

# Modelling Irish BROADBAND

Faith Clark reports on how geospatial data is being used to secure value-for-money as rollout of the Irish Government's controversial €3 billion National Broadband Plan gets underway

The plan, billed as the 'biggest investment since rural electrification', promises to deliver Next Generation Access (NGA) broadband with speeds of between 30 and 150 Mbps to more than 500,000 homes and businesses across the Republic. Its rollout has, however been beset with issues. Originally proposed back in 2012, the NBP has seen a number of major players back out of the procurement process as well as the resignation of a government minister. Even so, the award of a contract to the preferred bidder is due to be signed 'within weeks' according to a junior communications minister.

Currently around 90% of households in Ireland have Internet access at home. This is comprised of around 2% using dial-up subscriptions, just over one million fixed broadband subscriptions, and 13% of the population opting for mobile broadband subscriptions.

Expected to last up to 25 years the NBP shows a strong preference for the use of fibre for the majority of the network, with wireless technology such as 5G or fixed wireless networks reserved only for the most remote areas. However, as a result, a number of Irish Wireless Internet Service Providers (WISPs) have expressed concerns about the use of public money on infrastructure that will, in fact, duplicate services already on offer and already in use.

## Gathering evidence

In order to demonstrate the current state of play, and provide evidence of the private investment already made, 28 Irish WISPs joined together to undertake a detailed analysis of their current broadband coverage. For this purpose, mast data, including location, height and current capability and operating frequency details (i.e. NGA-capable

or planned for upgrade to NGA capability) for 1,700 tower sites was supplied to Leeds based Wireless Coverage Ltd.

Formed after more than two years of extensive research and development into wireless propagation and the role of GPU (Graphics Processing Unit)-accelerated computing, Wireless Coverage has already completed projects on behalf of WISPs in England and Scotland. Using its suite of ultra-high performance wireless planning system software (WISDM), the company allows service providers, and their customers, to check coverage availability, plan for expansion and market services.

The equipment data provided by the Irish WISPs was initially analysed to determine the lowest common denominator of wireless parameters that would comfortably achieve NGA broadband specifications. These calculations take into account the free space

path loss for signals working at legal power (i.e. the attenuation of energy between antennas) and the impact of relatively small antennas at receiving properties.

Wireless Coverage then obtained detailed Digital Terrain and Digital Surface Models (DTMs & DSMs) from aerial mapping company Bluesky. Photogrammetrically-derived and continuously updated, Bluesky offered the most up-to-date and comprehensive coverage for the Republic. The models include bare earth height measurements as well as detailed mapping of surface features such as building and trees.

### Fundamental to analysis

“The resolution, accuracy and currency of the Bluesky data is fundamental to the analysis we can perform,” comments David Burns, founder of Wireless Coverage, Chairman of the UK Wireless Internet Service Providers Association (UKWISPA), and an active member of 5GUK. “We have worked with Bluesky on a number of projects to date and the combination of our WISDM software and Bluesky’s unique DTMs and DSMs provides operators with a level of detail and accuracy that was previously unobtainable.”

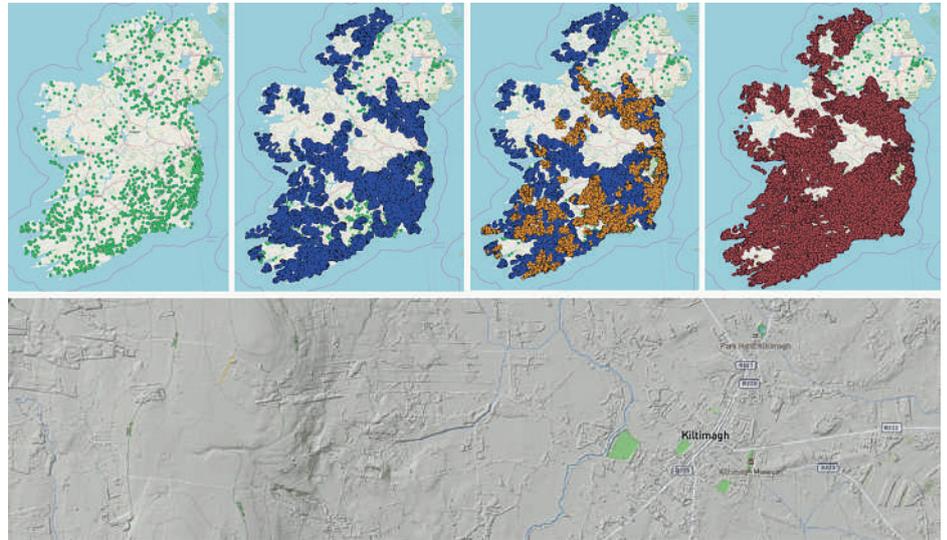
In addition to the Bluesky DTM/DSM data, Wireless Coverage also used address data from the Eircode database. Eircode, unlike postcodes that tend to define a number of properties, is a seven-character alpha-numeric code that uniquely identifies and locates every residential and business address in Ireland.

WISDM WISP Edition is an interactive planning and design system built to facilitate the creation of scalable, robust and performant fixed wireless networks. It enables the rapid creation of ‘ideal’ wireless networks over very large – thousands of square kilometres - areas. Well suited to rural expanses, as well as high density urban environments, WISDM can also be used to analyse the coverage of existing wireless networks and perform ‘what-if’ testing and planning.

Using WISDM Wireless Coverage performed several line-of-sight coverage passes to all the Eircode centroids, including; all sites from operators at NGA, all sites from operators at non-NGA, all sites from individual operators at NGA, and all sites from individual operators at non-NGA.

### Line of Sight testing

Within each pass, WISDM takes each site and performs a Wireless Line of Sight test to each property within a given radius. Wireless Line of Sight (LoS) tests differ from optical LoS calculations as they take into account the Fresnel 1 Zone (the First Fresnel Zone is the ellipsoid that stretches between transmitting and receiving antennas and considers the action of radio waves that do not travel in



The interactive map platform shows here (top left to right): site locations for all participating operators; NGA premises passed; NGA and planned NGA premises passed; NGA and standard premises passed. The lower image is an example render of DSM Data showing trees, buildings and other surface features

a direct path from transmitter to receiver). This is a more robust method of determining LoS and some properties with Near LoS, which in all probability could be successfully connected, may have been discounted from the final analysis.

Additional tests and safeguards were also performed to prevent double counting where a property has already been found to have LoS; identify properties that could receive NGA from more than one operator, and list properties that could access NGA from multiple participating WISPs.

WISDM’s high performance LoS calculation engine is capable of performing over 700 million tests per second and can use a wide variety of terrain and surface obstruction data, such as the Bluesky DTMs and DSMs, at any resolution. Compared to traditional methodology which can take up to 20 minutes to produce a high-resolution viewshed for a single site, Wireless Coverage was able to complete all 1,700 sites in just less than two seconds. With the impending signing of the NBP contract, this was considered essential by the consortium behind the project.

Following the analysis by Wireless Coverage it was determined that there are currently around 1.5 million properties that could be served by existing operators to a basic level i.e. either NGA or non-NGA compliant. Of these residential and business locations, nearly 690,000 are already NGA-compliant (i.e. 30 Mbps or higher) and around 84,000 premises are currently connected with service from one of the 28 contributing WISPs.

### Interactive map platform

To aid with the visualisation of these results Wireless Coverage also provided the WISP operators with an interactive map platform. The colour-coded map allows users (currently

limited access only) to view every property served by NGA-compliant broadband from a given mast; where, NGA-enabled sites have been deployed by contributing operators; where NGA-compliant properties are served by more than one operator, and where worst-case NGA coverage is displayed as medium resolution viewsheds (see illustration).

“Traditional wireless planning systems take around 15 minutes to perform the calculations needed to produce a single viewshed, so for this particular project, that would equate nearly 150 hours once the data had been sourced and prepared,” says Burns, who adds, “Using WISDM all 1,700 viewsheds were completed in less than two seconds. We believe that this is not only the fastest viewshed completed it is also the largest composite viewshed ever created.”

He continues. “Initial feedback from the WISPs has been very positive and many are engaging with us to discuss the wider application of the WISDM software suite. The map and covering report has also been submitted to the Irish Government and its advisors for review and we await their response.”

As service records are updated and other contributors come onboard and consent to be included within the project, Wireless Coverage will include these data in a living version of the WISDM-created Wireless NGA map of Ireland. The company is also planning the release of WISDM v2, with even richer features and an emphasis on full 3D and real-time 5G and Fixed Wireless planning, and continues to work with Bluesky data on a number of projects.

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