

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)
)
Emergency Broadband Connectivity) WC Docket No. 20-445
Fund Assistance)

**COMMENTS OF THE CITY OF SEATTLE, WASHINGTON STATE BROADBAND OFFICE, SEATTLE
PUBLIC SCHOOLS DISTRICT AND SEATTLE HOUSING AUTHORITY**

The City of Seattle, Washington State Broadband Office, the Seattle Public Schools District, and the Seattle Housing Authority submits these comments in response to the Public Notice released on January 4, 2021, seeking comment on the provision of assistance from the Emergency Broadband Connectivity Fund and through the Emergency Benefit Program (EBBP).¹ We appreciate the Commission seeking input on implementation of this critical Program to ensure it (1) most effectively reaches and supports low-income community members, and (2) supports the internet service levels and devices needed to successfully connect with remote learning, remote work, telemedicine, and social connections during the on-going pandemic. Our comments reflect the front-line expertise and recent experiences of our City, school district and housing authority staff, offering meaningful input on how the Program should be designed to reach the intended recipients and add value to their households. Our comments have also been informed by discussions with community-based digital inclusion and social service providers and our colleagues working on broadband and digital inclusion at the regional and state level. We know that many in rural areas of Washington State and elsewhere still need basic broadband infrastructure. However, households in urban, suburban, and rural areas where broadband is available face common challenges in learning about affordable service options, trying to subscribe, and in obtaining affordable and sufficient internet service to learn, work or seek work, and access health and essential services online.

¹ Public Notice, *Wireline Competition Bureau Seeks Comment on Emergency Broadband Connectivity Fund Assistance*, WC Docket No. 20-445 (Jan. 4, 2021).

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Introduction

Our comments here include these recommendations which will be most critical to a successful program:

1. Ensure a simple eligibility process with diverse local and national marketing and support for applicant facilitation. Support local partnerships to accomplish this.
2. Enable a range of providers to participate to ensure best consumer options and availability.
3. Ensure internet service levels and device capacities are adequate for the size of households and targeted uses.
4. Ensure transparency, sufficient notification, and mechanisms for consumers to understand the benefits and limitations of benefits offered.
5. Ensure the transition at the end of the benefit period is done in a manner that does not disadvantage residents with increased debt risks or loss of service.

Together the City of Seattle, Washington State Broadband Office, the Seattle Housing Authority, and the Seattle Public School District serve and have deep experience with the populations to be helped by the EBBP and with the internet providers.

The **City of Seattle** has assisted low-income residents with digital inclusion needs, including internet access, for over 20 years. This include working closely with the schools, library, housing authority as well as helping fund and partnering with local trusted and very diverse community-based organizations helping those impacted by the Covid-19 crisis which the EBBP has identified. During the pandemic, we have expanded our help signing people up for internet benefits, obtaining devices, and troubleshooting the barriers people have faced in getting online to access learning and essential services. We have aided Seattle Schools and the Seattle Jobs Initiative with internet sponsor agreements and have developed and supported marketing of internet and device resources for low income families. The City also has extensive experience with utility discount programs.

Washington State has long been a champion of sufficient and affordable broadband development. Most recently, in 2019, the Washington State Legislature enacted Second Substitute Senate Bill

5511, recognizing that broadband access is critical to the residents of Washington. The Washington State Broadband Office in the Department of Commerce leads and coordinates the State's work to develop and improve affordable, quality broadband throughout Washington state in order to drive job creation, promote innovation, improve economic vitality and expand markets for Washington businesses. The State goals include serving the growing needs of Washington's education, health care and public safety systems; industries and business; governmental operations and residents, and to improve broadband access for unserved and underserved communities and populations. The State Broadband Office, in collaboration with state legislators, Governor's office, agencies, internet providers, local government, tribes, education and community sector collaborators, has facilitated a number of COVID crisis responses including drive-up Wi-Fi locations, buildout, support for local systems and students.

The **Seattle Housing Authority** (SHA), in a variety of housing program types, provides long-term, low-income rental housing and rental assistance to 37,453 people, representing 18,651 households, in the city of Seattle. SHA owns and operates 8,438 apartments and single-family homes at 365 sites throughout the city. Additionally, SHA administers 10,835 Housing Choice Vouchers, enabling low-income tenants to receive rental assistance with other landlords in Seattle. Nearly 80 percent of those we serve are children, elderly or disabled. One in 10 students enrolled in Seattle Public Schools lives in SHA-supported housing. SHA believes in providing more than housing for its tenants, and partners with many organizations to offer an array of services and community activities to help those they serve improve their lives. SHA is an independent public corporation. The majority of SHA's funding is federal, through the U.S Department of Housing and Urban Development. Other income includes rent revenue and non-HUD public and private grants. SHA's low-income residents are families, students, seniors, disabled, veterans, immigrants, refugees, and the full array of community members that already face extra challenges in normal life activities. Affording internet service and devices, and having digital literacy skills have been on-going challenges for many SHA residents; the sudden *essential* need for these services and skills has increased understanding of the needs and the pitfalls associated with current program designed to help low-income residents get internet access.

The **Seattle Public Schools District** serves over 53,000 students and over 30% of students qualify for Free and Reduced Lunch programs. With the pandemic and precipitous shift to all remote learning, the District has spent the past 11 months intently engaged with diverse student households needing connectivity, devices, and technical support to participate in remote learning. The District has partnered with wireline and wireless ISPs to provide school-subsidized services to student households needing home internet connections, or supplemental service where their existing service capacity is insufficient. This has been an arduous process; low digital literacy, language barriers, and unstable housing have all necessitated largely one-on-one support to ensure our highest need student households got connected. This experience provides a clear view into how a new program would be best designed to ensure it reaches the intended recipients and adds value to their households.

As the Commission considers these and other submitted comments, we ask the Commission to focus on effectively impacting *individuals* across the nation and listening to local comments and ideas from those that are working daily to meet the challenges of getting individuals connectivity support, including both suitable internet service and devices. Our comments therefore focus on the areas that will determine whether economically-challenged and other vulnerable populations are able to benefit from the program, are not inadvertently harmed by participating in the program, and get a level of internet service and device that fully supports their connectivity needs. Specially, we provide input on sections *Participating Providers/Designating Non-ETC Providers, Tracking and Verifying Household Eligibility, Covered Services and Devices, Promoting Awareness, Program Reporting and Conclusion, and Reimbursement*.

Participating Providers/Designating Non-ETC Providers.

Streamline the eligibility process for non-ETCs to maximize service provider options.

To ensure the highest number of households have access to services from ISPs operating in their area, the process for eligibility for non-ETCs should be streamlined enough that small ISPs, municipal providers and other non-ETCs can easily participate in the program. If the EBBP includes high barriers to program participation from potential ISPs, it could mean that households are not able to obtain the subsidized services they need from the ISP they want or need to use.

In Seattle we have an array of ISPs offering residents service options based on their neighborhood or the multi-dwelling unit building where they live. This includes large (Comcast, Lumen), medium (Wave, Wave G), and small (Atlas Networks, Google Fiber WebPass) companies. Across our state, there are also other smaller providers and municipal providers. The EBBP should have an accessible, streamlined process targeted for all sizes of ISPs to participate. Designing for participation by all sizes of companies and types of providers will ensure the broadest access to eligible participants, and also support a competitive ISP ecosystem that will ultimately serve all community members with increased choice, service levels, and customer service accountability.

Tracking and Verifying Household Eligibility.

Eligible Households should be defined by qualified persons, not a single residential address.

This is a *critical* eligibility consideration. Low-income families and community members often do not have the luxury of living alone and often share housing to lower costs. In the current environment with multiple household members online much of the day, residents are faced with the need to either obtain multiple internet connections if the low-income option is insufficient or figure out how to obtain a much higher cost tier of service. The EBBP should:

- Make the subsidy available to each qualified head of household person, regardless of the number of household persons at that address.

- Additional qualified persons at a single residential address should have a separate, but *not* more rigorous verification process.
- Require ISPs to offer tiered service levels depending on the number and type of users at a single residential address and number of qualified head of household participants at a single residential address. For wireline service, this would allow ISPs to provide residences with more than one household to have one wireline internet connection to the house but offering double the service level (i.e., one residential address with two qualified EBBP households would have access to up to \$100/month service subsidy)
- Eligible households should be allowed to receive more than one connected device if they change to a new participating ISP and if there are multiple members of a household.

Eligibility verification should be streamlined and based on participation in other low-income support programs.

It is essential for the EBBP to streamline the eligibility and verification process to support more participation by both low-income residents and ISPs. A highest priority should be avoiding participants from having a cumbersome application process which requires resubmitting documentations to confirm their income eligibility. Households meeting the federal USDA Community Eligibility Provision should be considered eligible. Similar to Section 904's provision for reliance on school district information on students eligible for free/reduced lunch or breakfast, the EBBP should allow automatic eligibility for residents living in public housing and using other housing assistance programs.

Allow aggregated, bulk eligibility partnerships with school districts, public housing authorities and similar entities.

One of the most effective ways for the EBBP to quickly help large populations of eligible participants is to allow ISPs to partner with public housing authorities, tribal, and other low-income housing and similar providers to aggregate the benefit and 'turn-on' the internet service in every unit and centrally manage the service provision with the Housing Authority staff or other entity. This would:

- Remove all application barriers and account management challenges that often interfere with individual unit households registering low-cost programs.
- Support streamlined verification and eligibility tracking and limit the account management complexity for ISPs.
- Arrange for the most affordable, quality service available for residents.
- Allow for Housing Authorities to centralize communications with tenants about the internet service and options once the EBBP ends. Housing Authorities will also be more adept at providing the communications in cultural and language appropriate methods to meet the unique characteristics of their residents. The FCC had a similar provision for Lifeline broadband, which was put on hold during the last Administration.

Covered Services and Devices.

Covered services need to offer connectivity bandwidth based on household size and internet uses.

The EBBP will be effective if subsidies are targeted for internet services levels to meet the true needs of households; not more and not less. Many low-income households struggle with limited understanding of broadband service levels needed to meet their household needs. This makes them vulnerable to being “up sold” by an ISP looking to maximize the reimbursement level under the EBBP. The EBBP should provide clear service level guidelines based on household size and internet uses to ensure participating households are not subscribing to more than they need. This will help to minimize expense to EBBP, increase funds available to subsidize more households, and prevent households from being caught with unnecessary and unaffordable service plans once the EBBP ends.

Set service level ranges to meet the bandwidth needs of households with multiple simultaneous users.

There is no one-size-fits all service level solution for every type of low-income household. The actual needs of students, families, seniors, and remote workers are different. Bandwidth requirements increase relative to the number of people who are on a video conferencing call. A

baseline broadband service level of 25/3 Mbps will work fine for a low-income senior needing to use telemedicine or remote social activities, but that same service level results in poor connectivity performance and interrupted learning for a low-income student in a household with multiple remote learners and/or remote workers.

When considering minimum service levels, it is essential to understand the amount of bandwidth needed for video conferencing², which is the basis for remote learning, telemedicine, and many remote work activities. Unlike accessing video content from the internet for viewing – which can buffer data, as needed – using video conferencing applications (e.g, Zoom, Microsoft Teams) requires constant packets of data being sent and downloaded in real time. The higher the bandwidth available and the more symmetrical the service, the higher the video and audio quality of someone trying to participate in video conferencing. If students cannot participate in real time uploading/downloading of data, it adds to economic and social stigmas and additional barriers for participating in remote learning. The risk is very high that we might lose these students permanently.

Incentivize ISPs to increase service *upload* speed levels.

With households full of students and workers all needing to simultaneously use video conferencing and other interactivity during the day, an essential component of acceptable internet service levels is the *upload* speeds. We recommend a minimum service requirement of at least 5 Mbps *upload* speeds for any service eligible for EBBP subsidy. This recommendation comes from months of school district staff working to help households struggling to support multiple students in remote learning during the day. Students need to use video conferencing, and 3 Mbps upload service only supports two students. Many high poverty families have more than two students and experience great signal degradation and interference with classroom participation when trying to operate with services provisioned to only provide up to 3 Mbps in upload speed. To address this constraint, the District has often resorted to providing families with wireless hotspots *in addition to* a wired home connection to help supplement the upload

² See Exhibits 1, 2 and 3

connectivity. Having households with multiple service providers and service connections adds to the complexity of navigating connectivity and troubleshooting issues and is stressful for households already challenged by digital literacy and other barriers to full connectivity. The EBBP covered services should have robust download and *upload* speeds parameters to meet needs of larger households and minimize the need for layered service providers.

While upload speeds are not an issue for those fortunate to be served by ISPs with fiber systems that offer *symmetrical* high speed internet service, cable based ISPs have remained in the model of increased download speeds but *not provisioning more upload speeds*. For example, Seattle's largest ISP offers service packages that range from 25 Mbps to 150 Mbps of *download* speed, but all of them have offer 5 Mbps of *upload* speed³. The EBBP should be used as an opportunity to incentivize ISPs to place a new focus on providing increased upload speeds.

Data caps for low-income internet programs should be removed or increased.

This is a *critical* program consideration. Current data cap limitations, lack of consumer notification on caps, and high data overage charges are limiting quality remote learning and family use of essential services. The Seattle School District technical support staff have found in their work to resolve issues interfering with student access to remote learning that existing low-cost internet program data caps are insufficient. Households with multiple simultaneous users during the pandemic are pushing the data cap bounds even with average use. Seattle Schools and community organizations report increasing incidents where larger families or households with more than three or four students have exceeded data caps doing normal school work and are now incurring debt; even a one Terabyte (TB) limit can get exceeded.

Set minimum system standards for device eligibility.

Eligible devices and minimum system standards (adopted from the 2021 Higher-Ed student standard) should be defined as:

- Operating System: Windows 10 Home or Pro and Macintosh OS 10.13 or higher

³ See Exhibit 4

- Productivity Tools Microsoft Office, School learning management platform
- Processor Type: minimum - Core i5 Processor Core, recommended - i7 Processor
- Memory: 8 GB RAM or higher
- Hard Drive: minimum - 250GB, recommended -500GB or higher
- Graphics Card: 512MB Video Memory or higher
- Integrated or External Webcam for online learning, meetings, telehealth and work
- Headset with Microphone: for video conferencing, to help eliminate background noise
- Virus Protection Software
- Wi-Fi Adapter
- Warranty: 2 years, to include the battery, which has been issue for some refurbished computers
- Insurance: protect against breakage, liquid spills
- Web content filtering program as an option for parents

Set a seven (7) inch minimum screen size for eligible devices.

Any devices with a screen size less than seven inches would be considered insufficient to support remote learning or for pandemic unemployed workers to use for job resumes and online applications.

Include associated equipment integral to delivering internet service as covered devices eligible for reimbursement.

This would include rental costs for modems, routers, antennas, and indoor Wi-Fi signal repeaters that allow for the internet service to be distributed and accessible throughout a residence. This is especially important as students and workers spread throughout all rooms in a residence to find necessary space for focused remote learning and working.

The FCC should also clarify that providers include the modem *without cost* for cable or other fixed internet service or, if there is a charge, that this is an allowable expense that the EBBP can offset for low-income consumers under this program.

Expand or clarify that the benefit could be applied to hotspot modems.

In cases where the ISP requires rental or purchase of the hotspot modem device for use of cellular wireless internet services, the device should be eligible for reimbursement. The use of wireless hotspot modems as primary and supplemental forms of internet access is widespread, and for many it is essential. It has been key to getting sufficient connectivity to our low-income student households, for residents who are homeless or housing insecure, and for those living in areas not served, or underserved, by wireline ISPs. The inadequacy of 25/3 cable broadband low-income internet service in larger households has necessitated supplementing with additional cell-based hotspots. These should be covered by the EBBP.

Promote Awareness and Subscription.

National messaging should include full customer information and be complemented with support for localized outreach and assistance.

Sufficient consumer awareness and protection would include multiple notifications and channels to let new customers and current internet subscribers understand the program, how long the benefit lasts, when they are risking additional charges (e.g. data caps), and what their options are when the benefit is going to expire. Providers should be encouraged to *quickly* develop national and local media campaigns that use diverse program spokespeople and multiple languages to create program awareness and drive subscription and program participation. However, based on years of experience with existing ISP programs targeted for low-income residents, relying on nationally available messaging by the federal government or national ISPs alone will not be effective in reaching many high-need residents and ensuring sign-up. A City of Seattle Technology Access and Adoption survey of residents found that only 23% of low-income households that would qualify for low-income internet programs were using them and that 53% were unaware of the programs.⁴ No current federal data tracks awareness and uptake of the low-income internet programs.

⁴ See www.seattle.gov/tech/initiatives/digital-equity/technology-access-and-adoption-study

The FCC should fund directly and/or ensure providers are funding outreach and sign-up assistance partnerships via local and state government, tribes, ethnic media, anchor institutions and the trusted culturally competent community-based organizations that are often residents' primary contact in learning about and signing up for essential services. FCC, USAC and providers could offer outreach grants or partner with states, counties, tribes, and cities, or through national organization such as the National Digital Inclusion Alliance to ensure local outreach.

Program promotion should include outreach support funding for community organizations.

The most effective program promotion will come from *trusted community organizations and community ambassadors*. This is especially true for effective outreach to residents with limited English skills, different cultural backgrounds, and cautious seniors. Low-income residents are wary of information and promises provided by private telecommunication companies, especially traditional cable operators, due to a long history of hidden fees, less than transparent pricing, and complex fine print associated with service contracts. The City of Seattle has years of experience helping low-income households get connected to low-cost utility and internet programs and assisting with cable billing and service challenges. We have learned that many avoid taking advantage of existing low-cost programs out of fear of unexpected bills they don't understand, cannot afford, and could lead to debt. Transparency and clarity in the broadband benefit, quality customer service, and local assistance in explaining the benefit and helping people sign-up will be essential to its success in serving those who need it most.

The EBBP funding should include an awareness outreach allocation. Most nonprofits cannot afford to take on additional work or bear the burden of the outreach expense. For example, Housing Authorities need funding to help offset the costs of conducting outreach and helping tenants enroll in internet service. It is a very time-consuming and challenging process, especially working with ISPs around language capacity. Translation services are often needed to ensure that ELL understand the program and hands-on support is almost always needed to navigate the final connectivity. Smaller grants could be used to fund a portion of a community organization's employee time spent conducting outreach and direct participant support.

Provide awareness campaign funds to State agencies with local partners.

To raise EBBP awareness and drive maximum participation, awareness campaign funds should be provided to State agencies with local partners. This will be a most effective way to publicize the availability of the services and connected devices support through media and locations locally known to be able to reach eligible populations. State agencies should collaborate with schools, libraries, cities, counties, and other local institutions to encourage participation in this program.

Provide a digital toolkit for outreach.

To promote program awareness, a digital toolkit should be provided including posters, flyers and messaging that organizations can customize and shared through email, social media and other channels.

Program Reporting and Conclusion.

It is essential that participants clearly understand when and how the EBP will end and are assured that *they will not be subject to payment obligations that they have not understood and affirmatively agreed to once the EBP has ended*; this will help build trust and promote higher enrollment in the Program.

Provide at least three (3) written notices prior to program end.

Households should be provided with at least three (3) written notices prior to conclusion of benefits, which we recommend at the 6 week, 3 weeks and 1 week before program end, along with parallel emails if that has been collected, and an automated call if phone number is available, in the subscriber's preferred language. At minimal, a mailed notification of the ending date in large font and how to obtain assistance. The FCC should approve the language of these consumer notifications and they should be available in translated versions.

Require subscribers be offered a choice of converting back to a low-income program offering, ending all service, or converting to another tier of service.

Once the EBBP ends, participants should have the consumer choice of discontinuing service, roll back into or subscribe to previous low-cost program options. Customers should not be put into a position where they incur service costs they cannot afford and have not chosen. ISPs should not be allowed to have participants continue to incur high service plan costs once EBBP ends, without having a proactive OPT-IN option for participants.

Reimbursement.

Work with providers to ensure use of EBBP funds are aligned with current sponsored and single-payer broadband service contracts.

The FCC should take all reasonable steps to encourage providers to renegotiate local, COVID-era contracts for bulk purchases of internet service for low-income K-12 families, COVID impacted unemployed workers, and other households in need. Referred to as ‘sponsored agreements’ or ‘single payer agreements’, these contracts involve a community anchor institution (such as a school district or city) or a community-based organization agreeing to directly pay for hundreds, if not thousands, of internet service accounts for a year or more. These bulk contracts are entered so that low-income residents can afford to participate in distance learning, telemedicine, etc. in the absence of Federal assistance. With EBBP subsidies available, at least temporarily, for those same residents (and the same providers), the scarce public and philanthropic dollars committed to those contracts - often CARES Act funds - ought to be repurposed; for example, to extend the terms of the contracts in question for additional months or increase the speed of service being provided.

Providers should be required to submit additional documentation to receive reimbursement for a connected device provided to the household.

To avoid reimbursement fraud and to collect data on the types of devices being utilized with the EBBP, ISPs should be required to provide the device type, model, and a unique identifier (e.g., serial number) for each device reimbursement. If subscriber privacy can be maintained, the ISP

should also be required to include a unique account identifier that enables the device to be confirmed as associated with an EBBP subsidized account.

Increase reimbursement rate for connected devices to *up to* \$500 per subscriber.

To ensure connected devices meet the minimum system requirements, the FCC should increase the reimbursement rate for connected devices from \$100 to *up to* \$500 per subscriber, or enough funding to pay for, or substantially subsidize, the minimum standard cost for durable, adequate connected devices (i.e., Laptops, Desktops, Tablets). This is especially important to support households with students engaged in remote learning. The increase would help ensure that providers are equipping low-income residents with devices that will not fail quickly and will meet their needs.

Conclusion.

Thank you for the opportunity to help inform the Commission on the design of this critical program to help reach community members in need of connectivity support. If effectively rolled out, the Emergency Broadband Benefit Program will help those whose learning, work, and digital engagement has been most impacted during the COVID pandemic and economic downturn.

Our local and state public and private entities have stepped forward to help during this pandemic crisis. We know that there will be ongoing needs for lower cost internet options and for additional funding to help residents. We hope the FCC will work towards longer term solutions and diverse models of service delivery. The FCC has a key role in encouraging partnerships with public, private, and community-based organizations. Going forward, we hope the FCC works with us to address all aspects of digital equity: to ensure that residents learn about and sign up for broadband, obtain critical digital skills and navigation help, are able to get technical support, and that the design of online applications and services are accessible to all.

We appreciate and encourage the Commission's ongoing dialogue and collaboration with States, Counties, Cities, Tribes, Anchor Institutions, and diverse communities. In addition to urban areas, it is critical the Commission gain additional feedback directly from rural and tribal bodies and Black,

Indigenous, and People of Color (BIPOC) community members. We urge the Commission and USAC to actively pursue that type of input if sufficient input representing these communities is not received during this first comment period.

We are available for additional discussion and look forward to assisting in the implementation of the EBBP and upcoming FCC work on broadband deployment, adoption, and digital equity and opportunity. Seattle, King County, Washington State, and our regional Tribes have been working together to address all these aspects of developing a digital and equitable future. We look forward to continuing to work together with the FCC.

If you wish to follow-up, please feel free to contact either Alice Lawson, Broadband and Cable Program Manager (alice.lawson@seattle.gov) or David Keyes Digital Equity Program Manager (david.keyes@seattle.gov).

Respectfully Submitted By,

City of Seattle, Information Technology Department
Washington State Broadband Office, Department of Commerce
Seattle Public Schools District, Department of Technology Services
Seattle Housing Authority, Community Services Division

Exhibit 1. Video Call Bandwidth Comparison Chart

	Group - lowest	Group - HD video 720p	Group - HD 1080p
Zoom (computer)	0.8 Mbps up/ 1 Mbps down	1.5 Mbps up/ 1.5 Mbps down	2.5 Mbps up/ 3 Mbps down
Zoom (on your mobile)	0.6 Mbps up/ 1.2 Mbps down	1.5 Mbps up/1.5 Mbps down	
Microsoft Teams	0.5 Mbps up/ 1 Mbps down	1 Mbps up/ 2 Mbps down	
Google Hangouts Meet	2.6 Mbps up/ 2.6 Mbps down	3.2 Mbps up/ 3.2 Mbps down	3.2 Mbps up/ 3.2 Mbps down
Skype	0.5 Mbps up/ 0.128 Mbps down	2 Mbps/ 0.5 Mbps down	4 Mbps up/ 0.5 Mbps down (5+)
Whatsapp			

Source: <https://telecoms-channel.co.za/news/industry-news/compared-sa-video-calls-on-zoom-skype-teams-hangouts-and-whatsapp/>

Exhibit 2. Microsoft Teams Bandwidth requirements

This table describes how Microsoft Teams uses bandwidth on a *per user* basis. Teams is always conservative on bandwidth utilization and can deliver HD video quality in under 1.2 Mbps. The actual bandwidth consumption in each audio/video call or meeting will vary based on several factors, such as video layout, video resolution, and video frames per second. When more bandwidth is available, quality and usage will increase to deliver the best experience.

BANDWIDTH REQUIREMENTS	
Bandwidth(up/down)	Scenarios
30 kbps	Peer-to-peer audio calling
130 kbps	Peer-to-peer audio calling and screen sharing
500 kbps	Peer-to-peer quality video calling 360p at 30fps
1.2 Mbps	Peer-to-peer HD quality video calling with resolution of HD 720p at 30fps
1.5 Mbps	Peer-to-peer HD quality video calling with resolution of HD 1080p at 30fps
500kbps/1Mbps	Group Video calling
1Mbps/2Mbps	HD Group video calling (540p videos on 1080p screen)

Source: Teams Bandwidth requirements [Prepare your organization's network for Teams - Microsoft Teams | Microsoft Docs](#)

Exhibit 3. Zoom Bandwidth requirements

The bandwidth used by Zoom will be optimized for the best experience based on a participant's network. It will automatically adjust for 3G, Wi-Fi, or wired environments.

Recommended bandwidth for meetings and webinar panelists	
For 1:1 video calling:	<ul style="list-style-type: none"> • 600kbps (up/down) for high-quality video • 1.2Mbps (up/down) for 720p HD video • Receiving 1080p HD video requires 1.8Mbps (up/down) • Sending 1080p HD video requires 1.8Mbps (up/down)
For group video calling:	<ul style="list-style-type: none"> • 800kbps/1.0 Mbps (up/down) for high-quality video • For gallery view and/or 720p HD video: 1.5Mbps/1.5Mbps (up/down) • Receiving 1080p HD video requires 2.5Mbps (up/down) • Sending 1080p HD video requires 3.0Mbps (up/down)
For screen sharing only (no video thumbnail):	50-75kbps
For screen sharing with video thumbnail:	50-150kbps
For audio VoiP:	60-80kbps
For Zoom Phone:	60-100kbps

Recommended bandwidth for webinar attendees:	
For 1:1 video calling:	600kbps (down) for high-quality video and 1.2Mbps (down) for HD video
For screen sharing only (no video thumbnail):	50-75kbps (down)
For screen sharing with video thumbnail:	50-150kbps (down)
For audio VoiP:	60-80kbps (down)

Source: [System requirements for Windows, macOS, and Linux – Zoom Help Center](#)

Exhibit 4. Sample Cable Provider Internet Down/Up Speed Offerings

Note the limited upload speeds and that advertised speeds are not guaranteed minimum speeds.

Plan	Advertised Speed
	Down / Up
Performance Starter / Internet Essentials:	25 Mbps / 3Mbps
Performance Starter [25]:	25 Mbps / 3Mbps
Performance:	25 Mbps / 3Mbps
Performance [60]:	60 Mbps / 5 Mbps
Performance [70]:	70 Mbps / 5 Mbps
Performance Pro [75]:	75 Mbps / 5 Mbps
Performance Pro [100]:	100 Mbps / 5 Mbps
Performance Pro [150]:	150 Mbps / 5 Mbps
Blast [100]:	100 Mbps / 10 Mbps
Blast Pro [150]:	150 Mbps / 10 Mbps
Blast (NE) / Blast Pro [200]:	200 Mbps / 10 Mbps
Blast Pro [250]:	250 Mbps / 10 Mbps
Extreme 150:	150 Mbps / 20 Mbps
Extreme 250 [Central Division]:	250 Mbps / 20 Mbps
Extreme 250:	250 Mbps / 25 Mbps
Extreme 300:	300 Mbps / 25 Mbps

Source: www.dslreports.com/faq/15643