Case study: *iMesh*

IDT
Integrated Design Techniques Limited

Introduction

In the UK communications for traffic signal controllers have, in the past, used specialist circuits provided by British Telecom (BT). These circuits are being withdrawn from service and BT's replacement offerings have been late to market and are generally not highly regarded. Using UTMC protocols, traffic signal controllers can now make use of IP-connectivity.

IDT have developed a range of wireless products specifically for the traffic control market which are proven to support the latest generation of traffic signal controllers. The principal product in the range is called iMesh and enables several junctions to be linked wirelessly and thereby share a single communications link (the 'backhaul') to the instation. Our other key product is our i3G router which provides secure, private instation-roadside connections over public 3G networks without the cost, complexity or time required to deploy a RADIUS server or managed service.

This document provides three Case Studies of how iMesh can be deployed to provide reliable, secure wireless connectivity to traffic signals. The case studies represent three examples of scheme: small (9 junctions), medium (78 junctions) and large (491 junctions). For each example the problem is defined and the eventual solution described.

About iMesh

iMesh is IDT's multipoint-to-multipoint wireless router. It operates in the 2.45GHz and 5.8GHz bands and provides a minimum 35Mbps of bandwidth which is capable of supporting multiple UTC-controlled junctions as well as other data services such as CCTV and variable message sign information. iMesh makes extensive use of Open Standards and is very secure, supporting WPA2, MAC address databases. iMesh is built on a robust hardware platform which draws on IDT's experience of deploying approximately 3,000 pieces of equipment on the roadside. iMesh has been tested for operation between –15C and +60C. In practical deployment iMesh has proven to have high immunity to RFI and can support operating distances in excess of 500m. IDT's product offering includes a radio survey prior to installation and a complete installation package comprising cables, antennas, brackets, training and end-to-end support. The six leading UK installers of traffic signals are all equipped to install and maintain iMesh which has been installed in around 30 UK local authorities.

Small scheme - Gateshead - 9 nodes

Gateshead MetroCentre is one of the largest shopping centres in the world and is served by the A1 trunk road. The part of the A1 which passes the MetroCentre is the busiest non-motorway dual carriageway in the UK carrying approximately 120,000 vehicles per day.
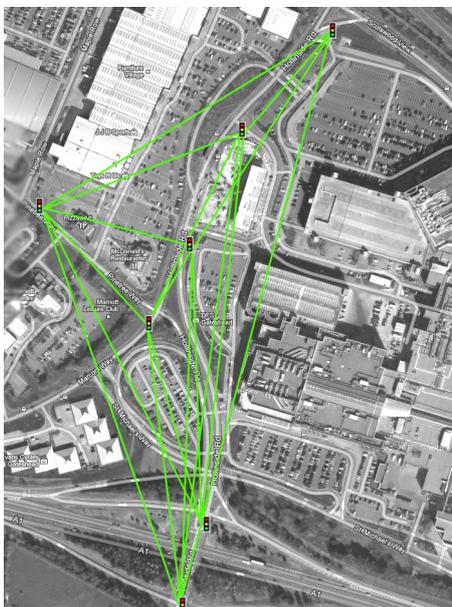
The A1/MetroCentre road network includes nine traffic signal controlled junctions. The Client (The Regional Traffic Signals Unit) wanted to install SCOOT UTC on all junctions under the control of an instation located 5Km away in Newcastle City Centre.

There were no BT circuits in the area and so the Client asked IDT to survey and propose a solution.

The scheme is shown on the left. iMesh routers installed at each traffic signal provide a multipath network. At one junction we installed an i3G router which provides the link to the instation. IDT deployed a VPN between the i3G router and the instation to provide the necessary security.

The financial saving is considerable. With BT's old circuits and standard offering the annual cost would have been approximately £10,200. With iMesh and i3G the annual cost is just £180.

Mid-sized scheme – Hertfordshire - 78 nodes

Hertfordshire's population of 1.1m is largely spread over largely rural area with a number of medium-sized towns such as St Albans, Watford etc. Hertfordshire Highways' UTC system is provided by Peek Traffic with communications previously provided by British Telecom.

The Client was faced with increasing annual costs from BT (over £200,000 per annum), outdated signal infrastructure and the need to relocate its instation. Although BT offered a replacement solution, IDT were asked to offer an alternative which was selected by the Client.

We surveyed the 113 most critical locations in five key towns. A number of junctions were too far from other nodes to be connected as part of an iMesh network. The result was 78 signal sites suitable for linking by iMesh, grouped into 16 areas (or 'clusters').

Based on the survey results, IDT assembled 'kits' of equipment specific to each junction comprising an iMesh router, cables, mounting brackets and detailed installation instructions. The IDT equipment was then installed by the Client's traffic signal contractor while IDT implemented VPNs over the backhaul links between each Cluster and the UTC instation. Using the VPNs IDT were able to remotely commission all the iMesh routers so that the UTC could be switched over from the old BT circuits.

Some of the remaining, isolated sites were connected using i3G routers supplied by IDT and others used existing ADSL links.

The Client was able to terminate 78 of the old BT circuits and 4 ADSL circuits which were also no longer required. This led to a financial saving of 85%.

Large scheme – Birmingham – 491 nodes

With a population of around 1m Birmingham is the second largest city in the UK. The City had a Peek UTC system but, under a PFI scheme with Amey, began the rollout, in 2012, of a new UTC system supplied by Siemens. Amey simultaneously chose iMesh to provide the wireless connectivity to as many junctions as feasible.

IDT undertook a detailed radio survey and designed a scheme in which 491 nodes were connected by iMesh, arranged in 53 clusters. The backhaul was delivered via SDSL circuits supplied by a third party telecom provider who arranged the changeover from the old BT circuits in such a ways that the downtime at each cluster was minimised.

The size of some individual clusters is large – in some cases up to 20 nodes - with link distances up to 700m. This is intentional and was designed to minimise the number of backhaul circuits required. The clusters make extensive use of pole-mounted iMesh routers, such as that shown on the left, and repeaters.

As with the Hertfordshire project IDT assembled 'kits' of equipment which were then installed by Siemens and Amey at the same time as the traffic signal controllers were installed. Siemens also won the contract to supply a number of variable message signs to Birmingham. Some of these signs fell within the coverage area of iMesh clusters and were therefore incorporated into those clusters. Working with Amey's IT team, IDT ensured that the data exchange with the VMSs was routed appropriately at the instation.

The Birmingham scheme is not yet fully operational but we understand that the financial saving through replacing the old BT circuits with iMesh is approximately 65%.

ITS United Kingdom

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