NWX-DOC-NTIA-OTIA (US)

Moderator: Francine Alkisswani
July 15, 2020
2:00 p.m. ET

Coordinator: Thank you for standing by. All lines will be in a listen-only mode for the duration of today's conference. Today's conference is also being recorded. If you have any objections, you may disconnect at this time. I would now like to turn today's meeting over to Francine Alkisswani. Thank you. You may begin.

Francine Alkisswani: Thank you. Good morning, good afternoon, I'm so sorry. Good afternoon to everyone. Hello and thank you for joining us today for the BroadbandUSA's monthly webinar and the Minority Broadband Initiative continuing webinar series on broadband.

My name is Francine Alkisswani and I'm the Telecommunication Policy Analyst with NTIA and lead on the Minority Broadband Initiative with NTIA. I will co-moderate today's session with Dr. Tonya Smith-Jackson, Senior Vice Provost for Academic Affairs, North Carolina A&T.

Today's webinar will focus on cyberinfrastructure and we very clearly and you will see during our presentation make the distinction between broadband as a necessary but not sufficient form of infrastructure for digital inclusion and the

global economy.

So we're focusing on moving beyond broadband at HBC, Historically Black Colleges and Universities and TCUs, Tribal Colleges and Universities. This session will provide an overview of how broadband, as I said, is not sufficient for our HBCU or TCU institutions to be competitive in the 21st century.

So let me begin by telling a little bit about the Minority Broadband Initiative. NTIA, National Telecommunications and Information Administration is located within the Department of Commerce and is the Executive branch agency responsible for advising the President on telecommunications and information policy issues.

Consistent several Executive Orders, and commitments that the Department of Commerce has made under the American Broadband Initiative to close the digital divide, NTIA through its Minority Broadband Initiative is increasing minority stakeholder engagement around solving broadband access challenges in vulnerable communities.

To that end, NTIA has launched the Minority Broadband Initiative working with Historical Black Colleges and Universities and Tribal Colleges and Universities to ensure that all Americans can participate in the digital economy.

The initiative is consistent with the Administration's commitment to expanding broadband Internet availability and adoption in rural America. While this focus may be rural America, it is not excluding urban America.

However, in launching the initiatives, NTIA will build upon relations with HBCUs, TCUs as community-anchor institutions in order to leverage minority

stakeholder engagement in finding new opportunities for broadband deployment. TCUs and HBCUs offer specific programmatic advantages including supporting economic growth and competitiveness in anchor communities through high capacity broadband networks and connectivity.

The Minority Broadband Initiative which we refer to as MBI seeks to partner with federal agencies, local government and the private sector to explore opportunities for broadband expansion through both a Tribal College and Universities campuses and HBCU campuses and their anchor communities, those communities surrounding them.

I'd like to say it is - when we look at the map of the United States, we want to point out that in doing so, we're covering roughly 27 states. You look at 16 states of which Tribal Colleges and Universities are located and the 11 states where primarily HBCUs are located, we're looking at those part of our country, our nation that suffer from persistent poverty, lack of connectivity, exclusion from the digital economy by virtue of that lack of connectivity and we hope to address that through the Minority Broadband Initiative and going beyond that to being a part of the global research community.

Now our presenters today are, which I will introduce briefly and then we'll move on into the program are Jason Arviso who is Director of IT at Navajo Technical University, President of Operations there. He has oversight of the IT department which manages campus computing environment and e-learning department.

And he also manages the National Science Foundation-funded Tribal Colleges and Universities Program Grant supporting increased enrollment and the retention and graduation from STEM courses and degree programs.

We have also Curtis Bradlee who's Interim Director of University Computing Information Technology Systems at South Carolina State University. He has served in this role for over two years and before serving there, he was the Enterprise System and Network Services Manager for South Carolina State University. His responsibilities include leadership of the strategic technology planning and operations for the University computing and information technology services.

Dr. Deborah Dent, CIO of Information Technology, Jackson State University. In this position, she oversees the management of the university's network and communication infrastructure enterprise resource planning system, the enterprise data warehouse, academic IT and other IT services.

She supports all levels of research, learning and teaching and has oversight of the security and institutional research function at the University and is PI, the Principle Investigator of the National Science Foundation cyberinfrastructure called CC STAR Networking Infrastructure grant. And US Army Engineer Research and Development Center critical infrastructure cyber protection contract.

And we have Al Kuslikis who is a Senior Associate with the strategic initiative at the American Indian Higher Education Consortium, kindly referred to as AIHEC. An important part of his work involves identifying strategies for support in science, technology, engineering and mathematics education and research program and information tribal colleges and universities, particularly his partnerships among the tribal colleges. As well as within the larger science and engineering communities.

Those are our panelists. And you can see they are rock stars in this domain. We're fortunate to have them join us for this discussion. But before we begin,

I'd like to also introduce our - the co-moderator for this panel who is Dr. Tonya Smith-Jackson. She's Senior Vice Provost for Academic Affairs at North Carolina A&T State University, professor of Industrial and Systems Engineering and former Chair of the Industrial and Systems Engineering Department.

She served for one year as a rotator at the National Science Foundation in the computer and information sciences and engineering directorate, information and intelligence systems division, cyber human systems program and the cultivating cultures in ethical STEM programs.

She is a Fellow in professional societies, the Institute of Industrial and Systems Engineer of the human factors in ergonomic society. And currently service as co-chair of the National Academy, FAA cybersecurity workforce study.

So there you have the clear complement of today's presenters. So finally before getting into this, let's go over a few of the logistics. We're going to open up the webinar for questions after the conclusion of presentations. So as you hear from these presenters, please use the question box on the right-hand side of the screen to submit your questions or comments.

Don't hold them. Don't wait. Put them in right away. The last one in isn't the one who gets all the questions answered. Second is the presentation along with the transcript and audio recording of today's session will be available on NTIA's BroadbandUSA website within seven days of this webinar under the events/past events tab.

So as we begin, I'd like to turn this over to Dr. Tonya Smith-Jackson so that we can begin this exciting and fascinating discussion with our presenters and

subject matter expert, so Dr. Tonya Smith-Jackson, could you please take over?

Tonya Smith-Jackson: Okay, thank you Dr. Alkisswani. I just wanted to basically set the stage for everyone. Good afternoon and thank you for joining this webinar. We are - specifically the title, moving beyond broadband at HBCUs and TCUs and before that, of course, the word cyberinfrastructure.

We know from being able to look at this at the national level, particularly I spent some time at NSF doing that very thing. We understand that the issue and the challenges are not just about broadband and connectivity, but also about the cyberinfrastructures that are built around our nation's institutions who serve minorities and particularly today we're going to talk about the challenges for HBCUs and TCUs.

And to think about it though, we are - when we're thinking about cyberinfrastructure, we are talking about the whole system, the ecosystem that we're building around these institutions who are very mission-oriented for their communities whether they're rural communities or communities with people of color for example and that's critical.

So we're trying to take a broader perspective in order to examine this issue of disparity and look at it from certainly a systems' view so that we can be more impactful about how we better resource these institutions so that they too can have equity and access. Because that really does matter.

So as you listen today, think about each of the speakers are going to provide you with the understanding of the current state, what the future state should look like and what we hope for and then, you know, talk about some aspects of what we can do to get to that future state.

So current state, future state and what needs to be done to get there. So I will now just turn this over to our presenters. So we can go to the next slide and we'll have Jason on first. Jason, I'll turn it over to you.

Chris Holt: Jason, you may be on mute.

Tonya Smith-Jackson: Yes, we're not hearing you. Okay, we may have to go out of order. So if we're not hearing from Jason, can we move the slide up to Curtis Bradlee? And then maybe in the meantime, we'll get Jason back on. Thank you. So Curtis Bradlee.

Curtis Bradlee: Hello, everyone. How's everyone doing? Hello? Can you hear me?

Tonya Smith-Jackson: We hear you just fine.

Curtis Bradlees: Okay, again I thank everyone for giving me an opportunity to speak and present what we have going, taking place here on the South Carolina State University campus. On the cyberinfrastructure, for us, where we're at now and where we're looking to go, as of right now, current infrastructure right now, we're still in the process of upgrading our cyberinfrastructure across the campus. At the moment right now, we have a (unintelligible) three-tier where we have a data center switch, distribution switch and then you have the access layer.

Much of our campus right now currently have multimode fibers. So right now we're actively replacing the fiber with single-mode fiber to get - to be able to increase our bandwidth across the campus. We have buildings across campus that have some distance. And so this, you know, it's working toward improving our broadband infrastructure.

Recently we've been able to start with our data center with the switches for the area and to be able to connect from one, or two of our data centers here on campus down to much of the departments that are performing research. We recently switched from a 10 gig backbone to at least 40 gigs right now with the ability to increase it to 100 gigs.

Right now we also are connected to the Clemson C-Light network with a portion of our network traffic with Internet 2 and as backup we also have carved out a path from commodity Internet just in case if we have any issues here on campus with the existing commodity Internet.

So right now, the - as we continue to upgrade fiber across the entire campus, we're beginning with some of our researchers to start the initial connection to other universities like Clemson has. One of our positions right now is trying to begin fitting data crossover. So we're in the process of setting up that connection so that our (unintelligible) connect to begin the transfer the data for the most part now.

Is there anything else I need to share?

Francine Alkisswani: You might, Jason, this is Francine Alkisswani. I'm sorry, not Jason, Curtis. You might want to talk a bit about the importance of the partnership, I think, that you have between you, Clemson, Claflin University, another HBCU.

And that connectivity to, I guess, it's the regional educational network. And how that supports the STEM on your campus and how that has been supported by the effects of COVID and what support that has brought to the campuses.

Curtis Bradlee: Sure. So for right now, for those of you who might now know, Claflin University, we're right beside each other (unintelligible) pretty much. I work with Joe Lee at Clemson, not at Clemson, but Claflin and right now some of the researchers that - research we have here on campus, some of the same activity we're doing at Claflin instructors are doing the same.

And so what we're trying to do is a few of our certain (unintelligible) and security. So with not having the resources for the different labs, whatnot, we're in the process of being able to share resources.

So for example, right now, we (unintelligible) with security, Joe - Clemson – Claflin we're basically connected to Clemson. And what we're trying to do is also connected Claflin with (unintelligible) state just in case our network connection from Clemson is down. We can have an alternate path that helps us out as well.

But many researchers are trying to access those labs that we have here on our campus. So we've been able to work together to be able to have that connection to be able to share those resources. Also with the relationship that we have also with Clemson, there's a lot of research that's already taken place over.

And so with lack of manpower or lack of resources, we're able to utilize that connection from the University here and be able to tap in and access those resources that's being managed by the Clemson IT team on that side over there.

Right now we are working with students right now that's in different areas of the country to be able to access those resources. Because of right now, the research network is separate from the commodity Internet. So we're looking at

a way to be able to allow students that, you know, around the country to be able to access the resources and connect across that research network.

Francine Alkisswani: Is South Carolina State a member of Quilt? Or do you have privileges of Quilt such as that umbrella organization for all the research institutions' networks by virtue of your partnership with Clemson?

Curtis Bradlee: I don't believe we have at the moment.

Francine Alkisswani: Okay.

Curtis Bradlee: I don't think so. Not at the moment.

((Crosstalk))

Curtis Bradlee: We're still more in that infrastructure (unintelligible).

Francine Alkisswani: Tonya, I'm turning this back over to you.

Tonya Smith-Jackson: Okay, thank you Curtis. I'm wondering, Jason - is Jason - is the technical problem resolved? It seems like more we talk about technology, the more challenges we face. Jason Arviso? No? Okay, I think next then, we'll just go to Dr. Deborah Dent. Go to the next slide, thank you.

Deborah Dent: Okay, good afternoon. And I'm Deborah Dent. I'm from Jackson State University. We're located in Jackson, Mississippi under the leadership of president, current president is Mr. Thomas Hudson. We're a Carnegie research institution and we're designated as an urban university of the State of Mississippi. And we mostly serve - we have a large population of first-generation students as most HBCUs. Now as far as our campus, where we are

now, I'm going to split this up into two parts.

Our basic campus, our infrastructure is over the last few years, we've moved to basically a cloud-based university. All of our enterprise systems, our ETR, our online systems, our just about everything that we have, we moved to a cloud-based system.

We were really nervous about that at first, but with the event of COVID-19, it really paid off because the students and the faculty and the staff still had access to everything that they needed to. So we were basically set up so that we could easily move to a totally remote organization, working organization and online.

Our biggest challenge was planning our faculty to move the traditional faculty to move to that online environment. Our commodity Internet is currently at 10 gigabytes but because we've been fortunate to receive CARES funding, we can use that CARES funding to upgrade our technology on our campus. And so we're going to be upgrading it to a 40 gigabytes.

So then we can talk about cyberinfrastructure and I'll go back and give the NSF definition of a cyberinfrastructure which is more than just the technology. It's more than just the equipment. There's cyberinfrastructure is that technology plus that workforce plus the tools that we - that are needed.

And so we are a member as far as the network regional, we're member of what we call the Mississippi Optical Network, we call it MissiON. And through MissiON we're connected to Internet 2 through 10 gigabyte connections. But with working with Clemson on our NSF CI empowerment initiative, just like South Carolina has. Because we work together on that.

We were able to collaborate. We were able to develop what we call a cyberinfrastructure plan for the campus which has helped us to be able to strategically plan our infrastructure. And so we received a 2018 NSF grant is a CC Star grant that allowed us to upgrade our research network to 100 gigs.

And so also as a result of that whole collaboration, we were able to start working with several other minority-serving institutions and we've instituted Mississippi - I mean the minority-serving cyberinfrastructure consortium. And we'll talk about that a little bit later. I did hear the question earlier too about asking were we a member of Quilt. Because we have that NSF grant, we've been invited to NSF workshops and as part of those NSF workshops are the Quilt meetings.

So we've been able to go to the Quilt meeting for the last two years which has been very beneficial. Most of the - everybody that's a member of the Quilt, they're members because the regional network that they're a part of are members of Quilt. We're working on getting Mississippi, the Mississippi Optical Network to join the Quilt right now.

So also what I wanted to say that is that we know that most states are experiencing budget cuts. So what we know that it's important that we increase our research capabilities because we're not going to just be able to survive on just state funding and everything.

So if we are able to increase our research capabilities, then we'll have capabilities - we'll have opportunities to increase the dollars that we can get from the research side of the house. And so I heard you say earlier too about that we're addressing the digital divide.

And so we're able to an extent address the digital divide right now with

technology with equipment, but the important thing is that technology and that equipment is that bridge and but we've got to do is we've got to be able to take our workforce from one side and take it over to the other side.

So that's why it's important that we're able to collaborate with one another and work on the workforce and sharing workforce and sharing and collaborating and being able to share the - that workforce technology and everything that we need to do.

So and the last thing is that I have on my slide that our major concern no matter what we're doing, we can build our campuses up to be just fantastic. But for what happened in Corbet, if they don't have access, if they don't have Internet access for where they're living outside of the campus, then it's not going to do us any good. So we - no matter what, we're always still going to have to focus on what do we need to do provide that Internet access to the people outside of the campus? And that's all.

Tonya Smith-Jackson: All right, thank you Dr. Dent and good point about the interdependence between broadband and cyberinfrastructure overall. All of it does matter. So we appreciate you bringing back the importance of that connection.

Okay, so we'll move to our next - we'll go ahead and move to our next speaker, Al Kuslikis from AIHEC.

Al Kuslikis: Very good, hello everyone. And good afternoon. And you're hearing okay, right?

Tonya Smith-Jackson: Yes, we hear you just fine.

Al Kuslikis: Okay, good. I hate to go through the whole thing and then find out well, when are you going to start? So thank you. So I'm Senior Associate for Strategic Initiatives at the American Higher Education Consortium and I'm very excited to be part of this conversation which is really new for me, for us at AIHEC.

Two years ago we were awarded a CC Star campus cyberinfrastructure grant from the National Science Foundation to basically conduct a study of all 37 tribal colleges looking at the level of their cyberinfrastructure and level of STEM programming - I mean that's supported by cyberinfrastructure. And also I'll do a little kind of a tribal college and university 101 before I do a little bit more into depth about that.

Could you advance to the next slide, please? Both - yes, so there's 37 tribal colleges and universities that as Francine mentioned, they're in 16 states. And 75 campus sites throughout those 16 states. Students are coming from 30 states, 30 or more states representing more than 230 federal recognized Indian tribes. And they're emerging even as we speak. There's a new college coming up in California. Another - a new one in Oklahoma that's developing. Up in Anchorage, Tribal College.

So this movement which started in 1968 with Navajo Community College which is now Dinè College serving the Navajo Nation along with Navajo Tech, we've got 36 additional colleges and as I say growing. It's a very new young type of institution Tribal Colleges. And you can appreciate the - just having the movement started in 1968.

A couple of - just a couple of things about our students. So 30, all 37 colleges offer 2-year degrees, 16 offer 4-year degree programs, 5 offer master degrees. Average age of students is between 16 and 24 although there are a lot of nontraditional students as well. And 78% of our students receive financial aid.

And average income of students is $21,000, a little over $21,000. Fifty-one percent of our students are first-generation college students.

The Tribal Colleges are very much tribal community focused type of institutions. You know community college in a much broader sense of community, they're working on all the different issues that tribes are - all the different challenges that tribes are facing in the whole Tribal Nation building process of language preservation, land and water - sustainability of land and water, food sovereignty, preservation of cultural tradition, building a workforce, a local workforce. Economic issues are prevalent in tribal communities, I'm sure you know. So workforce and economic development.

And so for us now that we've really moved into the cyberinfrastructure arena we're looking at how, as Francine mentioned in her introduction, not only broadband but the broader landscape of CI, cyberinfrastructure resources. How they can be brought to bear to support all these different issues and challenges, educational, economic development, health and wellness, etcetera. You know across the whole spectrum.

So tribal and TCU partnerships are very important of course. You know we - the colleges are providing services and resources that are supporting - that are intended - are targeting the same priorities as the tribes are.

So just very quickly moving into, so that's Tribal Colleges 101. Moving into our cyber study, so that - the work came in 2017 and the idea was that we were going to do, as I mentioned, a review of the cyber and the STEM Program supported by cyberinfrastructure at the colleges.

And we took a very broad view of that study. We were looking at the entire campus user community and their experience with campus infrastructure. The

way the infrastructure is used to support education. The way it supports delivery of all the services that the colleges provide.

And then looking to the future. What kinds of - what vision do the colleges have? And we didn't get as much into that as we could have. And we are moving in that direction now. What vision for the STEM Programs at colleges given access to the whole national community of CI partners. So what kinds of STEM Programs could they see emerging?

And so what we found is a lot. A lot of information. A lot about the specific infrastructure issues that the colleges have. And there's a fair number. They're - Tribal Colleges are small. They're small. Typically small. They are resource-challenged institutions in a number of ways. Their budgets are limited. They're located very remotely so it's hard often to rapidly fill positions when they're vacated both from instruction and support.

Their IT staffs are fairly limited. You have an IT Director and one or two IT staff oftentimes who both work maintaining the system, providing user support. All the things you might see. And I'm sure that's true for small institutions nationally regardless of what category - what niche they serve in the higher education spectrum.

But so what we - let's see. I guess maybe we can move onto the next slide. What we found is - oh the slide after that. Sorry. I kind of skipped one there. The one that shows kind of our outcome for - basically for broadband. Average connectivity at Tribal Colleges is 336 Megs per second. Average 2-year institution and among - institutions of higher education is 513. Four-year institutions it's 3.5 Gig. So we're pretty low on that scale of connectivity.

Something more to the point of resources that the colleges have, the refresh

rate for hardware average is a little over say eight and a third year. And the average is more like for institutions with higher ed, the average is more three to five years. So that's another indication of a resource challenge these colleges have.

Average TCU Internet cost, $40,000 a year for their - for assets. Highest and this is kind of it's so off the chart, I shouldn't even bring it up. Ilisagvik College up in Barrow or actually not, Utqiagvik, Alaska, the most northern point in the U.S., it's $250,000 a year. And they're getting 6 Megs for that so just imagine.

So anyway, so we've identified a number of challenges on the programmatic side and on the infrastructure side. And we're focusing resources on both of those right now. We've got a pilot project that we're working up with North Dakota State University in which North Dakota IT, the IT Department there is working - will be working with IT staff at all five Tribal Colleges in North Dakota to develop their - identifying their key cyberinfrastructure issues and providing support and upgrading them.

So getting the colleges to a point where they can start locally supporting STEM, you know, basically STEM research, data, you know, higher perform - high-performance computing applied to research computing. Just getting things kind of off the ground there at these colleges.

The parallel effort which we're doing for the North Dakota colleges but for all Tribal Colleges is creating kind of a work - implement a workforce development strategy in which we're providing access. We're providing training and technical support and working with Big Data.

And for all of our colleges, almost all of our colleges, environmental science

is a very popular degree. And a very high - and climate change is a very high priority in the Indian Country as well. So we're focusing on that discipline areas, developing a climate change data analysis training and support platform. And making it available to all faculty and all students giving them the opportunity to work with large data sets from NASA or NOAA or from USGS.

And actually doing work. The idea there is that we'd like to - our vision there is to have Tribal College students trained up in data analytics and the fundamentals of climate, science, and ecosystem services so that they can provide resilience, planning, vulnerability assessments, and resilient - and climate resilience planning to all tribes. Not just the tribes that they serve at their respective institutions or where they're affiliated but all tribes.

And that's kind of a foot in the door strategy for us. Such a high priority, climate change. Such a huge set of resources that are available to be brought to bear, the data from NASA. I forget to mention. We're partnering with the Texas Advanced Computing Center to provide the compute resources.

So through our platform faculty and students access the data from NASA or NOAA or USGS and they access the compute resources of the Texas Advanced Computing Center to do their - to run their analytics. All with mentors including - involving mentors from Texas, from (UCONN), NCAR, from the University of Miami which has a partnership with NOAA.

So I guess the point there is that we're really leveraging a lot of partnerships nationwide.

Let's see. Maybe I should stop there. Yes. Okay, final slide. The Tribal and TCU partnerships, broadband partnership. So looking, just specifically

looking at broadband, we - and Jason will be telling you about this, the Internet (unintelligible) Project which is very cool effort. Not effort, initiative to get connectivity out to every location on the Navajo Nation using wireless technology.

So that involves, you know, engineers, research, developing, working with partners, research. The research, the wireless research community to identify and develop and implement the right technology to sever the, you know, the terrain challenges of the Navajo Nation which if you've never been there, there's mountains, low mountains but there's mountains. There's valleys. There's canyons. There's just a lot of challenges there.

And if you notice in that first slide from way up the Navajo Nation is among a lot of the tribal communities in the west that are (unintelligible) deserts. They don't have affordable access to broadband. They don't have a lot of technology, access to a lot of technology locally.

Well, I should mostly on the connectivity side. Technology for students. Okay, my last comment, for students who through - because of the COVID-19 pandemic were forced to take courses from home which if you don't have connectivity at the home it's very hard to do.

So there's just those really basic connectivity issues alongside these larger ones that we're talking about. So let me stop there. And I hope I - actually maybe I went too long but thank you.

Tonya Smith-Jackson: All right. Thank you Al. Not at all. Thanks for that. And again, raising the point that all of this is interconnected. And some things are fundamental that are leading to, you know, not having equity and access and then of course that spills over into system-wide areas such as

cyberinfrastructure. So thank you.

So I think Jason has been able to take care of the technical issues. So if we go back to Jason Arviso. And Jason we'll hear from you.

Okay. I'm not hearing anything at this point. So it could be that we're still having some technical problems there. So I will turn this back over to Francine if we want to start the Q&A.

Francine Alkisswani: I spoke with - I took a moment and spoke with Jason. And sent him the number. And he said he would be able to get on. But I don't know whether he's on mute or what.

I don't see any questions in the chatbox. Not sure whether people think that we are - if they're going to get a recording of this that they don't need to put any comments in there.

So I'm going to - hello.

Maureen Lewis: Hi Francine. This is Maureen. I see several questions in the chat. I mean in the question and answer box.

Francine Alkisswani: Oh great. Would you then please pose them for us? Thank you.

((Crosstalk))

Maureen Lewis: … so the first one is from Joseph Daniels who asks are all these IHEs have broadband interconnectivity? So I think that must be Indian Higher Education institutions.

Al Kuslikis: Oh I'm sorry. What's that?

Maureen Lewis: It says are all the IHEs, do they all have broadband interconnectivity? And that was from Joseph Daniels.

Al Kuslikis: Yes and I think...

Dr. Tonya Smith-Jackson: And obviously that means Institutes of Higher Education actually.

Al Kuslikis: Yes.

Tonya Smith-Jackson: IHE. Yes.

Al Kuslikis: Institutes or not the AI - or AIHECs maybe. I don't know.

Maureen Lewis: No. It says IH...

((Crosstalk))

Maureen Lewis: IHE.

Al Kuslikis: Oh okay. Yes. Well...

((Crosstalk))

Al Kuslikis: ...I mean it's a question for the Tribal Colleges. Yes. Basically that's true except for Ilisagvik College with just 6 Megs.

Maureen Lewis: And he also asked are all - are the optic builds linear or ring in their configuration?

Tonya Smith-Jackson: Will you repeat the question Maureen?

Maureen Lewis: Certainly. It says are the optic builds linear or ring in their configuration?

Tonya Smith-Jackson: Oh so that's probably the network configuration. Somebody…

((Crosstalk))

Maureen Lewis: I believe so (unintelligible).

Tonya Smith-Jackson: Anybody want to take that question?

Al Kuslikis: I'll defer that to a technical person.

Francine Alkisswani: Deborah, Curtis.

Curtis Bradlee: For the one - for the university here right now we currently have a linear. But I know with Clemson and some other universities that are connected they have more ring-type connections to enforce the (unintelligible) connection.

Deborah Dent: And Jackson State has a ring.

Tonya Smith-Jackson: Okay. Okay.

Maureen Lewis: And there was...

Tonya Smith-Jackson: Go ahead.

Maureen Lewis: There was another question about the Quilt. The inquiry is can you explain

more about the Quilt? That's a question about the organization of Regional Education Network Association.

Tonya Smith-Jackson: So, you know, who wants to answer that? I think it first came up in Curtis' presentation.

Curtis Bradlee: No. I think Deborah is the one.

Tonya Smith-Jackson: Oh it was Deborah.

Curtis Bradlee: Deborah.

Tonya Smith-Jackson: Okay. Sorry.

Deborah Dent: Okay.

Tonya Smith-Jackson: Deborah do you want to explain the Quilt, what it is?

Deborah Dent: It's an organization of regional networks across the - if I can remember right, everybody within the U.S. They come together and they have meetings and they collaborate and they share information. They have several workshops and there's some - they're like a consortium. And they work together.

The universities that are members of each regional network are part of it. So the regional network some of them - they're - they may be independent organizations or they may be - or formed by the different schools coming together. For example, in Mississippi our regional network is just basically all of the - we have three, the four major research universities have come together. So we don't have any kind of formal organization.

But in some other states their regional networks, they actually had employees that work there. So the Quilt comes together. They're pretty much under the guidance of NSF. They have a Director. And you can find information about them by just Googling the Quilt. And you could probably get more detailed information.

Francine Alkisswani: What is the benefit of an HBCU or TCU? I guess does that - first of all, whether they are located in areas that have either state broadband networks or more to the point regional education networks. Are any of the Tribal Colleges and Universities a part of a regional education network, Al? And if so how many?

Al Kuslikis: There are a couple private colleges that are connected to their state networks. Salish Kootenai College is one. There's a couple in North Dakota that are as well.

And the majority of the private colleges are located within the geographic area served by the or represented by the Northern Tier Network.

And I should've mentioned this earlier. We do organize. We have for the last three years organized Annual Meetings in coordination with the Northern Tier Network Annual Meeting. Annual Meetings of the IT Directors of the Tribal Colleges.

And there's a lot of value there in generating, you know, conversations about, you know, specific technology issues. Cybersecurity was on that was discussed pretty much, quite a bit in-depth last meeting.

Al Kuslikis: Issues, the technical expertise represented by the folks in the Northern Tier

Network is kind of like expands the community of practice for our Tribal College IT Directors.

So it's really valuable that way because while even if the colleges aren't members of the Northern Tier Network yet. And yes, I mean so the members of the Northern Tier Network they all are very interested in expanding their community. And so working with Tribal Colleges is a priority for them. And we really appreciate that.

Maureen Lewis: So there's some additional...

Francine Alkisswani: Is there - go ahead Maureen.

Maureen Lewis: No, no, no. I was going to say first of all, so the web site address for the Quilt is www.thequilt.net. And that's available in the question and answer section.

Also, there are a number - there's some questions about the difference I guess between cyberinfrastructure and broadband. The questioner asks unfortunately it is not clear that we have the goals of HBCUs beyond broadband. Can someone please explain? It's from Barry (unintelligible).

Tonya Smith-Jackson: Let's - Deborah do you want to take that because you were the first to kind of really bring that up and you pulled the NSF definition for cyberinfrastructure?

Deborah Dent: Yes. A lot of times when we hear the word cyberinfrastructure we think that it's just the network, just the actual equipment that's in the ground. And we think of it as just when we're talking about where we have a network and the speed is 10 Gig or whatever.

But it's when you're talking about cyberinfrastructure, it's more. When we use the word cyberinfrastructure as far as the NSF definition it's more than just equipment. It's the equipment and then it's the people. It's the workforce that's required to actually look into this - into the area, the research area. It's a special workforce. You have to have special skills, a new skillset that they understand how to apply all of the sciences. You need to be able to look at if it's the data science or if it's the biology.

So it's really very broad, a big definition. But the point is we have to get into is realizing that it's more than just equipment. It's the equipment and the people and the tools that you use.

Francine Alkisswani: Could I ask a question here of you Tonya and Deborah and Al I guess from your NSF experience and background? Is - what would be the deciding factor then between a school simply I'm going to use - say it simply having broadband access which is the infrastructure that allows them to have high-speed Internet where they can conduct distance learning services. They can conduct their business, the basic enterprise businesses.

Compared to an infrastructure that the broadband infrastructure that supports research in biotechnology, bioinformatics, cybersecurity research, or all of the fields of research that is supported by NSF let's say and that require a base of infrastructure that is a cut above what broadband would allow and that makes it possible for researchers and scientists at Tribal Colleges and universities and HBCUs to be a part of a global network of researchers and participate in those research networks and communities. Does basic broadband allow for that or is that the domain of cyberinfrastructure?

And what is the relationship between that and having both HBCUs and TCUs being competitive as it were or such scientific grants whether it be NSF or

Homeland Security or Energy?

So it's a rather broad question but I think it could help clarify the importance of that.

Tonya Smith-Jackson: Well I'll just talk from what we tried to do at NSF when we were communicating about cyberinfrastructure. We often use the word sociotechnical because when you're talking about cyberinfrastructure in particular you are talking about sort of this overall, you know, enterprise that helps to connect, you know, could be laboratory.

It allows for shared confrontational resources. It's data governance. It's, you know, policies written around it. So and it's the staffing that you have and the human resources. All of that is needed more broadly, more expansively I should say to be able to have an impact on or a more significant impact on research.

So if you're going to research things like smart and connected health or health disparities, you do need - really need to have a stronger cyberinfrastructure to be able to do that. And you have this - what supports the network of researchers if you're going to do it across multiple institutions.

You know if HBCUs and TCUs collaborated around health disparities then we would need, you know, a stronger network. We would need, you know, collaboration. Tools that will support the collaboration. But we would also need people and organizations and staffing to support that collaboration.

So all of that goes into the aspect of cyberinfrastructure. But certainly, while that is a sociotechnical aspect of it, you obviously, you do need the tool. So when you think sociotechnical you're thinking people, tools and organizations

or environments.

So, you know, you need the tools as well. And that's where broadband, high-speed, you know, Internet access, all of those, you know, sort of software and hardware is used. They matter as well.

I don't know if that's clear but that's...

Francine Alkisswani: Yes. I think that helps. And I'd like to just throw in the pot here that helps exemplify what the point I'm trying to get to. And that is I had a conversation with one of the HBCU schools of engineering.

And I was attempting to find out how COVID, what the impact of COVID had had on this school of engineering's research. And I was - it was interesting to learn that this particular engineering, school of engineering had a program in which its broadband infrastructure was so robust and falls into the category of "Cyberinfrastructure" such that they have been able to maintain their relations and work in robotics and other areas of cybersecurity with their partner federal laboratory and their researchers have maintained operation and their students have been engaged, continue to engage in this research remotely because they had that form of infrastructure that allows them to do so.

Now obviously, the students also had connectivity in their home. But it's those levels I think where many of our schools of engineering, our medical schools, the kind of researchers that Al has been referring to would - might benefit from such relations.

So if it was that sort of thing that I was wondering how schools had been affected by that. You can have parts of schools that were closed down. So schools couldn't deliver full connectivity or access to distance learning, yet

you could have these islands of research and resources that we're able to manage. So, is there a role to play here in terms of Internet2 and/or Educause what does the panel of that and what it provides in terms of supports or skills?

Curtis Bradlee: This is Curtis. I want to shed - answer what is being asked and discussed about broadband and this type of infrastructure research network more - I'm going to describe more in a basic level. When I think of broadband, I think about limitation in bandwidth.

Like, when you have - in our homes, we have broadband cable, but when we're streaming a lot of content, sometimes your Internet service provider throttle that traffic and limit the bandwidth. Now, on research side, it's more this - it's frictionless, meaning that if I'm looking to - if I have a 40-gig connection, I'm not restricted.

So, if I have - with us on campus here, we have - researchers have, like, terabytes of data and they want to move that data from Saginaw State University to another university, and they're connected to the research network, they would take less time to transfer that amount of data – large amount of data - to another university.

Now, if I have 40 gigs of - 40 terabytes of data at home and try to send it to some other location, that could be a possibility that the Internet service provider might throttle my traffic. It might take five or six hours to send the data as opposed to the research network, which can take less than a minute or so transmit that data.

So, when we're looking at researchers -- and they have a lot of data, like several bytes of data -- they want to try to be able to transmit or access that resource - the resources of the location in a timely manner. So, on our

university campus as well they use Netflix and Hulu. That could impact the commodity Internet, but it would not impact the researchers because that traffic is separate from the commodity Internet. I hope that makes sense.

Francine Alkisswani: So, if you take Al's - a slide on TCU connectivity, comparing it to the rest of the United States higher education, there's no role - there's - it's impossible for any TCU - If I just look at that alone I would say it's impossible for any TCU to be competitive in U.S. research realm. Am I correct?

Curtis Bradlee: Correct.

Curtis Bradlee: Yes, we have limitations for research. Yes. Yes.

Al Kuslikis: Can I jump in on that? That's a really good question. I think - yes, I mean, if you think about not having the cyber infrastructure on campus to support the level of research that requires large data sets, you know, you can't attract faculty to your institution if - it won't happen. They're going to go somewhere where they - they can support their work.

What's still possible though, especially for students, you know, that are interested in climate science or a deep learning or -- what's another one I'm thinking of -- advanced manufacturing or engineering, if they're interested in those areas and they don't have the resources on campus to pursue, and having decent connectivity does allow them to access resources and data elsewhere.

And that's how we're doing the climate science project. There's no tribal college that has the compute resources to do this work unless maybe, you know, Navajo Tech does, but they can skip the data from one spot to a data repositories to a research - you know, a data analytics research computing location and do their work.

So, you don't necessarily have to have the (unintelligible) infrastructure on campus to still - to be able to participate, but you do have to have, you know, broadband access. And I think that's a model for all smaller institutions that are resource - you know, that have resource challenges, that they can still make these opportunities available to their students, even if, on-site, they don't have the resources.

You know, cloud computing is so big now -- cloud research computing -- you know, the Amazon cloud services - you can do a lot of great computer science without having the - you know, the computing horsepower right there locally.

Francine Alkisswani: Tonya, I'm turning this back over to you. Did you have a final slide that you wanted to discuss or more points or questions you wanted to raise to our panelists?

Jason Arviso: Hello, Dr. Alkiswani. This is Jason. I'm finally able to join.

((Crosstalk))

Jason Arviso: … now, offering with...

((Crosstalk))

Tonya Smith-Jackson: ... final time into - to focusing on Jason. Hello, Jason. Welcome.

Jason Arviso: Okay. I'm so sorry. I was just…

((Crosstalk))

Jason Arviso: … it might mean long-distance - is there actually - I had to talk to an operator that came on the second time and greeted me access, so ...

Francine Alkisswani: Well, I'm glad she did. So, the floor is yours.

Jason Arviso: Okay. Well, thank you, Dr. Alkisswani and Dr. Jackson and my panelists. I've been listening to the deep discussions throughout the afternoon, and each one of you really hit, you know, on certain challenges and trials that, you know, are reported to our - institutions such as ours, and it's (unintelligible) really at Navajo Technical University.

Again, my name is Jason I'm the Vice President of Operations at Navajo Tech. I've been employed there roughly 14 years. I started off as (unintelligible) institutional - or institutional development as Director of Information Technology and now working as Vice President of Operations. And, throughout my time there, I seen our infrastructure developed over time.

If we can go on to the next slide? Initially, when I came to the campus, we were already participating within NSF under the (teacup) directorate - the HR directorate. And then, they afforded us the ability to address infrastructure, and infrastructure meaning broadband capacity through our facility in Crownpoint, New Mexico.

We were able to accomplish that by bringing in broadband access, developing over broadband bandwidth into Albuquerque from Crownpoint, which is roughly 200-plus miles (unintelligible) microwave powers along that route. It actually allowed us to then establish OC3 connectivity. And I know part of the Internet2, and resources available and actually, you know, part (unintelligible) where they reported that capability or that access.

So, the infrastructure in itself didn't address Navajo Technical University's developing programs. And, due to the resource of the infrastructure, we were able to establish degrees. We now offer a master's degree in native language, and a Master's degree in managing information systems. So, we're developing.

The last component is of infrastructure that we have - you know, it really has afforded us the ability to then negotiate with the carriers to see how we might be able to best accommodate, you know, all of our infrastructure. You know, reliability and cost certainly are inclusions of the conversation, and at the point - at that point in time, it was relatively high.

I know I saw Al's slide that he mentioned, you know, when a small college payment of over $250,000 for just 6 Megs. That was us. You know, so, we were able to do it as well. We were paying a lot of money for this 6 Megs capacity.

And, so, we're developing, and were actually able to coordinate our efforts with the (unintelligible) institutions or the state optical networks. You know, aligning our infrastructure, you know, and they need support and education and knowledge from them to help us develop. Right now, the major, you know, concern then was the number of carriers on the reservation charging high rates.

The reliability was not all that great. The digital divide was pretty consistent across the Navajo nation. You know, when you look at today's taglines when it just says broadband capacity 25 megabits down and 3 megs up, no way really is that down on the reservation, you know, currently.

So, when we address broadband in the (unintelligible) deliverable or the - the

opportunity to utilize the infrastructure, we're really set back. We're challenged in that regard, and it's an ever-persistent challenge. But recently, I understand she's -- now that there's a Broadband Data Act, which addresses - you know, to ensure the FCC does, you know, assess independently data.

So, it will see our - if you do challenge the accuracy of the institution maps, we're able to supply and correct that circumstance in how many years prevalent across Navajo nation, you know, we have locations that appear on the map as fully served or adequately served or - in reality, there's no capacity there and there's no communication, and it really does you know, provide a mishap for our reservation and our people.

Can we go to the next slide, please? So, you know - and I heard (unintelligible) earlier from over CC* - the CC* program. For a number of years, we did participate under the HR director, the tribal colleges and universities program, and we did benefit a lot by building infrastructure programs, and then now it's - our (unintelligible) CC* and we're rejecting, you know, research components of National Science Foundation.

And our initial CC* program helped us to address what we call our science driver found at NTU. Al mentioned, you know, research and how things conducted, even though we don't necessarily have the resources to support the research, you know, we're creative enough to utilize what we have, and research is - they're being, you know, conducted.

But in NTU's regard, we have the science driver. We do have the big data sets. We are looking for (unintelligible) to transfer that data to and from our locations to the computing resources. You know, we're actively moving the resourcing of (condo) and (unintelligible) to get - to achieve that (unintelligible) scientists use, you know, for list simulation in the work they

need to conduct.

But they really just provided us the opportunity to see, you know, the opportunities there, you know, the ability to develop the science (unintelligible), you know, which actually adjusts it to send large data sets to and from locations in a secure fashion.

We've been able to dedicate the necessary bandwidth just to support, you know, that capacity (unintelligible) some data, and also they hope to develop a network that supports that enterprise, you know, capacity for the organization itself.

And working in coordination with them, with the funding that's Giga-pop the state optical unit we're out of Boulder or the NCAR (unintelligible) engineer to help us design and then develop the capacity to implement. And we worked out a number of resources. Half of colleges don't necessarily have the deep pockets to purchase the high-end switches, the high-end networking routers and such.

But we were able to come to a consensus and actually be - develop (unintelligible) infrastructure that is supported mainly by Fox or open-source software. So, in that regard, we're compiling our notes, we're getting together, we are building a model, and we hope to not just - you know, we hope to actually share with the reps of the TCU community and see if we can actually work collectively through (unintelligible) as a strategy to serve our institutions across the United States.

Our next (unintelligible) program - actually, it addressed building that relationship with the tribal - the tribal colleges near Arizona and New Mexico. So, it actually had brought on (unintelligible) call the Southwest Tribal

College IT consortium. I teach (unintelligible) and that's (unintelligible) college, the (unintelligible) college, (unintelligible).

And they're - we're - the first CC* allowed us to bring - pay that knowledge, (unintelligible) CC*, we're actually going to go ahead and replicate that and work to deploy and develop internal infrastructures that support their research endeavors, not just (unintelligible).

I know Al mentioned the ability for (unintelligible). You know, this is a shared concept, so that, you know, we have network engineers, we have IT staff, you know, throughout.

In fact, our capacity for opportunity is now, you know (unintelligible) many times over because we can call on Dine College, not just within our own institution, but we can call the main college and ask to see if they (unintelligible) you know, to choose some type of border, you know, to a problem that we're dealing with on our campus. But that's really the intent behind that, is CC* grant as well.

Okay, the next one, please. And, again, it's deductive. You know, the IT personnel - you know, we're building infrastructures that support more and more of our STEM programming. Strategic planning is certainly a major component of where we want to be now, and into the future. We know that faculties - you know, we have to build that expertise.

We have to develop the next mechanism and, you know, providing them their capability to bring their research and actually have them conduct their research while they're still in normal locations, they're still publishing and there conducting has deemed (unintelligible) sort of necessary.

Next slide, please. Again, just to (unintelligible) this - appear the members that we now have that are part of the IT, or the (unintelligible) IT – southwest college IT consortium, as we call it. In fact, we came up with an acronym for it, but I can't remember it right now, but one of those lines (unintelligible) picture of - the picture right there is (unintelligible) a snapshot of our infrastructure across the Navajo nation.

So, in the far-left corner, to the bottom, there's Albuquerque. It extends as far out as Flagstaff. So, we're building infrastructure just to (unintelligible) the best we can. You know, there are higher speeds throughout Navajo nation - and also to work with a wide for our communities and people across the reservation.

Francine Alkisswani: I have about five minutes, just to...

Jason Arviso: Okay.

Francine Alkisswani: ...sorry. Yes…

((Crosstalk))

Jason Arviso: … that's no problem with me. I just want to (unintelligible) mention that, initially, when I came, I - I've been through 6 Megs. I saw Al slide (unintelligible) 200 meg, and probably capacity, but we just use - we, you know, were able to work with a carrier to utilize their infrastructure and utilize it in such a manner to - they're just now operating us - just transport, and what they're paying for the transport of the fiber network, and we're actually able now to light it ourselves. We are Internet (unintelligible).

We are, in fact, our own ISP. So, we're working on obtaining some

aggregation from Albuquerque Giga-pop, as well as to - possibility of Phoenix in the (unintelligible) corridor and even often to see (unintelligible). So, our network will address aggregation and the possibility of providing capacity to our endpoints or to our communities, but also (unintelligible) diversity so that we're able to only have (unintelligible) our network environment operational.

The other major component we have right now that's dealing with the pandemic is the Navajo nation or tribal nation were afforded the ability to obtain the 2.5 gigahertz spectrum. That's coming to option - tribal nations now are first priority access to it, and through that, our nation actually wrote to the FCC and were - plan to the use of the STA (unintelligible) for special temporary authorization to utilize the 2.5 gigahertz (unintelligible) both Navajo Technical University.

And the Navajo Technical College and Dine College are deploying that upon our networks to serve people directly in their home, as the policy is, you know, supporting them through hotspots but (unintelligible) keep people in their homes, we need to provide that capacity there, and we're achieving that right now.

So, I just wanted to end with that. You know, there are a lot of neat developments returning. Things are changing. We have a 10-gig access now, you know, access to 40-gig, 100-gig. You know, the (unintelligible) opportunities are developing in - you know.

So, aligning yourself with R-1s, or the regional optical networks, and utilizing the higher learning aspects to include - to harness and promote, you know, their success for communities to really address, you know, the areas around health, public safety, economic development, government and education. You know, those are real benefactors and real opportunities to achieve that success.

And we wind up making progress also with our tribal leadership at the table and have developer programs (unintelligible) most of the Navajo nation, and higher learning or education is a key component. That - I'll conclude. And, say, thank you again, and I am, again, sorry for jumping on so late and not understanding how the technology works.

Francine Alkisswani: Jason, is it possible for you to quickly show your last two slides? Chris, did you - the last two? That one…

((Crosstalk))

Jason Arviso: … I'm sure I…

((Crosstalk))

Francine Alkisswani: … and I think there's just one more. But we have time to just quickly go over those.

Jason Arviso: (Unintelligible) that last line's just a (unintelligible) the (unintelligible) sizes that we do have on campus. Right there was, like, existing network, but, like, kind of belonged to science (unintelligible) design by (unintelligible) we're instituting.

Francine Alkisswani: Okay. Thank you. So, do we have time, Tonya for your - for this final slide -- we have about six minutes -- or shall we call it a wrap?

Tonya Smith-Jackson: Well, I do want to make sure we - do we have any other questions? We can probably take one or two more questions, if that's all right.

Maureen Lewis: Certainly. Let's see. So, Dr. Michael Hupp asks, "The U.S. workforce is (unintelligible) millions of cyber professionals. Is there a plan to make HBCUs and TCUs the hub for trained cyber security professionals?" And then he says, in (unintelligible), "possibly operating - possible new opportunity zone".

Francine Alkisswani: Well, I'll say, from the standpoint of the Minority Broadband Initiative, the (unintelligible) would like to work with cyber colleges and HBCUs individually or collectively to do the very thing you're proposing and - but securely, as it relates to opportunity zones. So, we do have the offline - to follow up with you and arrange for and facilitate a meeting between TCUs, HBCUs and yourself to discuss that potential opportunity.

Jason Arviso: And I would like to add real quickly to that. You know, that's a key contribution. I think tribal colleges and - or the higher learning can provide that education component.

You know, a real-life example is the community - our community has asked us to build a workforce development program that actually is (unintelligible) specifically to (unintelligible) industry meant to deploy (unintelligible) across the region of - we are designing the certificate on an associate degree around that design.

Al Kuslikis: And if I could just add a comment to that as well, they're absolutely right. I mean, it's really important to build a CI workforce (unintelligible) to check for (unintelligible), you know, the networking engineers, all of that. And, because so many of our colleges are small and they don't have the STEM resources to stand up a program like that, something that's centralized.

Offered through Navajo Tech or more broadly with other partners, an

(unintelligible), I think that's the way to deliver that kind of workforce development programming, and have as broad an impact as possible, you know, for all communities; not just tribal communities.

Maureen Lewis: There's a question from Joseph Durham who asks, "What do you do for cyber security training for staff, students and faculty?"

Tonya Smith-Jackson: I think training within the institutions.

Al Kuslikis: Yes, that's...

((Crosstalk))

Tonya Smith-Jackson:… you want to take it?

Deborah Dent: (Unintelligible) Jackson State today is that we have a cybersecurity specialist here and she - I explained -- and it's mandatory training. We did, through our campus platform - so, every so many months, she puts the training out that - she gets the training from (unintelligible), from (unintelligible) and other places, and that way we can provide trainings of the students, and for the faculty and the staff, especially to meet audit requirements.

Man 4: Yes, he - Randy and him were talking and…

((Crosstalk))

Tonya Smith-Jackson: And I think there are - you know, there are institutions who have very much like A&T information technology training and development offices that typically are under their CIO's units - you know, information technology services, for example. And, so, students, faculty and staff can be trained

through those - through those particular units.

Tonya Smith-Jackson: All right, well, we will move forward towards wrapping it up. I want to take a moment and thank the panelists. Thank you for sharing where you are right now, where you want to be in the future, helping us understand your operational context. I think what comes out of this too is - one aspect of inclusion is that we also have to understand diversity.

And, so, when we look at TCU's and HBCUs, the challenges are very similar, but there are also some differences that have to be considered, and this is why I think collaborations matter between these two groups of institutions so that we can move ahead when it - as we relate to cyber infrastructure.

And, again, so, thank you for your insights today. They were very helpful, and it helped us to get some important information out there that was - that we really needed to focus on. Other than that, I think there are some wrap-up things that have to be done, (Francine). So, I'll turn that part over to you.

Francine Alkisswani: Okay. I too want to thank each and every one of you for your participation. It has been insightful and helpful, and we think that there are grounds there for continuing, for follow-up and for collaboration across the board. So, thank you to all of our attendees for taking part. We hope this has been helpful information for you.

We welcome your feedback. If you didn't get them in the Chatbox, there's a question box. Feel free to send information or comment to me directly at F as in Francine, Alkisswani at NTIA.doc.gov. We ask you, BroadbandUSA staff - ask you to stay tuned for the next practical conversations which will take place September 16.

And we're always available to help communicate with broadband access and digital inclusion efforts. So, Chris, I think that probably brings us to our wrap. And, so, we want to thank you all again so very, very much, and we look forward to discussions with you again in the future.

Al Kuslikis: Thank you

Francine Alkisswani: Thank you, Tonya. Thank you, everyone. Everyone, stay healthy and safe.

Tonya Smith-Jackson: Thank you. That is true.

Francine Alkisswani: All right, bye-bye.

((Crosstalk))

Al Kuslikis: Bye-bye.

END