Urban Broadband Connectivity During COVID-19
DRAFT: 5/6/2020

Overview: COVID-19 has exposed the true depth of the digital divide in low-income urban communities; it has turned into an education divide and left unconnected adults without access to crucial information, support programs, and mobile health solutions. Innovative, immediate solutions – during the peak pandemic months and long into the future – are available and include options such as outfitting buses to serve as "mega-hot-spots" with broadcast radii of 500 feet (1.5 football fields), and outfitting multi-unit apartments with wireless broadband connectivity through rooftop-mounted fixed antenna systems. A strong coalition of willing partners and stakeholders has the potential to immediately deliver essential broadband internet connectivity – now widely recognized as a social determinant of health – to vulnerable communities within a matter of weeks.

Background: The digital divide today generally refers to the gap between people who have access to broadband internet, computers, and knowledge of how to use both and those who do not.[1] In low-income communities of color, digital divides tend to follow and reinforce social and economic divides and exacerbate existing inequalities,[2] including access to employment, public services, education, and health care.

COVID-19: The coronavirus crisis has laid bare this extant problem to an unprecedented degree. An estimated 12 million US students are unconnected during stay-at-home orders[3]. Adults in non-connected homes are also affected. How easy is it to sign up for unemployment or look for new job opportunities on a mobile device with intermittent cellular access? How will these community members participate in the newly exploding use of telemedicine options? As the pandemic induced economic crisis continues and a larger percentage of Americans become financially unstable, the digital divide is likely to deepen and ensnare more people.

Constraints: Urban digital divides are primarily economic issues. Residential broadband monthly subscription rates in the DC metropolitan region range from $85-$150[4] accounting for 10% of take-home income for low income households. The 2016 Pew Research Center's national, longitudinal, internet use survey indicated that 19% of non-users surveyed cited cost as their primary barrier[5].

Phased Pilot: In the short term, the following actions can be taken immediately, at relatively low costs, to extend broadband coverage in at risk Riverdale Park households.

1. Information dissemination at the household level regarding current programs available from large ISPs per the FCC's Keep Americans Connected pledge. For example, Comcast has expanded their Internet Essentials Plan coverage by extending free coverage to new customers for 60 days, increasing speeds from 15/2 Mbps to 25/3 Mbps, pausing data caps, and pledging no disconnects or late fees. In addition, Xfinity WiFi hotspots will be available for free – even to non-Xfinity internet subscribers.
2. Mega-hot-spot-buses: Since 2013, multiple school districts across the county have outfitted school buses with wifi access so that students can do their homework during the ride[6]. Additionally, some municipalities park the buses in high-density areas in the evenings so students can continue to be online[7]. Variants during COVID-19 include:
    a. In California, Governor Newsom has greenlit a pilot to outfit buses with super-hotspots to provide connectivity with at least a 500-foot radius (approximately 1.5 football fields). In high density areas, this would allow people to access connectivity from within their homes[8].
    b. Further, a novel proof-of-concept would be to leverage fixed antennae wireless configurations mounted on the top of buildings that connect back to the mega-hotspot on the bus, to extend the radius to several miles (this approach would require new architecture and research time).

Coachella Valley, CA wifi equipped school bus parked in a residential area after school hours: photo credit CBS news

3. Fixed antenna wireless options can also connect small multi-family buildings. CTC Engineering has provided the following blueprint for action[9], ideal for urban low income populations living in apartment buildings.
    i. Appropriate buildings of around two to four floors each with four to six units per floor and a shared hallway

ii. *Lead stakeholder (perhaps the city or county, a local university, or a utility) has fiber to a location within a half-mile of this development, will take responsibility for installation, maintenance, and operations and service will be delivered for free – so as to remove all barriers to use (cost to user and eliminating the need for marketing, billing, and other back-office tasks).*
iii. *mmWave wireless equipment brings bandwidth from the fibered location to the buildings, Wi-Fi access points on each floor, one for every four units, installed in the hallways so as not to require installers to enter private homes.*
iv. *Budgetary cost estimate for equipment and deployment (including installation labor but not including operating costs) is $500 to $750 per household, though cost could be lower depending on fiber location and labor costs.*

Needs: A coalition of stakeholders will be needed to implement these strategies. Primary needs for the Mega-Bus option include:

- Buses or large vehicles that can be parked for 4-8 hours
- Wireless broadband equipment to broadcast WiFi from buses
- Technical expertise to architect bandwidth solutions to account for specific urban geographies
- Technical expertise to install/maintain equipment
- Fiber access (optimal is cost-free)
- Backhaul to internet (ISP operations) (optimal is cost-free)
- Home routers

Team: Current team members from the University of Maryland include (alpha):

- Tara Burke, Manager, Smart Cities Initiative
- Gerrit Knaap, Director, National Center for Smart Growth, Professor, Urban Studies and Planning
- Nirupam Roy, Assistant Professor, Department of Computer Science

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