ARE YOU GOING RADIO GA GA?

ANALYSING RADIO FREQUENCY DATA IS ONE OF THE BIGGEST BIG SPATIAL DATA PROBLEMS AROUND. JAMES BRAYSHAW LOOKS AT HOW NEW FILE FORMATS ARE HELPING TO MANAGE THE CHALLENGE

Disruptive forces are in place across the telecoms industry. A shift in consumer behaviour has placed huge pressure on network operators. We are using voice less and data more, and mobile is increasingly becoming the primary platform for internet access.

Our consumption of data, the increase in mobile device usage and the evolution of our use of media are all increasing pressure on wireless and fixed networks. Telcos providing these networks must either reinvent themselves as diversified telcos with multiple offerings and new revenue streams or risk descending into a valley of falling revenues, thinner margins and commoditisation.

Add to this increasing M&A activity and the roll out of 4G, and it's clear there is a seismic shift in the industry. This shift demands greater, more detailed and sophisticated planning to deliver increased network capacity and better meet customer needs.

Combining next generation network data planning together with customer information and related data is key here, and this is where wireless radio frequency (RF) propagation data comes in. The RF propagation model takes the location of all the masts across a network and describes the reduction in signal strength from distance, transmitter angle, elevation model and building clutter. It can:

- Pinpoint areas where signal is of low strength and network improvements may be required.
- Enhance customer service, as organisations can share accurate maps of their service's area and verify availability for a specific address or location.
- Help with decisions about capacity planning and service optimisation, pinpointing the best locations for masts, small cells and wifi
- Eliminate 'dead zones' by providing detailed insight into network performance in real-time

And it isn't just telcos that need to use this data: other industries are benefitting, too – retailers, for example, are using location to define the best coverage to select a mobile provider.

The challenge
But there is an issue. This data tends to be harvested using network design and optimisation software. The RF data format and structures
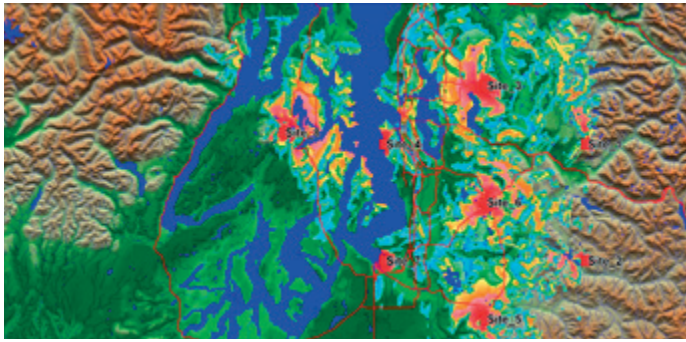
Mobile phone coverage projected using elevation and land use data around Seattle
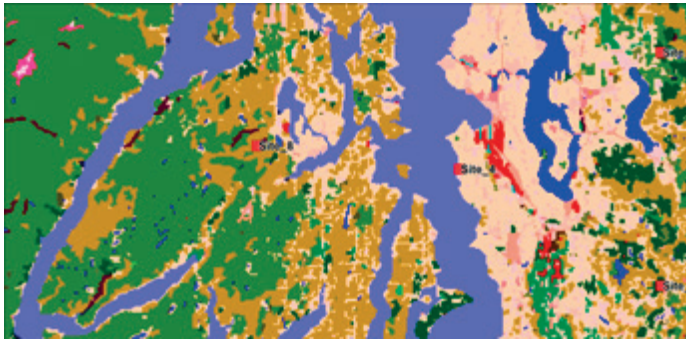
Land use classification data is used to aid modelling of mobile phone coverage

created by RF engineers are not always optimised for spatial analysis and map display across the organisation. If businesses are to add value from RF propagation data, they need to look at new, less complex ways to analyse and present this information.

There are challenges in the structure and format of many data sets and RF propagation data is no exception. Large, complex data files require specific analytical skills. A lack of accuracy and precision can skew entire data sets. Creating something physical – a map, for example – from something digital (the data) requires linear thinking, the ability to visualise and high-performance tools. It also needs to be real-time, which presents a Big Data challenge.

Data within RF planning teams can be time-consuming to produce and held in specialist formats that limit its use elsewhere in the enterprise. Many teams across a wireless telco require access to the output datasets produced by RF propagation models, such as signal strength or quality for specific technologies. Access to an-up-to-date network coverage map is a key requirement. Regulatory compliance, marketing campaigns, responses to sales requests, customer service information and emergency planning are all areas where current information about the company's network is critical.

Network statistics along with competitive data, customer locations and demographics help all areas of the business make improved decisions, but this can be hindered by professionals in other departments having limited access to engineering data formats and by there being insufficient technical skills to visualise and analyse the data in conjunction with other datasets and BI tools.

Solving the issue

New file formats are the key to maximising the impact of RF propagation data. Formats such as Multi Raster Resolution (MRR) enable RF planning teams to model, visualise and analyse network coverage at a national scale, with densely populated areas covered at high resolution. These formats use compression methods that enable the rapid rendering of data and smaller file sizes, and are similar to those used in image data formats such as MrSID and ECW. The main difference is the type of data that can be held within the files – rather than just displaying a picture, the raster file represents real-world values and models. Each grid cell can have multiple attributes, including integer, floating point or classified data

formats. This means that the file can be used to analyse and visualise the data behind the grid. You can apply formulas to the data to derive value-added datasets and use colour ramps to better understand the results.

In RF planning, digital elevation models can be used with mast locations, signal attenuation models, clutter and land use data to derive signal strength data in a gridded format. The benefit of the compression means that where teams had to work with projects at a sub-regional scale, they can now handle regional markets or national coverage in a single file.

Take an example of a Danish digital surface model at 1.6m resolution where 657 files with a disk size of 130Gb can be reduced to a single file of 39Gb. This vastly reduces the management overhead of data, and decision-making is enabled without the presence of artificial boundaries. Smart caching logic means that when the file is viewed, only what is needed is loaded, making the visualisation super-fast. In addition data can be stored at a resolution appropriate for the degree of interest, with higher resolution in urban areas and lower resolution in rural areas.

There is also the ability to visualise and inspect the MRR format through web-mapping tools which enables access for business analysts, market analysts and executives. Customer locations can be accurately pinpointed, and network coverage overlaid, along with competitor information to visualise targets for network improvement or retail stores. Further insights can be gained through integrations with BI tools holding customer data. Marketing users can drill down into the data to understand the market penetration for existing customers as well as potential targets for new campaigns.

Crucially, these file formats enable businesses to pass on the benefits to their consumers. Visual detail on network strength at a certain location helps them when selecting a mobile operator, and also saves the telco resources in terms of time spent troubleshooting, dealing with complaints or providing PAC codes.

These file formats present and analyse valuable information in a precise, accurate and thoughtful way. Optimised for spatial analysis and map display, the data presents businesses with deep intelligence that can be used across different business functions and can ultimately be used to drive a greater customer experience.

Another approach

Another way in which telcos can make better use of their data holdings is through use of Big Data technology. The traditional way to view the network coverage is through predictive physical modelling, but a different approach is to use customer verified data. In the past handling billions of customer usage data points to generate coverage maps was beyond the capabilities of most systems. Now, using Big Data technology combined with location intelligence, it is possible to process these points to produce coverage maps that are more accurate than ever before.

THESE FILE FORMATS PRESENT AND ANALYSE VALUABLE INFORMATION IN A PRECISE, ACCURATE AND THOUGHTFUL WAY

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