

DUDE, WHERE'S MY INTERNET: AN EXAMINATION OF BROADBAND INTERNET
ACCESS, INFRASTRUCTURE, AND POTENTIAL FOR EXPANSION IN MISSOURI

ABSTRACT

Broadband Internet is increasingly becoming a necessity in today's society. Providers of these services are expanding access to the high-speed Internet as well as its speed and capacity. With the recent release of the National Broadband Map and the National Telecommunications and Information Agency (NTIA) supported broadband research projects, more is becoming known about *where* and to *what extent* these providers are offering their services. As such, more is known about how areas of the United States (U.S.) vary in their level of access to these services. Within the state of Missouri, Governor Jay Nixon has set a goal of making broadband available to over 95% of residents. Of particular interest are those areas that are not effectively provided access to broadband. Areas without access also likely vary in the amount of effort or investment necessary to make access available. That is, the closer an unserved community is to existing infrastructure and service, the lower the cost to connect them to the existing broadband network. Broadband providers do not typically release their service areas, or footprints, to the public in any detail, making it difficult to assess which areas receive service and which do not. Moreover, assessing proximity of unserved areas to the middle mile, the infrastructure linking each Internet provider to the backbone, is even more difficult due to lack of publicly available information about this infrastructure. Additionally, in the cases where the location of middle mile infrastructure has been documented, it is often recorded at a coarse spatial resolution making it difficult to evaluate the precise location of this infrastructure.

To address these issues, this thesis examines methodologies for evaluating access to broadband service and inferring the location of supporting infrastructure. To do this, a range of different

representations of the geographic extent to which broadband providers provide access are evaluated. Next, a methodology is proposed for using what is known about the geographies of provider service areas--and the spatial relationship among each other--to infer where middle mile infrastructure might likely be located within a region of interest. Given that middle mile infrastructure is likely located along utility rights of way, the inferred locations of middle mile can then be compared relative to the geographic location of features known to be rights of way, including those supporting public utilities, such as roads, utilities, and pipelines, to further refine the approximation of middle mile. The developed analysis framework is then used to assess access to broadband in the state of Missouri and to evaluate the potential effort required to extend service to areas without access. First, the level of access is measured by combining all broadband provider footprints to evaluate where access does and does not exist. Next, the location of middle mile is inferred through transformation of provider service areas into their medial axis. Using those results, the locations of the modeled middle mile are compared to the location of a recently built middle mile extension in south-central Missouri to evaluate the model's performance and to provide better understanding of which right of way features most closely correspond with the actual middle-mile. Finally, locations for potential middle mile expansion into unserved areas are identified using a combination of the distance of an unserved area from current service, presence of population, and connection to areas with access through right of way infrastructure. The results indicate that the governor's goal of 95% access to Missouri residents has been met. Additionally, while there are areas within the state that do not have access to Broadband, only a few of them have the population demand present to entice Internet service providers to expand their infrastructure into the areas.