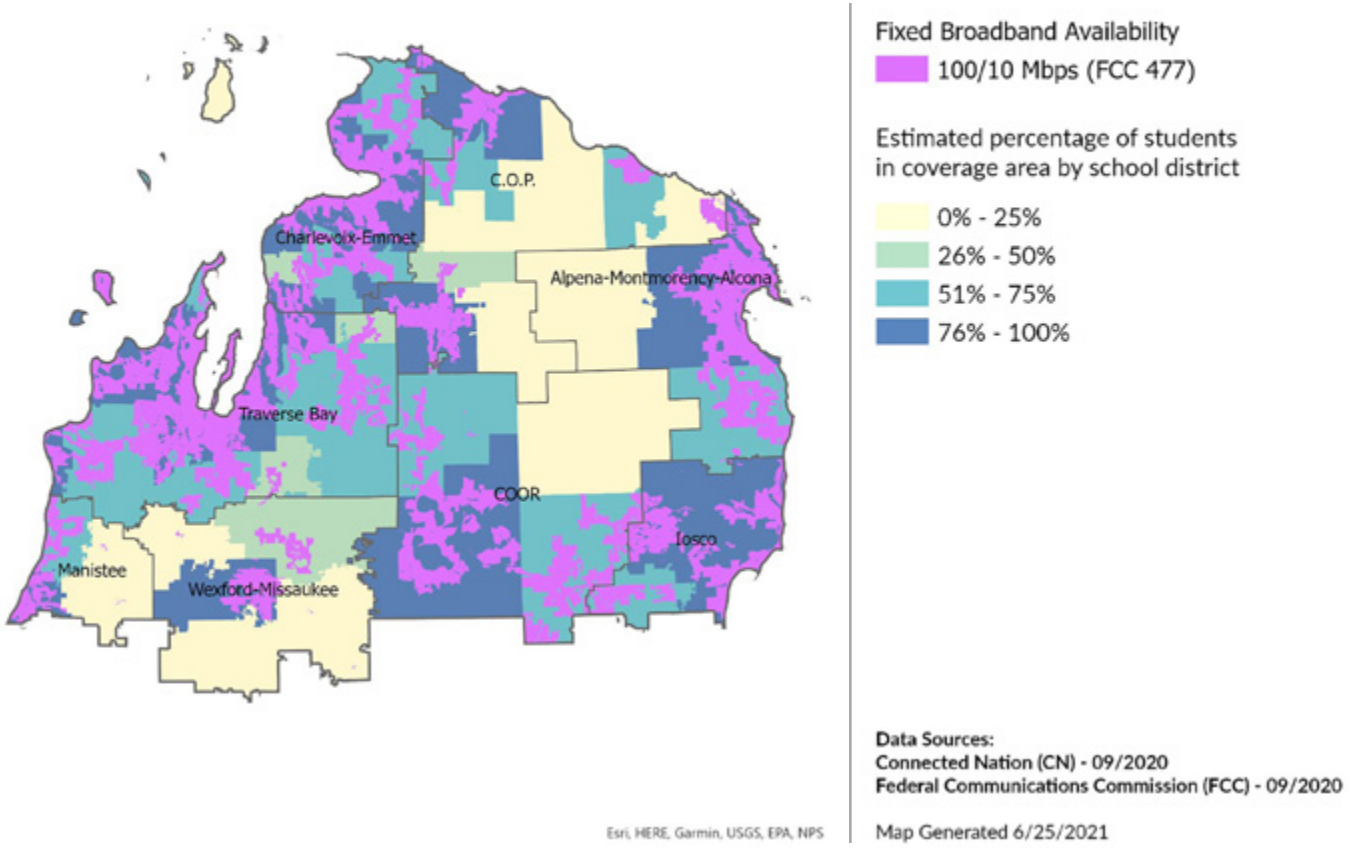


MAISA REGION 1

Alger
Baraga
Shippewa
Delta
Dickinson
Gogebic
Houghton
Iron
Keweenaw
Luce
Mackinac
Marquette
Menominee
Ontonagon
Schoolcraft

MAISA Region 2

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

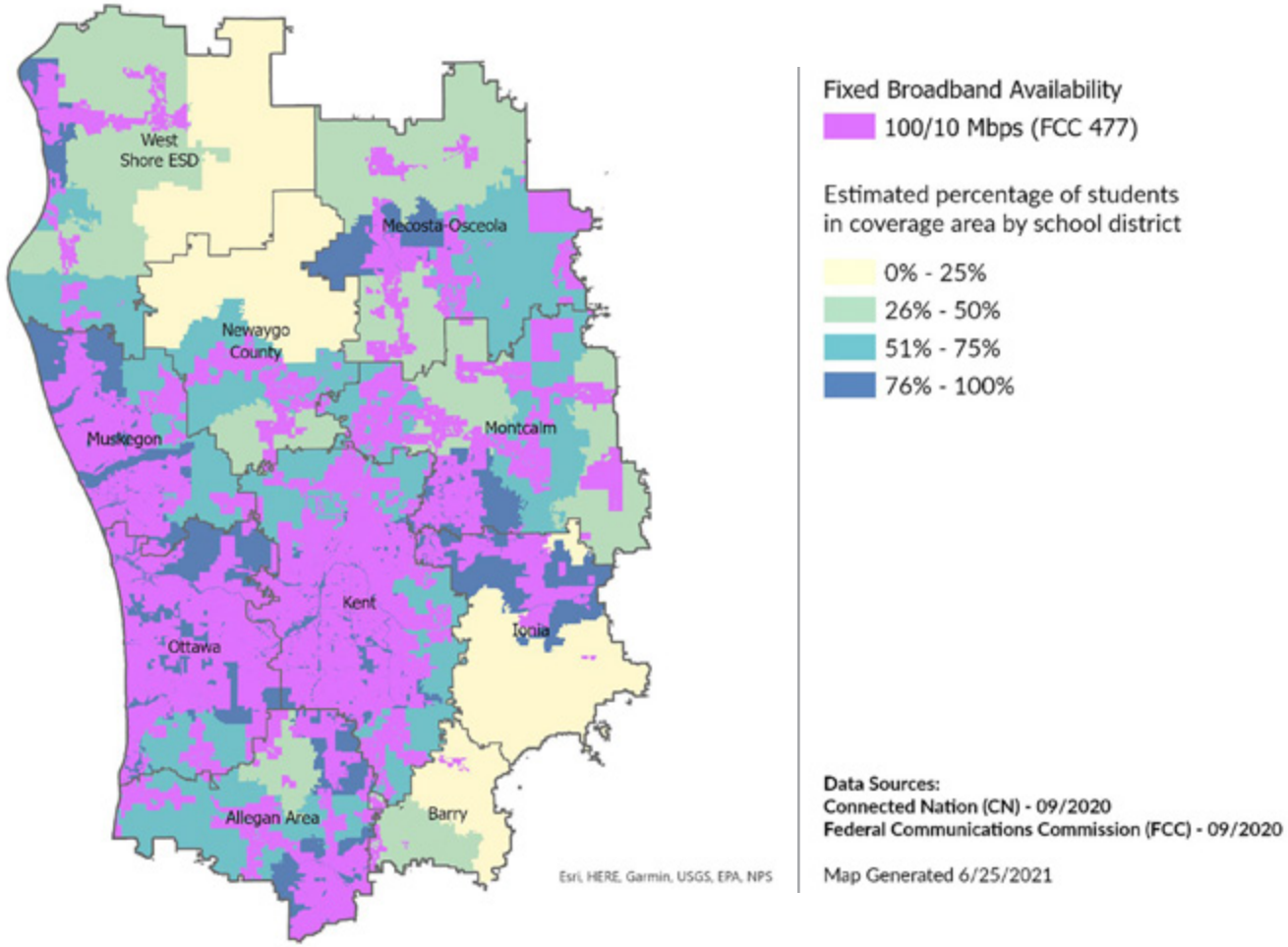


MAISA REGION 2

Alcona
Alpena
Antrim
Benzie
Charlevoix
Cheboygan
Crawford
Emmet
Grand Traverse
Iosco
Kalkaska
Leelanau
Manistee
Missaukee
Montmorency
Ogemaw
Oscoda
Otsego
Presque Isle
Roscommon
Wexford

MAISA Region 3

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

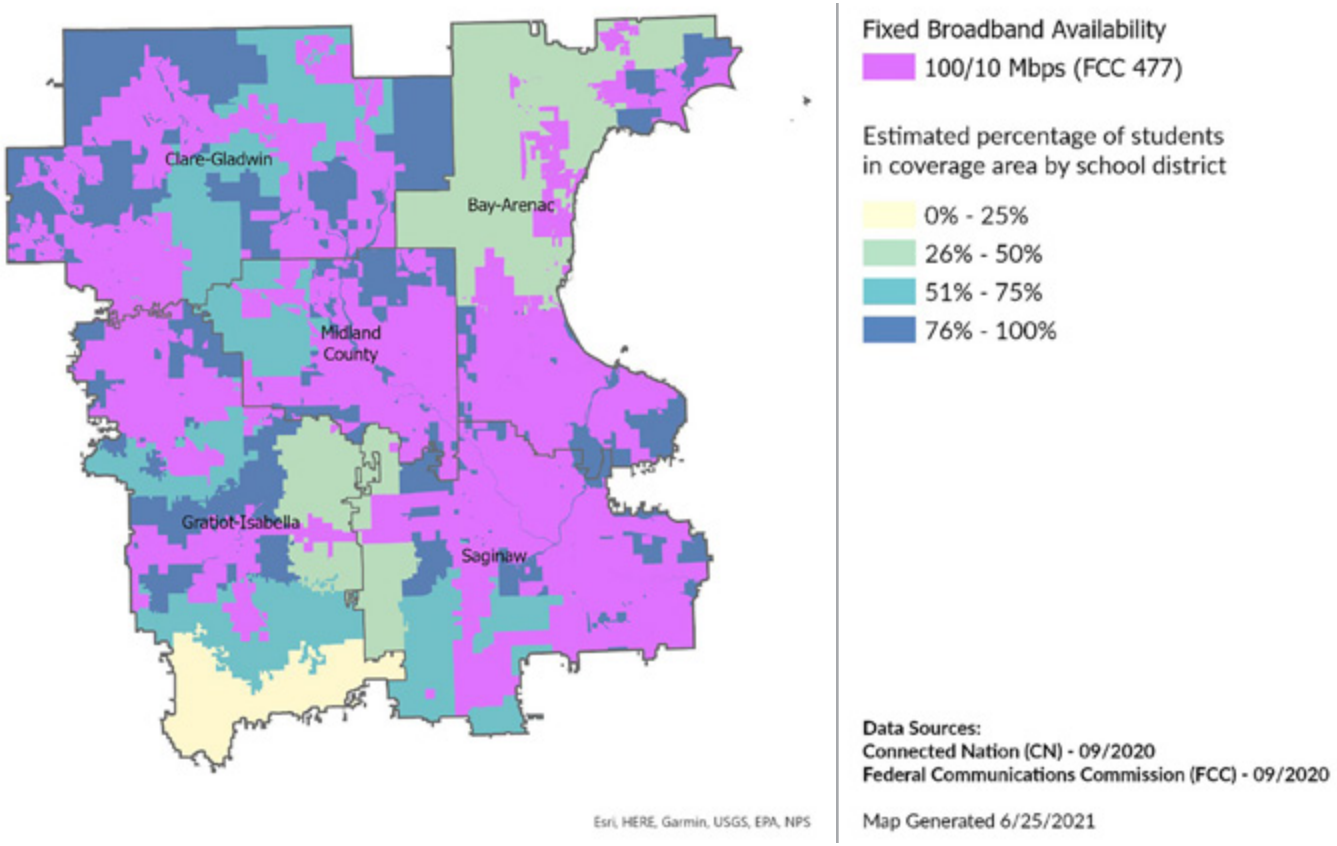


MAISA REGION 3

Allegan
Barry
Ionia
Kent Lake
Mason
Mecosta
Montcalm
Muskegon
Newaygo
Oceana
Osceola
Ottawa

MAISA Region 4

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

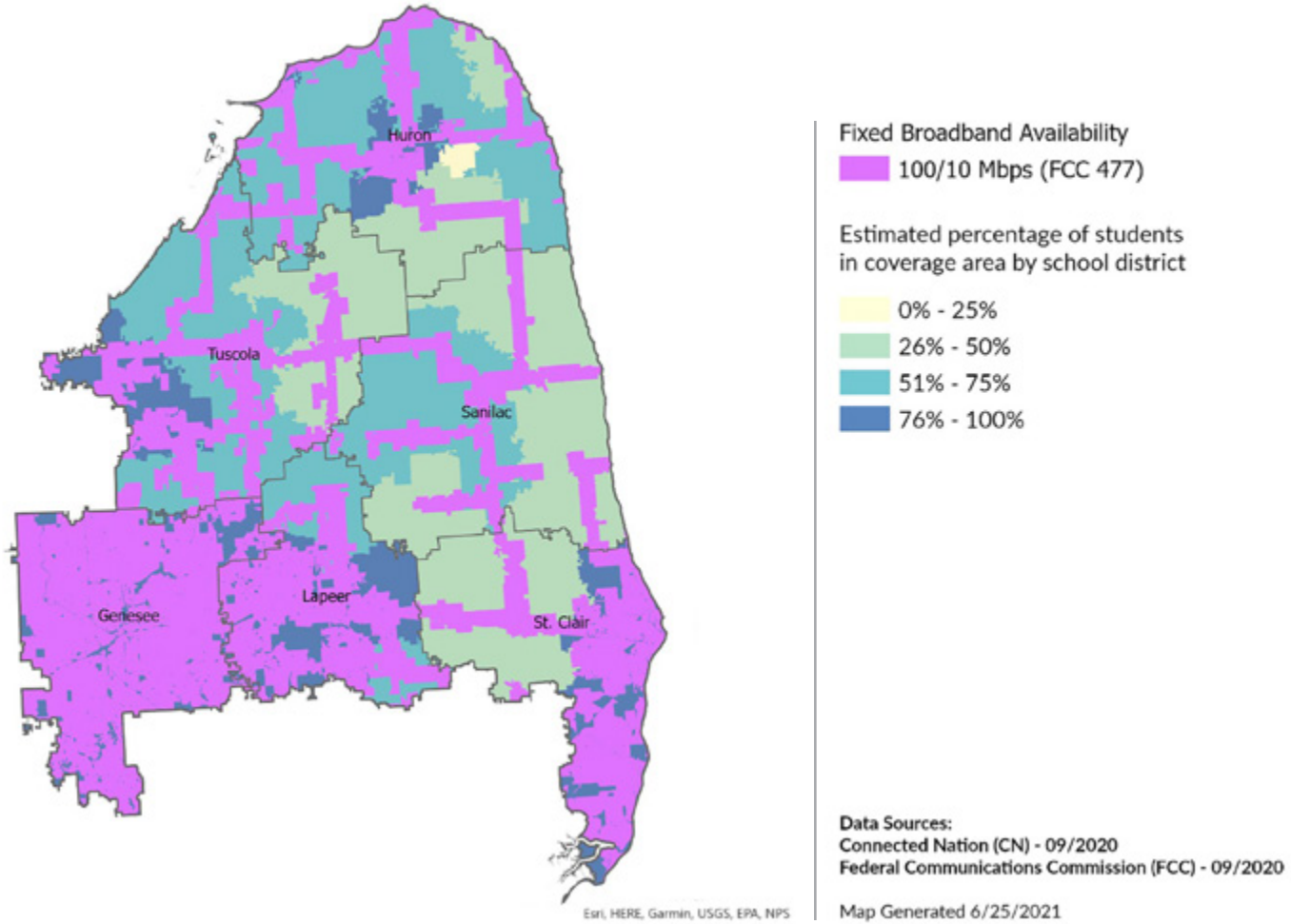


MAISA REGION 4

Arenac
Bay
Clare
Gladwin
Gratiot
Isabella
Midland
Saginaw

MAISA Region 5

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

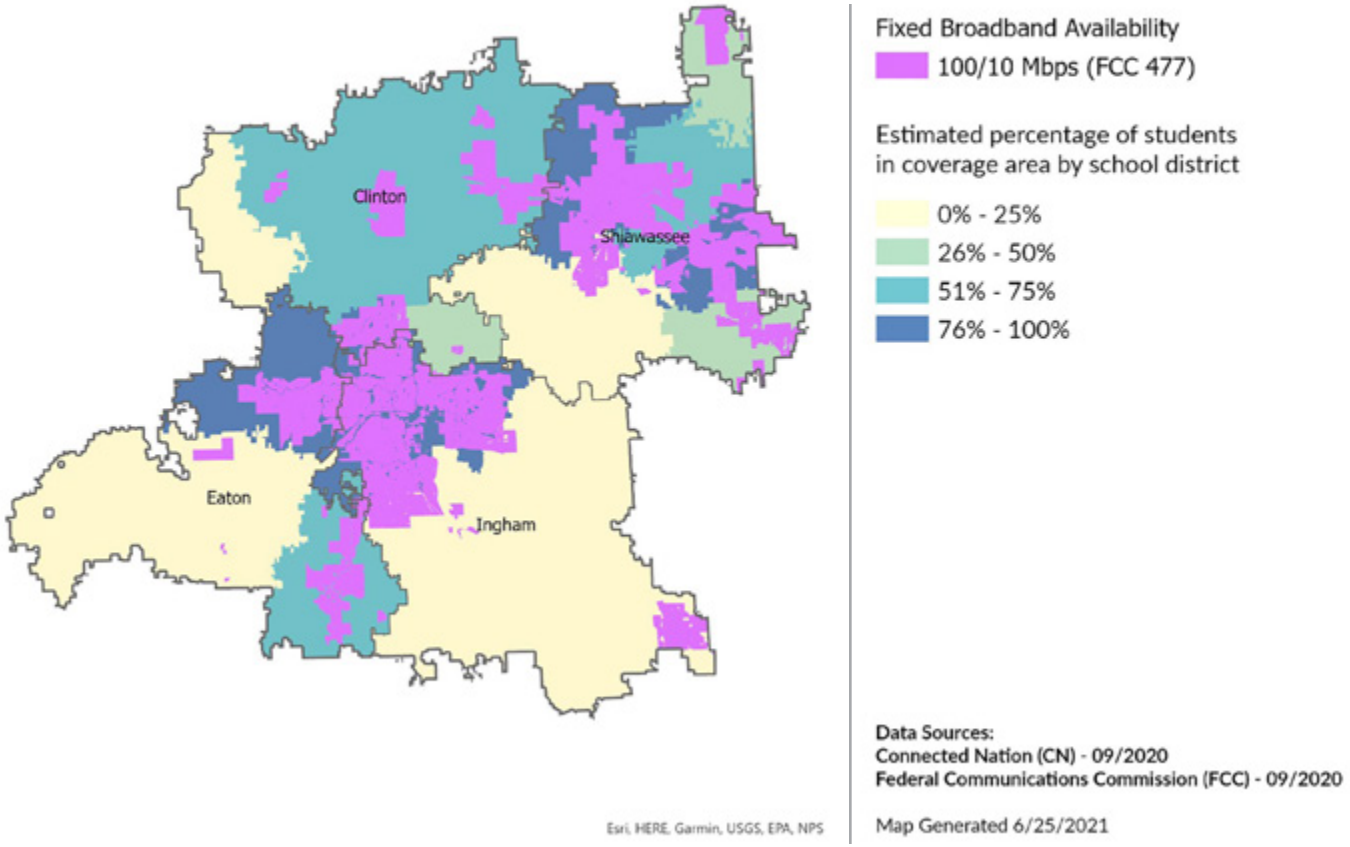


MAISA REGION 5

Genesee
Huron
Lapeer
St. Clair
Sanilac
Tuscola

MAISA Region 6

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

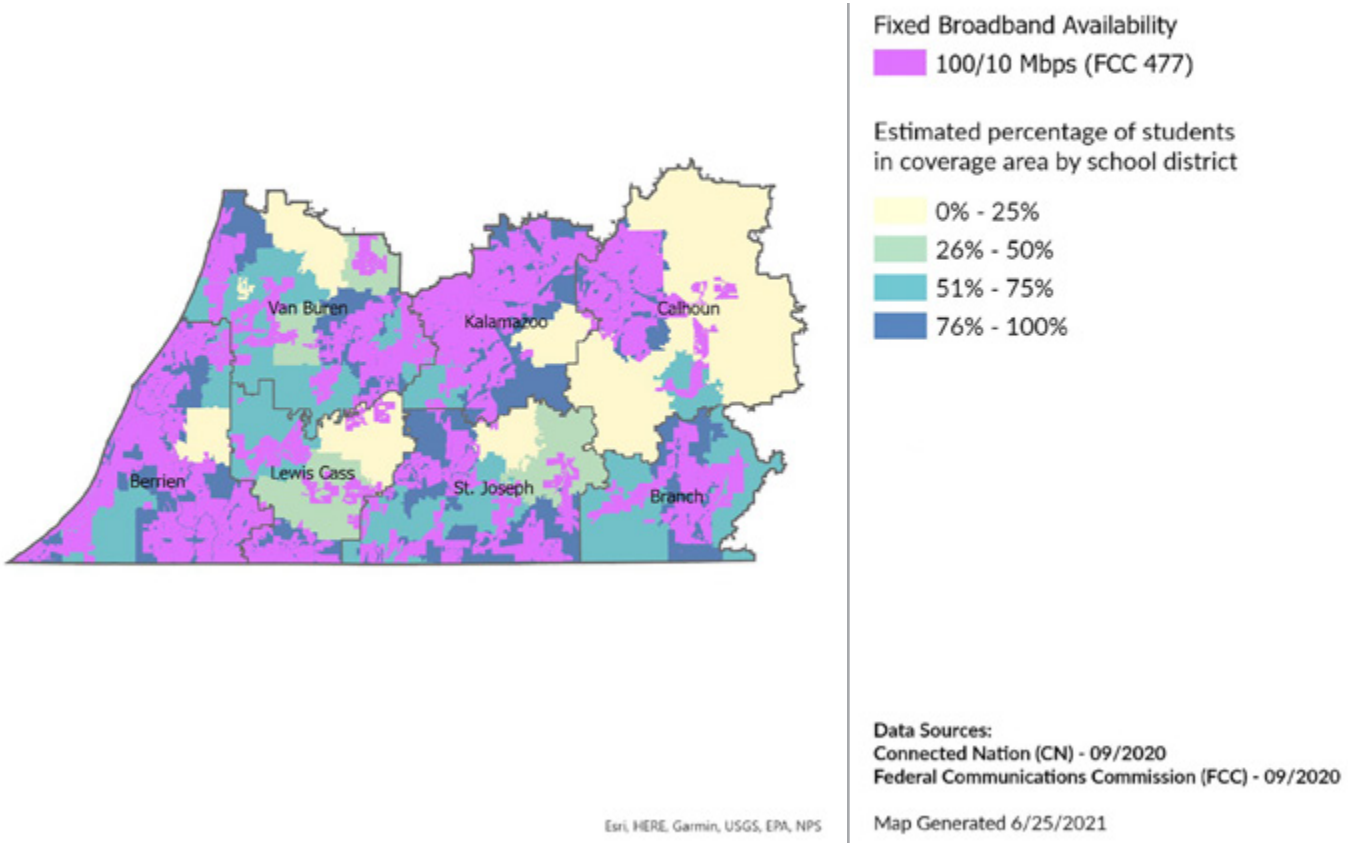


MAISA REGION 6

Clinton
Eaton
Ingham
Shiawassee

MAISA Region 7

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

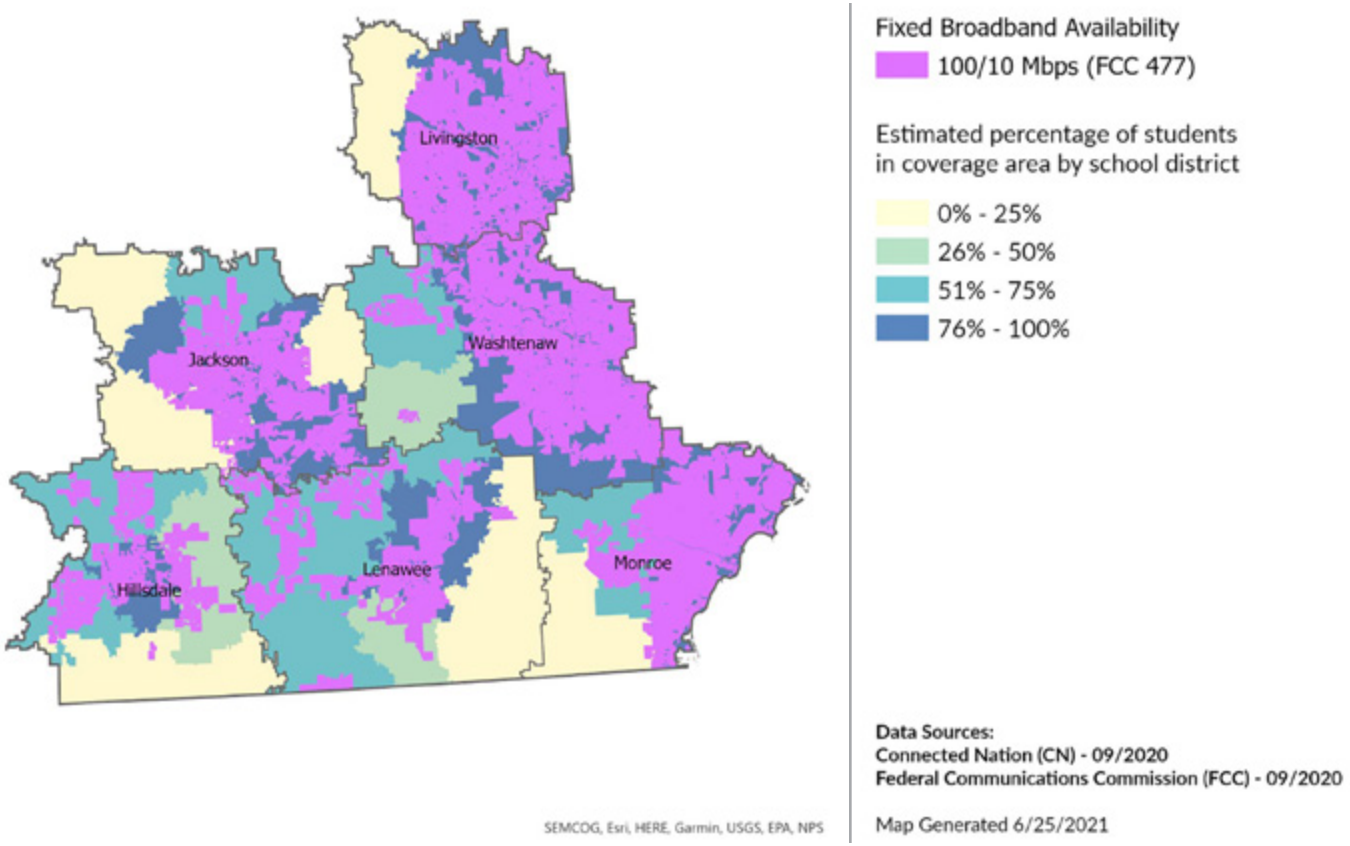


MAISA REGION 7

Berrien
Branch
Calhoun
Lewis Cass
Kalamazoo
St. Joseph
Van Buren

MAISA Region 8

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

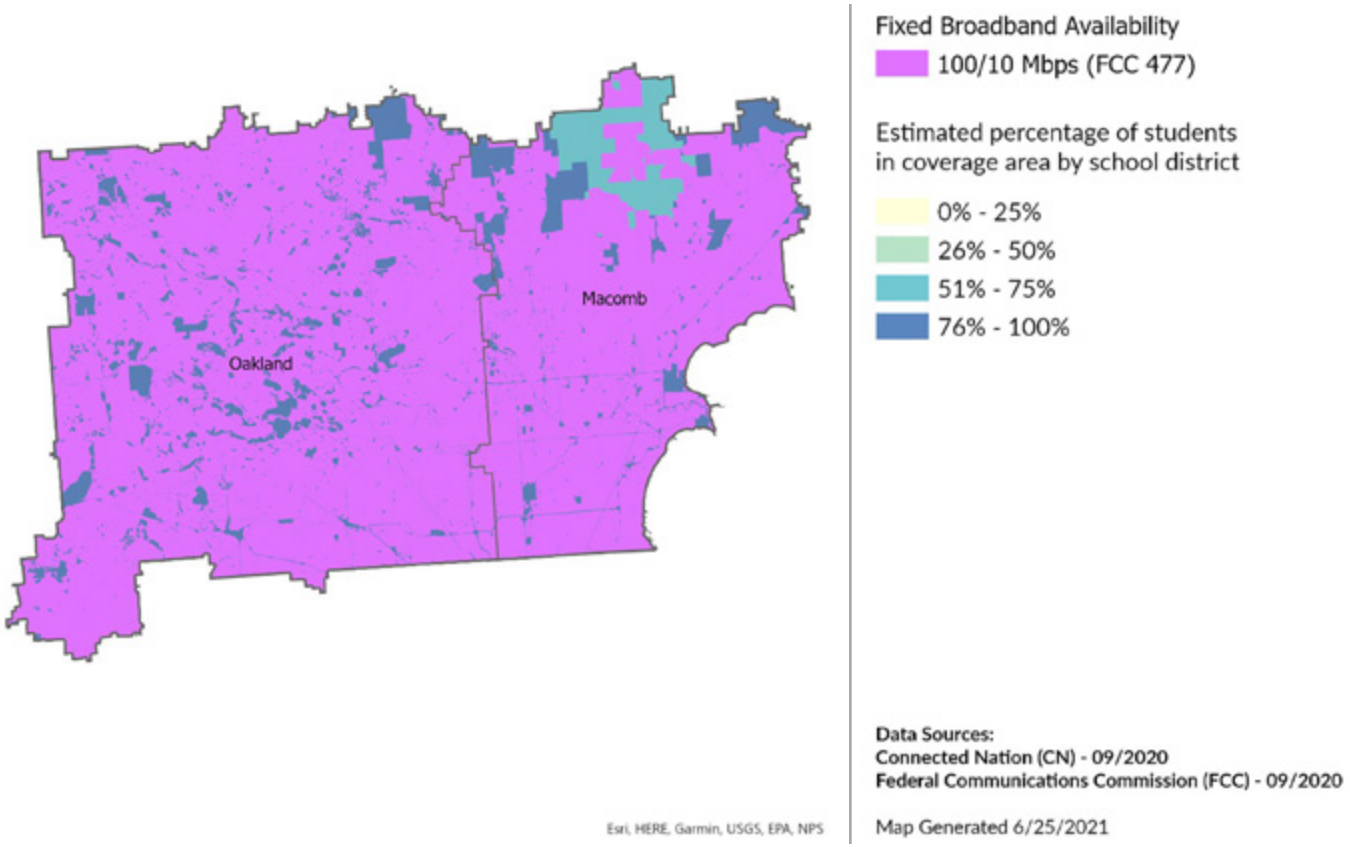


MAISA REGION 8

Hillsdale
Jackson
Lenawee
Livingston
Monroe
Washtenaw

MAISA Region 9

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



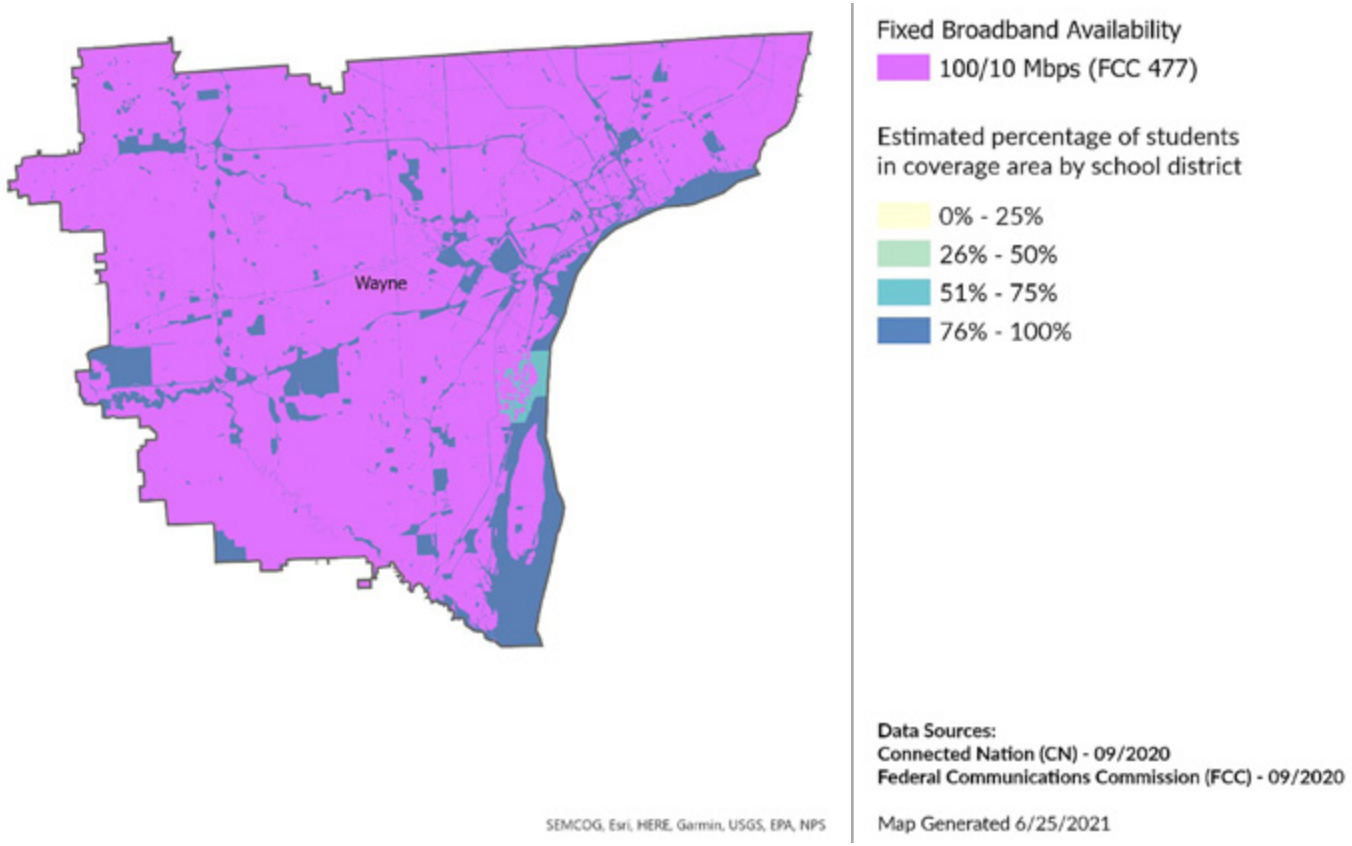
MAISA REGION 9

Macomb

Oakland

MAISA Region 10

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

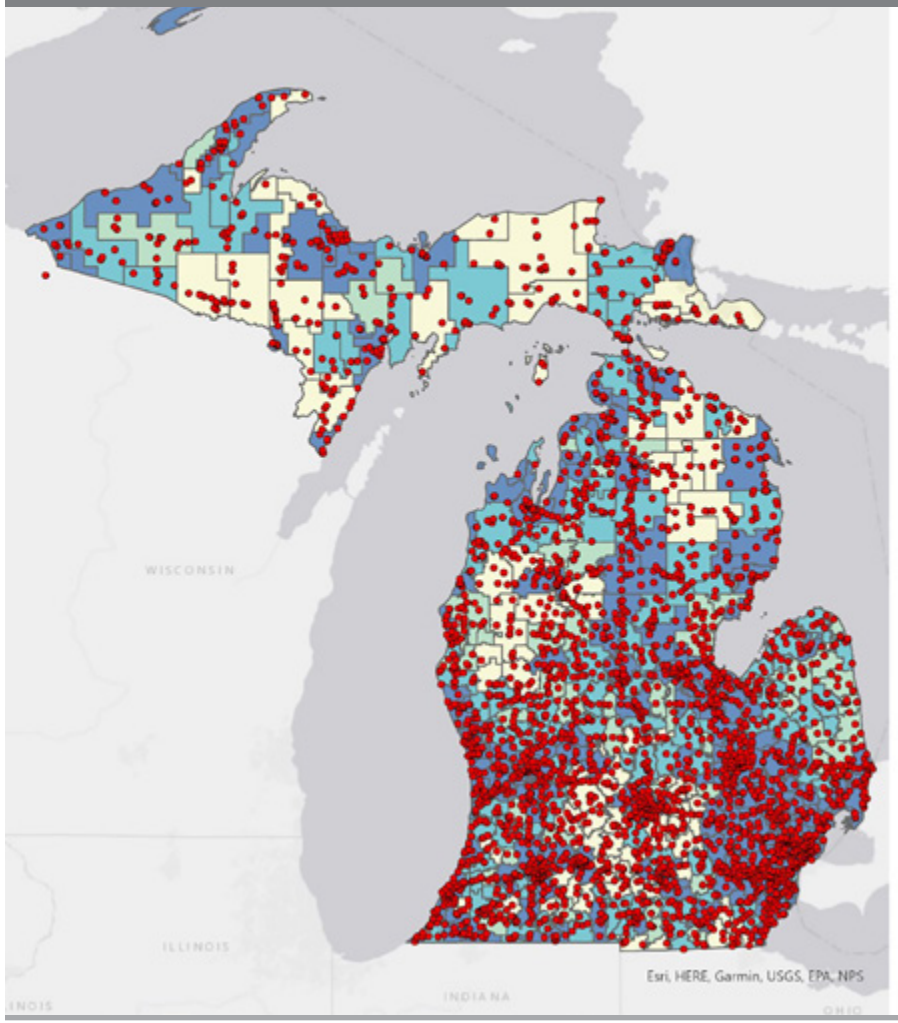


MAISA REGION 10

Wayne

D. Maps: Towers

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — TOWERS (FAA Obstacle)



Description

- Tower (>100 Feet)

Estimated percentage of students in coverage area by school district

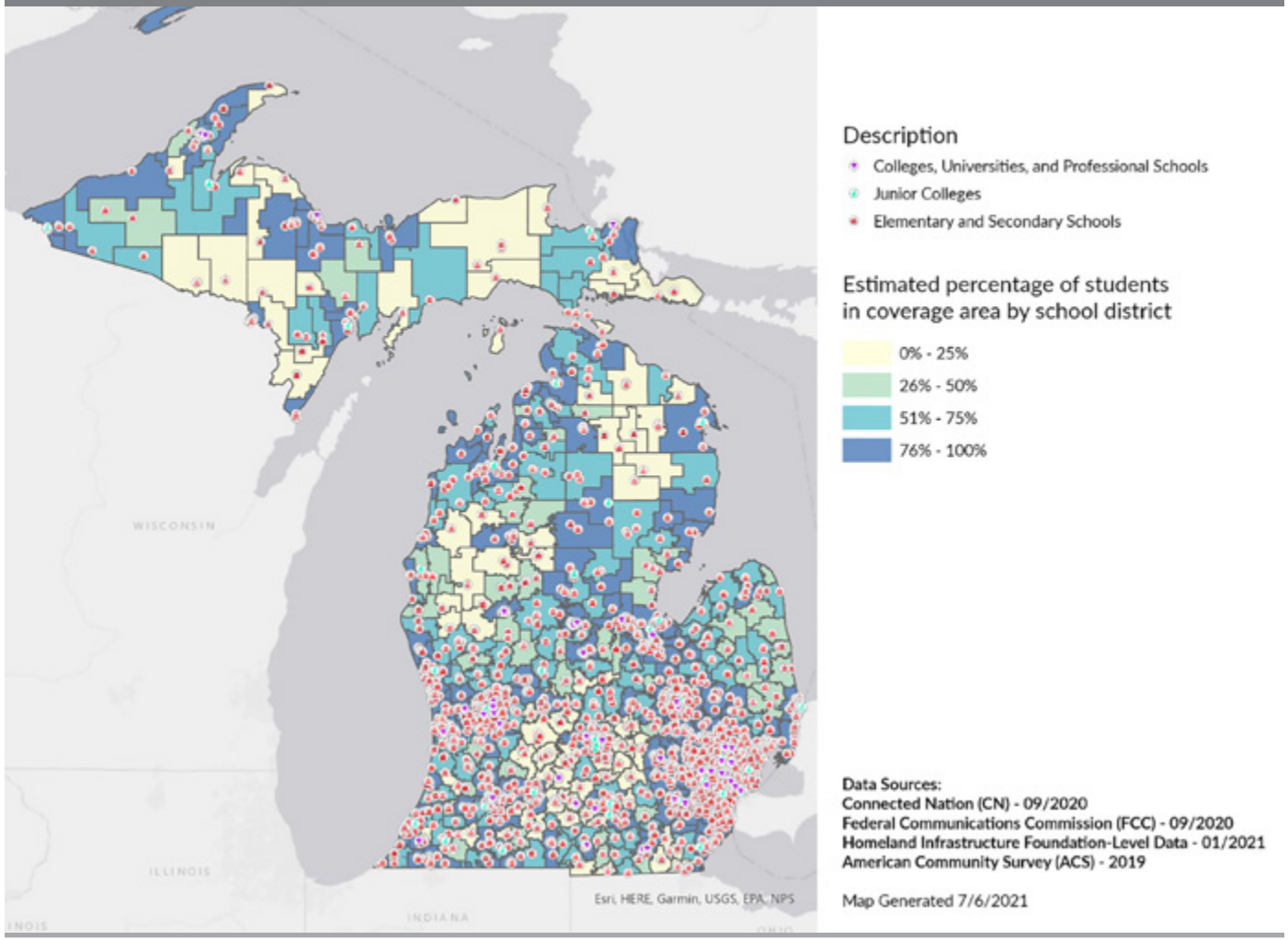
- 0% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

Data Sources:
Connected Nation (CN) - 09/2020
Federal Communications Commission (FCC) - 09/2020
Federal Aviation Administration (FAA) - 01/2021
American Community Survey (ACS) - 2019

Map Generated 7/6/2021

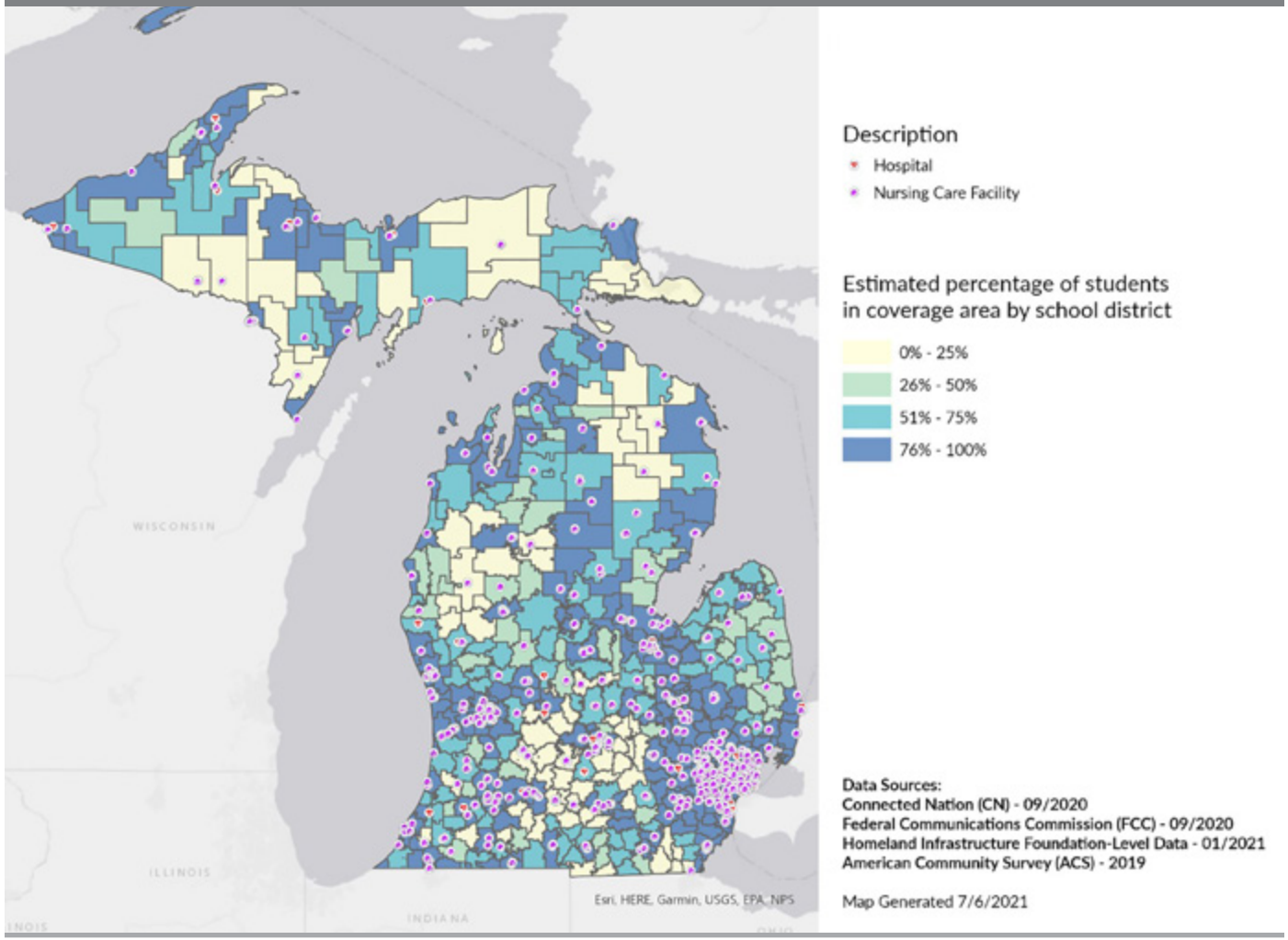
D. Maps: Educational institutions

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — EDUCATIONAL INSTITUTIONS



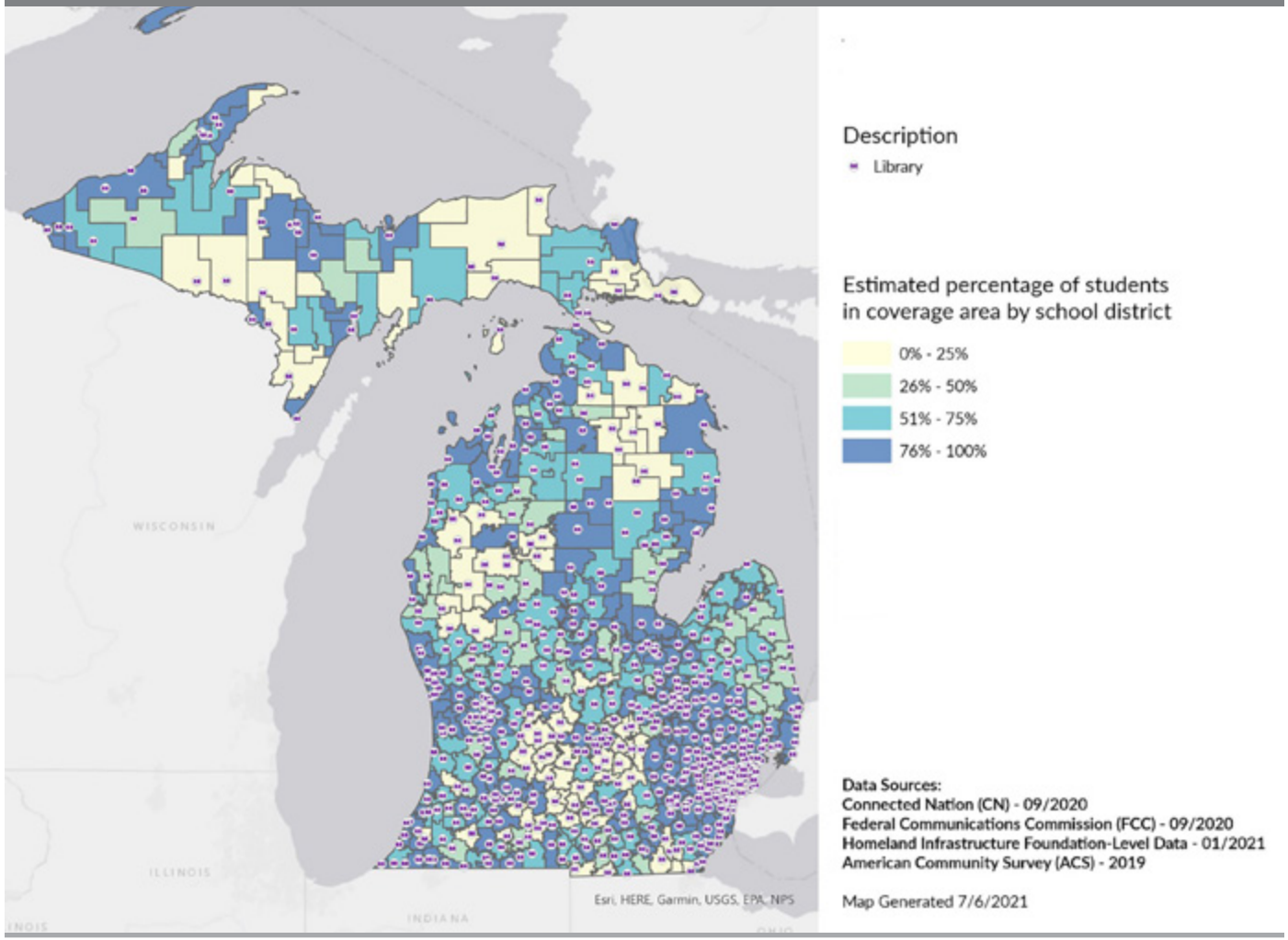
D. Maps: Healthcare institutions

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — HEALTHCARE INSTITUTIONS



D. Maps: Libraries

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — LIBRARIES



E. Statewide commissions, offices, councils, and initiatives[6]

Statewide broadband commissions, offices, and councils

Alabama Rural Broadband Oversight Committee

Formed through 2018 Act 395, the Oversight Committee meets at least annually, provides general oversight of the implementation of the Alabama Broadband Accessibility Act, and recommends further statutory changes to promote rural broadband development. Codified in **Ala. Code Sec. 41-23-210 et seq.**

Arkansas State Broadband Office

The **Arkansas State Broadband Office** serves the State Broadband Manager, a position described in **Arkansas State Code Sec. 25-4-125** and changed to a governor-appointed position by Act 792 of 2019. The State Broadband Manager is tasked with coordinating the state's efforts to expand and improve broadband capacity and availability by serving as a single point of contact for broadband policy; gathering, compiling, and maintaining information; formulating, updating, and maintaining a state broadband plan; and producing the semiannual State Broadband Manager's Report. More recently, the State Broadband Office has played a leading role in developing the rules for Governor Hutchinson's proposed $25 million broadband grant initiative, Arkansas Rural Connect.

California Broadband Council

The **California Broadband Council** was created by 2010 SB 1462 (**Cal. Government Code Sec. 8885 et seq.**) to promote broadband deployment in unserved and underserved areas of the state, as well as broadband adoption throughout California. The council is charged with reviewing implementation of the 2008 Broadband Task Force Report recommendations and improving coordination among state agencies. The council assists applicants in becoming more competitive for federal funds made available through the National Broadband Plan, building on the $420 million in broadband infrastructure grants from the federal American Recovery and Reinvestment Act (ARRA) and the $57 million in California Advanced Services Fund grants already awarded in the state.

Colorado Broadband Deployment Board

Formed through 2014 Chapter 173 (**Colo. Rev. Stat. Sec. 40-15-509.5**), the **Colorado Broadband Deployment Board** implements and administers the deployment of broadband service in unserved areas of the state by awarding grants from the Broadband Fund. The board is scheduled for repeal on Sept. 1, 2023 (**Colo. Rev. Stat. Sec. 24-34-104**).

Connecticut Office of State Broadband

2015 S.B. 1502, First Special Session (Conn. Gen. Stat. Sec. 16-2a), established an Office of State Broadband within the Office of Consumer Counsel. The Office of State Broadband works to facilitate the availability of broadband access to every state citizen and increases access to and the adoption of ultra-high-speed gigabit-capable broadband networks. The Office of Consumer Counsel may work in collaboration with public and nonprofit entities and state agencies and may provide advisory assistance to municipalities, local authorities, and private corporations for the purpose of maximizing opportunities for the expansion of broadband access in the state and fostering innovative approaches to broadband in the state, including the procurement of grants for such purpose. The Office of State Broadband includes a Broadband Policy Coordinator and such other staff as the Consumer Counsel deems necessary to perform the duties of the Office of State Broadband.

Georgia Broadband Deployment Initiative

Recognizing the importance of broadband availability to all Georgians, the General Assembly passed **2018 Act 423** (Ga. Code Sec. 50-40-1 et seq.), also known as Achieving Connectivity Everywhere (ACE) Act, creating the **Georgia Broadband Deployment Initiative**. The purpose of the Georgia Broadband Deployment Initiative is to coordinate and establish broadband programs to increase economic, education, and social opportunities for Georgia citizens and businesses. The initiative provides for the expansion of broadband infrastructure and services through new state and local broadband planning policies.

Hawaii Broadband Assistance Advisory Council

The **Broadband Assistance Advisory Council (BAAC)** was created to advise the director of the Department of Commerce and Consumer Affairs (DCCA) on policy and funding priorities to promote and encourage use of telework alternatives for public and private employees, as well as to expedite deployment of affordable and accessible broadband services in Hawaii.

Idaho Governor's Broadband Task Force

Established through **2019 Executive Order 7**, the Idaho Broadband Task Force will make recommendations to the governor on policies and actions the state should take to dramatically improve the state in connectivity and service levels.

Illinois Broadband Advisory Council

Formed through 2018 Public Act 100-833 (**Ill. Rev. Stat. ch. 220, Sec. 80/1 et seq.**), the Broadband Advisory Council shall: (1) explore any and all ways to expand the availability to end-user customers of broadband services using available technologies, including, but not limited to, wireline, wireless, fixed wireless, and satellite applications; (2) identify barriers to broadband adoption among the residents and small businesses of Illinois; (3) research ways to eliminate barriers to adoption through measures such as digital literacy programs; programs to assist older citizens in using broadband internet access; programs to facilitate adoption by disabled citizens; and programs to encourage collaborative efforts among public universities, community colleges, libraries, public housing, and other institutions; (4) assess the availability of broadband for low-income households compared to the availability of broadband for other households; (5) explore the potential for increased use of broadband service for the purposes of education, career readiness, workforce preparation, and alternative career training; (6) explore the potential for increased use of broadband services to facilitate aging in place; (7) explore ways for encouraging state and municipal agencies, including public housing authorities, to expand the use of broadband services for the purpose of better serving the public, including audio and video streaming, Voiceover Internet Protocol, teleconferencing, and wireless networking; (8) cooperate and assist in the expansion of electronic instruction and distance education services; and (9) as the Federal Communications Commission updates the benchmark downstream data rates and upstream data rates, publish the revised data rates in the Illinois Register within 60 days after the federal update.

Indiana Broadband Ready Communities Development Center

The Broadband Ready Communities Development Center was created as a tool to encourage broadband development throughout Indiana by serving as an information resource and certifying local communities as being broadband ready. The Center was established by **Ind. Code Sec. 5-28-28.5-0.5 et seq. Senate Bill 177** in the 2020 legislative session moved the Development Center to the Office of Community and Rural Affairs.

Kansas Statewide Broadband Expansion Planning Task Force

Established through **2018 Chapter 65**, the **Statewide Broadband Expansion Planning Task Force** (**Kan. Stat. Ann. Sec. 66-1286**) is composed of 17 voting members. The mission of the task force is to: (1) work collaboratively to develop an approach that includes, but is not limited to, the development of criteria for the creation of a statewide map for defining and evaluating the broadband needs of Kansas citizens, business, industries, institutions, and organizations; (2) identify and document risks, issues, and constraints associated with a statewide broadband expansion project and to develop any corresponding risk mitigation strategies where appropriate; (3) consider any recent actions by the Federal Communications Commission relating to broadband services, including, but not limited to: The 2018 Broadband Deployment Report; recommendations of the Broadband Deployment Advisory Committee; and any actions to implement broadband initiatives using the Connect America Fund Phase II, the Mobility Fund II, or the Remote Areas Fund; (4) identify opportunities and potential funding sources to expand broadband infrastructure and increase statewide access to broadband services; remove barriers that may hinder deployment of broadband infrastructure or access to broadband services;

and consider options for the deployment of new advanced communication technologies; (5) develop criteria for prioritizing the expansion of broadband services across Kansas; (6) review current law and regulations concerning access to the public right-of-way for public utilities and make corresponding recommendations for any changes necessary to encourage broadband deployment; and (7) propose future activities and documentation required to complete the statewide broadband expansion plan, including an upgradable, functional map of the state of available broadband service, as well as including which technologies should be deployed and the methods to finance broadband expansion. The Office of Broadband Development in the state Department of Commerce staffs the Statewide Broadband Expansion Planning Task Force.

Kentucky Infrastructure Authority

House Bill 362 in the 2020 legislative session establishes the Broadband Deployment Fund to provide grants to government agencies and private sector entities to construct infrastructure for the deployment of broadband service in underserved areas of the commonwealth. The Broadband Deployment Fund will be managed by the Kentucky Infrastructure Authority as specified in **Ky. Rev. 224A.011 et seq.**

Maine ConnectME Authority

The **Maine ConnectME Authority** (**Me. Rev. Stat. Ann. tit. 35-A, Sec. 9201 et seq.**) was created by the legislature with the goal of expanding broadband access in the most rural, unserved areas of the state that have little prospect of service from a traditional provider. The authority's purpose is to identify unserved areas of the state; develop proposals for broadband expansion projects, demonstration projects, and other initiatives; and administer the process for selecting specific broadband projects and providing funding, resources, and incentives. The authority is funded by a 0.25% surcharge on in-state retail communications services and funds proposals through grants, direct investments, or loans made on behalf of, in partnership with, or in support of one or more communications service providers.

Maryland Rural Broadband Coordination Board

The **Maryland Rural Broadband Coordination Board** was established in July 2006 by **S.B. 753** (Md. Economic Development Code Ann. Sec. 13-501 et seq.). The board reviews and approves the disbursement of funds from the Rural Broadband Assistance Fund and, through cooperation with other public, private, and nonprofit entities, obtains further resources for establishing broadband communication services in rural and underserved areas in Maryland. The board consists of nine members, including the secretary of business and economic development; the secretary of transportation; a representative from the Department of Information Technology; the chair of the Rural Maryland Council; and the chair or designee from five regional councils. The board is staffed by the Rural Maryland Council. Authorization for the board extends through June 30, 2020; however, the board stopped meeting in 2010. The board issued a final report in August 2010.

Massachusetts Broadband Institute

2008 Chapter 231 (**Mass. Gen. Laws Ann. ch. 40J, Sec. 6B**) established the **Massachusetts Broadband Institute (MBI)** as a new division within the Massachusetts Technology Collaborative. The act gives the MBI the authority to invest up to $40 million of state bond funds in necessary and long-lived infrastructure assets, such as conduits, fiber-optic cable, and wireless towers. As the state entity for broadband mapping and availability, the MBI collected, verified, and mapped detailed information about the levels of broadband availability in Massachusetts to create the Massachusetts Broadband Map.

Minnesota Governor's Task Force on Broadband

On March 29, 2019, Governor Walz issued **Executive Order 19-10** continuing the governor's Task Force on Broadband. The task force will consist of 15 members, with the governor appointing one member to serve as chair. The task force is charged with creating an annual report to be issued by December 31 each year. The report will address areas such as the needs, barriers, issues, and goals for broadband access; the needs and use of broadband in various sectors; digital

inclusion definitions and the benefits, needs, and strategies for addressing identified gaps; availability and accessibility for unserved and underserved populations; advances in broadband technology; opportunities to coordinate with other levels of government; and continued review of the adequacy and appropriateness of the broadband goals. This new task force will build on the work of former **Governor Dayton's Task Force on Broadband**.

Minnesota Office of Broadband Development

Established through **legislation in 2013**, the Office of Broadband Development is established within the Department of Employment and Economic Development (**Minn. Stat. Sec. 116J.39 et seq.**). The purpose of the office is to encourage, foster, develop, and improve broadband within the state in order to: (1) drive job creation, promote innovation, and expand markets for Minnesota businesses; (2) serve the ongoing and growing needs of Minnesota's education systems, healthcare system, public safety system, industries and businesses, governmental operations, and citizens; and (3) improve accessibility for underserved communities and populations.

Nebraska Rural Broadband Task Force

LB 994, passed by the state legislature and signed into law by Governor Ricketts on April 17, 2018, created the **Rural Broadband Task Force** (**Neb. Rev. Stat. Sec. 86-1101 et seq.**) to review issues relating to availability, adoption, and affordability of broadband services in rural areas of Nebraska. The task force shall: (1) determine how Nebraska rural areas compare to neighboring states and the rest of the nation in average download and upload speeds and in subscription rates to higher-speed tiers, when available; (2) examine the role of the Nebraska Telecommunications Universal Service Fund in bringing comparable and affordable broadband services to rural residents and any effect of the fund in deterring or delaying capital formation, broadband competition, and broadband deployment; (3) review the feasibility of alternative technologies and providers in accelerating access to faster and more reliable broadband service for rural residents; (4) examine alternatives for deployment of broadband services to areas that remain unserved or underserved, such as reverse auction programs described in section 4 of this act, public-private partnerships, funding for competitive deployment, and other measures, and make recommendations to the Public Service Commission to encourage deployment in such areas; (5) recommend state policies to effectively utilize state universal service fund dollars to leverage federal universal service fund support and other federal funding; (6) make recommendations to the governor and the legislature as to the most effective and efficient ways that federal broadband rural infrastructure funds received after the operative date of this section should be expended if such funds become available; and (7) determine other issues that may be pertinent to the purpose of the task force. The task force shall present its findings in a report by Nov. 1, 2019, and by November 1, of every odd-numbered year thereafter.

New York Broadband Program Office

In 2015, Governor Andrew M. Cuomo established the $500 million **New NY Broadband Program** to invest in broadband expansion. The program provides state grant funding through an innovative "reverse auction" method to support projects that deliver high-speed internet access to unserved and underserved areas of New York state at speeds of 100 Mbps in most areas and 25 Mbps in the most remote areas. Nearly 90% of all funding has been awarded to projects that will address unserved areas of the state, connecting these locations for the first time. An unserved area is defined as an area where the fastest available advertised internet download speed offered by a wireline-based provider is less than 25 Mbps. An "underserved" area is defined as an area where broadband service is available only from a wireline-based provider at advertised internet download speeds between 25 Mbps and 99 Mbps.

NC Broadband

The North Carolina Department of Commerce created the NC Broadband Division in 2011, now called the **Broadband Infrastructure Office**, after the e-NC Authority transferred its ARRA federal funds and authority to the North Carolina Department of Commerce. The broadband division of the North Carolina Department of Commerce is a new initiative dedicated to encouraging the adoption and use of broadband internet, identifying unserved and underserved areas, and working to promote greater broadband availability across the state.

Oklahoma Rural Broadband Expansion Council

In the 2020 legislative session, **House Bill 4018** created a 14-member council that shall conduct a study of rural broadband access in the state and shall divide the state into separate geographic areas based on the information it obtains regarding existing capability for persons and businesses to access broadband telecommunication services, the cost for obtaining the services from existing service providers, the estimated costs for improving rural broadband access, the likelihood of changes in rural broadband access in the near and intermediate future based on available information regarding private or public sector plans or programs to create or enhance broadband access in rural areas, the need for change in state or local law or policy that impacts the ability for persons or business entities in rural areas to access broadband services at a reasonable price, and such other information the council may determine to be relevant in order to establish the geographic areas. The council shall incorporate the information into a mapping system that depicts resources, broadband coverage, connectivity speeds, and such other features the council deems relevant. And the council shall undertake a study of incentives or programs that will have the effect of improving existing rural broadband access and establishing broadband access to areas that currently do not have such access. The incentives or programs may include federal funds; tribal funds or resources; donated funds or funding available from foundations; endowments or similar sources; state or local tax incentives; state or local financing incentives; or options or federal, tribal, state, or local regulatory policies that would be conducive to improving existing broadband access or establishing such access where it does not currently exist.

Oregon Broadband Office

The Oregon Broadband Office was established in December 2018, through an **executive order**, to promote access to broadband services for all Oregonians in order to improve the economy and quality of life. The Broadband Office was codified in statute in 2019 with the passage of **House Bill (HB) 2173**. The Oregon Broadband Office will support and coordinate efforts with the Oregon Broadband Advisory Council.

Oregon Broadband Advisory Council

The **Oregon Broadband Advisory Council** was created by **2009 H.B. 3158**. The council's mission is to develop and ensure the implementation of a statewide broadband network with a focus on extending broadband access to unserved and underserved communities across Oregon. The council aims to ensure that Oregon citizens can take full advantage of the commerce, education, and health and safety benefits provided by broadband internet access. The council also will encourage public-private partnerships to promote the deployment of broadband and will report to the legislature on the affordability and accessibility of broadband technology in all areas of Oregon.

Texas Governor's Broadband Development Council

HB 1960, enacted in 2019, creates the Governor's Broadband Development Council and will be composed of 17 members. The council shall: (1) research the progress of broadband development in unserved areas; (2) identify barriers to residential and commercial broadband deployment in unserved areas; (3) study technology-neutral solutions to overcome barriers identified under subdivision (2); and (4) analyze how statewide access to broadband would benefit (a) economic development; (b) the delivery of educational opportunities in higher education and public education; (c) state and local law enforcement; (d) state emergency preparedness; and (e) the delivery of healthcare services, including telemedicine and telehealth.

Utah Broadband Advisory Council

The Utah Broadband Advisory Council was formed in June 2011 and meets monthly to examine the condition of broadband adoption and deployment in the state. The council will provide the governor and legislature with recommendations and policy guidance. Members of the council represent a diverse group of interests, including legislators, state and local government, healthcare, education, libraries, public safety, economic development, and tribal entities.

Vermont Division of Telecommunications and Connectivity Advisory Board

In **Act 41 of 2015**, the Vermont Legislature created the **Division for Telecommunications and Connectivity** within the Vermont Department of Public Service (Vt. Stat. Ann. tit. 30, Sec. 201 et seq.). The division's mission is to promote and expand access to high-speed internet to underserved locations in Vermont. The division awards broadband development grants from the Connectivity Initiative as part of its effort to bring high-speed internet to Vermont's hardest-to-reach locations. The division also manages and leases roughly 340 route miles of state-owned open-access fiber-optic cable located throughout Vermont. The **Telecommunications and Connectivity Advisory Board** is an eight-member board charged with making recommendations to the Commissioner of Public Service regarding his or her telecommunications responsibilities and duties. The board consists of members of government, private industry, and community organizations. The board meets up to six times a year.

Virginia Office of Telework Promotion and Broadband Assistance

In 2006, Governor Tim Kaine signed Executive Order 35 creating the Office of Telework Promotion and Broadband Assistance. The duties of the office include promoting and encouraging use of telework alternatives for public and private employees, including appropriate policy and legislative initiatives, and supporting the efforts of both public and private entities within the commonwealth to enhance or facilitate the deployment of, and access to, competitively priced, advanced broadband services.

Virginia Broadband Advisory Council

The Virginia Broadband Advisory Council was created by **2009 S.B. 1336** (codified in **Va. Code Sec. 2.2-2699.3** and **Va. Code Sec. 2.2-2699.4**) and expires on July 1, 2021. The Broadband Advisory Council was established to help determine the commonwealth's goals for broadband and how best to achieve them. It is composed of 11 members: four legislators, two ex-officio members, five citizen members, the secretary of technology, and the secretary of commerce and trade.

Washington Governor's Statewide Broadband Office

Created in **2019 Chapter 365** (**Wash. Rev. Code Sec. 43.330.530 et seq.**), the Governor's Statewide Broadband Office will encourage, foster, develop, and improve affordable, quality broadband within the state in order to: (1) drive job creation, promote innovation, improve economic vitality, and expand markets for Washington businesses; (2) serve the ongoing and growing needs of Washington's education systems, healthcare systems, public safety systems, industries and business, governmental operations, and citizens; and (3) improve broadband accessibility for unserved communities and populations.

West Virginia Broadband Enhancement Deployment Council

The **West Virginia Broadband Enhancement Deployment Council** was established in code during the 2017 Regular Legislative Session with the passage of **2017 Chapter 22** (**W. Va. Code Sec. 31G-1-1 et seq.**) and signed into law by Governor Jim Justice. The council consists of 13 voting members. The council shall: (1) explore any and all ways to expand access to broadband services, including, but not limited to, "middle mile," "last mile," and wireless applications; (2) gather data regarding the various speeds provided to consumers in comparison to what is advertised; The council may request the assistance of the legislative auditor in gathering this data; (3) explore the potential for increased use of broadband service for the purposes of education, career readiness, workforce preparation, and alternative career training; (4) explore ways for encouraging state and municipal agencies to expand the development and use of broadband services for the purpose

of better serving the public, including audio and video streaming, Voiceover Internet Protocol, teleconferencing, and wireless networking; and (5) cooperate and assist in the expansion of electronic instruction and distance education services.

Wisconsin Broadband Office

The mission of the **Wisconsin Broadband Office (WBO)**, within the Public Service Commission of Wisconsin, is to make Wisconsin more competitive through advancing the availability, adoption, and use of broadband technologies.

Wyoming Broadband Advisory Council

During the 2018 legislative session, Gov. Matt Mead signed into law **Act 36** (Wyo. Stat. Sec. 9-12-1501 et seq.), which provided $10 million to establish a broadband infrastructure grant fund and $350,000 to establish a broadband coordinator position at the Wyoming Business Council and a **Broadband Advisory Council** to oversee the agency's efforts. The Broadband Advisory Council contains 11 members.

Statewide broadband initiatives

Broadband Florida Initiative

2009 SB 2626 (**Fla. Stat. Sec. 364.0135**) authorizes the Florida Department of Management Services to apply for grants and lead broadband planning and development efforts in Florida. The department used the funds from federal grants to establish the Broadband Florida Initiative. The initiative leads collaborative efforts in broadband capacity building across local, regional, and state public and private institutions. The Broadband Florida Initiative includes a grant development team and an E-Rate program team. The E-Rate team provides direct support to eligible community anchor institutions so that Florida can best leverage available funding opportunities. The initiative also created the now defunct Florida Broadband Joint Work Group, which produced Florida's Broadband Strategy White Paper in June 2009. The Broadband Florida Initiative also created the Florida Broadband Mapping Project. The Florida Broadband Mapping project was mapping landline and wireless services using information from providers and other sources. The collected and verified broadband mapping information supported the broadband development objectives identified in Fla. Stat. Sec. 364.0135.

Iowa Communications Network

The **Iowa Communications Network (ICN)** is a distance learning and state government broadband carrier network committed to providing strong broadband solutions for the education, government, and healthcare sectors of Iowa. ICN provides high-speed, flexible broadband internet, data, videoconferencing, and voice (phone) services to authorized users, under Code of Iowa, which includes: K-12 schools, higher education, hospitals and clinics, state and federal government, National Guard armories, and libraries. The **Iowa Telecommunications and Technology Commission (ITTC)** was established, in 1994 by statute (**Iowa Code Sec. 8D.1 et seq.**), with the sole authority to supervise the management, development, and operation of the Iowa Communications Network. The commission's duty is to ensure that the ICN operates in an efficient and responsible manner and provides the best economic service attainable to its authorized users consistent with the state's financial capacity.

Connected Nation Iowa

Connected Nation Iowa has been instituted as a subsidiary of Connected Nation and operates as a nonprofit. Connect Nation Iowa was commissioned by the Iowa Utilities Board to work with all broadband providers to create an Iowa broadband map in order to accurately pinpoint remaining gaps in broadband availability in Iowa. The map project will support the activities of the Iowa Broadband Deployment Governance Board, which includes developing a statewide plan for the deployment and adoption of broadband in the state.

Connected Nation Michigan

Connected Nation Michigan is a subsidiary of Connected Nation and operates as a nonprofit in Michigan. Connected Nation Michigan partnered with the Michigan Public Service Commission to engage in a comprehensive broadband planning and technology initiative as part of the national effort to map and expand broadband. The program began by gathering provider data to form statewide broadband maps and performing statewide business and residential technology assessments, but has since progressed to working with localities on community plans through the Michigan Collaborative Broadband Committee.

North Carolina Broadband Task Force

Established through **Executive Order 19-91**, the Broadband Task Force is required to submit a report to the governor by June 1, 2019, that assesses how the state is implementing the state broadband plan, the homework gap, and "dig once" policies.

Connect Ohio

Governor Ted Strickland, on Dec. 17, 2007, launched **Connect Ohio**, a public-private partnership that seeks to expand broadband services across the state by working with local communities and providers to map gaps in access. Connect Ohio's three-year strategy involves a partnership between the state and broadband providers to create detailed maps of broadband coverage in order to accurately pinpoint remaining gaps in broadband availability in Ohio. Connect Ohio will also work to establish public-private partnerships that will assist in supplying computers to areas that have broadband service but lack computer access.

Oklahoma Broadband Initiative

Oklahoma was awarded a grant in January 2010 under the State Broadband Data Development (SBDD) program to fund the Oklahoma Broadband Initiative. The first phase of the initiative is the **Oklahoma Broadband Mapping Project**, which includes the collection of the necessary data to identify broadband assets, gaps in broadband services, and opportunities for expansion of broadband services. The data has been consolidated into the Oklahoma Broadband Map and depicts what areas of the state are served, underserved, and unserved by broadband. The second phase of this initiative is the Oklahoma Broadband Technology Opportunities Program (BTOP) grant application to build the **Oklahoma Community Anchor Network (OCAN)**, a 1,005-mile "middle-mile" infrastructure that will connect 32 anchor institutions in underserved or unserved areas of the state.

Pennsylvania Broadband Initiative

In 2018, Governor Tom Wolf launched his Broadband Initiative, a dedicated effort to provide high-speed internet access to every household and business in Pennsylvania.

F. Bandwidth analysis

The table below depicts our estimation of the minimal bandwidth requirements for a family of four working and attending school remotely.

	Download/User (in Mbps)	Upload/User (in Mbps)	House	Adult #1	Adult #2	Child #1	Child #2	Download (in Mbps)	Upload (in Mbps)
BACKGROUND SERVICES USAGE									
Home Devices	1	0.25	X					**1**	**0.25**
Streaming Video	5		X					**5**	**0**
INDIVIDUAL SERVICES USAGE									
Videoconferencing (1 to 1)	1.5	1.5		X		X	X	4.5	4.5
Videoconferencing (group)	3	3			X			3	3
Video Streaming (1080p)	5			X	X			10	0
Music Streaming	1.5					X	X	3	0
IP Telephony	0.15	0.15		X	X			0.3	0.3
Online Console Gaming	3	6						0	0
							Estimated Bandwidth Required	26.8	8.05
							Estimated Bandwidth Required with 25% Concurrency (in Mbps)	**34**	**10**
							MINIMUM TARGET BANDWIDTH	**50**	**10**

Assumptions

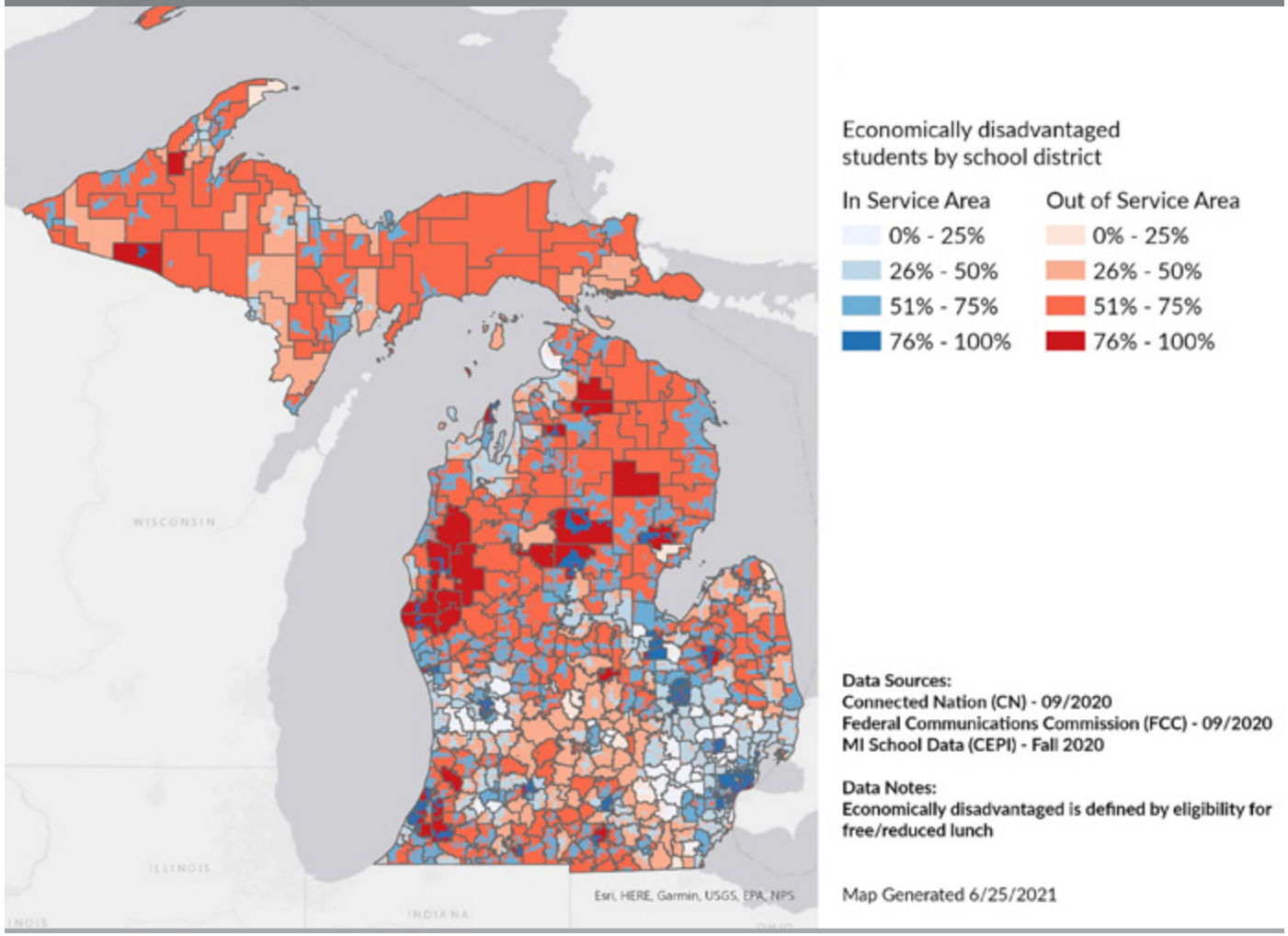
- We assumed that the primary learning mechanisms employed by K-12 students are group video calls (e.g., Zoom), one-to-one video calls, video streaming of live content, video streaming of stored video content (e.g., YouTube), email, social media communications, web-based content, and web-based productivity and collaboration tools (e.g., G-Suite).
- Group-based video calls and video streaming are by large the main bandwidth drivers. Therefore, the calculations are mostly based on those two learning mechanisms. Other mechanisms, if utilized concurrently with those two services, can impose additional bandwidth requirements (or alternatively they can utilize the remaining bandwidth that results from the statistical multiplexing of those services from multiple users).
- It's assumed that a notable amount of noninstructional activities will occur throughout a typical day. Given there may be multiple household members with multiple devices, this usage may vary. Usage may consist of, but is not limited to, web browsing, video streaming of stored video content, music streaming, IP telephony, online gaming, email, social media communications, access to web-based content, and use of web-based productivity and collaboration tools (e.g., Office 365).
- It's assumed that there is background usage occurring throughout the day from IT devices (e.g., desktops, laptops, tablets, smartphones, etc.) that require frequent updates and synchronization, IoT devices such as Smart Home or Virtual Assistant products, as well as some background streaming of TV content. This usage is assumed to be concurrent to other services being used directly by individuals in a household.
- Usage for online productivity tools, social media communications, email, and web browsing are assumed to be delivered on a best-effort basis using the available bandwidth for that moment in time. Calculations for other internet services are considered within the overall estimated bandwidth requirement; thus, the calculations provided should be assumed to account for any bandwidth necessary for these best-effort general productivity services.
- The calculations do not consider the use of advanced learning mechanisms such as virtual reality or augmented reality; remote access to computer-intensive applications, such as 3D computer-aided design (CAD), computer-generated imagery (CGI), and video production; computer- or console-based video-gaming or action-intensive multiplayer cloud-based video gaming; and 4K video streaming.
- The bandwidth calculation is based on a point-in-time assessment conducted in January 2021, and needs to be revised as COVID-19 conditions change and new learning technologies evolve and become mainstream.
- The common devices expected in most households include the following:
  - Laptops (Windows/Mac/Chromebooks)
  - Desktops (Windows/Mac)
  - Smartphones (iPhone/Android/Windows)
  - Tablets (iPad/Android/Windows)
  - Game consoles (PS 4/5, Xbox One/Series X)
  - Smart TVs
  - Streaming devices (Chromecast, Apple TV, Roku, Fire TV)
  - Smart Home devices (Google Home, HomePod, Nest)
- The calculations are based on a standard household composed of:
  - Two adults in a remote work environment
- Each adult regularly operates two internet-capable devices
  - Two K-12 students in remote instruction
- Each student regularly operates two internet-capable devices

Other technical considerations

- Consistent availability of bandwidth from broadband services is dependent on access technology (xDSL, xPON, CATV HFC, 4G LTE/5G, etc.), oversubscription rate considered by service provider, concurrent utilization of services by other households or small businesses sharing the access equipment in service provider's point of presence, backhaul capacity availability, network congestion and availability, terminal device, and home network capabilities.
- Due to real-time voice conversation capabilities required for learning purposes, satellite internet access services are not considered feasible given the high latency associated with those services.
- Service providers are beginning to impose data caps to fixed internet access. After such data cap is reached, the access bandwidth is throttled down to levels that can affect the quality of experience for learning services. It's assumed that such data caps will not affect more than 95% of the population to prevent usage abuse.
- Though cybersecurity-related services from service providers are desirable to protect households from external threats, no consideration is being made in terms of content filtering services to restrict access to certain services (e.g., gaming) or websites (e.g., adult content, violence, gambling, etc.), in accordance with net-neutrality principles.

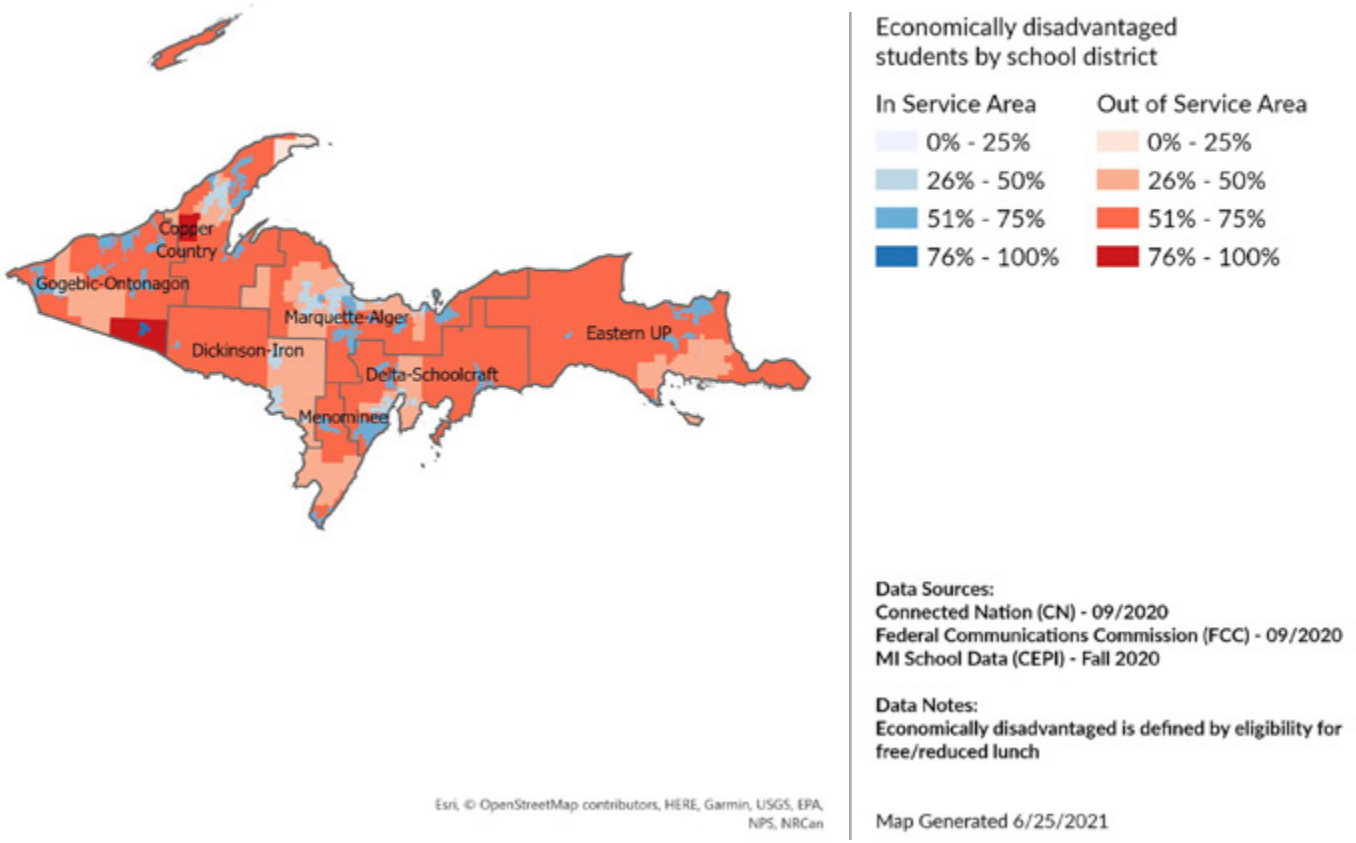
G.Maps: Broadband availability by economically disadvantaged status

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



MAISA Region 1

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

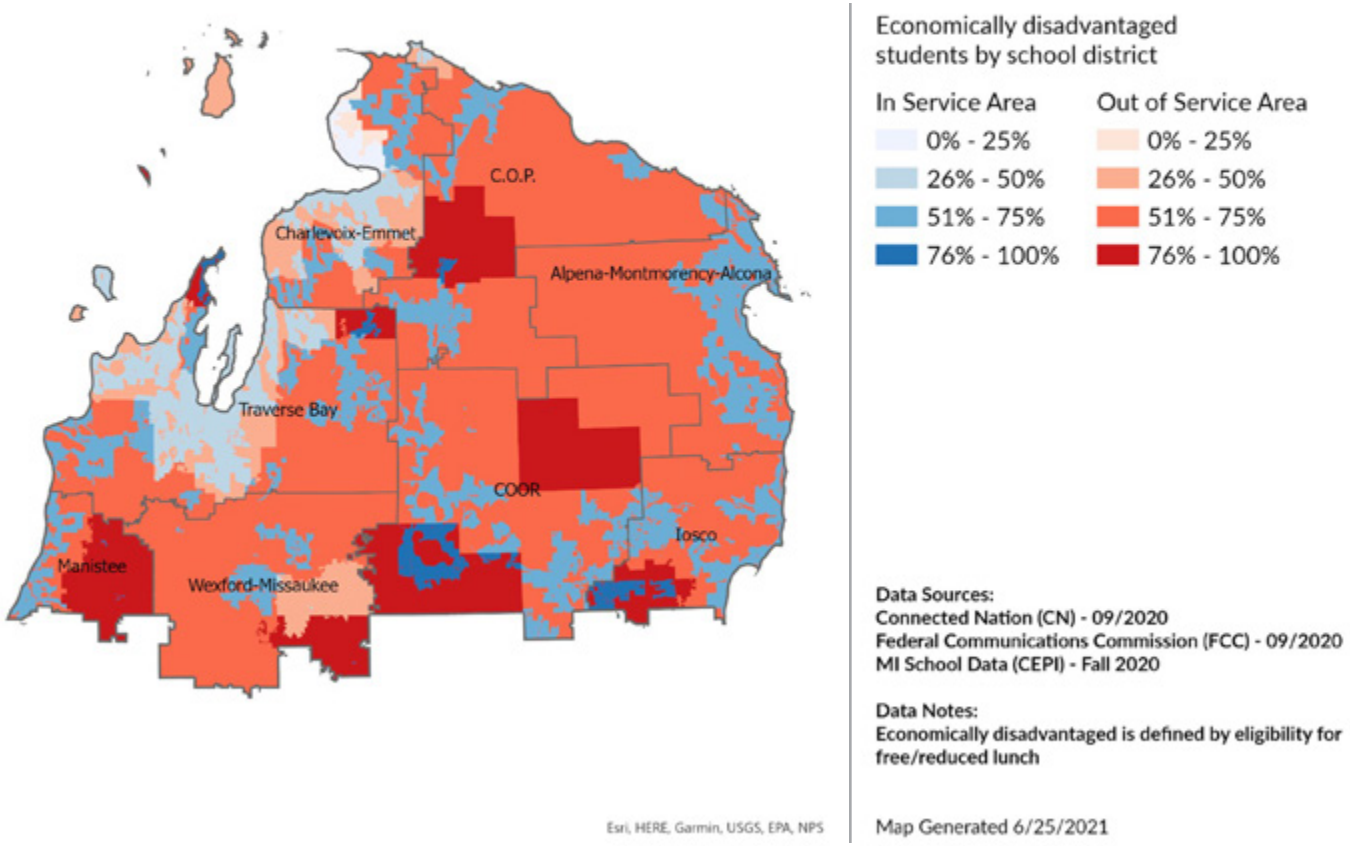


MAISA REGION 1

Alger
Baraga
Shippewa
Delta
Dickinson
Gogebic
Houghton
Iron
Keweenaw
Luce
Mackinac
Marquette
Menominee
Ontonagon
Schoolcraft

MAISA Region 2

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

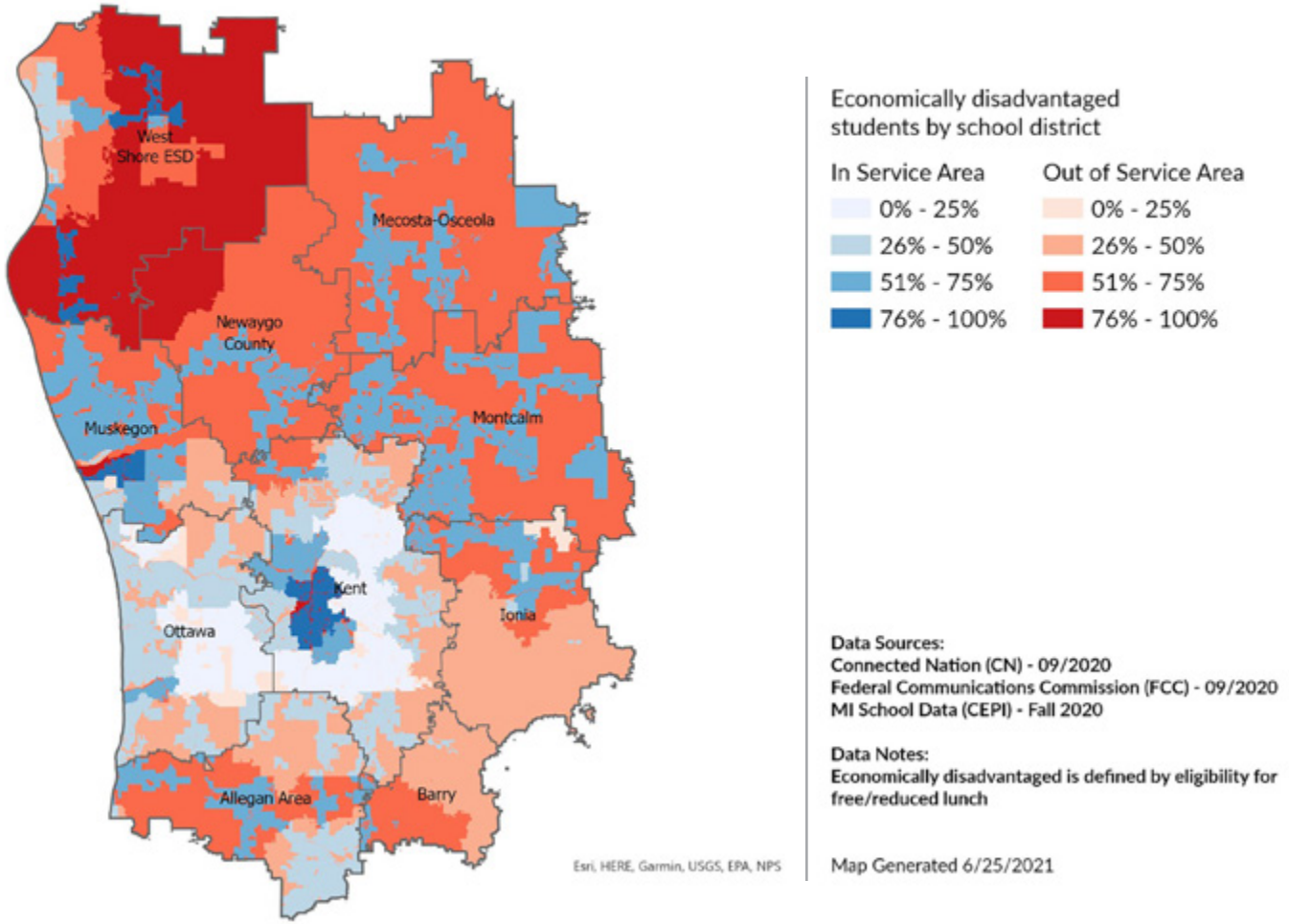


MAISA REGION 2

Alcona
Alpena
Antrim
Benzie
Charlevoix
Cheboygan
Crawford
Emmet
Grand Traverse
Iosco
Kalkaska
Leelanau
Manistee
Missaukee
Montmorency
Ogemaw
Oscoda
Otsego
Presque Isle
Roscommon
Wexford

MAISA Region 3

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

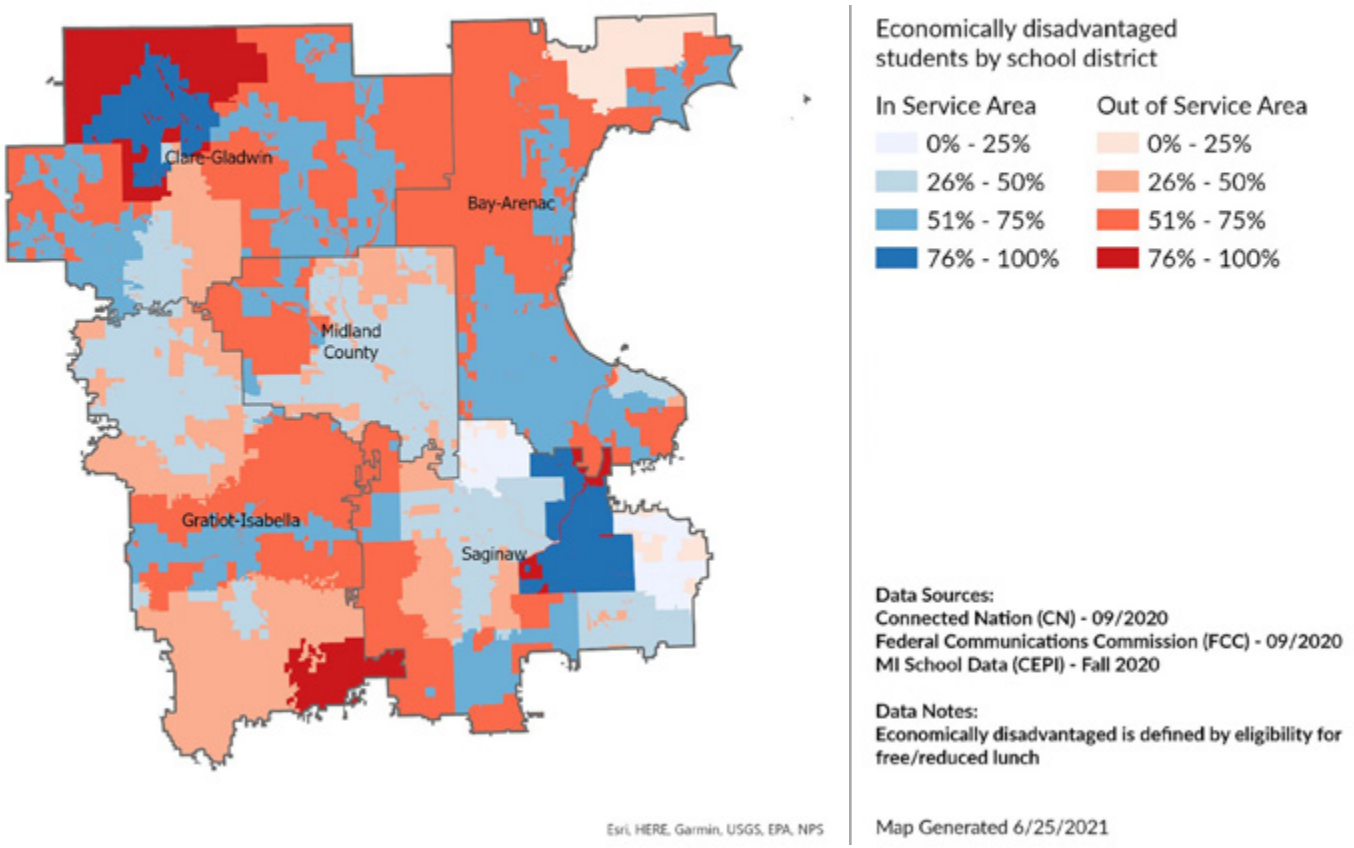


MAISA REGION 3

Allegan
Barry
Ionia
Kent Lake
Mason
Mecosta
Montcalm
Muskegon
Newaygo
Oceana
Osceola
Ottawa

MAISA Region 4

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

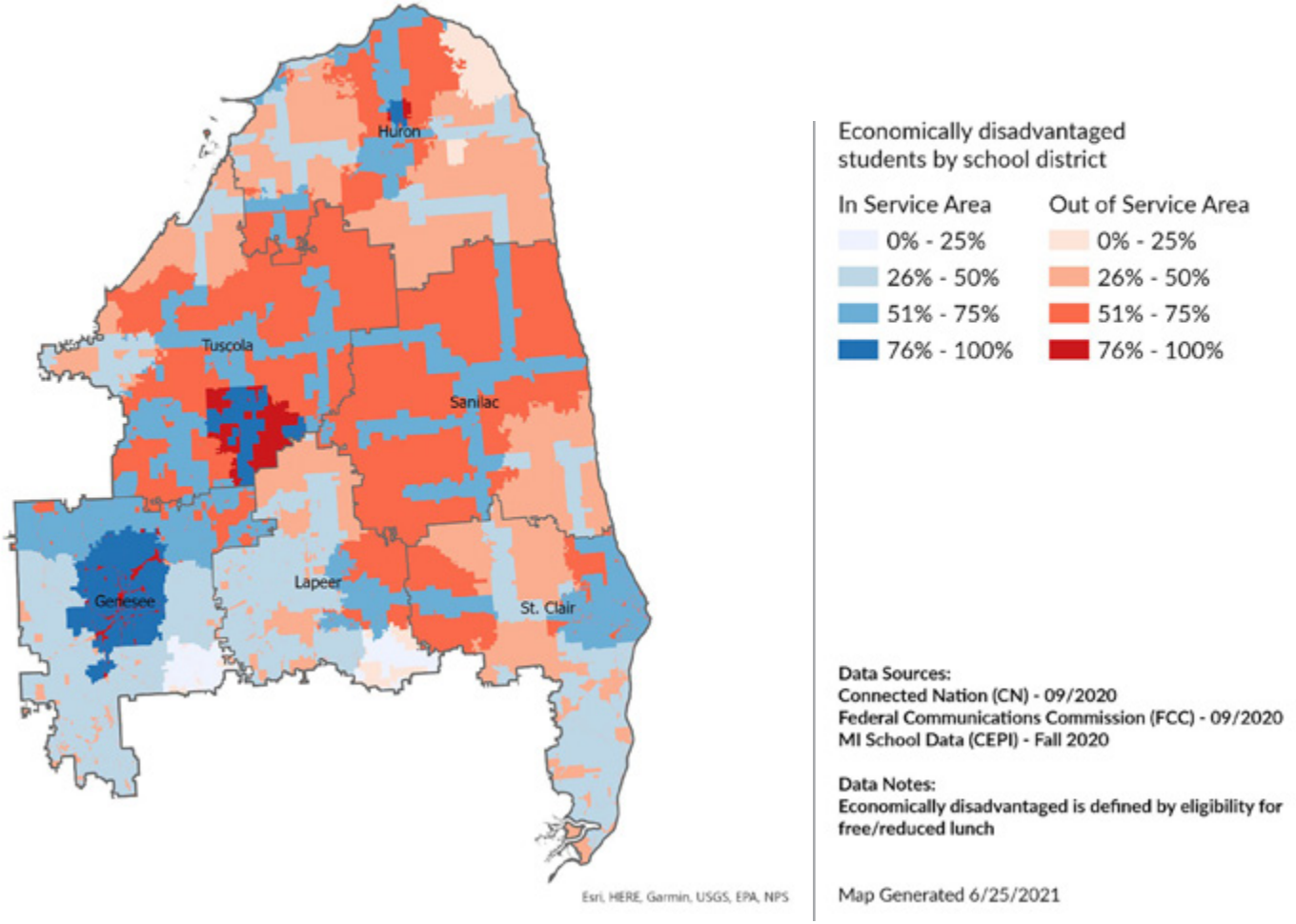


MAISA REGION 4

Arenac
Bay
Clare
Gladwin
Gratiot
Isabella
Midland
Saginaw

MAISA Region 5

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

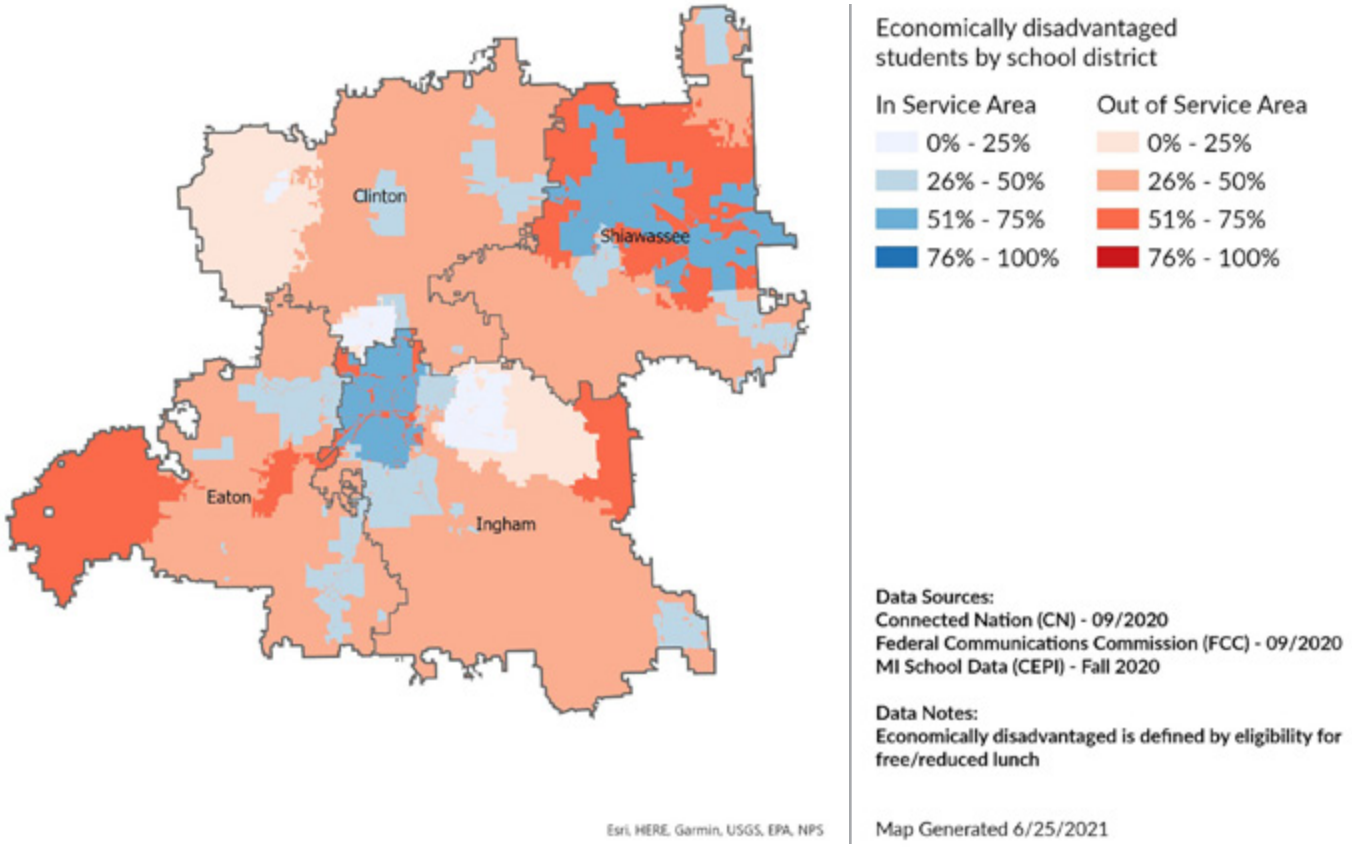


MAISA REGION 5

Genesee
Huron
Lapeer
St. Clair
Sanilac
Tuscola

MAISA Region 6

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

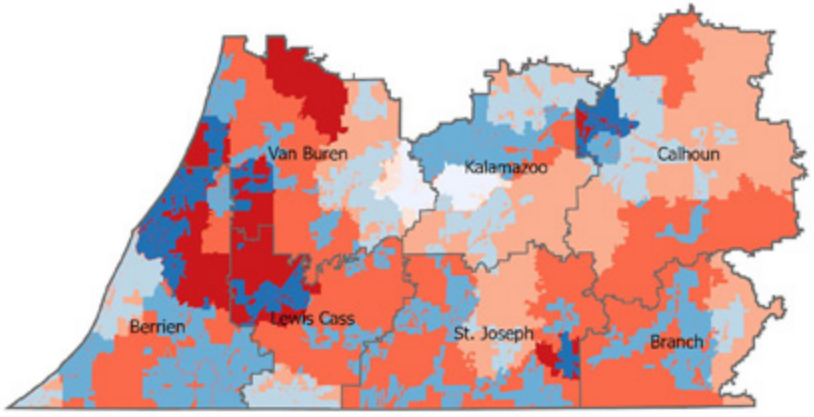


MAISA REGION 6

Clinton
Eaton
Ingham
Shiawassee

MAISA Region 7

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



Economically disadvantaged students by school district

In Service Area	Out of Service Area
0% - 25%	0% - 25%
26% - 50%	26% - 50%
51% - 75%	51% - 75%
76% - 100%	76% - 100%

Data Sources:
Connected Nation (CN) - 09/2020
Federal Communications Commission (FCC) - 09/2020
MI School Data (CEPI) - Fall 2020

Data Notes:
Economically disadvantaged is defined by eligibility for free/reduced lunch

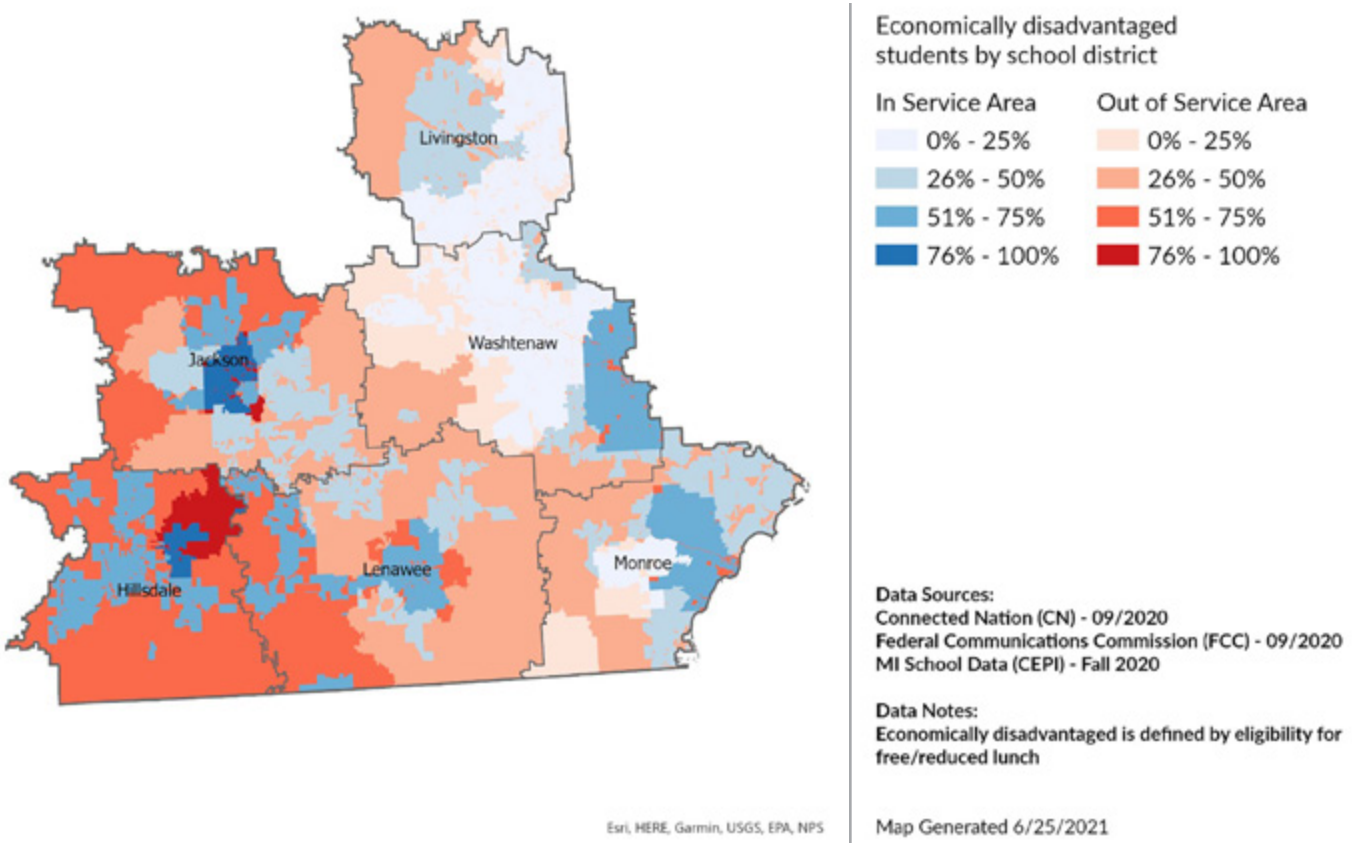
Map Generated 6/25/2021

MAISA REGION 7

Berrien
Branch
Calhoun
Lewis Cass
Kalamazoo
St. Joseph
Van Buren

MAISA Region 8

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN

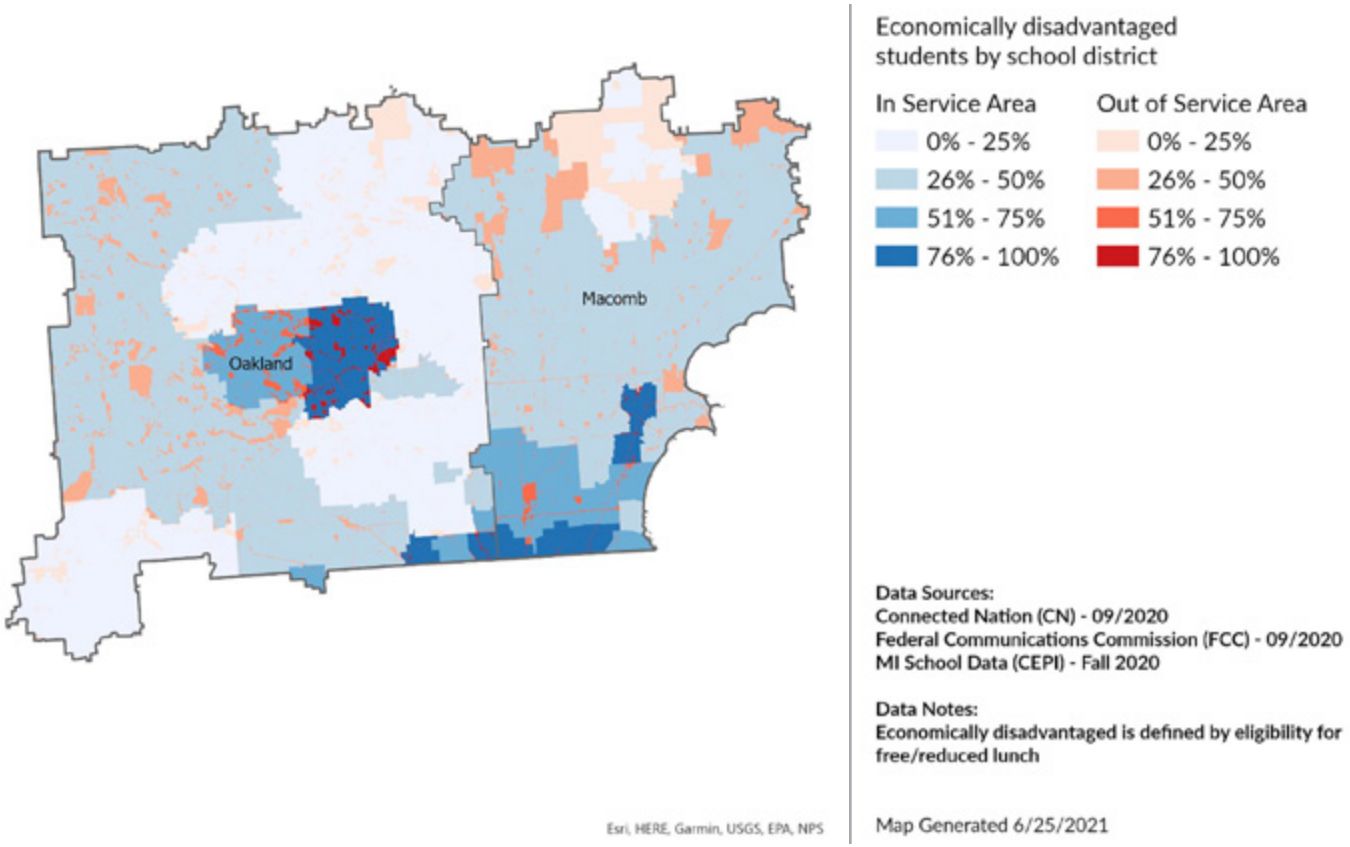


MAISA REGION 8

Hillsdale
Jackson
Lenawee
Livingston
Monroe
Washtenaw

MAISA Region 9

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



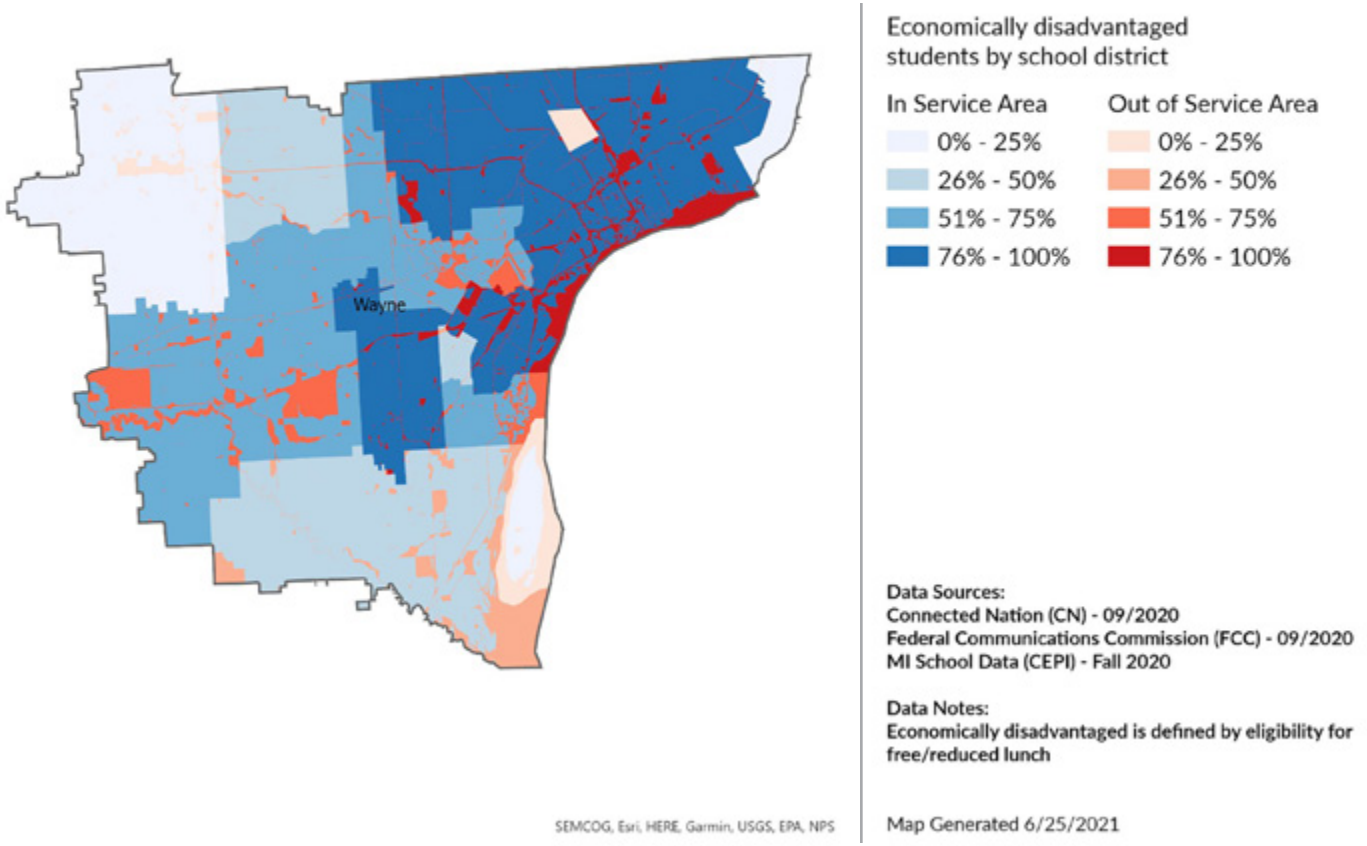
MAISA REGION 9

Macomb

Oakland

MAISA Region 10

STUDENT FIXED BROADBAND AVAILABILITY MAP (100/10 MBPS) — STATE OF MICHIGAN



MAISA REGION 10

Wayne

H. Solution Paths

MODEL	POTENTIAL PARTNERS	SOLUTION CONSIDERATIONS	MAJOR COST COMPONENTS
Educational wireless	• Community colleges & universities • EducationSuperHighway • Federal Communications Commission • Intermediate school districts • K-12 school districts • Merit Network, Inc. • Michigan Association of Intermediate School Administrators (MAISA) • Michigan Department of Education • Michigan High-Speed Internet Office • State Education Network • Telecommunications providers • Universal Service Administrative Company	• Overall solution costs • Availability of individual school building internet bandwidth • Constraints as a result of PA224 • Potential constraints on using educational resources funded through E-Rate for residential use • Affordability for end users • Funding opportunities through Michigan State Senate Broadband Bills (2021 S.B. 513- 520) • Federal funding initiatives	• Telecommunication service charges • Infrastructure & equipment for private wireless broadband networks based on usage, capacity, coverage/density, & geography requirements • Student wireless broadband connectivity devices (e.g. hotspots) for connecting student devices • Ongoing operations & maintenance
Public wireless	• Counties & municipalities • Federal Communications Commission • Healthcare • Institute for Local Self-Reliance • K-12 & higher education • Libraries • Michigan Economic Development Corporation • Michigan High-Speed Internet Office • State of Michigan • Telecommunications providers	• Overall solution costs • Availability of individual governmental building internet bandwidth • Constraints as a result of PA224 • Affordability for end users • Funding opportunities through Michigan State Senate Broadband Bills (2021 S.B. 513- 520) • Federal funding initiatives	• Telecommunication service charges • Infrastructure & equipment for private wireless broadband networks based on usage, capacity, coverage/density, & geography requirements • Ongoing operations & maintenance

MODEL	POTENTIAL PARTNERS	SOLUTION CONSIDERATIONS	MAJOR COST COMPONENTS
Vertical asset	• Counties & municipalities • Federal Communications Commission • Institute for Local Self-Reliance • K-12 & higher education • Michigan High-Speed Internet Office • Private organizations • State of Michigan • Telecommunications providers	• Infrastructure build-out costs, including upgrading or expanding existing broadband networks • Operational costs associated with ongoing network administration & operation • Household/customer broadband equipment costs • Additional funding opportunities through Michigan State Senate Broadband Bills (2021 S.B. 513- 520)	• Aggregate bandwidth requirements & oversubscription considerations • Infrastructure build-out including usage, capacity, & coverage/density, & geography requirements • Licensing & related expenses associated with the use of public and/or private vertical assets • Ongoing operations & maintenance
Electric cooperatives	• Electrical utilities • Federal Communications Commission • Michigan Electric Cooperative Association (MECA) • Michigan High-Speed Internet Office • Municipalities • Telecommunications providers	• Potential right-of-way considerations • Incremental costs associated with broadband infrastructure build-out • Household/customer broadband equipment costs • State & federal funding opportunities	• Planned service areas & broadband service levels • Existing condition & availability of usable assets (e.g., utility poles, etc.) • Infrastructure build-out, including coverage requirements • Licensing & related expenses associated with the use of electrical grid assets
Middle mile	• Federal Communications Commission • Michigan High-Speed Internet Office • Counties & municipalities • Telecommunications providers	• Adequacy, age, & condition of existing fiber networks • Constraints as a result of PA224 • Household/customer broadband equipment costs • Additional funding opportunities through Michigan State Senate Broadband Bills (2021 S.B. 513- 520)	• Planned service areas & broadband service levels • Infrastructure build-out, including coverage requirements • Ongoing operations & maintenance

MODEL	POTENTIAL PARTNERS	SOLUTION CONSIDERATIONS	MAJOR COST COMPONENTS
Neighborhood wireless	• Federal Communications Commission • Michigan High-Speed Internet Office • Municipalities • Private organizations • Community groups • Telecommunications providers	• Operational costs associated with ongoing network administration & operation • Household/customer broadband equipment & service costs	• Required customer broadband equipment (i.e., wireless networking) • Quantity of broadband subscribers within a geography (for cost sharing)
Nextgen satellite	• Federal Communications Commission • Michigan High-Speed Internet Office • Telecommunications providers	• Household/customer broadband equipment & service costs	• Required customer broadband equipment (i.e., satellite dish)

Solution models assume the use of customer-provided equipment for device access (except for educational wireless model).

I. Example community broadband playbook resources

Connected Nation

Connected Nation has developed a community broadband playbook accessible on the connectmycommunity.org website (**connectmycommunity.org/playbook/**). The purpose of the playbook is to help communities develop a local environment and culture to enhance and support the expanded access, adoption, and use of broadband (high-speed internet) and related technologies. While the playbook on the website is laid out and intended to be followed in order, it certainly isn't the only way for communities to accomplish their desired objectives. The playbook is designed to challenge communities to develop effective technology leadership and advocacy and to ask questions that will enable an accurate assessment of their current needs and ultimately lead to better planning, execution, and expansion of broadband technology.

Merit Network, Inc.

Merit Network, Inc. has developed the Michigan Moonshot Broadband Framework, which is another excellent resource for broadband planning activities. It's Chapter 3 lists frameworks and toolkits developed by leading organizations and is accessible at **www.merit.edu/community/moonshot/framework/**.

J. Data sources

Report sources

1. CoSN Student Home Connectivity Study, May 2021.
   www.cosn.org/about/news/cosn-releases-key-findings-breakthrough-study-student-home-connectivity
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   data.census.gov/cedsci/table?q=broadband&g=0400000US26&tid=ACSST1Y2019.S2801&hidePreview=true
3. Future Ready Schools website — Interactive map about access in your state.
   futureready.org/homework-gap/#map
4. Michigan Education Technology Leaders, Michigan Association of Intermediate School Administrators, Michigan Department of Education infographic:
   What Michigan Needs to Know to Close/Impact the Digital Divide.
   www.gomaisa.org/downloads/general/maisa_digital_divide_infographic_042320_1.pdf
5. Michigan State University — MSU Today.
   Poor internet connection leaves rural students behind. March 2, 2020.
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6. National Conference of State Legislatures — State Broadband Task Forces, Commissions, or Authorities and Other Broadband Resources.
   www.ncsl.org/research/telecommunications-and-information-technology/state-broadband-task-forces-commissions.aspx
7. Broadband Expansion Act of Michigan — Act 224 of 2020.
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8. 2020 Institute for Local Self-Reliance
   muninetworks.org/

Mapping sources

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  www.mischooldata.org/historical-economically-disadvantaged-counts
- Connected Nation Broadband Availability, September 2020
  connectednation.org/michigan/mapping-analysis/
- FAA Digital Obstacle File, January 2021
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- United States Census Bureau — American Community Survey,
  School Enrollment Base, 2019
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- Homeland Infrastructure Foundation-Level Data Hospitals, December 2020
  hifld-geoplatform.opendata.arcgis.com/datasets/hospitals
- Homeland Infrastructure Foundation-Level Public Schools, December 2020
  hifld-geoplatform.opendata.arcgis.com/datasets/public-schools
- Form 477 Mobile Voice and Broadband Coverage Areas
  www.fcc.gov/form-477-mobile-voice-and-broadband-coverage-areas

MAISA
MICHIGAN ASSOCIATION OF INTERMEDIATE SCHOOL ADMINISTRATORS
SUPPORTING REGIONAL EDUCATION SERVICE AGENCIES

MiConnect

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