Educational Service Unit Coordinating Council
Information Services Committee Meeting
Wednesday, March 4, 2020, 11:30 AM
ESU 7 plus Zoom, 2657 44th Ave, Columbus, NE 68601

1. Call to Order
2. Roll call
3. Agenda Item
    1. DE2TAILS - Innovation Grant
    2. Equitable Access and Digital Resources Innovation Grant
    3. Learn360 Discussion
    4. MSA 2020-2021
    1. Approve NOC Budget Requests for 2020-21
    2. Approve TLT Budget Requests 2020-2021
    5. SpaceX Document/Presentation
    6. Staff Reports
    1. Scott Isaacson
    2. Beth Kabes
    3. Rhonda Eis
    4. Next Meeting Agenda Items
    5. Adjournment

{{Name: Agenda Item Name}}
{{Discussion: Agenda Item Discussion}}
{{Comments: Agenda Item Comments}}
{{Actions: Agenda Item Actions}}

Nebraska Open Meetings Act

84-1407. Act, how cited. Sections 84-1407 to 84-1414 shall be known and may be cited as the Open Meetings Act.

84-1408. Declaration of intent; meetings open to public. It is hereby declared to be the policy of this state that the formation of public policy is public business and may not be conducted in secret. Every meeting of a public body shall be open to the public in order that citizens may exercise their democratic privilege of attending and speaking at meetings of public bodies, except as otherwise provided by the Constitution of Nebraska, federal statutes, and the Open Meetings Act.

84-1409. Terms, defined. For purposes of the Open Meetings Act, unless the context otherwise requires:

(1)(a) Public body means (i) governing bodies of all political subdivisions of the State of Nebraska, (ii) governing bodies of all agencies, created by the Constitution of Nebraska, statute, or otherwise pursuant to law, of the executive department of the State of Nebraska, (iii) all independent boards, commissions, bureaus, committees, councils, subunits, or any other bodies created by the Constitution of Nebraska, statute, or otherwise pursuant to law, (iv) all study or advisory committees of the executive department of the State of Nebraska whether having continuing existence or appointed as special committees with limited existence, (v) advisory committees of the bodies referred to in subdivisions (i), (ii), and (iii) of this subdivision, and (vi) instrumentalities exercising essentially public functions; and

(b) Public body does not include (i) subcommittees of such bodies unless a quorum of the public body attends a subcommittee meeting or unless such subcommittees are holding hearings, making policy, or taking formal action on behalf of their parent body, except that all meetings of any subcommittee established under section 81-15,175 are subject to the Open Meetings Act, and (ii) entities conducting judicial proceedings unless a court or other judicial body is exercising rulemaking authority, deliberating, or deciding upon the issuance of administrative orders;

(2) Meeting means all regular, special, or called meetings, formal or informal, of any public body for the purposes of briefing, discussion of public business, formation of tentative policy, or the taking of any action of the public body; and

(3) Videoconferencing means conducting a meeting involving participants at two or more locations through the use of audio-video equipment which allows participants at each location to hear and see each meeting participant at each other location, including public input. Interaction between meeting participants shall be possible at all meeting locations.

84-1410. Closed session; when; purpose; reasons listed; procedure; right to challenge; prohibited acts; chance meetings, conventions, or workshops.

(1) Any public body may hold a closed session by the affirmative vote of a majority of its voting members if a closed session is clearly necessary for the protection of the public interest or for the prevention of needless injury to the reputation of an individual and if such individual has not requested a public meeting. The subject matter and the reason necessitating the closed session shall be identified in the motion to close. Closed sessions may be held for, but shall not be limited to, such reasons as: (a) Strategy sessions with respect to collective bargaining, real estate purchases, pending litigation, or litigation which is imminent as evidenced by communication of a claim or threat of litigation to or by the public body; (b) Discussion regarding deployment of security personnel or devices; (c) Investigative proceedings regarding allegations of criminal misconduct; (d) Evaluation of the job performance of a person when necessary to prevent needless injury to the reputation of a person and if such person has not requested a public meeting; (e) For the Community Trust created under section 81-1801.02, discussion regarding the amounts to be paid to individuals who have suffered from a tragedy of violence or natural disaster; or (f) For public hospitals, governing board peer review activities, professional review activities, review and discussion of medical staff investigations or disciplinary actions, and any strategy session concerning transactional negotiations with any referral source that is required by federal law to be conducted at arms length. Nothing in this section shall permit a closed meeting for discussion of the appointment or election of a new member to any public body.

(2) The vote to hold a closed session shall be taken in open session. The entire motion, the vote of each member on the question of holding a closed session, and the time when the closed session commenced and concluded shall be recorded in the minutes. If the motion to close passes, then the presiding officer immediately prior to the closed session shall restate on the record the limitation of the subject matter of the closed session. The public body holding such a closed session shall restrict its consideration of matters during the closed portions to only those purposes set forth in the motion to close as the reason for the closed session. The meeting shall be reconvened in open session before any formal action may be taken. For purposes of this section, formal action shall mean a collective decision or a collective commitment or promise to make a decision on any question, motion, proposal, resolution, order, or ordinance or formation of a position or policy but shall not include negotiating guidance given by members of the public body to legal counsel or other negotiators in closed sessions authorized under subdivision (1)(a) of this section.

(3) Any member of any public body shall have the right to challenge the continuation of a closed session if the member determines that the session has exceeded the reason stated in the original motion to hold a closed session or if the member contends that the closed session is neither clearly necessary for (a) the protection of the public interest or (b) the prevention of needless injury to the reputation of an individual. Such challenge shall be overruled only by a majority vote of the members of the public body. Such challenge and its disposition shall be recorded in the minutes. (4) Nothing in this section shall be construed to require that any meeting be closed to the public. No person or public body shall fail to invite a portion of its members to a meeting, and no public body shall designate itself a subcommittee of the whole body for the purpose of circumventing the Open Meetings Act. No closed session, informal meeting, chance meeting, social gathering, email, fax, or other electronic communication shall be used for the purpose of circumventing the requirements of the act.

(5) The act does not apply to chance meetings or to attendance at or travel to conventions or workshops of members of a public body at which there is no meeting of the body then intentionally convened, if there is no vote or other action taken regarding any matter over which the public body has supervision, control, jurisdiction, or advisory power.

84-1411. Meetings of public body; notice; contents; when available; right to modify; duties concerning notice; videoconferencing or telephone conferencing authorized; emergency meeting without notice; appearance before public body.

(1) Each public body shall give reasonable advance publicized notice of the time and place of each meeting by a method designated by each public body and recorded in its minutes. Such notice shall be transmitted to all members of the public body and to the public. Such notice shall contain an agenda of subjects known at the time of the publicized notice or a statement that the agenda, which shall be kept continually current, shall be readily available for public inspection at the principal office of the public body during normal business hours. Agenda items shall be sufficiently descriptive to give the public reasonable notice of the matters to be considered at the meeting. Except for items of an emergency nature, the agenda shall not be altered later than (a) twenty-four hours before the scheduled commencement of the meeting or (b) forty-eight hours before the scheduled commencement of a meeting of a city council or village board scheduled outside the corporate limits of the municipality. The public body shall have the right to modify the agenda to include items of an emergency nature only at such public meeting.

(2) A meeting of a state agency, state board, state commission, state council, or state committee, of an advisory committee of any such state entity, of an organization created under the Interlocal Cooperation Act, the Joint Public Agency Act, or the Municipal Cooperative Financing Act, of the governing body of a public power district having a chartered territory of more than one county in this state, of the governing body of a public power and irrigation district having a chartered territory of more than one county in this state, of a board of an educational service unit, of the Educational Service Unit Coordinating Council, of the governing body of a risk management pool or its advisory committees organized in accordance with the Intergovernmental Risk Management Act, or of a community college board of governors may be held by means of videoconferencing or, in the case of the Judicial Resources Commission in those cases specified in section 24-1204, by telephone conference, if: (a) Reasonable advance publicized notice is given; (b) Reasonable arrangements are made to accommodate the public's right to attend, hear, and speak at the meeting, including seating, recordation by audio or visual recording devices, and a reasonable opportunity for input such as public comment or questions to at least the same extent as would be provided if videoconferencing or telephone conferencing was not used; (c) At least one copy of all documents being considered is available to the public at each site of the videoconference or telephone conference; (d) At least one member of the state entity, advisory committee, board, council, or governing body is present at each site of the videoconference or telephone conference, except that a member of an organization created under the Interlocal Cooperation Act that sells electricity or natural gas at wholesale on a multistate basis, an organization created under the Municipal Cooperative Financing Act, or a governing body of a risk management pool or an advisory committee of such organization or pool may designate a nonvoting designee, who shall not be included as part of the quorum, to be present at any site; and (e)(i) Except as provided in subdivision (2)(e)(ii) of this section, no more than one-half of the state entity's, advisory committee's, board's, council's, or governing body's meetings in a calendar year are held by videoconference or telephone conference; or (ii) In the case of an organization created under the Interlocal Cooperation Act that sells electricity or natural gas at wholesale on a multistate basis or an organization created under the Municipal Cooperative Financing Act, such organization holds at least one meeting each calendar year that is not by videoconferencing or telephone conferencing. Videoconferencing, telephone conferencing, or conferencing by other electronic communication shall not be used to circumvent any of the public government purposes established in the Open Meetings Act.

(3) A meeting of a board of an educational service unit, of the Educational Service Unit Coordinating Council, of the governing body of an entity formed under the Interlocal Cooperation Act, the Joint Public Agency Act, or the Municipal Cooperative Financing Act, of the governing body of a risk management pool or its advisory committees organized in accordance with the Intergovernmental Risk Management Act, of a community college board of governors, of the governing body of a public power district, of the governing body of a public power and irrigation district, or of the Nebraska Brand Committee may be held by telephone conference call if: (a) The territory represented by the educational service unit, member educational service units, community college board of governors, public power district, public power and irrigation district, Nebraska Brand Committee, or member public agencies of the entity or pool covers more than one county; (b) Reasonable advance publicized notice is given which identifies each telephone conference location at which there will be present: (i) A member of the educational service unit board, council, community college board of governors, governing body of a public power district, governing body of a public power and irrigation district, Nebraska Brand Committee, or entity's or pool's governing body; or (ii) A nonvoting designee designated under subdivision (3)(f) of this section; (c) All telephone conference meeting sites identified in the notice are located within public buildings used by members of the educational service unit board, council, community college board of governors, governing body of the public power district, governing body of the public power and irrigation district, or entity or pool or at a place which will accommodate the anticipated audience; (d) Reasonable arrangements are made to accommodate the public's right to attend, hear, and speak at the meeting, including seating, recordation by audio recording devices, and a reasonable opportunity for input such as public comment or questions to at least the same extent as would be provided if a telephone conference call was not used; (e) At least one copy of all documents being considered is available to the public at each site of the telephone conference call; (f) At least one member of the educational service unit board, council, community college board of governors, governing body of the public power district, governing body of the public power and irrigation district, Nebraska Brand Committee, or governing body of the entity or pool is present at each site of the telephone conference call identified in the public notice, except that a member of an organization created under the Interlocal Cooperation Act that sells electricity or natural gas at wholesale on a multistate basis, an organization created under the Municipal Cooperative Financing Act, or a governing body of a risk management pool or an advisory committee of such organization or pool may designate a nonvoting designee, who shall not be included as part of the quorum, to be present at any site; (g) The telephone conference call lasts no more than five hours; and (h) No more than one-half of the board's, council's, governing body's, entity's, or pool's meetings in a calendar year are held by telephone conference call, except that: (i) The governing body of a risk management pool that meets at least quarterly and the advisory committees of the governing body may each hold more than one-half of its meetings by telephone conference call if the governing body's quarterly meetings are not held by telephone conference call or videoconferencing; and (ii) An organization created under the Interlocal Cooperation Act that sells electricity or natural gas at wholesale on a multistate basis or an organization created under the Municipal Cooperative Financing Act may hold more than one-half of its meetings by telephone conference call if the organization holds at least one meeting each calendar year that is not by videoconferencing or telephone conference call. Nothing in this subsection shall prevent the participation of consultants, members of the press, and other nonmembers of the governing body at sites not identified Daily Documentation 1st Quarter in the public notice. Telephone conference calls, emails, faxes, or other electronic communication shall not be used to circumvent any of the public government purposes established in the Open Meetings Act.

(4) The secretary or other designee of each public body shall maintain a list of the news media requesting notification of meetings and shall make reasonable efforts to provide advance notification to them of the time and place of each meeting and the subjects to be discussed at that meeting.

(5) When it is necessary to hold an emergency meeting without reasonable advance public notice, the nature of the emergency shall be stated in the minutes and any formal action taken in such meeting shall pertain only to the emergency. Such emergency meetings may be held by means of electronic or telecommunication equipment. The provisions of subsection (4) of this section shall be complied with in conducting emergency meetings. Complete minutes of such emergency meetings specifying the nature of the emergency and any formal action taken at the meeting shall be made available to the public by no later than the end of the next regular business day.

(6) A public body may allow a member of the public or any other witness other than a member of the public body to appear before the public body by means of video or telecommunications equipment.

84-1412. Meetings of public body; rights of public; public body; powers and duties.

(1) Subject to the Open Meetings Act, the public has the right to attend and the right to speak at meetings of public bodies, and all or any part of a meeting of a public body, except for closed sessions called pursuant to section 84-1410, may be videotaped, televised, photographed, broadcast, or recorded by any person in attendance by means of a tape recorder, camera, video equipment, or any other means of pictorial or sonic reproduction or in writing.

(2) It shall not be a violation of subsection (1) of this section for any public body to make and enforce reasonable rules and regulations regarding the conduct of persons attending, speaking at, videotaping, televising, photographing, broadcasting, or recording its meetings. A body may not be required to allow citizens to speak at each meeting, but it may not forbid public participation at all meetings.

(3) No public body shall require members of the public to identify themselves as a condition for admission to the meeting nor shall such body require that the name of any member of the public be placed on the agenda prior to such meeting in order to speak about items on the agenda. The body may require any member of the public desiring to address the body to identify himself or herself.

(4) No public body shall, for the purpose of circumventing the Open Meetings Act, hold a meeting in a place known by the body to be too small to accommodate the anticipated audience.

(5) No public body shall be deemed in violation of this section if it holds its meeting in its traditional meeting place which is located in this state.

(6) No public body shall be deemed in violation of this section if it holds a meeting outside of this state if, but only if: (a) A member entity of the public body is located outside of this state and the meeting is in that member's jurisdiction; (b) All out-of-state locations identified in the notice are located within public buildings used by members of the entity or at a place which will accommodate the anticipated audience; (c) Reasonable arrangements are made to accommodate the public's right to attend, hear, and speak at the meeting, including making a telephone conference call available at an instate location to members, the public, or the press, if requested twenty-four hours in advance; (d) No more than twenty-five percent of the public body's meetings in a calendar year are held out-of-state; (e) Out-of-state meetings are not used to circumvent any of the public government purposes established in the Open Meetings Act; (f) Reasonable arrangements are made to provide viewing at other instate locations for a videoconference meeting if requested fourteen days in advance and if economically and reasonably available in the area; and (g) The public body publishes notice of the out-of-state meeting at least twenty-one days before the date of the meeting in a legal newspaper of statewide circulation.

(7) The public body shall, upon request, make a reasonable effort to accommodate the public's right to hear the discussion and testimony presented at the meeting.

(8) Public bodies shall make available at the meeting or the instate location for a telephone conference call or videoconference, for examination and copying by members of the public, at least one copy of all reproducible written material to be discussed at an open meeting. Public bodies shall make available at least one current copy of the Open Meetings Act posted in the meeting room at a location accessible to members of the public. At the beginning of the meeting, the public shall be informed about the location of the posted information.

84-1413. Meetings; minutes; roll call vote; secret ballot; when.

(1) Each public body shall keep minutes of all meetings showing the time, place, members present and absent, and the substance of all matters discussed.

(2) Any action taken on any question or motion duly moved and seconded shall be by roll call vote of the public body in open session, and the record shall state how each member voted or if the member was absent or not voting. The requirements of a roll call or viva voce vote shall be satisfied by a public body which utilizes an electronic voting device which allows the yeas and nays of each member of such public body to be readily seen by the public.

(3) The vote to elect leadership within a public body may be taken by secret ballot, but the total number of votes for each candidate shall be recorded in the minutes.

(4) The minutes of all meetings and evidence and documentation received or disclosed in open session shall be public records and open to public inspection during normal business hours.

(5) Minutes shall be written, except as provided in subsection (6) of this section, and available for inspection within ten working days or prior to the next convened meeting, whichever occurs earlier, except that cities of the second class and villages may have an additional ten working days if the employee responsible for writing the minutes is absent due to a serious illness or emergency.

(6) Minutes of the meetings of the board of a school district or educational service unit may be kept as an electronic record.

84-1414. Unlawful action by public body; declared void or voidable by district court; when; duty to enforce open meeting laws; citizen's suit; procedure; violations; penalties.

(1) Any motion, resolution, rule, regulation, ordinance, or formal action of a public body made or taken in violation of the Open Meetings Act shall be declared void by the district court if the suit is commenced within one hundred twenty days of the meeting of the public body at which the alleged violation occurred. Any motion, resolution, rule, regulation, ordinance, or formal action of a public body made or taken in substantial violation of the Open Meetings Act shall be voidable by the district court if the suit is commenced more than one hundred twenty days after but within one year of the meeting of the public body in which the alleged violation occurred. A suit to void any final action shall be commenced within one year of the action.

(2) The Attorney General and the county attorney of the county in which the public body ordinarily meets shall enforce the Open Meetings Act.

(3) Any citizen of this state may commence a suit in the district court of the county in which the public body ordinarily meets or in which the plaintiff resides for the purpose of requiring compliance with or preventing violations of the Open Meetings Act, for the purpose of declaring an action of a public body void, or for the purpose of determining the applicability of the act to discussions or decisions of the public body. It shall not be a defense that the citizen attended the meeting and failed to object at such time. The court may order payment of reasonable attorney's fees and court costs to a successful plaintiff in a suit brought under this section.

(4) Any member of a public body who knowingly violates or conspires to violate or who attends or remains at a meeting knowing that the public body is in violation of any provision of the Open Meetings Act shall be guilty of a Class IV misdemeanor for a first offense and a Class III misdemeanor for a second or subsequent offense.

Revised 6-3-19

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Software Innovation Network

Project Charter

February 3, 2020

Purpose

Building on the work of *Data Ecosystem Innovation Grant project*, the creation of the Software Innovation Network focuses on cooperative software development, evaluation and licensing to address currently unmet needs. The *Education Innovation Network* will review, revise and improve current practices to provide high-quality software and features to students, educators and administrators:

- by being highly attentive to meeting Nebraska-specific needs and use cases
- at a low, sustainable cost
- with equitable statewide access
- while raising the level of data privacy and security protections

Sponsor

Nebraska Innovation Grant Program funded by Nebraska Innovation Education Fund operated through the Nebraska Department of Education, Dean Folkers, Information Systems Officer

Scope

This Education Innovation Network will include school districts and educational service units working together and with the Educational Service Unit Coordinating Council (ESUCC) **to develop and maintain a portfolio of innovative digital tools and resources.** Through surveys and follow-up interviews, **common areas of need will be identified,** clearly defined **and prioritized.** The highest-priority needs will be selected for focus, and project teams will be assembled to advance toward meeting those needs.

Desired Goals and Outcomes

- **Review** appropriate and available **data** to determine priority software needs in Nebraska.
- **Create a process** for prioritizing, evaluating options, testing, deployment, ongoing evaluation and ultimate sustainability / decommissioning for state-wide enterprise-level software solutions.

- **Develop a governance structure** to support the process and ensure strategic investment in innovative projects.
- **Use the process** to select and implement two or more projects.
- **Evaluate and revise** the process based on the experience of the project implementations.

Authority

The Software Innovation Network, also known as the Equitable Access and Digital Resources Innovation Network is chartered by the Nebraska Department of Education (NDE). Representatives serve on behalf of their organizations and communities of practice to provide input to the Network leadership and stakeholders to shape the way our education system specifies, evaluates, acquires and uses software and related resources to improve teaching and learning.

Membership

The Network's leadership and project teams will broadly represent the K-12 education community in Nebraska. For purposes of this Network, a leadership team will assist in advising the work of the Network. In addition, district and ESU's may submit an application to participate in the work of the Network.

Leadership Team: The ESUCC Technology Director will serve as the chair and Network Manager. Members of the leadership team will be representative of the education system and provide opportunities for coordination and strategic priorities. Members selected of the leadership team represent nominated, recommended, or volunteers to reflect the diverse needs desired to support the system.

Leadership team membership will include the following representative groups including Educational Service Units (ESUs) and school districts:

- Technology director
- Technology integration
- Professional Learning
- Administration
- Digital Learning / Learning Engineer
- Special Education
- NDE
- Cooperative Purchasing
- Instructional materials
- Network Nebraska
- Network director - ESUCC Technology Director
- NDE Information Services Officer

Meetings and Timeframe

The ESUCC Technology Director (Network director) or designee will chair each leadership team meeting and attend project team meetings. Project teams will be formed by the leadership team to manage and track project work.

Leadership team meetings will be at minimum bi-monthly and more frequent as the Network is formed and starts its work, scheduled by the Network director and leadership team members. The meeting agenda will be determined by the Network director with input from leadership members. Meetings may be face-to-face or via video conferencing.

At the end of each fiscal year in June or more frequently as needed, the Network director and leadership team will evaluate the effectiveness of the Network and make recommendations to the NDE Information Services Officer for future approaches.

Duration: The initial resources of the Education Innovation Fund provide resources for the Education Innovation Network through June 30, 2021.

2019-2020 Charter Membership Appointments

- Technology director - Bill Pulte, ESU 3
- Technology integration - Craig Hicks, ESU 13
- Professional Learning
- Administration
- Digital Learning / Learning Engineer
- Special Education
- NDE
- Cooperative Purchasing
- Instructional materials
- Network Nebraska
- Network director - Scott Isaacson, ESUCC Technology Director
- NDE Information Services Officer - Dean Folkers

ADDENDUM/EXTENSION TO 2017-2020 SPECIAL BUY AGREEMENT BETWEEN ESUCC COOPERATIVE PURCHASING AND Infobase Learning

This Amendment and Extension is made by and between Nebraska ESUCC Cooperative Purchasing ("Cooperative") and Infobase Learning ("Contractor") to the 2017-2020 Special Buy Agreement ("Agreement") signed by the Cooperative on July 10, 2017, and by the Contractor on June 20, 2017. The Addendum is as follows:

The Terms and Conditions of the Agreement are amended as follows:

No Changes to Terms and Conditions Agreement.

Exhibit "A" is amended to add the following goods or services:

The following products are being recommended as additions to the ESUCC 2017-2020 Special Buy.

- **Learn360 –** With an appealing new design, enhanced functionality, and an improved user experience, *Learn360* is the ultimate streaming multimedia resource for the K–12 educational market—the complete district solution. Teachers, students, and parents can access more than 164,000 media resources on any Internet-enabled device, anytime, anywhere, and engaging content landing pages make it easy to find the wealth of videos, interactives, printables, audio content, and maps and flags. The entire site and all landing pages can be filtered by grade level (all grades, elementary, or middle/high) for targeted browsing.

Exhibit "B" is amended to add the following pricing information:

Learn360

Price Band – per student	MSRP	ESUCC Price	ESUCC Price to Members (includes 2% Admin fee)
10,000 – 20,000	$	$ .75/Student	$ .77/Student
20,001 – 40,000	$	$ .70/Student	$ .72/Student
40,001 – 60,000	$	$ .55/Student	$ .56/Student
60,001 – 90,000	$	$ .43/Student	$ .44/Student
90,001 – 120,000	$	$ .30/Student	$ .31/Student

Product Description	MSRP	Minimum School Price	District Price
Middle/High School Resources			

Feature Films for Education Collection	$	$735	$725/school
World Almanac	$	$425	$0.33/Student
American History Online	$1099	$725	$0.55/Student
Bloom's Literature	$1099	$725	$0.55/Student
Science Online	$1099	$725	$0.55/Student
Issues and Controversies	$1099	$725	$0.55/Student
Modern World History	$765	$ 525	$0.45/Student
Ancient & Medieval History	$765	$ 525	$0.45/Student
Today's Science	$765	$ 525	$0.45/Student
Health Reference Center	$765	$ 525	$0.45/Student
		K-8 Resources	
World Almanac for Kids	$575	$525	$0.45/Student
World Almanac for Kids Elementary Edition	$575	$525	$0.45/Student
The Mailbox	$575	$525	$0.45/Student

The Agreement permits amendment and modification by a signed, written agreement by both parties that identifies itself as an amendment. The Cooperative has approved an extension and now desires to extend the Agreement for an additional term of thirty-six (36) months until July 31, 2023. Upon the signature of an authorized officer of the Cooperative and the Contractor, the Agreement is hereby extended.

COOPERATIVE **CONTRACTOR**

_____	_____
Name:_____	Name:_____
Executive Director	Title:_____
Executed on Date:_____	Executed on Date:_____

ESU	Public Students Prk-12	NonPublic Students Prk-12	Total Students	Public plus 50% Cost	NonPublic ($0.46)
4	6,707	606	7,313	$4,275.45	$278.76
5	5,671	346	6,017	$4,047.31	$159.16
8	10,966	1,923	12,889	$5,213.35	$884.58
13	14,337	456	14,793	$5,955.69	$209.76
15	3,689	139	3,828	$3,610.84	$63.94
16	8,192	482	8,674	$4,602.47	$221.72
17	1,546	20	1,566	$3,138.92	$9.20
18	42,258		42,258	$12,104.32	$0.00
TOTALS	93,366	3,972	97,338		$1,827.12
licensed	97,338				
ESU	$2,798.47				

NON RENEWING ESUs

ESU	Public	NonPublic	Total Students	Marketplace Pricing at $0.21	2019-20 Fee
1	11,560	890	12,450	$3,859.50	$6,539.80
2	12,918	1,822	14,740	$4,569.40	-
3	60,444		60,444	$18,737.64	$16,398.88
6	14,270	805	15,075	$4,673.25	-
7	13,269	2,399	15,668	$4,857.08	$7,550.44
9	9,646	661	10,307	$3,195.17	$6,031.10
10	31,342	1,284	32,626	$10,114.06	-
11	4,954	47	5,001	$1,550.31	-
19	53,483		53,483	$16,579.73	-

ESU	Total Fee with 50/50 Formula 2019-20(Columns E+F)
1	$6,539.80
3 (no Millard)	$16,398.88
4	$5,336.18
5	$5,026.68
7	$7,550.44
8	$6,801.87
9	$6,031.10
13	$6,903.86
15	$4,512.22
16	$5,689.55
17	$4,000.06
18	$12,682.16
	$87,472.80

Total Fee with MSA 50/50	MSA Per Student Cost	Marketplace Pricing	Savings Moving into	ESU
$4,554.21	$0.62	$2,267.03	$2,287.18	4
$4,206.47	$0.70	$1,865.27	$2,341.20	5
$6,097.93	$0.47	$3,995.59	$2,102.34	8
$6,165.45	$0.42	$4,585.83	$1,579.62	13
$3,674.78	$0.96	$1,186.68	$2,488.10	15
$4,824.19	$0.56	$2,688.94	$2,135.25	16
$3,148.12	$2.01	$485.46	$2,662.66	17
$12,104.32	$0.29	$13,099.98	-$995.66	18
$44,775.48	$0.46	$30,174.78		

ESU
1
2
3
6
7
9
10
11
19

Not included - Millard Pulbic

Marketplace Pricing	
Price band per	ESUCC member
10,000 - 20,000	$0.77
20,001 - 40,000	$0.72
40,001 - 60,000	$0.56
60,001 - 90,000	$0.44
90,001 - above	$0.31

PDO Training Form

Contact Person/Affiliate Chair: Jamen Hall
Affiliate: NOC
Email: jamen.hall@esu6.org
Phone: 402-761-7001

Contractor/Company: None selected yet
Presenter:
Email:
Phone:
Address: City, State, Zip:
Point of Contact:

Workshop Title: None selected yet
Date of Workshop: No date selected yet
Projected cost of workshop (include presenter fees, materials, expenses, etc):

Budget request for 2020-21
$21,000 for NOC training
$9,000 for online instructional materials
$30,000 total

How does workshop align with ESU CC Goals and ESUCC/NDE priority areas?

Office Use:
Contract sent: Date Received:
W-9/W4NA: Date Received:

Rural Broadband Task Force
General Written Comments Received Oct. 1, 2018-Aug. 13, 2019

Date	First	Last	Organization	City	State
Dec. 9, 2018	Michael	Matt Miller	Microsoft	Redmond	WA
Dec. 10, 2018	Rod	Wagner	Nebraska Library Commission	Lincoln	NE
Dec. 10, 2018	Holly	Woldt	Nebraska Library Commission	Lincoln	NE
July 15, 2019	Shawn	Strizek		Valparaiso	NE
July 23, 2019	Nancy	Hinrichs		Bruning	NE
July 23, 2019	Jamie	Hadden	SpaceX.com	Hawthorne	CA
July 28, 2019	Jenna	Christensen		Pender	NE

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December 9, 2018

Nebraska Rural Broadband Task Force
Attention: Anne Byers, Community IT Manager
anne.byers@nebraska.gov

Chairman Friesen and Chairman Toner,

Thank you for the opportunity to share Microsoft's vision for how the State of Nebraska can bring broadband internet access to its unserved rural communities.

Advancements in internet-based technology are rapidly transforming how we work, communicate, access information, and educate our children. However, 19.4 million Americans in rural areas lack of broadband access and are unable to take advantage of the economic and educational opportunities enjoyed by their urban neighbors.

Closing the rural broadband gap is possible thanks to advances in new, cost-effective wireless technologies. Specifically, a combination of the TV white spaces spectrum, fixed wireless, and satellite coverage can significantly reduce the initial capital and operating costs compared with the cost of using fiber cables alone.

At Microsoft, we're prepared to invest our own resources to help serve as a catalyst for broader market adoption of these wireless technologies. As part of our Airband initiative, we are executing a three-part strategy to connect rural Americans:

1. Direct projects with partners

Microsoft will invest in partnerships with telecommunications companies with the goal of bringing broadband connectivity to three million people in rural America by July 4, 2022.

Our goal is not to enter the telecommunications business ourselves or even to profit directly from these projects. We will invest in the upfront capital

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projects needed to expand broadband coverage, seek a revenue share from operators to recoup our investment, and then use these revenue proceeds to invest in additional projects to expand coverage further.

2. Digital skills training for people of all ages

Working through Microsoft Philanthropies, our Rural Airband Initiative will invest in helping train people of all ages in these rural communities on the latest technologies so they can use this new connectivity to improve education, healthcare, agriculture, and transform their businesses.

3. Stimulating investment by others through technology licensing

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

That's why we're launching a new program to stimulate investment through royalty free access to at least 39 patents and sample source code related to technology we've developed to better enable broadband connectivity through the use of TV white spaces spectrum in rural areas.

Please find attached our whitepaper, A Rural Broadband Strategy, which further details our approach to connecting rural America to new opportunities. We hope this information useful to the Task Force, and we would welcome the opportunity to further discuss how we can help all Nebraskans realize the economic and educational benefits that come from broadband internet access.

Sincerely,

Michael Mattmiller
State Government Affairs Director
Microsoft Corporation
[redacted]

A Rural Broadband Strategy

Connecting Rural America to New Opportunities

Microsoft

CONNECTING RURAL AMERICA TO NEW OPPORTUNITIES

Executive Summary

Advancements in technology are rapidly transforming how we work, communicate, access information, and educate our children. Powered by cloud computing, these new capabilities are driving economic growth and innovations that weren't possible a decade ago.

However, 34 million Americans still lack a critical connection to the wealth of opportunities that the cloud presents: a broadband internet connection.

Of these, 23.4 million live in rural areas and their lack of broadband access means they are unable to take advantage of the economic and educational opportunities enjoyed by their urban neighbors.[1]

Yet despite this glaring disparity, real progress to close the rural broadband gap has plateaued in recent years. High costs, the absence of new and alternative technologies, and market and regulatory conditions have all hampered efforts to expand coverage.

But this is changing, thanks to recent advancements in technology, newly-adopted standards, business model innovations, and a growing demand for a broad range of cloud services.

A New Rural Broadband Strategy

The time is right for the nation to set a clear and ambitious but achievable goal: to eliminate the rural broadband gap within the next five years—by July 4, 2022.

We believe the nation can bring broadband coverage to rural America in this timeframe, based on a new strategic approach that combines private sector capital investments focused on new technologies along with affordable public sector support.

This whitepaper presents new directional findings by The Boston Consulting Group suggesting that a combination of technologies can substantially reduce the total cost of extending broadband coverage.

Specifically, a technology model that uses a combination of the TV white spaces spectrum, fixed wireless, and satellite coverage can reduce the initial capital and operating costs by roughly 80 percent compared with the cost of using fiber cables alone, and by approximately 50 percent compared with the cost of current LTE fixed wireless technology.

One key to deploying this strategy successfully is to use the right technology in the right places.

TV white spaces[2] is expected to provide the best approach to reach approximately 80 percent of this underserved rural population, particularly in areas with a population density between two and 200 people per square mile.

Microsoft itself has considerable experience with this technology, having deployed 20 TV white spaces projects worldwide that have served 185,000 users.

But TV white spaces alone will not provide the complete solution. Satellite coverage is expected to be the most cost-effective solution for most areas with a population density of less than two people per square mile, and LTE fixed wireless for most areas with a density greater than 200 people per square mile. This mixed model for expanding broadband coverage will likely bring the total national cost of closing the rural broadband gap to roughly $10 billion.

Microsoft's New Rural Airband Initiative

At Microsoft, we're prepared to invest our own resources to help serve as a catalyst for broader market adoption of this new model. We're committed to three elements on a five-year basis:

1. Direct projects with partners.

   Microsoft will invest in partnerships with telecommunications companies with the goal of bringing broadband connectivity to 2 million people in rural America by July 4, 2022.

   We and our partners will have 12 projects up and running in 12 states in the next 12 months.

   Our goal is not to enter the telecommunications business ourselves or even to profit directly from these projects. We will invest in the upfront capital projects needed to expand broadband coverage, seek a revenue share from operators to recoup our investment, and then use these revenue proceeds to invest in additional projects to expand coverage further.

2. Digital skills training for people of all ages.

   Working through Microsoft Philanthropies, our Rural Airband Initiative will invest in helping train people of all ages in these rural communities on the latest technologies so they can use this new connectivity to improve education, healthcare, agriculture, and transform their businesses.

   Our first partnership under the Rural Airband Initiative will be a multi-year partnership with National 4-H Council—engaging America's largest youth development organization, 4-H, to provide digital literacy skills training to youth, as well as teen-led learning programs in rural communities.

3. Stimulating investment by others through technology licensing.

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

   That's why we're launching a new program to stimulate investment through royalty-free access to at least 39 patents and sample source code related to technology we've developed to better enable broadband connectivity through the use of TV white spaces spectrum in rural areas.

A Vital Role for the Public Sector

Although we believe the private sector can play the leading role in closing the rural broadband gap, the public sector also has a vital role to play. Three related governmental measures are needed:

First, the Federal Communications Commission (FCC) needs to ensure the continued use of the spectrum needed for this mixed technology model. Specifically, it will be important for the FCC to ensure that at least three channels below 700 MHz—the so-called TV white spaces—are available for wireless use on an unlicensed basis in every market in the country, with additional TV white spaces available in smaller markets and rural areas.

In addition, federal and state infrastructure investments should include targeted funds on a matching basis for the capital investments that will best expand coverage into rural areas that currently lack broadband access. These funds should be made available for use by multiple technologies based on what is most cost-effective in the region, including TV white spaces, fixed wireless, and satellite usage.

Finally, there is a need for improved data collection on rural broadband coverage. The FCC can help by accelerating its work to collect and report publicly on the state of broadband coverage in rural counties, thereby aiding policy makers and the private sector in making targeted investments.

In urban America, we've become accustomed to ongoing capital investments to expand broadband capacity in areas that already have broadband coverage. The time has come to expand this coverage to the rural areas that currently lack it entirely.

We believe a new rural broadband strategy makes this feasible and with Microsoft's Rural Airband Initiative we're prepared to put our own resources and energy behind this effort. We can all innovate together, achieving what none of us can accomplish alone.

And just as we look forward to sharing what we have learned, we look forward to applying over the next five years what we undoubtedly can learn from others. Given the ever-expanding range of cloud services, broadband access is no longer just about watching videos and movies (as enjoyable as this can be). Broadband connections have become indispensable for accessing healthcare, advancing education, improving agriculture, and growing a small business.

As a country, we should not settle for an outcome that leaves behind over 23 million of our rural neighbors. To the contrary, we can and should bring the benefits of broadband coverage to every corner of the nation.

SPOTLIGHT: A HISTORY OF CONNECTING AMERICA

IMAGE SOURCE: MICROSOFT

On March 7, 1916, 800 of America's most prominent leaders from the fields of science, business, art, and government gathered at the New Willard Hotel in Washington, D.C. to honor Alexander Graham Bell and mark the 40th anniversary of his patent for the invention of the telephone.

The event, called "Voice Voyages," was sponsored by The National Geographic Society and featured the unprecedented public demonstration of a coast-to-coast telephone call.

After dinner, receivers were handed out to guests. They listened in as John J. Carty, chief of engineering at the American Telephone and Telegraph Company, connected with people in Pittsburgh, Chicago, Denver, Salt Lake City, Pocatello, El Paso, Boise, Seattle, and even Ottawa, Canada—21 cities in 17 states and one foreign country all in a matter of minutes.

Until that evening, commercial telephone service was mostly limited to exchanges connecting people in relatively contained geographical areas.

That evening's demonstration made clear that telephone service was poised to revolutionize communications and unite every part of the country, from

the largest cities to smaller towns. But the event's most amazing demonstration was still to come.

Up to that point in the evening, the calls had been made over copper wires.

Next, Carty placed a call to U.S. Secretary of the Interior Franklin Lane in New York. The call went by wire to the Navy's "Radio Arlington" towers across the Potomac, which dispatched the call over the air to New York. They were now "talking without wires."

"Perhaps never before in the history of civilization has been such an impressive illustration of the development and power of human mind over mundane matter," reported National Geographic Magazine in its coverage of the event.

"And if the occasion was impressive and its setting inspiring, the events of the evening were dramatic beyond measure, for it seemed indeed that fact has outrun fantasy."

Innovations that made it possible to use wires, cables, radio waves, and fiber optics to instantly transmit ideas, images, voices, videos, and data across vast distances have given rise to technological advances that have revolutionized how we live and learn, work and play, create community and share experiences.

Access to the capabilities these technological advances have made possible is a prerequisite for full participation in the economic and social life of modern American society. Communities that lack access are at risk of falling behind as the rest of us continue to move forward.

As we enter a new era of rapid, technology-driven progress—where capabilities that were once beyond imagining are quickly becoming commonplace—it's worth remembering the words of the writer who covered the Voice Voyage in National Geographic Magazine 101 years ago:

"I feel humbled and meek and overwhelmed, for no man can say, after the things we have seen, after the things that we have heard, that anything is no longer possible."

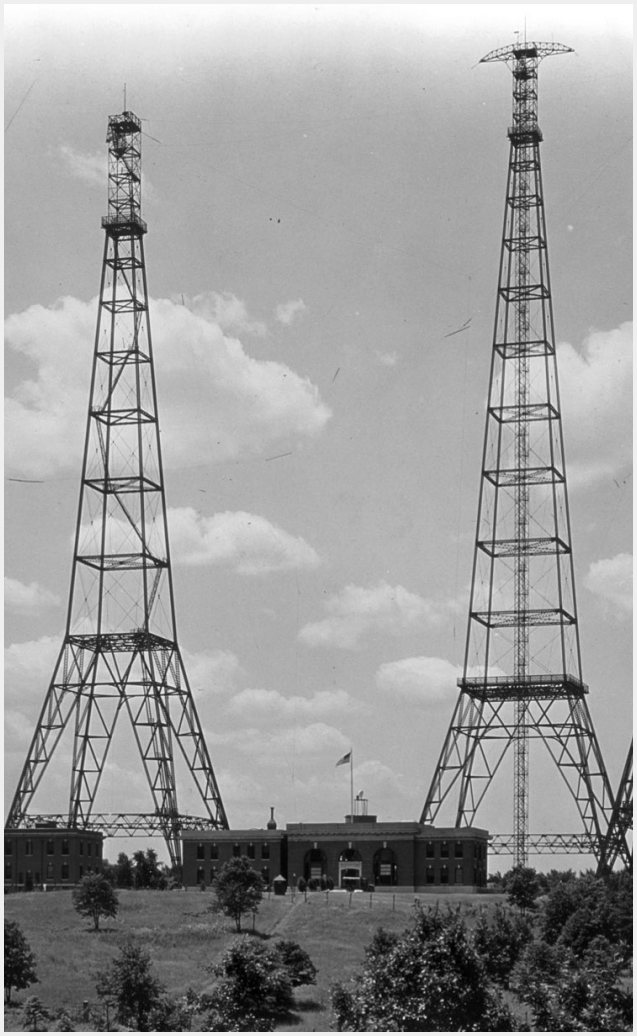


IMAGE SOURCE: THE NATIONAL GEOGRAPHIC MAGAZINE, MARCH 1916

RURAL AMERICA: ON THE WRONG SIDE OF THE DIGITAL DIVIDE

Chapter One

While the rest of the country moves forward into a new era of cloud computing, a significant portion of our country finds itself at a disadvantage. As FCC Chairman Ajit Pai has acknowledged,

"There's a big and growing divide, a 'digital divide,' in this country between those who have high-quality internet access and those who don't. Disproportionately, those living in rural America find themselves on the wrong side of that divide."[3]

People living in rural areas of this country are significantly less likely to incorporate digital technology into their lives than their urban counterparts. They are 7 to 12 percent less likely than those in urban areas to own a smartphone, tablet, or traditional computer.[4] They are less likely to own multiple devices, or to use the internet daily.[5] And 19 percent say that they never go online—compared with 11 percent in urban communities.[6]

Many rural communities simply do not have the broadband access that most Americans take for granted. They rely on dial-up technology to transmit data over copper lines, unable to access online services even at basic download and upload speeds.[7]

In other words, a significant portion of rural communities lack the internet speeds that were available in urban areas over a decade ago.[8]

The Rural America Broadband Gap

The dismal state of rural broadband in America is rooted in four main causes.

First, and most importantly, installing traditional broadband and internet alternatives is expensive. Fewer customers living longer distances apart means less revenue and higher installation costs for telecommunications companies.

Industry estimates suggest that installing fiber optic cable—the gold standard of broadband service—can cost $30,000 per mile.[9] This means that delivering sufficient broadband to remote parts of the U.S. would cost billions of dollars, an expense the private sector has not yet been willing to pay.[10]

Second, the development of alternatives to fiber optic cable has been slow and uneven. While mobile telecommunications technologies such as 4G LTE have given customers broadband-like speed through mobile devices such as smartphones, the cellular model of this technology is designed for densely populated areas and face the same connectivity and capacity gaps as traditional broadband.

Satellite broadband can be the right solution in very sparsely populated areas, but it often suffers from high latency, lack of significant bandwidth, and high data costs.

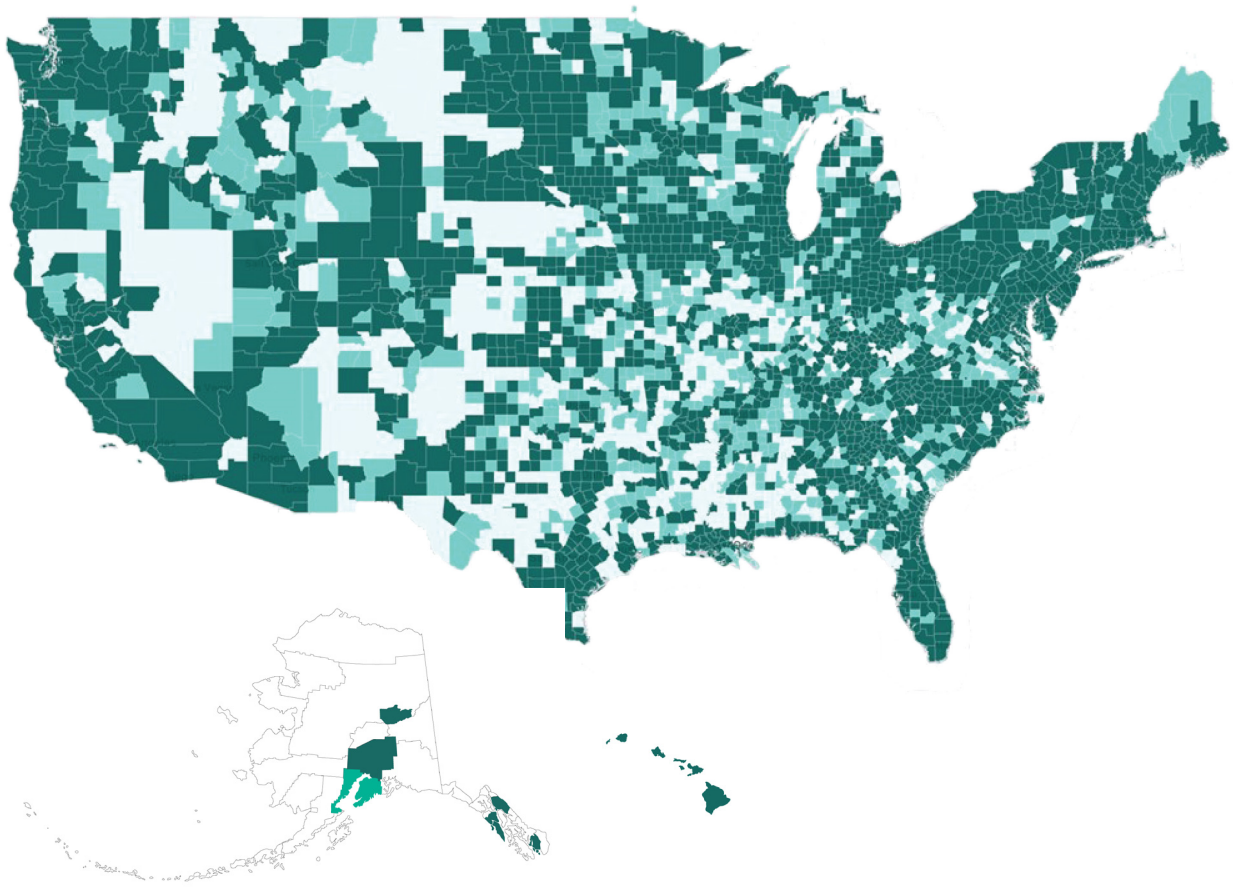
Third, regulatory uncertainty has contributed to challenges in bringing broadband to rural America. For example, providers seeking access to critical rights of way for network facilities often face confusing federal, state, and local permitting rules that add time and expense to projects.[11]

Finally, there is a perception that weak demand for broadband in rural areas cannot support private investment.

This perception is clearly outdated given the high demand for cloud-based services by small businesses and households.

To date, companies looking to run a sustainable business have not had confidence in the rural market. As a result, low-density communities remain underserved as service providers focus their attention on proven urban markets.

U.S. Broadband Access by County



66-100% of population

33-65% of population

Less than 33% of population

(Average Percentage)

DATA SOURCE: FCC 2016 BROADBAND PROGRESS REPORT

A CALL TO ACTION: A NEW RURAL BROADBAND STRATEGY

Chapter Two

The time is right for the nation to set a clear and ambitious, but achievable goal: to eliminate the rural broadband gap within the next five years—by July 4, 2022—through a new Rural Broadband Strategy.

We believe this new focus can bring broadband coverage to rural America in this timeframe based on a new strategic approach that combines private sector capital investments focused on new technologies with affordable public sector support.

A combination of new technologies can substantially reduce the cost of extending broadband coverage across the nation. Specifically, a technology model that uses a combination of wireless technology leveraging the TV white spaces spectrum, LTE fixed wireless, and satellite coverage can reduce the initial capital and operating costs by roughly 80 percent compared with the cost of using fiber cables alone; and by approximately 50 percent compared with the cost of current LTE fixed wireless technology.

The Breakthrough Promise of TV White Spaces Technologies

After more than a decade of development, new technologies for deploying broadband effectively and affordably to low-density areas are ready to play an important role in connecting rural America and for those living without broadband internet today. Those are technologies leveraging the TV white space.

Wireless technologies that utilize TV white spaces are designed to transmit in VHF and UHF spectrum that was traditionally allocated for broadcast television. By leveraging these unused frequencies, TV white spaces devices can create wireless broadband connections, while protecting broadcasters and other licensees from harmful interference.

In addition, because the characteristics of television spectrum permit signals to travel long distances, it is ideally suited for bringing broadband to rural America.

New directional findings by The Boston Consulting Group suggest that a combination of technologies utilizing TV white spaces are the most efficient technologies to connect areas populated at densities from two to 200 people per square mile.

As the population thins, satellite becomes the most cost-effective solution because the infrastructure costs of building towers make TV white spaces, or any terrestrial wireless technology, less attractive.

In higher-density rural areas, higher-frequency 4G LTE technologies become the most cost-effective option. It is worth noting that this model did not look at higher-frequency Wi-Fi technologies, which might prove more cost-effective than 4G LTE technologies in higher-density areas.

Overall, TV white spaces technologies appear to be the optimal solution for a little more than 19 million people, or about 80 percent of rural America without broadband access.

Under the current regulatory environment, it would take roughly $10 to $15 billion to deploy TV white spaces to connect the 23.4 million people living in rural America without broadband access.

This would be roughly 50 percent less than the cost of using fixed wireless (4G LTE) technology ($15-25 billion) and approximately 80 percent less than the cost for using fiber-to-the-home ($45-65 billion).

However, the most optimal deployment would be to provide a mix of several technologies on a county-by-county basis. This could lower costs by at least 10 percent ($8-12 billion) compared with using TV white spaces alone.

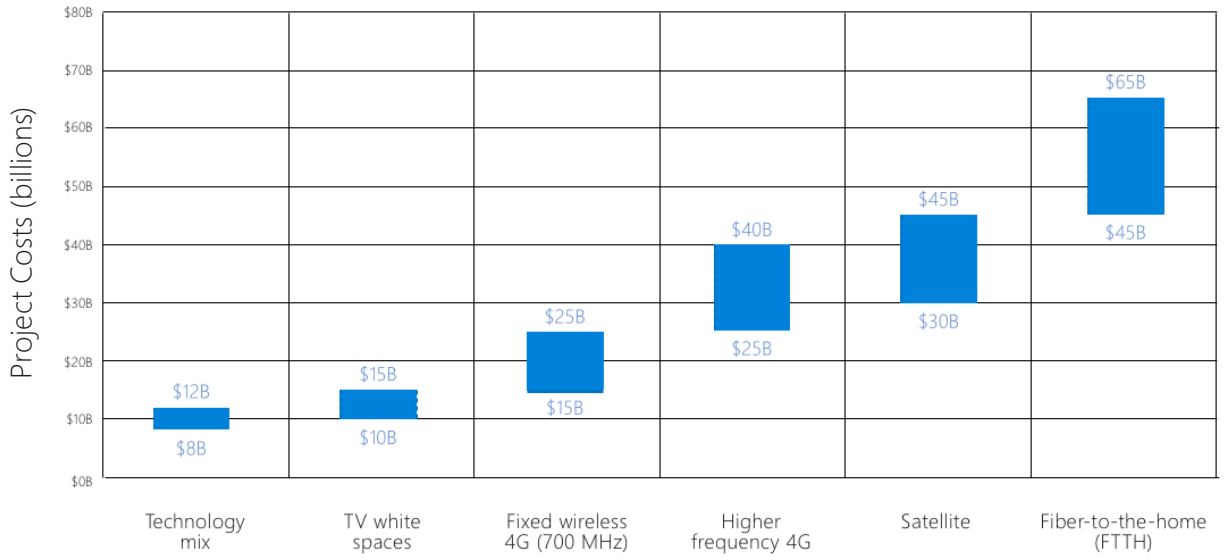
Our confidence in wireless technologies using the TV white spaces is based on a decade-long experience. Along with our industry and academic peers, we have been working to perfect the technology and address the challenges that come with it.

Building on the collective experience of Microsoft and others—in the United States and around the world—we and our network operator partners have found ways to use TV white spaces to distribute broadband efficiently without requiring consumers to engage in any complex engineering.

We found that these deployments of TV white spaces technologies do not interfere with TV broadcast reception and licensed wireless microphones that use the same spectrum band.

Moreover, we have also been able to extend the reach of TV white spaces signals farther than ever before.

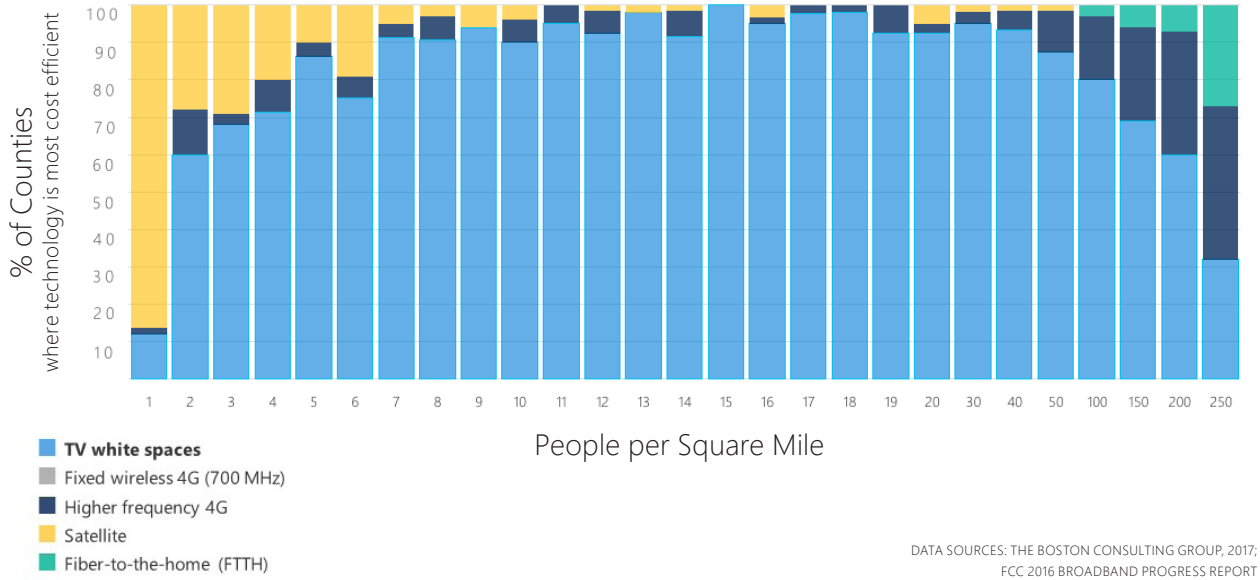
Cost Comparison to Connect 23.4 Million People in Rural America



DATA SOURCES: THE BOSTON CONSULTING GROUP, 2017; FCC 2016 BROADBAND PROGRESS REPORT

The Best Solutions for Rural Densities

Percentage of counties where a technology is most efficient within each population density band



DATA SOURCES: THE BOSTON CONSULTING GROUP, 2017; FCC 2016 BROADBAND PROGRESS REPORT

We are excited to deploy TV white spaces as part of a blended set of innovative solutions that will make up the new Rural Broadband Strategy.

How TV White Spaces Work

The term "TV white spaces" refers to the unassigned (or otherwise unused) spectrum below 700 MHz that can be used to deliver broadband access, services, and applications.

This available spectrum is uniquely suited for delivering broadband to rural areas because it can carry communications over far greater distances and penetrate through walls and other obstacles than cellular and other spectrum bands. Because of these unique characteristics, technologies leveraging TV white spaces are sometimes referred to as "Super Wi-Fi."

This technology became a possibility in 2008 during the Bush Administration when the FCC adopted regulations paving the way for more efficient use of such underused spectrum while protecting broadcasters and other licensees from interference.[12]

One example is Dynamic Spectrum Access, a term that describes radio-enabled devices operating in conjunction with an internet database to transmit on available spectrum.

These devices report their location and other information to the database, which identifies which TV white spaces channels are available and an appropriate power level. The database also includes a list of all protected TV stations and frequencies to avoid interference with TV broadcasts and wireless microphone signals.

Once the available spectrum is identified, devices can use those frequencies, and even switch from one group of channels to another as different channels become available. This engineering happens in the background and requires no action by the end-user.

Microsoft's Role in Fostering the TV White Spaces Ecosystem

For more than a decade, Microsoft and other companies, research, and academic institutions around the world have been working to pioneer and perfect software-defined radios and cognitive radio systems for use in TV white spaces and other unused spectrum.

These technologies leverage an evolutionary shift from inflexible hardware-defined radios to increasingly flexible software-defined radios that can dynamically adapt to their changing spectrum environment (e.g., by having software, as opposed to hardware, define power levels, frequencies, channel sizes, modulation schemes, etc.).

By leveraging this flexibility, software-defined radios and cognitive radio systems can more efficiently use limited spectrum resources, in the TV white spaces and in other spectrum bands.

Like cell phones (which took 13 years to go from initial approval to the first available commercial products), Wi-Fi devices (which took 14 years) and 4G LTE devices (which took nine years), TV white spaces technologies presented numerous technological and other hurdles that had to be overcome to make them a feasible solution for closing the digital divide.

Microsoft's first public involvement with these emerging technologies began in 2002 when the FCC Spectrum Policy Task Force recommended that more spectrum should be made available on a dynamic basis. This marked the beginning for the first proposals to make the TV white spaces and other bands available on an unlicensed basis.[13]

Microsoft's first published research on TV white spaces was in 2003.[14] Microsoft and other companies were also involved in the FCC's first field testing of TV white spaces technology in 2008, which helped inform the FCC's 2008 decision to allow unlicensed access to the TV white spaces, under the control of geolocation databases.[15]

Since then, Microsoft has been involved in numerous TV white spaces research projects and other forms of dynamic spectrum access.[16]

Microsoft Research developed the first TV white spaces database research platform. Beginning in 2009, under experimental licenses from the FCC, Microsoft Research conducted the first large-scale, outdoor trials using radios tuned to the TV white spaces on our corporate campus in Redmond, Washington.

This work paved the way for what was the largest TV white spaces field trial in the world in Cambridge, England in June 2011. The Cambridge trial helped inform regulations that were ultimately adopted by the regulator, Ofcom, to allow access to the TV white spaces in the UK.

In April 2012, a consortium of local and global companies was formed to launch series of pilot projects in Singapore, which also helped inform that country's white spaces regulations.

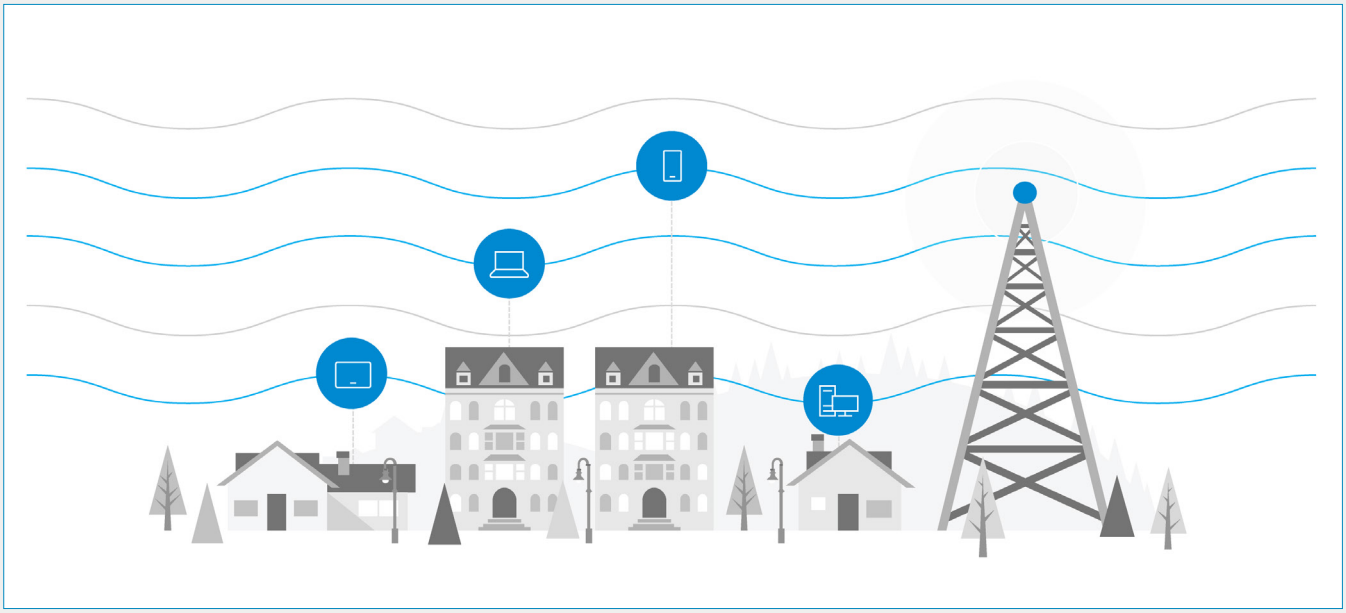
An important part of Microsoft's work in the TV white spaces arena has been to share knowledge and seek collaborative partnerships.

In 2014, Microsoft publicly released the source code for the Microsoft Spectrum Observatory to create an open dialogue with academics, governments, and other members of industry about making the most efficient use of spectrum.[17]

These partnerships have shown that most spectrum in most places is not used most of the time—an idea at the fringes of policy discussions only a few years ago.

Now, there is no question that spectrum is being used inefficiently. Furthermore, spectrum can, and should, be shared across a variety of spectrum bands, and under a range of licensing regimes.

SPOTLIGHT: TV WHITE SPACES SPECTRUM EXPLAINED



"White spaces" spectrum is a name for allocated but unused spectrum. "TV white spaces" are the unassigned or otherwise unused blocks of spectrum below 700 MHz located between the frequencies assigned to TV broadcasters and other licensees.

There is more TV white spaces spectrum in smaller cities and rural areas, which tend to have fewer licensed users of spectrum. TV white spaces can be used to create wireless broadband connections over great distances without interfering with incumbent licensees. The TV white spaces spectrum is great for: last-mile wireless broadband access; in-building and in-home coverage; and the Internet of Things (IoT).

In each case, network operators take advantage of the ability of radio waves in the VHF and UHF broadcast frequencies to travel long distances and pass through natural and manmade obstacles.

Base station radios transmitting via TV white spaces can send and receive signals from up to 10 miles in rural areas, giving consumers broadband connections capable of applications ranging from high-definition video streaming to video conferencing.

The TV white spaces are also useful in more densely populated areas, particularly for expanding coverage in buildings.

IoT encompasses a range of high- and low-bandwidth applications that leverage the propagation characteristics of TV white spaces. This includes a full range of applications used for public safety, transport, energy grids, agriculture, healthcare, and the environment.

The FCC has regulations allowing unlicensed access to TV white spaces. Under those regulations, certified TV white spaces devices operate under the control of a TV white spaces database.

TV white spaces databases are cloud-based services that perform two basic duties for the regulator: (1) providing TV white spaces devices access to broadcast spectrum that is not assigned to a broadcaster or another licensee; and (2) protecting incumbent licensees from interference. The FCC certifies both white spaces databases and devices that are used to access TV white spaces spectrum.

To access TV white spaces spectrum, a TV white spaces device contacts a TV white spaces database over the internet and requests a list of channels at its specified location (as determined through professional installation or geolocation capabilities, such as GPS).

Examples include: a TV white spaces base station radio able to reach the internet over a fiber backhaul connection; an in-home access point able to reach the internet over a cable modem connection; or even a Wi-Fi device able to reach the internet over a 4G LTE connection.

Depending on their operating characteristics and intended uses, the FCC will designate such devices that directly contact TV white spaces databases as either “fixed devices” or “mode two personal portable devices.”

Before these devices begin transmitting over the TV white spaces, they obtain lists of available channels (or frequencies) from the TV white spaces database. The TV white spaces device reports its location to the TV white spaces database, which then communicates which channels can be used by that TV white spaces device at that particular location.

The TV white spaces device will only transmit on channels specified by the TV white spaces database. If no channels are returned by the database, the TV white spaces device cannot transmit until it is given another list of channels. Once the device receives a list of channels, it selects the channels to begin transmitting on.

Client devices designated by the FCC as either fixed devices or mode one personal-portable devices will be under the control of devices with direct contact to the TV white spaces database. The client devices will be in listen-only mode and will only begin transmissions upon hearing an enablement signal from the base station, access point, or other device with direct contact with a TV white spaces database.

TV white spaces devices with direct connections to the internet are required to re-contact the TV white spaces database at specified time intervals (or if moved from their current location) for lists of new TV white spaces channels. The activity is invisible to the user and requires no action by the consumer.

Technologies Using TV White Spaces Can Help Bring Broadband to Rural America

After many years of tests and improvements, technologies leveraging the TV white spaces spectrum are ready for widespread adoption. Through trials and pilots, Microsoft and our partners have validated that TV white spaces are particularly well-suited for bringing broadband to remote areas for many reasons:

Greater distances.
TV signals travel over far longer distances compared with conventional Wi-Fi, making white spaces better suited for extending signals over areas that are more spread apart.

At the same power as Wi-Fi operating in the 2.4 GHz band, a TV white spaces signal can travel up to four times the distance (e.g., 400 feet as opposed to 100 feet). That translates to 16 times the coverage area.

However, the FCC allows fixed TV white spaces devices (such as base station radios) to operate at up to 4 watts EIRP and up to 10 watts EIRP in rural areas. Our experience in rural deployments demonstrates that these signals can provide internet connections at up to 10 miles from the base station.

Greater penetration.
In a typical home, Wi-Fi can penetrate through up to two walls, making it less suitable for distributing a signal across spread-out properties with multiple obstructions.

In contrast, like traditional TV signals, signals traveling on TV white spaces can penetrate through more walls and obstacles, including heavy foliage, hills and other topographical challenges presented by rural areas.

Affordability.
Because TV white spaces technology transmits broadband data over the airwaves using spectrum, it avoids the expensive wired infrastructure on which other rural cost estimates are based.

Deploying TV white spaces technology rather than fiber or other wired alternatives can save up to 80 percent of the costs of deployment.

It also has significant cost advantages over traditional wireless services—as little as 50 percent of the cost of deploying 700 MHz LTE and only about 30 percent of the cost of higher-frequency LTE.

Combined, these unique advantages presented by TV white spaces technologies can significantly improve the economics of deploying wireless broadband in rural and other underserved communities.

Moreover, the fact that these technologies operate on an unlicensed basis will make their deployment far more straightforward than if FCC licenses were required for each implementation.

Already, TV white spaces technology has been tested by initiatives that serve the needs of students, farmers, health care providers, and others who are stuck on the wrong side of the digital divide.

In the United States, Microsoft is partnering with a full range of network operators—from major fixed-line operators to nationwide and regional mobile operators, rural cooperatives, and wireless internet services providers—to demonstrate the impact of broadband access based on TV white spaces.

In Southern Virginia, for example, Microsoft has partnered with Mid-Atlantic Broadband Communities, B2X, and the Tobacco Region Revitalization Commission to provide a "Homework Network" to school children in rural and underserved Charlotte and Halifax Counties. The largest of its kind in North America, this project extends wireless broadband from local schools to students' homes using TV white spaces equipment.

In addition, Microsoft has been working in Washington State and upstate New York to bring "precision agriculture" to farms using sensors and algorithms to determine exactly how much water, fertilizer, and pesticides crops need.

The Economist has praised precision agriculture's potential to help "feed a world whose population is forecast to hit almost 10 billion by 2050," and TV white spaces technology could be key to its success.

Through "Farm Beats," an end-to-end IoT platform created by Microsoft, TV white spaces have been harnessed to bring data from various sensors (such as cameras, drones, and soil sensors) to farmers. But for farms that lack broadband, precision farming is not possible.

By setting up a high bandwidth link from the farmer's home to an IoT base station on the farm, Microsoft has been able to extend existing broadband connections to the typically offline farmland, where the sensors can then connect to it.

Moreover, the system is built to work even without grid-based power—the IoT base station's design enables it to use weather forecasts to appropriately cycle different components of the station based on the availability of adequate solar power.

Microsoft's other current and already-planned TV white spaces projects currently include partnerships with:

MERIT and Allband:
Providing residential broadband access and connected animal tracking and state park trailhead cameras in rural Alpena and Montmorency Counties in Northeastern Michigan.

Also in Michigan, Microsoft is partnering with the Gigabit Libraries Network to enable pilots using libraries in Gaylord, Lansing, and Marquette as anchors for Wi-Fi hotspot networks.

WildFire:
Deploying residential broadband access in rural areas around the City of Dalton, in northwestern Georgia.

Axiom:
Deploying broadband access for small businesses and residences in rural Washington County, Maine.

Pioneer:
An internet service provider in Southwest Kansas deploying a trial network providing broadband access to residential customers and farms in Scott County.

Microsoft has also significant global experience and research in solving connectivity problems using TV white spaces technology.

For example:

In the Philippines:
Microsoft responded to the devastating series of typhoons that hit the country in 2013 by developing a TV white spaces solution that provided internet connections and Skype calling to affected citizens.

In Kenya:
Microsoft deployed the Mawingu TV white spaces Broadband Project in Laikipia County to help provide the Red Cross with low-cost internet access, which has helped improve the organization's efficiency, scope of services, and bottom line.

In rural South Africa:
Microsoft leveraged TV white spaces spectrum to bring wireless broadband access to five schools as part of the broader Microsoft 4Afrika Initiative, which aims to bolster Africa's economic development and global competitiveness through innovation, skills, and affordable internet access.

Also in South Africa, we recently announced a partnership with Brightwave to bring TV white spaces and Wi-Fi-enabled broadband access to 609 primary and secondary schools to over 200,000 students.

In the United Kingdom:
Broadband trials in Scotland have connected rural communities on the Isle of Bute and in Orkney.

Microsoft TV White Spaces Pilot Projects

More than 20 projects connecting 185,000 people

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

DATA SOURCE: MICROSOFT, 2017

MICROSOFT'S RURAL AIRBAND INITIATIVE

Chapter Three

Microsoft is prepared to invest our own resources to help serve as a catalyst for broader market adoption of this new model. Through our Rural Airband Initiative, we are committed to three elements on a five-year basis:

Direct Projects with Partners

We will invest in partnerships with telecommunications companies with the goal of bringing broadband connectivity to 2 million people living in rural America by July 4, 2022.

With our network operator partners, we will have 12 projects in 12 states up and running within the next 12 months in Arizona, Georgia, Kansas, Maine, Michigan, New York, North Dakota, South Dakota, Texas, Virginia, Washington, and Wisconsin. And we will continue to grow further from this substantial start.

By investing significant resources, we hope not only to bring connectivity to 2 million citizens, but to stimulate more capital spending by others that focuses on expanding broadband coverage in rural areas.

Our goal is not to profit directly from these projects, although we of course recognize that expanded broadband coverage will bring new commercial opportunities for every company in the tech sector that provides cloud services, including our own. We will rely on a business model focused on investing in the upfront capital projects needed to expand broadband coverage, and then seek a revenue share from operators to recoup our investment. We will use these revenue proceeds to invest in additional projects to expand coverage further over the next five years.

Digital Skills Training for People of All Ages

Working through Microsoft Philanthropies, our Rural Airband Initiative will also invest in helping to train people of all ages in these rural communities on the latest technology so they can use this new connectivity to improve education, healthcare, and agriculture, and transform their businesses.

We will deploy a suite of initiatives to couple the technology itself with efforts to ensure that people will benefit from it, with a special focus on ensuring that technology access and education begin at a young age.

We will work with groups familiar with the unique needs of rural communities to bring skills trainings tailored to the needs of those areas.

Our first partnership under the Rural Airband Initiative will be a multi-year partnership with National 4-H Council—engaging America's largest youth development organization, 4-H, to provide digital literacy skills training to youth, as well as teen-led learning programs in rural communities.

Microsoft is already working with partners to deploy broadband to students in rural Virginia.

Over the next five years, Microsoft will use this model to work with network operator partners to cover at least 500,000 of the 5 million households with school-age children who lack broadband internet access. By combining broadband access with the necessary skills, we hope to increase digital literacy for millions of Americans who are ready to improve their lives with digital tools and data.

Stimulating Investment by Others Through Technology Licensing

Our ultimate goal is to help serve as a catalyst for market investments by others to reach additional rural communities. We therefore are launching a new technology program to stimulate investment through royalty-free access to at least 39 patents and sample source code related to technology we've developed to better enable broadband connectivity through the use of TV white spaces spectrum in rural areas.

Our Rural Airband Technology Program will make our U.S. patents available under a royalty-free license to all comers, including to our competitors, for any work they undertake to stimulate broadband access through TV white spaces. These patents help tackle common problems associated with TV white spaces in a variety of ways:

- They enable the efficient utilization of TV white spaces by dynamically allocating the spectrum among users as needed. For example, Microsoft's patented technology enables selection of a particular band depending on whether the device is moving or fixed, frequency scanning based on a location-based database query, and the use of guard bands for TV white spaces transmission.


4-H
WELCOME!

- They mitigate TV white spaces device interference with incumbent spectrum licensees, such as TV broadcasters and licensed wireless microphones. For example, they enable the detection of an incumbent on a channel and cause a TV white spaces device to switch to an alternate channel.

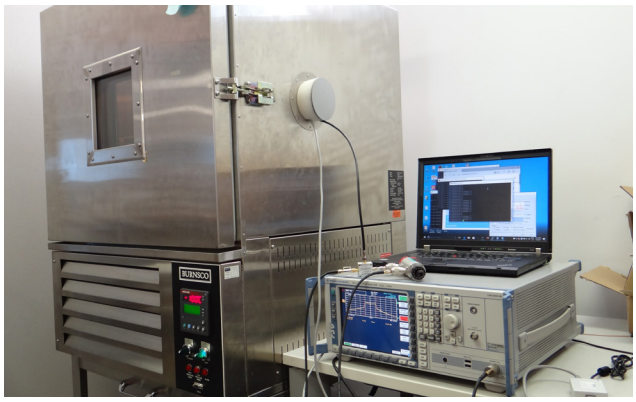
  In addition, they significantly decrease the likelihood that a device will transmit over an occupied channel by shaping a baseband signal according to governing telecommunications policies and local geography to optimize the transmission.

  They also enable multiple TV white spaces devices to measure signals in various frequencies around them, communicate such measurements with one another, and thereby identify where available TV white spaces are located on the spectrum.

- They enable the use of a robust location-based database for signal allocation without the need to rely on spectrum sensing.

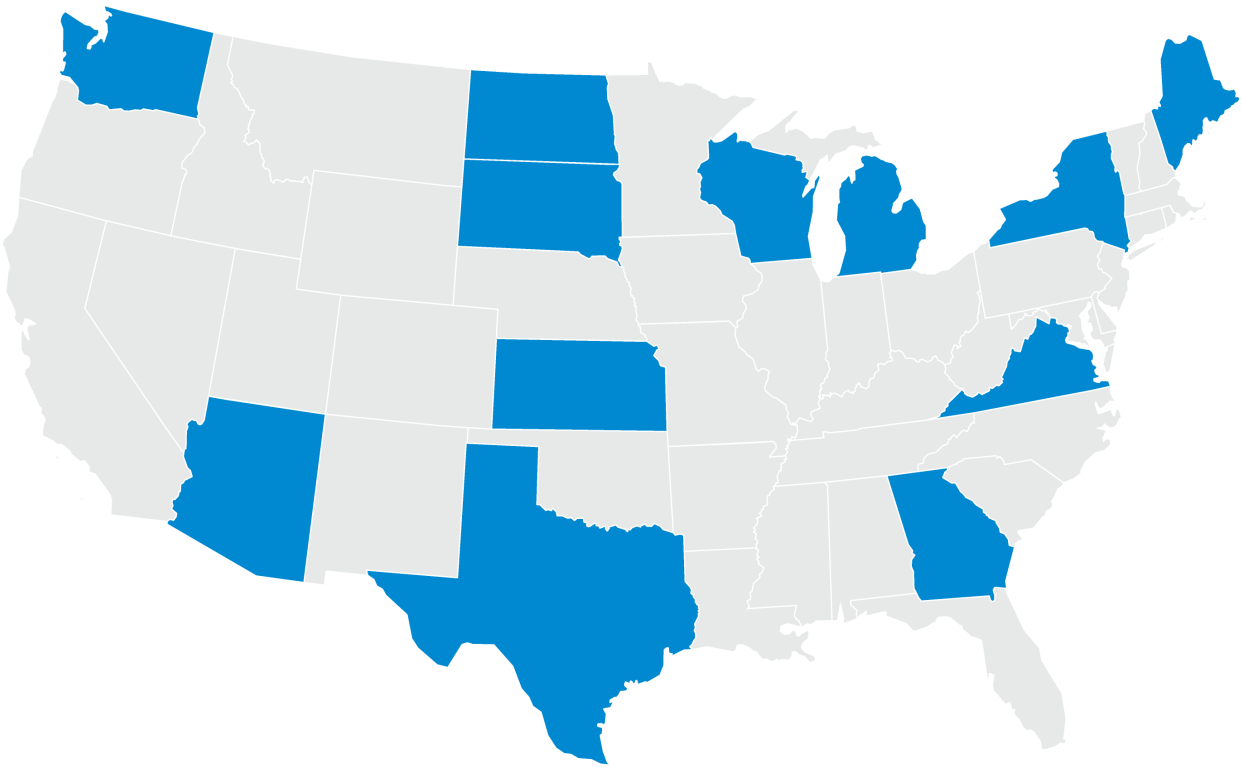
  Microsoft's database-driven TV white spaces technology has continuously been improved through the use of machine learning that populates, maintains, and improves the content of the database, and cloud-based analytics to respond to database queries that, for example, leverages prior spectrum assignments for particular devices.

- They harness cognitive radio to provide greater bandwidth and coverage for broadband over and above cellular in two ways: first, switching from cellular/Wi-Fi to TV white spaces based on a trigger condition (such as bandwidth constraints in the cellular band); or second, simultaneously transmitting in two different spectrums (cellular and TV white spaces).



Microsoft TV White Spaces Pilot Projects: United States

Up and Running 12 Projects, 12 States in the Next 12 Months



Arizona	Maine	North Dakota	Virginia
Georgia	Michigan	South Dakota	Washington
Kansas	New York	Texas	Wisconsin

DATA SOURCE: MICROSOFT, 2017

CASE STUDY: THE HOMEWORK NETWORK BRINGING BROADBAND ACCESS TO STUDENTS IN RURAL VIRGINIA

Today in the United States, it is estimated that about 5 million households with school-age children do not have broadband connectivity. For these children, almost every aspect of academic success—from keeping up with assignments, to communicating with teachers, to applying for college—is much more difficult than it is for their friends and peers who have high-speed internet at home.

At a time when 70 percent of teachers assign homework and research that requires a broadband connection, this means there are millions of children in this country who are not able to access the tools and information they need to thrive in school and gain the skills and knowledge they will require as they move on to college or enter the workforce.

The homework gap is particularly acute in Charlotte and Halifax counties in southern Virginia, a rural area where half of students don't have broadband access at home. To help close this gap, Microsoft and the Mid-Atlantic Broadband Communities Corporation (MBC) announced the launch of an innovative Homework Network that will provide broadband access for education purposes to more than 1,000 rural households—and about 3,000 students—by the end of 2017.

The Southern Virginia Homework Network will be the largest deployment of TV white spaces technology in the United States thus far. Given the region's scattered rural population, hilly terrain, and dense tree cover, low-band

white spaces spectrum is an ideal solution for extending internet services to remote homes without the prohibitive costs required for implementing more traditional broadband infrastructure such as fiber optic cables.

The announcement followed a successful pilot program that reached about 100 households across the two counties. One of the first families to gain access was a household with three school-age children and their mother, who is a teacher. Before the pilot program, the entire family spent most of its evenings at school or a library—where broadband access was available—so they could keep up with assignments and other schoolwork. This is now work they all can do at home.

Currently, the project has moved into the first phase of building out the complete TV white spaces network. Using equipment from Adaptrum—a white spaces technology company based in San Jose—the network will include 18 high-power base stations on towers near fiber-connected schools to deliver long-range coverage that can penetrate hills and trees. MBC is also providing Adaptrum radio receivers for students' homes. The network is being installed by B2X Online, a local internet service provider.

The Homework Network in southern Virginia grew out of Microsoft's Affordable Access Initiative, which aims to support and scale innovative businesses that are developing technologies with the potential to extend broadband access to billions of people around the world who lack connectivity today. The project in Virginia received support from the Virginia Tobacco Region Revitalization Commission.

"Rural southern Virginia is now home to a highly innovative solution, which can serve as a model for other parts of the state, the U.S. and even around the world, to help young people succeed in school," says Virginia State Senator Frank Ruff, who co-chairs the Commission. "We are proud to help support and fund such an important project starting here in Charlotte and Halifax counties."

The Homework Network is a model that offers the promise of affordable broadband connectivity for the millions of students in the United States who face unfair barriers when it comes to essential access to critical digital tools and technology.

THE VITAL ROLE OF THE PUBLIC SECTOR

Chapter Four

While we believe the private sector can play the leading role in closing the rural broadband gap, the public sector also has a vital role to play in achieving the U.S. government's longstanding communications policy goal of ensuring that advanced services, such as broadband, are universally available across the United States.[19]

The leadership of the FCC,[20] the White House,[21] Congress,[22] and the states all have focused on these efforts during the past year, and are poised to act.

We hope that policymakers will take specific actions to accelerate the deployment of broadband to rural America:

First, through FCC action, ensure access to TV white spaces spectrum, so this can be used by innovative, unlicensed wireless technologies to extend the reach of existing infrastructure to provide affordable broadband in rural areas.

Second, ensure that federal and state infrastructure investments include targeted funds on a matching basis for the capital investments that will best expand broadband coverage in rural areas. Critically, public funds should be made available and directed to projects that will spur private investment on a technology-agnostic basis so that the most effective technologies can be deployed to solve the rural broadband challenge.

Third, take concrete steps to ensure that the FCC has the data it needs to accurately measure the availability and adoption of broadband internet access technologies. This will enable the government and private sector to assess the success of different initiatives, technologies, and business models, and to design evidence-based policies in the future.

The FCC Should Ensure Access to TV White Spaces Spectrum

The FCC has the potential to significantly advance the availability of affordable broadband in rural and underserved areas without the need for congressional action or congressional funding.

The single most effective action the government can take to connect rural America is to provide sustained nationwide access to TV white spaces spectrum.

The FCC must finalize outstanding TV white spaces policies in a manner that promotes the growth and evolution of this technology.

A forward-looking decision by the FCC in 2010 made the United States the first country in the world to approve TV white spaces technologies. This act was part of a long and proud tradition of American leadership in spectrum policy. Under former Chairman Kevin Martin, the FCC approved unlicensed access to TV white spaces through a unanimous, bipartisan vote in 2008.

The original TV white spaces regulations were proposed under former FCC Chairman Michael Powell, with bipartisan support. After subsequent revisions to the FCC's technical rules, the current TV white spaces rules went into effect in 2012. Soon thereafter, however, the FCC launched a series of rulemaking proceedings to implement the Television Band Incentive Auction. Congress explicitly ensured that TV white space technologies would continue to advance after the auction, but the auction required a reorganization of the entire TV spectrum band. This introduced regulatory uncertainty and slowed the evolution of and investment in TV white spaces technologies.

Now, with the post-auction band plan locked in place, the FCC can eliminate the remaining regulatory uncertainty that has served as a barrier to meaningful private investment. The Incentive Auction reduced the number of available channels that can be used for TV white spaces technologies.

To make the significant investments necessary to reach economies of scale, potential TV white spaces network operators and device and chip manufacturers have converged on the need for a minimum of three usable TV white spaces channels in every market, with additional TV white spaces available in smaller markets.

Consequently, the Incentive Auction's reduction in the number of channels available for TV white spaces technology led the FCC to put in place new rules to ensure channel availability, so as to support broadband investment.

That brings us to today.

Recognizing the importance of the technology, the FCC has already adopted rules to provide consumers and innovators with two of the needed three TV white spaces channels.

The FCC must preserve those channels going forward and push back on attempts to undermine the use of those channels for broadband. The FCC will also need to act on channel number three, the so-called "Vacant Channel."

The "Duplex Gap."
First, the FCC approved use of TV white spaces technologies in the small block of spectrum between mobile service uplink and downlink called the "duplex gap." These rules are in place and will protect nearby licensed mobile wireless services.

Channel 37.
Second, the Commission approved technical rules allowing TV white spaces devices to share Channel 37 with wireless medical telemetry systems used in some medical facilities, but required additional unspecified testing before these rules can go into effect. The FCC's conservative rules ensure that TV white spaces technologies will not operate in close proximity to these medical telemetry systems. If the FCC moves forward with a trial period, it must not allow an open-ended trial period with no structure that can be manipulated to effectively prevent shared use on Channel 37. Moreover, the trial period should be location- and time-bounded.

The "Vacant Channel" proceeding.
Finally, there are spectrum gaps between full power TV channels everywhere in the country—so-called "vacant channels." The FCC has proposed to preserve one of these vacant channels in every market for TV white spaces technologies after the post-Incentive-Auction reorganization of the band. Preserving this channel will not impact any full-power broadcaster. An analysis using the FCC's own software also demonstrates that preserving a TV white spaces channel in most markets is expected to have no impact on low-power TV stations, and a de minimis impact even in the few areas where there is any impact at all.

By preserving access for TV white spaces technologies in the duplex gap, Channel 37, and in vacant channels, as well as positively concluding a number of outstanding TV white spaces issues, Chairman Pai and the FCC will put a pivotal piece in place in the FCC's pro-broadband, pro-investment, pro-innovation policy.

Public Funding Should Provide Incentives for Effective Private Investment in a Technology-Neutral Manner

While we believe that private sector investment can lead the way in closing the rural broadband gap, public sector spending can accelerate this work.

The public-sector entities funding rural broadband development have already made great strides in bringing telecommunications to rural America, and they can play an additional key role in reaching millions more Americans without connectivity.

In continuing to meet this challenge, we suggest that public sector spending be guided by two key principles:

First, public spending should include targeted funds on a matching basis for private sector capital investments that will best expand coverage into rural areas that currently lack broadband access.

Second, these funds should be made available for use by multiple technologies based on what is most cost-effective in serving the most people in a region, including TV white spaces, fixed wireless, and satellite usage.

Federal Programs

The FCC can follow these principles in supporting the deployment of rural broadband through its universal service authority. The Universal Service Fund appropriately has been reoriented to include support for rural broadband development.[23] Among other programs within the Universal Service Fund, the Commission's E-Rate program remains an important means of bringing broadband to schools and libraries throughout the country; but it could be leveraged further in innovative, cost-neutral ways to help close the digital divide.[24]

We encourage the FCC to continue supporting and accelerating the deployment of spectrum-based technologies in that program, an area where Microsoft has partnered with Virginia educational organizations, local network operators, and state economic development authorities.[25] The FCC can use these funds in a forward-looking, technology-agnostic manner that provides sufficient flexibility for all providers to deploy creative solutions for rural broadband connectivity. To the extent that Congress passes infrastructure legislation addressing rural broadband goals, we hope that funding decisions can be guided by these goals, as well.

State Programs

State governments are taking important steps to foster broadband. In September 2016, the Federal-State Joint Conference on Advanced Services provided a survey to the FCC regarding the status of various state broadband deployment initiatives.[26]

New York State, for example, has devoted $500 million of state funds to build out its "New NY Broadband Program," which aims to ensure that every New Yorker has access to high-speed internet by 2018.[27] Similarly, Wisconsin's Broadband Expansion Grant Program has awarded nearly $4 million worth of grants geared toward constructing broadband infrastructure in underserved areas of the state.

Combined, the 42 grants that have been approved take an "all-of-the-above" approach when it comes to means of deployment—some will focus on fixed wireless systems, some on digital subscriber line (DSL) systems, some for fiber to the home/premises (FTTH), some for fiber and coaxial cable backbone facilities, and one has been approved for a Wi-Fi system.[28] The Public Services Commission of Wisconsin estimates that these projects will connect 600 businesses and over 20,000 homes to broadband service.[29]

We encourage state governments, like their federal counterparts, to focus on funding these and similar initiatives in a manner that can spark investment and innovation from the private sector. In addition, we urge state funders to support programs in a technology-neutral manner that fosters innovative solutions such as those used in the Rural Airband Initiative.

Accelerated Data Reporting on Rural Broadband Coverage

There is a need for improved data collection regarding rural broadband coverage.

Without accurate data it will be impossible to gauge progress and determine where and how to expand work. Moreover, businesses need accurate data to help decide whether, and where, to invest their resources.

Collecting more accurate and up-to-date data regarding the state of broadband in rural America can help make such decisions easier. Currently, the most recent and most widely accepted data regarding broadband availability in rural America dates back to December 2014—nearly three years ago. Given the importance of the goal, the need to move quickly, and the amount of public and private capital at stake, accurate and timely data is essential.

Congress has recognized this need. The House of Representatives is exploring how to improve the accuracy of broadband mapping in rural America to ensure that any "false positives" in those areas can be identified so that benefits available do not go unused.[30] The FCC also needs accurate and current data.[31]

Given the rapid timescale of technology innovation, timely collection of data is essential. We support public-sector efforts to explore creative ways to achieve this goal, including broadband mapping and self-reporting by providers to build out broadband solutions for rural America.

SPOTLIGHT: TV WHITE SPACES STANDARDS EXPLAINED

Source: FCC 2016 Report

Standards Body	Standard	Standard Description
Institute of Electrical and Electronics Engineers (IEEE)	802.11af	Enables wireless local area network operation in TV white spaces spectrum in the 54 and 790 MHz. The standard was approved in February 2014.
IEEE	802.22	Enables wireless wide area network operation using white spaces in the television spectrum band. This standard was finalized in July 2011.
Internet Engineering Task Force (IETF)	Protocol to Access White Spaces Device (PAWS)	Enables international standardization of the interface between the database and white space devices.
U.S. Database Administrators Group	Database Synchronization Interoperability Specification	Defines the method for White Spaces Database (WSDB) Operators in U.S. TV band to interchange records of protected entitles and fixed TV band devices that are registered by one WSDB Operator, but must be supplied to all other WSDB Operators.
European Telecommunications Standards Institute—Broadband Radio Access Networks (ETSI—BRAN)	EN 301 598	Enables European standardization of radio local area network (RLAN) operations in the television spectrum band.

The TV white spaces device ecosystem is rapidly maturing. After substantial investment, the building blocks are falling into place for a globally scalable marketplace for devices capable of dynamically accessing unused TV white spaces spectrum.

With favorable and stable regulations, technologies leveraging TV white spaces spectrum can be as cheap as Wi-Fi technologies, which today carry most of the world's data traffic. Moreover, by using a new Institute of Electrical and Electronics Engineers (IEEE) standard called 802.11af, next generation Wi-Fi radios could access TV white spaces spectrum, extending the range and complementing the throughput of current generation Wi-Fi radios which operate at higher 2.4 GHz and 5 GHz frequencies and therefore are better for short-range, higher-capacity communications.

For radios that leverage the TV white spaces to be as affordable as those that use Wi-Fi, they must be standardized and mass manufactured with silicon-based chips. This will equip device manufacturers to produce a full range of low-cost wireless devices using TV white spaces.

Numerous standards have been developed, including the IEEE's 802.11af standard for local area networks and the 802.22 standard for wide area networks.

Today's Wi-Fi devices are built upon the 802.11 family of IEEE standards. U.S. companies would be willing to mass manufacture 802.11af baseband chips if the FCC ensures that there is sufficient usable TV white spaces spectrum available on a nationwide basis.

By leveraging higher modulation schemes, channel aggregation, and MIMO, wireless devices based on the 802.11af standard should be able to deliver throughput of 400 Mbps or more. With favorable regulations from the FCC, low cost 802.11af-based devices would begin to enter the US market in about 24 months.

Moreover, the Internet Engineering Task Force's Protocol to Access White Spaces Device (PAWS) standardized protocol for device-to-database communication is now stable, with devices and databases now deploying to meet the draft standard.

In addition, the TV white spaces database providers have developed a specification for database-to-database communication, which is being extended to countries beyond the United States.

In Europe, the European Technical Standards Institute (ETSI) completed and approved EN 301 598 in 2014, which forms the basis of the UK's TV white space rules and could become the European (and by default in Middle East and Africa) standard for TV white spaces devices. While there have been a number of standards efforts, the chart best captures the standards work most relevant to the emergence of TV white spaces technology.

Each of these advances is creating opportunities for vendors to begin product development. Indeed, while current TV white spaces technologies are based on proprietary technologies, the first generation of standards-based devices are in development.

Mediatek, for example, demonstrated its first tri-band 5 GHz, 2.4 GHz, and TV white spaces prototype radio based on the 802.11af Wi-Fi standard in a trial in Glasgow, Scotland, in 2015. With sufficient spectrum, the advancement of standardized white spaces technology is set to accelerate.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NEW OPPORTUNITIES FOR RURAL AMERICA

Chapter Five

For rural communities across America, the introduction to broadband access could mean significant advantages and potential opportunities.

The bridging of the urban–rural digital divide could unleash tremendous potential for the lives and livelihoods of millions of those living in rural America.

Economic Growth and Opportunity

Broadband has consistently been associated with economic growth and higher incomes. A study led by technology provider Ericsson found that doubling broadband speeds can add the equivalent of $126 billion to GDP.[32] Here in the United States, a 2015 study concluded that rural communities with broadband access generally had higher incomes and lower unemployment rates than communities with less broadband deployment.[33]

Beyond individual incomes, expansion of broadband contributes to the growth of competitiveness of rural America.

Rural counties adopting broadband are positioned to attract new businesses, countering the "rural brain drain" crisis, by encouraging talented workers to remain in their communities to find adequate employment.[34]

Many ranchers, farmers, and local merchants could leverage the modern internet to sell their goods. And those working in service industries would be able to use the internet to improve their offerings, communicate with customers, or reach new markets.[35]

Small Businesses and Entrepreneurs

Broadband can particularly benefit small businesses because innovations such as cloud computing lower barriers to entry, increase productivity, and significantly decrease costs.

In addition, the internet provides easy, instantaneous connections to potential customers and diversity of suppliers worldwide. Studies show that businesses in rural areas with access to broadband experience a significant and positive economic impact.

In Iowa, for example, a growing number of small businesses are finally able to sell their goods and services across the state and around the world because of the availability of broadband.[36]

In 2013, this capability resulted in approximately $20 billion in sales, or the equivalent of 12 percent of the state's GDP for that year.[37] Given such figures, it is no surprise that the FCC has recognized and remains committed to addressing the disproportionate impact that the rural–urban digital divide has had on small businesses.[38]

Quality and Accessible Healthcare

Broadband access is also an important part of managing healthcare delivery and wellness programs. Indeed, the availability of "telemedicine" has been an important development in rural areas which often have fewer doctors per capita than urban areas.[39]

In a 2014 study by the State of Utah, it was found that telemedicine availability resulted in increased potential coverage of doctors and increased ability to remotely diagnose medical issues, thereby decreasing the overcrowding of local hospitals.[40]

The Delta Health Partnership, for example, uses videoconferencing to connect diabetes patients with nurse practitioners, physician assistants, and others—consultations that would ordinarily require four-to-six-hour roundtrips by car for patients or their providers.[41]

As another example, the Saint Vincent Health System in Erie, Pennsylvania has used telemonitoring to reduce readmissions rates in its facilities by 44 percent.[42]

Investing more resources to improve the connectivity of broadband to hospitals and health care providers based in rural communities would likely yield better services in health protection and restore greater efficiency to wellness programs for those in need.

By contrast, at Washington County Memorial Hospital, losing internet connections has forced ambulances to find alternative hospitals with better internet connections, even if the alternative hospital is located an additional 40 minutes away.[43]

Greater broadband connection for larger rural health care providers would lessen the demand for more bandwidth, which in turn would lower costs, resulting in more resources to be reinvested in patient care.

Currently, these rural health care providers pay up to three times as much for broadband as their urban counterparts, and many times these providers forgo broadband altogether.[44]

Access to broadband can also help the quality of medical and rehabilitation treatment to groups such as veterans, many of whom live in rural communities.

Broadband can bring patients closer to their care providers and expand the number of services available to them.

Education Outcomes

Rural schools that adopt broadband are cherishing the many new, exciting educational opportunities that the internet has made possible within the past decade.

Such technological advances have given students with broadband access more personalized educational experiences, the ability to conduct internet-based research, the convenience of online testing, and the ability to track progress.[45]

Moreover, students in rural areas who gain internet access at home, will be better suited to deal with a troubling trend called the "homework gap,"[46] a growing educational prerequisite in light of the increasing amount of homework that will require internet access.[47]

In addition to measuring performance in school, extending internet access can better prepare a student's future with access to online applications for tests, jobs and college. Public libraries and other public institutions can also be leveraged as anchors in networks extending broadband access to students at home.

Productive Farming and Agriculture

Access to broadband, and particularly the Internet of Things, promises to enhance agricultural productivity in exciting ways.

Broadband access has given farmers the ability to search for new customers, find buyers willing to pay higher prices, and identify the most affordable sources of seeds, fertilizers, and farm equipment.[48] Farmers also use advanced wireless technologies to conserve resources and boost yields, from web-based irrigation scheduling[49] to "prescriptive planting" technologies that tell farmers how to increase their outputs based on data gathered by tractors.[50]

Having access to such new internet-based technologies will prime many rural farmers to compete more effectively.

Extending broadband connectivity to rural communities could unlock tremendous advantages to education, healthcare, and agriculture, as well as create opportunities for small businesses.

Broadband technology would ensure that all residents within rural communities benefit from technology, access and opportunity.

Whether those transformational benefits empower students with greater educational resources, permit farmers to market produce to more customers, or create better healthcare services to the community, the opportunity for broadband cannot be overstated.

WORKING TOGETHER TO EXPAND ACCESS & OPPORTUNITY FOR RURAL AMERICA

Conclusion

In urban America, we've become accustomed to ongoing capital investments to expand broadband capacity in areas that already have broadband coverage.

The time has come to expand this coverage to the rural areas that currently lack it entirely.

We believe a new rural broadband strategy makes this feasible. And with Microsoft's Rural Airband Initiative, we are prepared to put our own resources and energy behind this effort.

We also believe there is an opportunity for other companies large and small to join in with market-based investments.

We all have the opportunity to innovate together—achieving together what none of us can accomplish alone.

And just as we look forward to sharing what we have learned as a company, we look forward to applying over the next five years what we undoubtedly can learn from others.

Broadband connections have become indispensable for accessing healthcare, advancing education, improving agriculture, and growing a small business. As a country, we should not settle for an outcome that leaves behind 23.4 million living in rural America. To the contrary, we can and should bring the benefits of broadband coverage to every corner of the nation.

We look forward to working in partnership with government leaders at all levels, private sectors companies that have the expertise to develop and deliver affordable solutions, and local community members who can help enable the capabilities that a new generation of digital innovations and cloud computing can provide.

SPOTLIGHT: A CLOUD FOR GLOBAL GOOD CREATING TRUSTED, RESPONSIBLE, AND INCLUSIVE TECHNOLOGY

Cloud computing is delivering capabilities that promise new ways to expand access to economic opportunity and address some of our most pressing problems.

While the cloud is enabling new opportunities in almost every aspect of our lives—from healthcare, to education, communication, and business—it is creating disruption in other ways. There are deep concerns about whether and how this technology can be used to benefit everyone.

Clearly, we've reached a critical crossroads where we must rethink how people interact, companies conduct business, and governments protect public safety, manage economic growth, and deliver services.

At Microsoft, we are fundamentally optimistic about the future. But we also recognize that the cloud must be used to drive societal and economic opportunity. What's needed is a balanced set of policy and technology solutions that will promote positive change and ensure that the benefits of cloud computing are broadly shared.

A Policy Roadmap

In response to our ongoing discussions with governments to offer policy options to help create the right conditions for a trusted, responsible, and inclusive cloud, Microsoft launched a global policy agenda called A Cloud for Global Good.

This multi-year initiative seeks to encourage lawmakers and policy influencers across the world to consider policies and programs that can help their citizens, cities, countries, and regions embrace the benefits of cloud computing while addressing the disruptions that accompany any major technological change.

While we are excited by the opportunities offered by a future powered by the cloud, we understand that not everyone shares our optimism and that the benefits of cloud transformation are not being felt equally.

Microsoft is upfront and direct about the potential impacts of cloud computing that people around the world are concerned about, including: diminished privacy; job displacement; access to education and skills development; fair access; and the impact on the environment.

Our Cloud for Global Good initiative offers a policy roadmap that seeks to maximize the opportunities of cloud computing and minimize the challenges. This roadmap covers 15 policy areas, from personal privacy and cybersecurity, to tech fraud, public safety, digital literacy, and affordable and ubiquitous access.

Under each policy area, we offer comprehensive recommendations and considerations grounded in the belief that for cloud-based technology to achieve the full promise of the opportunities to improve people's lives at great scale, we need a trusted cloud, a responsible cloud, and an inclusive cloud. These three principles guide everything that we do.

To truly build a cloud for global good, it will be essential for governments, citizens, businesses, and organizations to work together to create a framework for cloud computing—one that respects the things that people care about, opens the door to the achievement of the dreams they aspire to, and provides benefits that are equally accessible for all.

More on the policy recommendations in A Cloud for Global Good can be found at: www.microsoft.com/cloudforgood

ENDNOTES

[1] Based on Form 477 data as of December 31, 2014 relied on by the FCC in its 2016 Broadband Progress Report. See In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, GN Docket No. 15-191, 2016 Broadband Progress Report, 31 FCC Rcd 699, ¶ 79 (2016) ("FCC 2016 Broadband Progress Report").

[2] Unless stated otherwise, all references to "TV white spaces" in this whitepaper are meant to encompass wireless technologies capable of optimally accessing the TV white spaces spectrum.

[3] "Mason Dockter, FCC chairman visits Iowa, discusses rural broadband access," *Sioux City Journal* (Jun. 7, 2017), http://siouxcityjournal.com/news/local/fcc-chairman-visits-iowa-discusses-rural-broadband-access/article_90754cf6-e35c-5120-9e4b-9c5ce1bcff44.html.

[4]Andrew Perrin, "Digital gap between rural and nonrural America persists," *Pew Research Center* (May 19, 2017), http://www.pewresearch.org/fact-tank/2017/05/19/digital-gap-between-rural-and-nonrural-america-persists/.

[5] Id.

[6] Id.

[7] Jennifer Levitz and Valerie Bauerlein, "Rural America Is Stranded in the Dial-Up Age," *Wall Street Journal*. (Jun. 15, 2017), https://www.wsj.com/articles/rural-america-is-stranded-in-the-dial-up-age-1497535841.

[8] Julianne Twining, "A Shared History of Web Browsers and Broadband Speed," *Platform* (Apr. 10, 2013), https://www.ncta.com/platform/broadband-internet/a-shared-history-of-web-browsers-and-broadband-speed-slideshow/.

[9] Jennifer Levitz and Valerie Bauerlein, "Rural America Is Stranded in the Dial-Up Age," *Wall Street Journal* (Jun. 15, 2017), https://www.wsj.com/articles/rural-america-is-stranded-in-the-dial-up-age-1497535841.

[10] Id.

[11] See Sean Buckley, "Lawmakers introduce new bill to accelerate rural broadband deployments on highway rights of way," *Fierce Telecom* (Mar. 13, 2017), http://www.fiercetelecom.com/telecom/lawmakers-introduce-new-bill-to-accelerate-rural-broadband-deployments-highway-rights-way.

[12] See In the Matter of Unlicensed Operation in the TV Broadcast Bands, and Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186 and 02-380, 23 FCC Rcd. 16807 (2008), See also Larry Greenmeier, Taking Waves: FCC Green Lights Unlicensed Use of Wireless 'White Space' Frequencies, *Scientific American* (Oct. 15, 2010), https://www.scientificamerican.com/article/fcc-white-spaces/.

[13] See Report of the Spectrum Rights and Responsibilities Working Group, FEDERAL COMMUNICATIONS COMMISSION SPECTRUM POLICY TASK FORCE (Nov. 15, 2002), https://transition.fcc.gov/sptf/files/SRRWGFinalReport.pdf; Report of the Unlicensed Devices and Experimental Licenses Working Group, FEDERAL COMMUNICATIONS COMMISSION SPECTRUM POLICY TASK FORCE (Nov. 15, 2002), http://transition.fcc.gov/sptf/files/E&UWGFinalReport.pdf.

[14] See Victor Bah, Amer Hassan, & Pierre Devries, Draft Proposal for Comment: Etiquette Rules and Procedures for Unlicensed Bands, MICROSOFT CORP. (Jan. 27 2003), https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/FCC_proposal_v11.pdf.

[15] See Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807 (2008).

[16] See, e.g., Deepak Vasisht, Zerine Ketanovic, Jong Ho Won, Xinxin Jin, Ranveer Chandra, Sudipta Sinha, & Ashish Kapoor, FarmBeats: An IoT Platform for Data-Driven Agriculture, USENIX (Mar. 27, 2017), https://www.microsoft.com/en-us/research/wp-content/uploads/2017/03/FarmBeats-webpage-1.pdf; Abusayeed Saifullah, Mahbubur Rahman, Dali Ismail, Chenyang Lu, Ranveer Chandra, & Jie Liu, SNOW: Sensor Network over White Spaces, ACM SENSYS 2016 (Nov. 16, 2016), https://www.microsoft.com/en-us/research/wp-content/uploads/2016/12/SNOW-sensys2016.pdf; Sid Roberts, Paul Garnett, & Ranveer Chandra, Connecting Africa Using the TV White Spaces: From Research to Real World Deployments, IEEE (Apr. 1, 2015), https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/main-5.pdf; Aakanksha Chowdhery, Ranveer Chandra, Paul Garnett, & Paul Mitchell, Characterizing Spectrum Goodness for Dynamic Spectrum Access, IEEE (Oct. 1, 2012), https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/SpectrumGoodness.pdf. Numerous other publications over the last 15 years may be found at https://www.microsoft.com/en-us/research/project/networking-over-white-spaces-knows/#.

[17] "Microsoft's Spectrum Observatory project opens up for increased collaboration," *Microsoft Corporate Blogs* (Apr. 8, 2014), https://blogs.microsoft.com/on-the-issues/2014/04/08/microsofts-spectrum-observatory-project-opens-up-for-increased-collaboration/.

[18] "TV dinners: Unused TV spectrum and drones could help make smart farms a reality," *The Economist* (Sep. 17, 2016), http://www.economist.com/news/science-and-technology/21707242-unused-tv-spectrum-and-drones-could-help-make-smart-farms-reality-tv-dinners.

[19] See Telecommunications Act of 1996, Section 706, 47 U.S.C. § 1302.

[20] In addition to expanding TV White Spaces, the FCC also has launched initiatives to overcome wireless and wireline infrastructure impediments, which may permit faster and cheaper access to needed infrastructure. See "Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment," WC Docket 17-84, April 21, 2017, https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-38A1_Rcd.pdf; "Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment," WC Docket 17-84, April 21, 2017, https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-37A1_Rcd.pdf. The FCC also is exploring the use of spectrum at 3.5 GHz and in the millimeter wave frequencies for rural broadband service. Senator John Thune recently has urged the FCC to focus on innovative uses of spectrum. See Letter from Sen. John Thune to Chairman Ajit Pai, June 21, 2017, available at https://www.commerce.senate.gov/public/_cache/ files/3cefb171-0d50-4c23-9f31-48942e874cc6/4 CAB0C0B754962807BB0C203E951D581.thune-letter-on-mid-band-spectrum.pdf.

[21] President Trump has made infrastructure improvement a centerpiece of his Administration's domestic policy and his budget proposals. On June 21, 2017, the President committed that expansion of rural broadband development would be a part of his national infrastructure initiative. See Alan Bjerga, "Trump Pledges Rural Broadband Support in Infrastructure Package," *Bloomberg* (Jun. 21, 2017), https://www.bloomberg.com/news/articles/2017-06-22/trump-pledges-rural-broadband-support-in-infrastructure-package.

[22] Senator John Thune of South Dakota has taken a leadership role with the MOBILE NOW Act, which would foster innovative licensed and unlicensed wireless solutions, require the government to make available additional spectrum for mobile and fixed broadband use, and require agencies to act on requests for infrastructure quickly, among many other improvements. S. 19, 115th Cong. (2017), https://www.congress.gov/bill/115th-congress/senate-bill/19. In addition, the Gigabit Opportunity Act, introduced by Senator Shelley Moore Capito of West Virginia and Rep. Doug Collins of Georgia, would create "gigabit opportunity zones" in which eligible entities could obtain tax and other advantages for investment in gigabit-capable broadband networks. S. 1013, 115th Cong. (2017), https://www.congress.gov/bill/115th-congress/senate-bill/1013/text.

[23] See Federal Communications Commission, "Universal Service for High Cost Areas - Connect America Fund," https://www.fcc.gov/general/universal-service-high-cost-areas-connect-america-fund; In the Matter of Connect America Fund, Universal Service Reform – Mobility Fund, Report & Order, WC Docket 10-90 (Mar. 7, 2017).

[24] Id.

[25]See "Joint Petition for Clarification or, in the Alternative, Waiver of Microsoft Corporation, Mid-Atlantic Broadband Communities Corporation, Charlotte County Public Schools, Halifax County Public Schools, GCR Company, and Kinex Telecom, In the Matter of Modernizing the E-rate Program for Schools and Libraries," WC Docket No. 13-184 (Jun. 7, 2016).

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[27] "The Plan: The New NY Broadband Program," *New York State*, https://www.ny.gov/programs/broadband-all.

[28] Frequently Asked Questions regarding the Broadband Expansion Grant Program, *Public Service Commission of Wisconsin*, https://psc.wi.gov/Documents/Frequently%20Asked%20Questions%20 regarding%20the%20Broadband%20Expansion%20Grant%20Program%20FY18.pdf.

[29] Id.

[30] See Defining and Mapping Broadband Coverage in America, *House Energy & Commerce Committee*, https://energycommerce.house.gov/hearings-and-votes/hearings/defining-and-mapping-broadband-coverage-america; see also Doug Brake, A Policymaker's Guide to Rural Broadband Infrastructure, Information Technology and Innovation Foundation, ITIF (Apr.10, 2017), https://itif.org/publications/2017/04/10/policymakers-guide-rural-broadband-infrastructure.

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[35] Id.

[36] "How Broadband Is Helping Iowa Businesses," *Connect Iowa* (Apr. 2015), http://www.connectiowa.org/sites/default/files/connected-nation/whitepaper-iabusinessadoptiontrends-april2015_final.pdf.

[37] Id.

[38] "2016 Broadband Progress Report" at ¶ 4.

[39] See, e.g., David A. Lieb, "Report: rural Mo. has fewer doctors per capita," *Associated Press* (Jul. 28, 2011), https://www.yahoo.com/news/report-rural-mo-fewer-doctors-per-capita-204225930.html.

[40] Utah Telehealth Study – Phase 1 Report, "Pilot Healthcare Strategies for the Utah Division of Occupational and Professional Licensing" (Mar. 21, 2014), http://dopl.utah.gov/docs/Phase1_Report_Major-trends-drivers-and-data-points.pdf.

[41] Id.

[42] Id.

[43] Jennifer Levitz and Valerie Bauerlein, "Rural America Is Stranded in the Dial-Up Age," *Wall Street Journal* (Jun. 15, 2017), https://www.wsj.com/articles/rural-america-is-stranded-in-the-dial-up-age-1497535841.

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[46] Jessica Rosenworcel, "Bridging the Homework Gap," *Huffington Post* (Jun. 15, 2016), http://www.huffingtonpost.com/jessica-rosenworcel/bridging-the-homework-gap_b_7590042.html.

[47] Id.

[48] Ivan T. Kandilov and Mitch Renkow, "The Impact of the USDA Broadband Loan Program on U.S. Agriculture," *NARDeP* (Aug. 9, 2013), http://www.nardep.info/uploads/Brief_USDABroadbandLoans.pdf.

[49] Liz Morrison, "New tools, technology help farmers increase water use, irrigation efficiency," *Corn + Soybean Digest* (Feb. 24, 2014), http://www.cornandsoybeandigest.com/precision-ag/new-tools-technology-help-farmers-increase-water-use-irrigation-efficiency.

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https://news.microsoft.com/rural-broadband

Rural Broadband Task Force Meeting
December 10, 2018

Public Comment from Rod Wagner, Director of the Nebraska Library Commission, [redacted]

Good morning Chairman Toner and members of the Rural Broadband Task Force.

My name is Rod Wagner. I am the Director of the Nebraska Library Commission.

The Nebraska Library Commission is part of the executive branch of state government. Per state statute, the Commission is responsible for the statewide promotion, development and coordination of library services. In fulfilling these functions, the Commission works with all types of libraries – public, school, college and university, special and institutional libraries. Some of the Commission's services are provided directly to the public and to state government personnel.

Today I would like to share with you some information about the most relevant group of libraries related to rural broadband, the small public libraries.

Nebraska has 268 public libraries. The great majority are municipal libraries. Some are under a township or county government. Of these 268 libraries, 210, or 78%, fall under the Task Force's definition of "rural", as being located in service areas with less than 2500 people.

According to 2017 self-reported broadband data submitted by public library directors, 130 of these 210 libraries, or 62%, have maximum download speeds at or below 10mbps, and classified by the Task Force as "unserved".

Another 34 public libraries, or 16%, have maximum download speeds below 25Mbps, but greater than 10Mbps, which the Task Force considers "underserved".

That leaves about 21%, or 45 of these 210 rural public libraries with either DSL, cable, fixed wireless, or fiber capable of 25Mbps download speeds or above, which the Task Force considers "served", at least for residential purposes.

I am sure you know that public libraries are often the only places that people without internet at home can go to get access to the internet, particularly in small, rural communities. Perhaps you've heard about or observed the gathering of cars along the curb and in the parking lots of these public libraries at all hours of the night and on weekends.

These members of the community gravitate to the public library for internet in order to use the internet to conduct their small business activities, apply for jobs, engage in continuing education, order things online, and apply for social programs.

Many of these cars contain school children with laptops and tablets, trying to get access to Wi-Fi to complete their homework for school the next day, and who have become what FCC Commissioner Rosenworcel refers to as the "Homework Gap".

Nebraska public libraries, as community anchor institutions, provide a valuable service for these rural residents, yet the bandwidth that is currently available is insufficient. These libraries could be an even more vital resource if we assisted them with faster broadband, using a variety of different interventions.

Toward that goal, the Nebraska Library Commission is partnering with the Office of the CIO on a small $25,000 demonstration grant from the Institute for Museum and Library Services (IMLS). The grant provided for fixed wireless connections from the public libraries to the school buildings in the towns of Bancroft, Bayard, Genoa, Imperial, Verdigre, and Wymore to augment their existing internet. The grant also paid for two new desktop computers within each library, which were advertised and promoted as "Homework Hotspots".

The good part about this grant initiative is that the project sites have been very successful and the Homework Hotspots increased the available internet speeds for students by 400% to 1500%. The sad part about this grant is that it could only fund six locations, and even larger grants of the same variety will only address the needs of a couple dozen libraries, and ONLY IF the school districts and libraries can agree to partner at the local level.

The Nebraska Library Commission's 2018-2022 Five-Year Plan outlines specific activities to ensure the availability of high-speed broadband for public libraries to meet the digital demands of their communities. These activities include identifying partnerships between Nebraska public libraries and the public, private, and voluntary sectors to increase libraries' broadband speeds.

The Nebraska State Advisory Council on Libraries adopted a motion at their November 16 meeting to encourage the Rural Broadband Task Force to support improved broadband services for Nebraska public libraries.

As the Nebraska Library Commission, we would like to join with the Rural Broadband Task Force in researching these rural broadband challenges, and helping develop solutions that will benefit our rural communities and library customers.

We look forward to attending future Task Force meetings and participating in any of the subcommittees as invited.

Thank you for this opportunity to comment.

I would be happy to respond to any questions that you may have.

Addendum to comments presented by Rod Wagner, Director Nebraska Library Commission

The datasheet that was used in Rod Wagner's comments included all Nebraska Legal Services Areas for with populations less than 10,000. In his comments this translated to 210 total libraries.

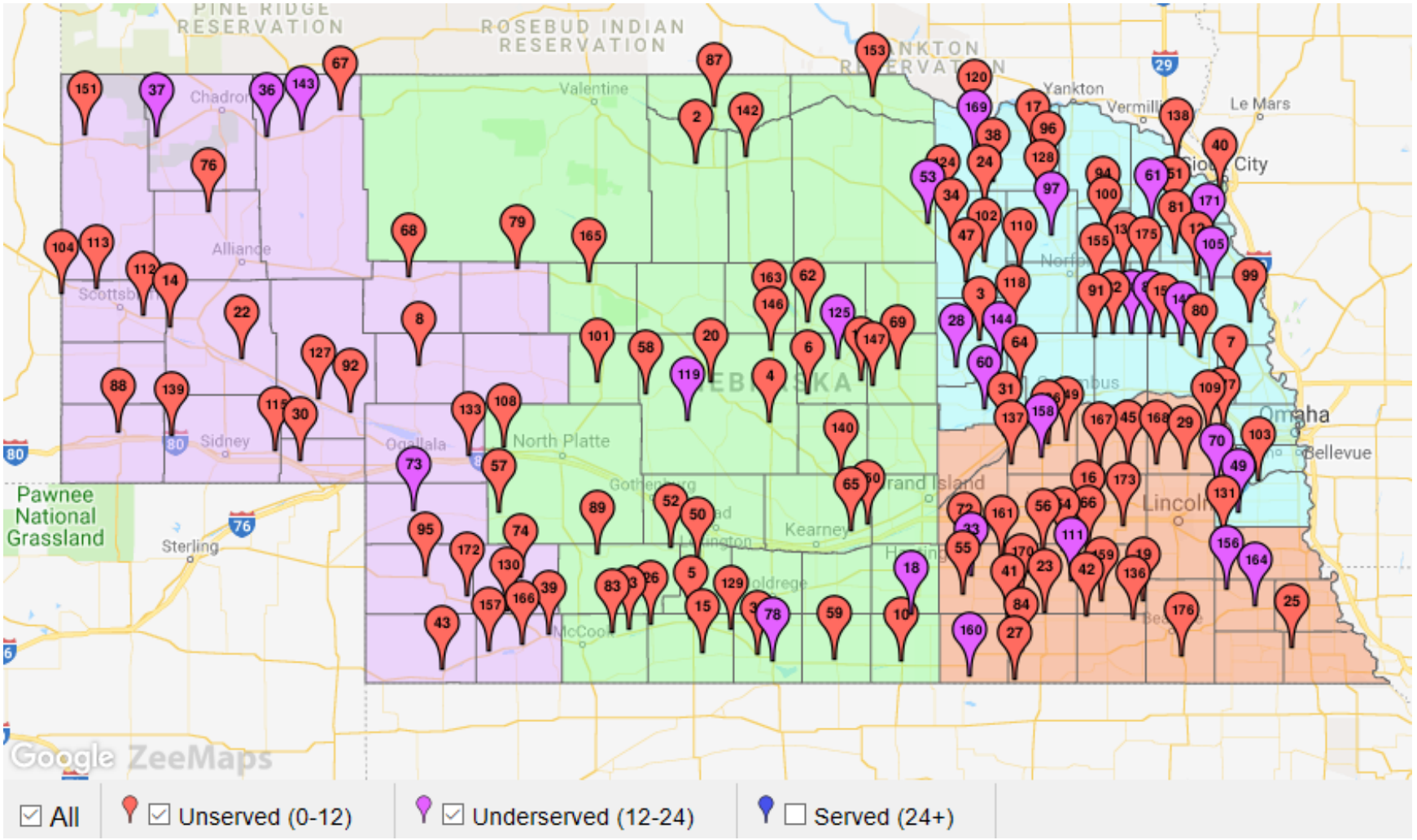
His comments were intended to be directed to all Nebraska Legal Services Areas with populations of less than 2,500. This datasheet translates to 177 total libraries.

Using the correct datasheet provides the following new statistics:

- 177 (or 66%) out of 268 public libraries meet the RBTF's definition of "Rural", with fewer than 2500 Legal Service Area population
- Of the 177 libraries, 120 or 68% have bandwidths < 10Mbps, which the RBTF classifies as "Unserved"
- Of the 177 libraries, 28 or 16% have bandwidths $\geq$ 10Mbps, but < 25Mbps, which the RBTF classifies as "Underserved"
- Of the 177 libraries, 29 or 16% have bandwidth $\geq$ 25Mbps, which the RBTF classifies as "Served"

Unserved (0-12Mbps) and Underserved (12-24Mbps) Nebraska Public Libraries up to 2,500 Library Service Area Population

Link to ZeeMap (https://www.zeemaps.com/view?group=3247498&x=-99.456747&y=41.329378&z=11)



Sent July 15, 2019

Hello,

Just wanted to drop you a note about affordable internet availability (or rather, the lack of availability) at our rural home.

We are currently using wireless internet through Verizon as our only internet connection. However, our location does not receive a reliable wireless signal. For instance, within, and even in the area surrounding our house, the wireless signal can range from no signal at all, to a maximum of "two bars" of 4G.

We have attempted, several times, over the past twenty years, (Alliant, then Alltel, now Verizon) to somehow get a better wireless signal to our location. Each time, they have sent a technician out to "check their towers", but the signal has never shown significant improvement.

We have also attempted to get a landline connection at our house which could provide a data speed faster than 56k. Windstream is not able to accomplish this because we are located "toward the end" of their service line. We did have a landline phone through Windstream several years ago, but we dropped our landline service when we learned that we couldn't get faster than 56k internet speed.

Another option we explored is DTN Speednet. They provide an internet signal from the top of the Brainard, NE COOP grain elevator. We are located about eight or nine miles from Brainard, NE and do not have line-of-sight with the the grain elevator, therefore, we were told, we would not be able to get internet service through them.

We are aware of satellite internet, but after looking into that option, it is cost prohibitive for us. Another concern I have with satellite internet is signal reliability. This concern arises from our experience with satellite TV and its unreliable signal during thunderstorms and heavy rain.

These are the only internet options that we are aware of at our location.

Thank you for taking the time to listen to the internet connection difficulties we are having at our rural home. We are hoping to establish reliable and affordable internet access at our house because our children will most likely need more internet capabilities as they progress through school. (Second grade and seventh grade, 2019-2020).

Sincerely,

Shawn and Kathy Strizek
Valparaiso, NE

Name: Nancy E Hinrichs
City: Bruning
State: Nebraska

Comments: Southeast Nebraska has very spotty and undependable service for businesses, schools and personal use.

Sent: Tuesday July 23, 2019 - 11:56 am

RBTF Comment July 23, 2019

Via e-mail –Ocio rural broadband

Hi Anne, Tom, team,

Reaching out to you from SpaceX, where we are well on our way towards deploying a satellite constellation to provide rural broadband connectivity all around the world, including to Nebraska. I'm a sales engineer on the effort, focused primarily on enterprise and government applications.

Would you be interested in settling up a call to discuss our Starlink system, applicability to your needs, timelines, and etc?

Broadly speaking, Starlink is best at providing connectivity to remote, isolated users (farms, small towns, remote residences), so our system offers a good solution for those users who are hardest to reach via fiber. Service levels of 100 Mbps down / 40 Mbps up would generally be anticipated, but depends on how dense the user-base is within a region. Latency will be very low, ~30 ms or so, far quicker than existing satellite-based solutions due to our much lower orbit, and comparable to fiber. User segment is a 19-inch electronically steered antenna, mounted on one's rooftop.

Look forward to discussing with you! My best,

Jamie

Jamie Hadden | Sales Engineer

Name: Jenna Christensen
City: Pender
State: Nebraska

Comments: My students lag behind and our graduation rate is suffering because we do not have low cost access to broadband internet. There is no service in the town other than the school or library. We would love to go 1:1, but no internet access outside of school makes that pointless. Please help me help my students obtain a brighter future and break the persistent cycle of poverty.

Sent: Sunday July 28, 2019 - 10:04 am

ESUCC Information Services Update

Scott Isaacson
March, 2020

DE^{2}TAILS

Xin Wang from RMC is completing the final report and evaluation of the grant projects and this will be available in March. The final reimbursement request has been submitted to NDE.

Software Innovation Network

The charter for the network was finalized and the emphasis is on recruiting leadership team members and convening the team to begin work. From the charter, the goals and outcomes are:

- **Review** appropriate and available **data** to determine priority software needs in Nebraska.
- **Create a process** for prioritizing, evaluating options, testing, deployment, ongoing evaluation and ultimate sustainability / decommissioning for state-wide enterprise-level software solutions.
- **Develop a governance structure** to support the process and ensure strategic investment in innovative projects.
- **Use the process** to select and implement two or more projects.
- **Evaluate and revise** the process based on the experience of the project implementations.

Leadership team membership will include the following representative groups including Educational Service Units (ESUs) and school districts:

- Technology director
- Technology integration
- Professional Learning
- Administration
- Digital Learning / Learning Engineer
- Special Education
- NDE
- Cooperative Purchasing
- Instructional materials
- Network Nebraska
- Post-secondary representative
- Network director - ESUCC Technology Director
- NDE Information Services Officer

Nebraska Cloud

SSO Usage and Update

School day usage of the SSO framework is up from 1174 sessions per day at the end of the 2018-2019 school year to 1537 sessions per day with the latest data ending February 29, 2020. Applications with the most usage are the NebraskaCloud app launch portal, Houghton Mifflin, Moodle, Adobe Creative Cloud and TestWiz.
Our next enhancements to this framework will be to add additional ways of connection with applications and users such as Learning Tools Interoperability (LTI) and Clever integrations. We also plan to bring the new app launch portal out of testing and make it live for everyone in April.

SRS

The team continues to address fixes and improvements to the system, especially in the areas of ADVISER reporting, bugs in completing forms, and improving helpdesk response times. The team has released 9 fixes into the live system since our last board meeting. Helpdesk tickets are down, with 86 currently open. We have continued short monthly check-in calls with the advisory team between their quarterly full-length meetings. A few key user representatives met in February to plan for adding 504 plan support to the SRS application and are sharing their work with the SRS advisory committee for more feedback. Another key enhancement coming will be an administrative dashboard or checklist to help administrative users see a concise list of problems such as errors reporting students to ADVISER, expired forms, or incomplete data.

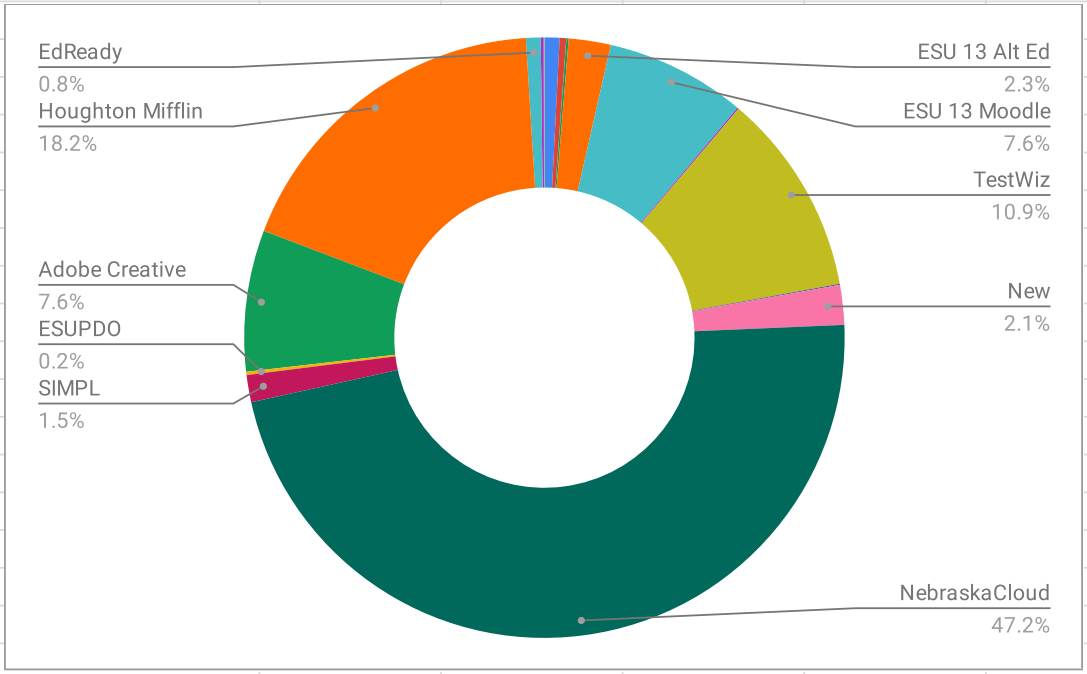
Marketing

I have increased the number of presentation proposals to NETA, NDLA, and the NDE Data conference to help get the word out about our work.

SSO Sessions by Application

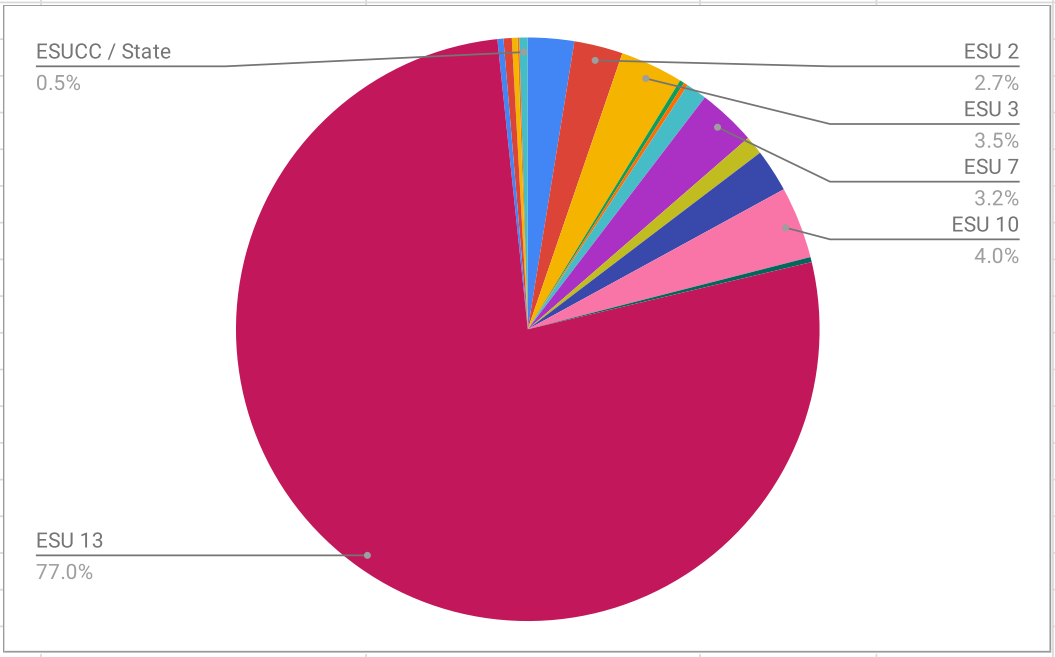
Feb. 1 - Feb. 29, 2020

Application	Sessions
ADVISER Dashboard	217
ESUPDO Overdrive/SORA	94
ESU 9 Connect	2
ESU 13 Impact	32
ESU 13 Alt Ed Moodle	605
ESU 13 Moodle	2022
MyVRSpot	21
TestWiz	2922
NVIS	14
New NebraskaCloud Portal	572
NebraskaCloud Portal	12622
SIMPL	390
TestWiz	1
SAS Curriculum Pathways	4
ESUPDO Registration	43
Adobe Creative Cloud	2031
Houghton Mifflin Harcourt	4872
EdReady	212
Follett Software	41
OER Commons	11



SSO Sessions by ESU

Feb. 1 - Feb. 29, 2020



ESU 1	933
ESU 2	983
ESU 3	1273
ESU 4	92
ESU 5	85
ESU 6	420
ESU 7	1181
ESU 8	378
ESU 9	868
ESU 10	1452
ESU 11	103
ESU 13	28092
ESU 15	121
ESU 16	167
ESU 17	112
ESU 18	4
ESU 19	32
ESUCC / State	171

PROJECT NAME: Digital Learning Projects – Instructional Materials
PROJECT DIRECTOR: Rhonda Eis
REPORT PERIOD: March 2020

OverDrive – ESUCC Professional Library

- Collection
  - 187 titles – 138 ebooks and 49 audiobooks
  - Additional book requests can be made by filling out the Book Request Form
- Usage and Users for February 2020
  - Checkouts – 24 audiobooks and 21 ebooks
  - Number of users who have checked out books – 28

ESU 1	3		ESU 10	3
ESU 3	4		ESU 13	2
ESU 4	2		ESU 16	2
ESU 5	1		ESU 17	1
ESU 7	2		ESU 18	1
ESU 8	3		ESUCC	4

Learn360

Statewide Usage – August 1, 2019 – March 1, 2020

Logins	Searches	Video Views	Video Downloads	Non-Video Views	Custom Video Views
142,542	76,473	164,566	674	8,002	8,590

Infobase - ESUCC Marketplace Cooperative Agreement for Learn360 under review.

Open Education Resources (OER) Project

- Nebraska OER Hub: https://www.oercommons.org/hubs/nebraska
- Hub Stats – 40 new members added - increased to 945 members
- Groups – 19 groups
  - New – ESU 16 Business Teachers – 14 members; Nebraska Social Studies – 44 members
- Aligned to Nebraska Standards – 260 resources
- Authored or Remixed - 159 resources
- Searchable OER on the Nebraska Hub – 14,887

TLT Affiliate -Upcoming Trainings

- July 23 & 24
  - Blended Learning & Coaching with Catlin Tucker – 2 days in Kearney