

## Broadband USA Applications Database

**Applicant Name:** The University of Texas at Austin

**Project Title:** Broadband University Innovation for Low-Density Deployments (BUILD)

**Project Type:** Last Mile

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### Executive Summary

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Overview Texas has by far the largest rural population in the United States, as well as a highly diverse and rapidly growing citizenry. Texas also has well-educated population centers boasting vibrant industries in sectors including energy, technology, medicine, and law, resulting in arguably the nation's most significant digital divide. The BUILD (Broadband University Innovation for Low-Density Deployments) project, led by the University of Texas at Austin along with Texas A&M – Texas's two flagship research universities – intends to attack this problem in two complementary ways. First, we will use our world-recognized wireless technical expertise to develop highly innovative, flexible, and ultimately low cost solutions for wireless broadband that can be adopted nationally and serve as a model for open access. Second, we have partnered with several underserved cities in between our two universities and under this grant will deploy our innovative solution to approximately 40,000 unserved or underserved Texans in 10,500 households across over approximately 4000 square miles. The project will serve over one hundred Community Anchor Institutions, Critical Community Institutions, and Public Safety agencies, including hospitals, community colleges, libraries, primary and secondary schools, fire and police stations. The overall cost of the project is \$21,774,969, of which 53.04% is cost-shared, resulting in a request for \$10,225,969 in federal funding. The cost per household to this grant is therefore about \$975. We would like to emphasize that many of the costs born here and included in the \$975/household are one-time R&D expenditure that will allow future systems to perform better at lower cost. We expect a future such system to cost about half this amount per subscriber in similar terrain and population density. The reason these targeted communities are appropriate for an Innovative BTOP project is that they represent a cross-section of typical rural Texas communities, with a city center of a few thousand people surrounded by 10 or more miles of farm and ranch land that is more sparsely populated. These areas cumulatively range from unserved to underserved, and from rural to low-density, small-scale urban. The purely rural and unserved areas are targeted by the other UT Austin led grants of which BUILD is a partner. The Team The BUILD project will forge a cooperative partnership between many important players in Texas who have thus far not collaborated sufficiently. The project will be led by the Wireless Networking and Communications Group (WNCG) at UT Austin, one of the nation's largest and most respected wireless research centers. Prof. Andrews, the WNCG Director and proposed BUILD Director, will be joined by Prof. Robert W. Heath, the WNCG Associate Director. Between the two, they have over thirty years of wireless research and development experience, 400 international peer-reviewed publications, twenty patents, approximately 10 years of industry experience, and they supervise 30 PhD students and several postdoctoral fellows who will contribute to the project. They are also both experts on wireless broadband standards in particular,

having authored best-selling textbooks and standards contributions in this area. The other key partner at UT Austin is Prof. Lowell Feldman of the Law School, an expert on broadband regulation and deployment, who will be actively involved in the BUILD project as well as the liaison to three closely-related UT projects that will develop Middle Mile Access which BUILD will directly tap into, will create a center for developing sustainable best practices and dispute resolution, and will attempt to solve the “Red Lining” problem for low income areas by targeting green-line investment through a collection of non-profit service providers. BUILD will also partner with Larry Flournoy, the Associate Director of Texas A&M’s Academy for Advanced Telecommunications and Learning Technologies, who has over a dozen years of experience expanding broadband access to hospitals and in telemedicine; Prof. Henry Pfister of Texas A&M’s electrical engineering department will contribute additional wireless technical expertise and experience. BUILD is not in any sense a typical university project: it is highly inter-disciplinary and cuts across academia, industry, city government, and other public institutions. We will actively work with the cities of Giddings, Bastrop, La Grange, Weimar and Schulenburg in our deployments. We have had constructive discussions with their leaders and supporting letters indicating their enthusiasm for this project and willingness to provide a substantial cost-share are included. These cities were selected due to their location in the “Texas Triangle” between San Antonio, Dallas, and Houston, and more specifically between Texas A&M, Austin, and Houston. Because of this proximity their populations are likely to gradually increase (for example, there is considerable pent-up demand for telecommuting in these communities), and we will be able to forge strong working relations that will provide a platform for further deployments into neighboring counties after this project has concluded. Technical Solution and Innovation The project also calls for extensive collaboration with the private sector. Given the desire to develop innovative solutions that will decrease in cost over time and be well-adapted to rural settings, we will partner with NxN Wireless, a local equipment developer that will be nearly entirely devoted to serving this project and integrating low-cost solutions from mass-production. BUILD has asked for a received a 5-year right to use an extremely valuable 700 MHz FCC Auction 73 B Block license courtesy of a local service provider, Worldcall Interconnect (“WCX”) that covers all the communities mentioned. WCX will allow 100% of the revenue generated through the BUILD project to be re-invested into operating the BUILD services during this period. This spectrum allows a multiplicative increase in the coverage area, allowing BUILD to not only serve the aforementioned cities but the broader rural areas surrounding them. Currently many these areas have no broadband, and where it does exist is ad hoc, expensive, and difficult/costly to install and maintain. This said, these areas are, we believe, considered served – but are also underserved. The key technical aspects of our solution are a leverage of just-released 4G wireless broadband standards such as mobile WiMAX and LTE, use of coveted 700 MHz spectrum that provides long range, innovative methods for attaching to existing utility poles, and the development of a simple open-source protocol stack that allows for flexible deployment and open network access. The residential service will provided in a medium form-factor CPE that can be placed near a window facing the base station – because of the desirable properties of 700 MHz propagation no custom or exterior installation will be required in most cases. Peak data rates are forecasted at 45 Mbps with more typical burst rates in the 1-5 Mbps range depending on proximity to the base station. The CPE will output both Ethernet and WiFi so the customer can connect all their devices to the single CPE. Mobile service will be provided primarily for emergency, law enforcement, and medical services through a similar, slightly more expensive CPE but with a smaller form factor. We will offer each Anchor

Institution the ability to partner with the University of Texas and our BUILD project by being included directly into our network. While this is clearly a Middle Mile goal, the totality of what we are doing in these five communities makes this a last mile innovative infrastructure project. Each resident will have access to readily available Broadband provided in an Open and Non-Discriminatory manner. Importantly, not only will we operate on a completely application agnostic manner, we will also design the network to interwork with the various competing 4G standards. Thus whether it's an iPhone or a G-phone, and whether it is tied to a service provider or not, if the user device can be authenticated it will be allowed to use the network and obtain high-speed service. Summary The BUILD project proposes ambitious deliverables, technical innovation, academia-industry-government collaboration, and substantial broadband deployment to important underserved areas. The developed technical solution and methodology will have impact beyond the proposed deployments and if successful, provide a platform for future rural wireless broadband growth. The requested funds will directly create dozens of jobs and indirectly save or create many times this amount in the proposed areas, while supporting highly-regarded non-profit and public entities committed to technical innovation and the education, health, and connectivity of Texas communities. The network will be non-discriminatory and open.