Mast-as-a-Sensor | Transport

5G Case Study

Mast-as-a-Sensor

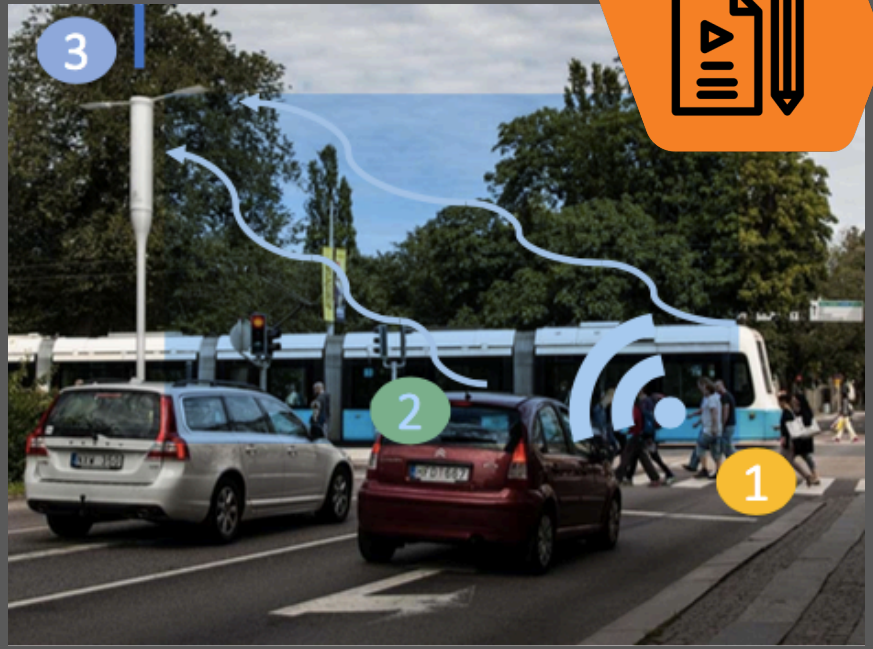
West Midlands Combined Authority
Department for Digital, Culture, Media & Sport
EUROPEAN UNION
European Regional Development Fund
MIDLANDS ENGINE
HM Government
Supported by the Getting Building Fund (GBF)

Synopsis

West Midlands 5G (WM5G) partnered with Ericsson - with its 144-year history in delivering access to communications and over 24,000 people employed across the Stockholm-based company's R&D team - WM5G knew they would be able to help realise the vision for current and next generation cellular networks to provide privacy-enabled transport insights.

The trial was conducted across live 4G and 5G networks in Kings Heath, Birmingham to provide a proof of concept. With 2 billion cars expected on our roads by 2035, intelligent transportation systems will prove critical to reducing emissions and economic costs in the future.

WM5G and Ericsson's Mast-as-a-Sensor trial demonstrates how to use existing infrastructure (4G and 5G masts) and turn them into sensors, using AI and machine learning to produce real-time traffic data.



One day, insights from Mast-as-a-Sensor will help improve access across the West Midlands and make it easier and faster to get from A to B. AI and machine learning will help enhance the experience of road users making the region more attractive visit, to live, work or study. By better understanding congestion hotspots across our roads it is also possible to improve emission levels and reduce pollution.

Synopsis

So how does it work? Several steps are taken to use 4G and 5G masts as traffic sensors. These are:

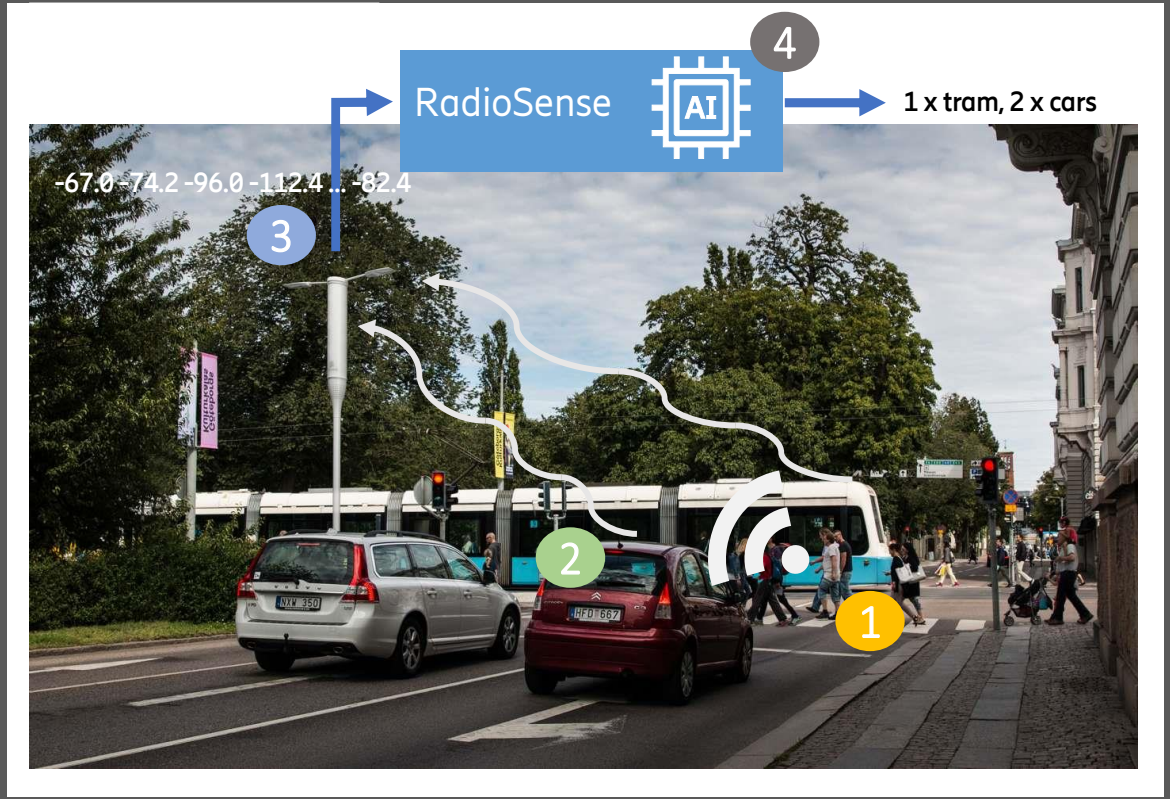
1) Radio waves travel from smartphones towards a cellular mast

2) Radio waves scatter off the surfaces of nearby vehicles

3) Radio mast reports radio wave scattering characteristics to a system known as RadioSense

4) RadioSense uses machine learning and AI to turn radio wave characteristics into vehicle counts

N.B. This system only uses completely anonymous data that strongly adheres to citizens' privacy.



Problem

18% of global CO2 emissions down to road users and so smarter traffic management and analysis is required to counteract this.

The problem with existing traffic sensor deployment is that it's costly and slow to deploy due to planning regulations.

Furthermore, very few functioning sensors report traffic data in real-time and there is inconsistencies in the quality and granularity of the data these sensors produce.

Solution

To counteract these problems, WM5G and Ericsson's solution made use of existing radio infrastructure along the A435 in Kings Heath, Birmingham and compared the efficiencies to that of a Transport for West Midlands (TfWM) traffic sensor nearby.

The aim was to then validate machine learning models trained on network counters, against the actual TfWM traffic sensor.

Our findings were that it is possible to count vehicles and vehicle types using radio network data, with sufficient accuracy.

Benefit

The benefits of our solution are significant. It has been proven that there is now no longer the need for slow deployment of regular traffic sensors as each mast is a sensor creating large-scale deployment instantly.

As radio masts are 'always on', data is accessible in real-time, providing better and more impactful traffic management resulting in less congestion on our roads.

Thanks to the AI and machine learning, congestion hotspots can be identified and managed before they develop, thus improve the flow of traffic. It will also help support the region's ambition to reduce emissions and improve air quality.

In action

By enabling existing 5G masts to operate as sensors, it is possible to fast track the benefits traffic sensors could offer our urban environments.

With no further infrastructure required to operate the Mast-as-a-Sensor solution, insights can be collated as soon as the AI system has been paired with existing masts.

This ‘plug and play’ solution offers reliable, real time traffic insights at scale and will provide the information necessary to start utilising smart traffic management systems. Something the conventional traffic sensor network would be unable to do without further growth and investment.

The data captured and analysed by the AI can help manage and improve existing congestion levels within towns and cities as well as identify and predict future congestion hotspots. As vehicles will spend less time stuck in traffic, journeys will become quicker, more efficient and less polluting removing unnecessary CO2 and emissions from our roads.

As the AI evolves, masts as sensors will make it possible to meet emissions targets and create a greener more sustainable future making further more accurate predictions from the data it collects.

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It’s been an absolute pleasure working with Chris and West Midlands 5G on this project and we hope for continued collaboration in 2021 with the aim of trialling this technology on a larger scale, and particularly within the 5G spectrum.

”

Armin Catovic, Senior Technology Specialist in AI and ML, Ericsson

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Very exciting to deliver a real world 5G first for the region. Supporting the West Midlands Combined Authority’s strategy in building a healthier, happier, better connected and more prosperous West Midlands.

”

Chris Deakin, Project Manager – Transport,
West Midlands 5G

“

Working with Ericsson has shown how mobile communications infrastructure can add value to our urban areas by providing live road user data which will help Local Authorities to manage the roads more effectively. A great insight into a proof of concept which provides valuable information with minimal additional investment.

”

Chris Holmes, Programme Director – Transport, West Midlands 5G

Takeaways

Sustain

WM5G and Ericsson can work towards implementation at scale with its proof of concept. Sustaining the trial could result in improved traffic model accuracy, better CO2 emissions modelling and weather (precipitation, humidity, temperature) insights.

Learnings

Our results are based on a small data set from a single site – with a larger dataset from multiple sites, the results are expected to be significantly better and once 5G's subscriber base is higher, additional benefits aside from vehicle counting can be unlocked.

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WM5G

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