

A Powerful Tool to Expand Internet Connectivity

The I3 Connectivity Explorer allows users to assemble and analyze essential data needed to assess their communities' current situations, envision their goals, and develop action plans.

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The I3 Connectivity Explorer (<https://i3connect.org>) is a freely available broadband assessment platform. Its audience includes everyone who knows that her or his broadband options are limited and wants to improve the situation. In the United States, most people would agree that their broadband options are limited, unless perhaps they live in a metropolitan neighborhood supporting multiple high-speed network providers. Readers of this magazine know the landscape well. This project's goal is to help users assemble and analyze the essential data needed to assess their community's current situation, envision their goals, and develop action plans.

School districts in several states already have used the tool to develop remote learning plans and their responses to COVID-19, city managers have used the system to discuss the state of their internet infrastructure compared with that of nearby cities, and grant seekers have used the system to gather basic data needed for funding applications. The I3 Connectivity Explorer has demonstrated its usefulness for educating communities about broadband in multiple USDA rural workshops. With the addition of digital distress indicators (for school districts and counties) to the I3 Connectivity Explorer, the platform has become a powerful tool for rapid assessment of areas most affected by poor connectivity that can therefore be recognized as

candidates for long-term investment. ISPs can use the tool as part of their planning toolkits.

Internet connectivity in the United States is presently undergoing the transition from depending on disparate, privately held and operated ventures to becoming fundamental infrastructure: a public good. This transition is following the historical paths other aspects of the country's infrastructure, such as water, gas and the electrical grid, have taken. All started as novel inventions and evolved to be so essential to modern living and the market economy that they became "infrastructure." The COVID-19 pandemic is showing just how essential the internet is to all sectors: health care, education, free markets, remote work and even government services.

The transition from an amenity into infrastructure is never quick nor easily accomplished. For example, it took community intervention – organized through government agencies and deployed via public-private partnerships – to complete rural electrification. Infrastructure reaches beyond physical (or in some cases legal) structures into businesses, homes and lives. All infrastructure consists of multiple layers. At its heart is a core, such as electrical lines, or, in the case of broadband, networking protocols, towers, cables, fiber and routers and the ISPs that run them. Yet infrastructure reaches outward to include universal access, devices, skills and the intention

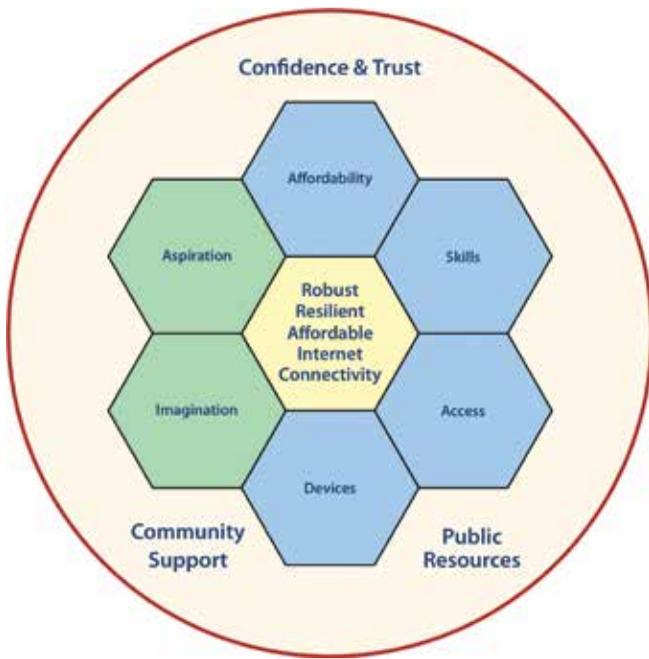


Figure 1: Infrastructure

required to make the core useful. Finally, infrastructure requires active community support to keep it in place and working reliably over the long term in order to build markets, economies and lives around it. Confidence and trust, both in one’s own abilities and in the community to maintain the infrastructure, are essential components. Where would FedEx or UPS be without transport infrastructure, including roads, airports and air-traffic control?

TOOL PROVIDES ESSENTIAL DATA

This perspective drives the I3 Connectivity Explorer. The compass rose illustrated in Figure 2 represents the conceptual design of this mapping tool. Place – the place you’re most interested in – is at the center. Over time, the datasets have grown from the broadband-planning quadrants of provider data and speed tests to include demographics and adoption and use data, which touch on digital equity. Other dimensions, such as economic development data and community anchor institutions, add depth to understanding. A number of the key datasets are shown in Figure 2. The tool presents the data in easy-to-interpret maps, charts and tables at a variety of resolutions. Overall, the I3 Connectivity Explorer platform draws from more than 20 data sources.

The focus on community, and a secondary focus on goal setting, influenced the design of user interactions. The I3 Connectivity Explorer views broadband connectivity data broadly through the lens of the places where people live: towns, counties and county subdivisions, tribal regions, school districts and congressional districts. The areas supported lie in the mid-range between national and address level.

The application platform combines data from U.S. government agencies – the FCC, Census Bureau, EPA,

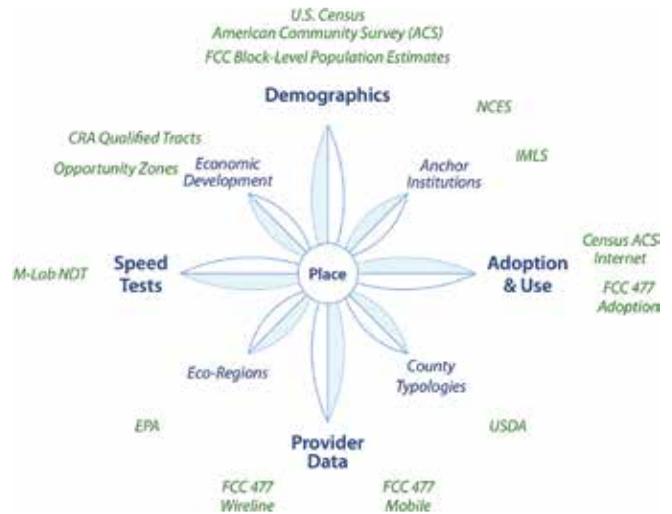


Figure 2: The I3 compass rose

USDA, National Center for Educational Statistics (NCES), and Institute for Museum and Library Services (IMLS) – and other public sources, such as the Measurement Lab (M-Lab) and ProPublica Congress API. One strategic goal of this project is to demonstrate how to leverage open data and open-source components to build open source tools that are both cheaply available and useful to community builders at scale.

The I3 Connectivity Explorer localizes national data to locations of interest. Figure 3 illustrates the geographic areas currently supported. The platform focuses on planning and organizational units, such as census-defined places, tribal areas, school districts, counties and legislative districts. What’s not supported? Right now, the tool does not handle data at the lowest levels (street addresses) or the highest (national levels).

HOW TO USE THE TOOL

To use the I3 Connectivity Explorer, start by selecting one or more places as a starting point. From there, zoom out to surrounding counties or states. An increasing number of statewide views are available as well. For example, it’s possible

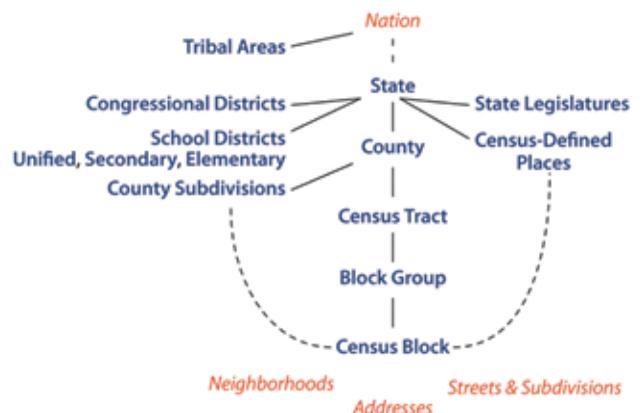


Figure 3: Geographies served

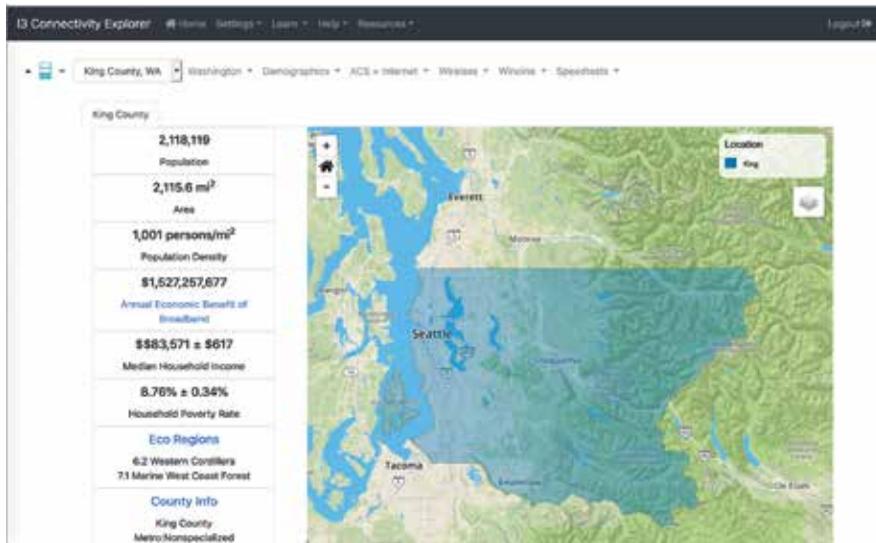


Figure 4: King County, Washington, homepage

to see (and download) the statewide digital distress indicators for school districts in a state. A digital distress indicator is a comparative measure of the level of digital readiness of various regions, such as school districts or counties. A good introduction to the topic is found in “Digital Distress: What Is It and Who Does It Affect?” (<https://tinyurl.com/y4m7v6ah>). The I3 Connectivity Explorer adapted this measure to rank school districts and counties within a state.

The I3 Connectivity Explorer also encourages users to set their own planning goals and use the data to measure the current state relative to those goals. Notebooks contain one or more locations that users want to investigate. Planning goals, such as the target upload and download speeds, are part of each notebook’s setting. As an example of how user-specified goals are used, the latest M-Lab view displays the fraction of speed tests (originating from the location of interest) that meet or exceed users’ stated goals, as well as the FCC’s relatively low bar of 25 Mbps down and 3 Mbps up. The “Well-Served Blocks Views” (for a location or a state) show the fractions of census blocks that are “well served” based on users’ specified target speeds and targeted number of providers.

Figure 4 shows the homepage for a notebook that includes King County,

Washington. From that page, various drop-down menus allow users to delve deeper into areas such as demographics, census estimates of internet usage, wireless and wireline provider data, and M-Lab speed test data. The layer control on each map allows users to add more data, such as the locations of libraries, schools (public, private, post-

secondary, historically Black colleges, and tribal colleges) or tracts eligible for investment under the Community Reinvestment Act or the U.S. Department of Housing and Urban Development’s Opportunity Zones.

In a detailed view, such as the internet subscription details view shown in Figure 5, users can drill deeply into datasets and overlay additional related data. The view shown is highly detailed; it shows the presence or absence of internet devices in the home, according to the U.S. Census American Community Survey. In the figure, the breakdown is by age, and the map shows seniors (age 65 or older) who do not have either a computer or an internet connection. Note that the user has jumped from King County, Washington, to a public school district in Michigan simply by swapping notebooks.

Throughout the platform, users will find ways to learn more about the data, where it comes from, what it means, and how it’s processed. All data from any source comes with a frame that determines the questions that users can meaningfully ask of the data. For

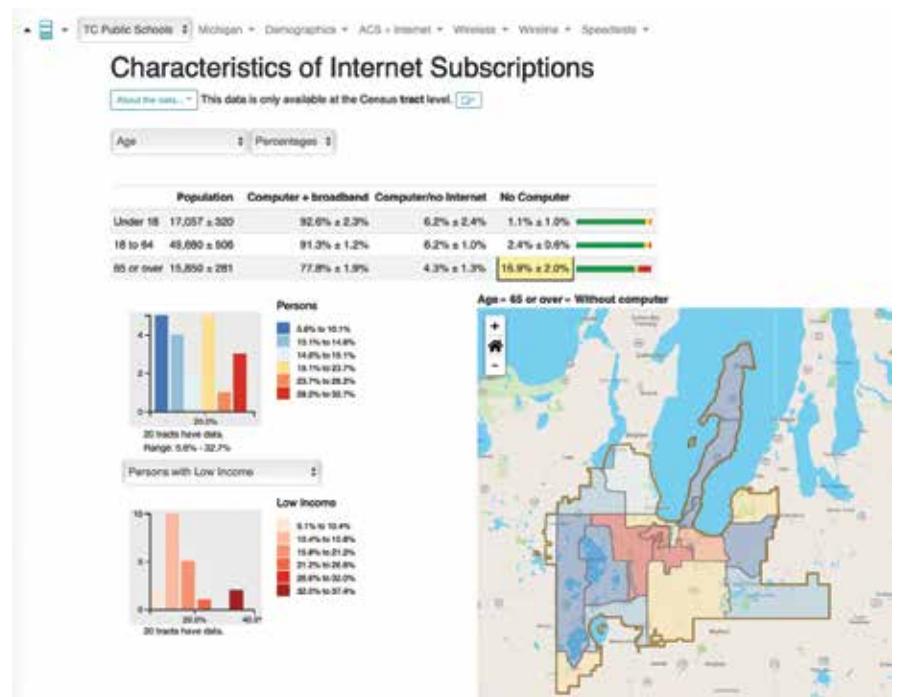


Figure 5: Detail of internet subscriber data

example, the FCC's 477 provider data can reveal which providers are active in a region (or nearby), and which technologies they offer, but can't reveal anything about actual adoption.

As a stand-alone application, the I3 Connectivity Explorer provides background data about internet connectivity together with solid information about how to interpret that data. Used to support broadband action teams (see "Going to BAT in rural Washington," <https://magazine.wsu.edu/2020/04/26/going-to-bat-in-rural-washington>) or with assessment tools that guide groups through a broadband self-assessment, such as the Access and Connectivity Toolkit (<https://actbroadband.online>), the I3 Connectivity Explorer helps people and communities ask better questions sooner.

A companion forum, the I3 Telegraph (<http://community.internet-is-infrastructure.org>) helps fulfill the

educational purpose of the project by providing a site where users can request help, ask questions, contribute lessons learned and guide the development process. Using the system is free and is supported by a small group of committed "angels." A login account is required to minimize use of cookies and maximize user support. Right now, almost 900 registered users have investigated locations in all 50 states, the District of Columbia and Puerto Rico.

GET INVOLVED

The I3 project was initiated in 2017 by the Center for Internet as Infrastructure, LLC after the principal became immersed in internet connectivity issues and open data while serving as a White House Presidential Innovation Fellow. At that time, there were few effective maps, and bringing all the relevant data into focus was hard. The system has matured substantially since then, and the center

is now actively seeking partners to help keep the system running and freely available to the community users who need it most. If you would like to help or know of an agency or a nonprofit organization that would like to be involved, please contact the Center for Internet as Infrastructure, LLC at info@internet-is-infrastructure.org.

Create an account at <https://i3connect.org> or join the forum at <https://community.internet-is-infrastructure.org>. At a time when federal and state standards are evolving and future demands are growing, the I3 Connectivity Explorer helps people understand their present connectivity situations. ❖

Dr. Robert Ballance is the founder of the Center for Internet as Infrastructure, LLC, which helps accelerate the transition of internet connectivity from a desirable innovation to essential infrastructure.

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