



Q&A

SMART CITIES

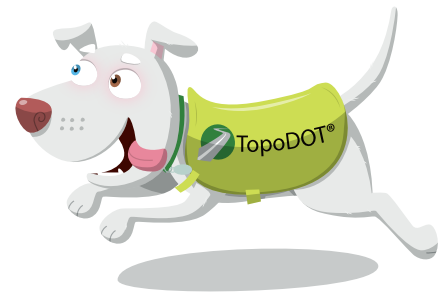


Q1: Find piggle wiggle, the topodot dog. What has she found?

A: Piggle Wiggle is tail-waggingly happy - she's managed to track down the Topcon vehicle! The car is carrying a tech-stuffed laser scanner (also called LiDAR, which stands for Light Detection and Ranging), which makes the vehicle into a Mobile Mapping System. The mobile scanner can actually be attached to any type of vehicle; cars, boats, even flying machines - so that it can collect mapping data wherever it travels!

LiDAR devices work by shooting out laser beams and seeing how long it takes for the beams to bounce back: things which are further away take longer to bounce beams back to the scanner. LiDAR collects all these bounce-back times (called 'data points') and uses them to create a detailed 3D map of the surroundings.

The geospatial data collected by LiDAR systems is used by surveyors to plan roads and pipes, to identify surfaces that need repairing, and to plot the positions of surrounding structures, like trees and buildings. The Topcon vehicle is busy measuring the road surface, which, before LiDAR, people had to do manually - walking on the road: very slow and potentially very dangerous!



Q2: Find Draco the dragon. What has he spotted?

A: Is it the pointy fin in the water: an unnerving hint that an equally pointy-toothed predator is lurking just beneath the surface of the Thames!? Is it the petrified pedestrian who seems panicked by the prospect of being toasted!? No - Draco's found himself a boat! And not just any boat.

The man onboard is a hydrographer - a surveyor who works to measure and map the physical features of oceans, seas, lakes and rivers. He's explaining to Draco how the laser scanner mounted to the roof of the boat can be used to measure and



create a 3D picture of the River Thames, so that the river bed, its sides, and the land around can be checked for movement. And, because it's not every day that the hydrographer has a dragon to show off to, he also explains that he can use sonar: underwater radar that allows him to scan beneath the surface, so that he can make a full picture of the entire River Thames - above and below! The river eventually empties out into the North Sea, so hydrographers use the information they gather to help them understand what to do to protect the coastline from what's happening on the river.

Q3: There is a Viking inside the building. What's he doing?

A: The tech-loving GeoSlam Viking is way more interested in measurements and models than he is raiding and Ragnarök! He's using a handheld laser scanner, which collects thousands of measurements every second, to record the inside of the building and create a 3D model of the room in real time. Architects, builders and engineers use this technique to help plan for building redevelopments, work out where to install

new building elements, or even where to fit new furniture! I wonder where the Norseman will place his helmet hooks and situate his shield shelf?

And for extra points, can you find out what a **real** Viking's helmet actually looked like?



Q4: Can you find the yellow ground-penetrating radar? What do you think it does?

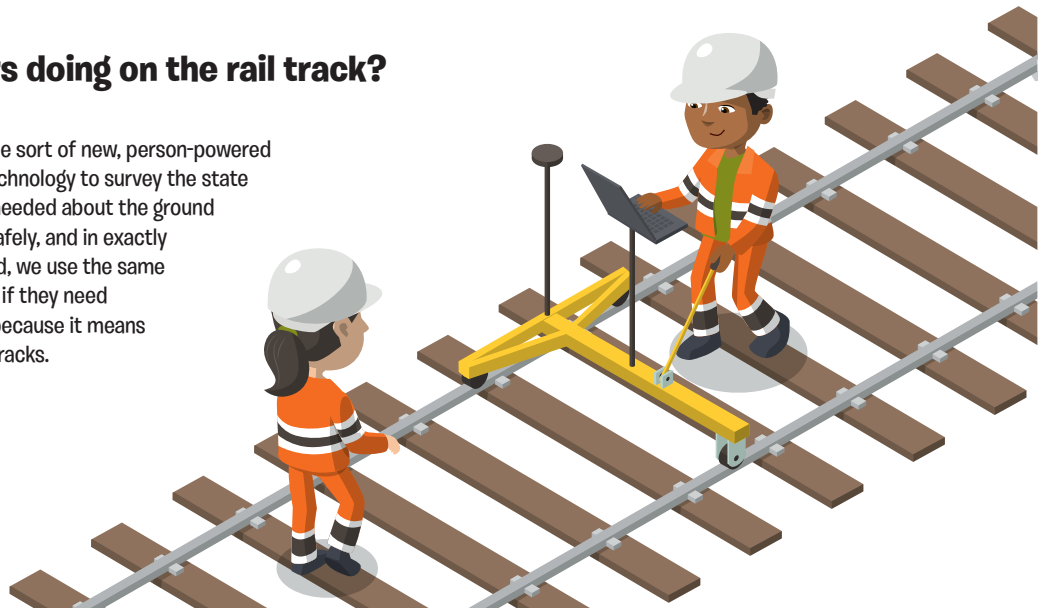
A: We've already talked about LiDAR and the 'geospatial' data it collects, but the radar you can see being walked along the path like a concrete lawnmower is a 'geophysical' device. This particular system measures things under the surface of the earth, and is known as Ground Penetrating Radar. Because light can't pass through the solid surface of the pavement, the radar device uses sound

pulses instead to make its measurements. This particularly perky engineer is looking for pipes beneath the pavement, and because she has her GPR unit, she doesn't have to dig up the concrete to do it! This saves money, time and bother for everyone, and that's a different kind of GPR – a Generally Perfect Result!



Q5: What are the surveyors doing on the rail track?

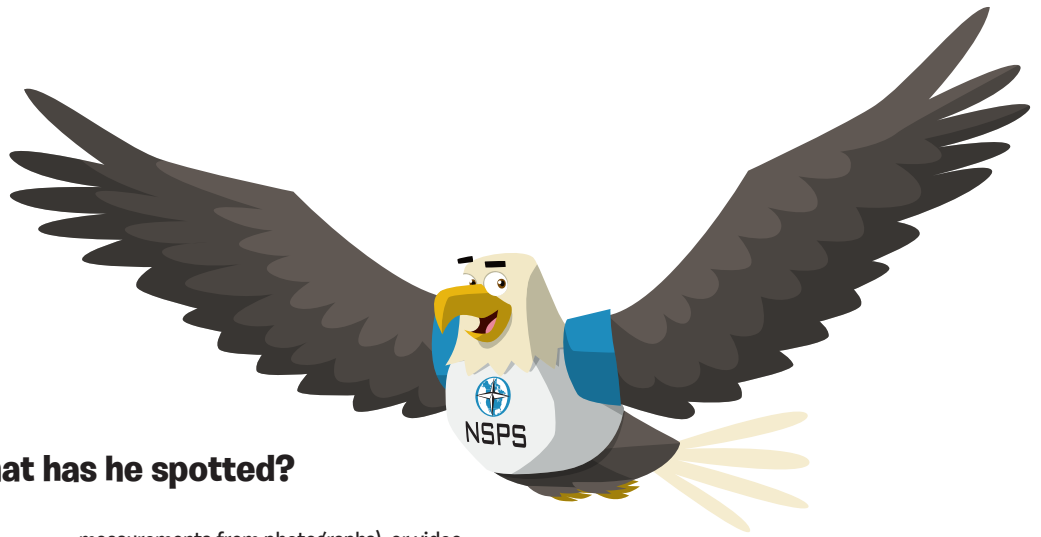
A: Well, thankfully they aren't trying out some sort of new, person-powered peddle train! The team is using clever laser technology to survey the state of the tracks. Super-accurate information is needed about the ground that trains run on so that tracks can be laid safely, and in exactly the right place. Once the tracks have been laid, we use the same technology to check on them regularly to see if they need repairing. Ultimately, this helps to save lives, because it means trains can run safely without coming off the tracks.



Q6: Can you find the surveyor checking the height of the tree with her laser rangefinder?

A: The woman in the park being watched over by a big, bronze behemoth of a statue is a forestry surveyor; she works with trees. Here, she's using a laser rangefinder to measure the height of a tree from the ground. Depending on how old trees are, this technology can help us to check how they are growing. If the tree needed to be cut down for any reason, these measurements would come in handy there too, as we would need to know how much space to clear, so that people don't get hurt or buildings don't get damaged when it falls.





Q7: Find Evan the eagle. What has he spotted?

A: The mighty Evan has had his fine feathers ruffled by a robot, and now he's suffering from wing envy! He's spotted an unmanned aerial vehicle (UAV), which is also called a 'drone'. Drones can be very small or quite big, and they can carry all sorts of equipment.

measurements from photographs), or video cameras, such as GoPros. Taking measurements from the air provides a different perspective, and helps us analyse areas that can't easily be measured on foot or by vehicles – such as forests, steep mountainsides, or tall bridges and buildings.

Surveyors and engineers use drones to help measure the surface of the earth from the sky. They fit the drones with things like LiDAR scanners, or photogrammetry equipment (which can take

However, not just anyone can pilot one of these sky-dwelling super machines. You have to be a qualified drone pilot!



Q8: Find Helen and her ruby red shoes. What do you think she is doing?

A: Helen is busy using the checking the condition and recording the position of all the drains in the street; these allow the water to escape after it rains so it does not flood. She hasn't spotted the cheeky mouse hiding behind the phone box, though, or she'd be kicking off those heels and sprinting down the street barefoot!

This is a very busy road, so Helen is using a phone app called Trimble Catalyst with KOREC K-Mobile software. This uses an antenna that listens to signals sent by satellites, giving Helen an accurate position that the software plots onto a map. All the important information that Helen records can be seen straight away by other members of her team back at her office. So, if Helen finds any problems, someone can be sent out to fix it.

Using the Catalyst is like tracing a picture, only rather than drawing onto tracing paper, your picture is inside the computer and it allows you to draw much bigger areas, like whole towns and cities.

Wait a minute... Oh no! I think Helen might have spotted the mouse! Maybe she can use her tech to call a teammate to the rescue, preferably with a large block of cheese!