BAPCO 2020

The Annual Event for Public Safety Technology

10 - 11 MARCH 2020
RICOH ARENA, COVENTRY
BAPCO-SHOW.CO.UK

A UK Space Agency funded partnership project between industry and public sector to test a hybrid cellular and satellite communications system, for healthcare in rural Wales

Agenda

Objectives and Approach
- Emergency Applications
- Critical Care
- Peripatetic health and Social Care

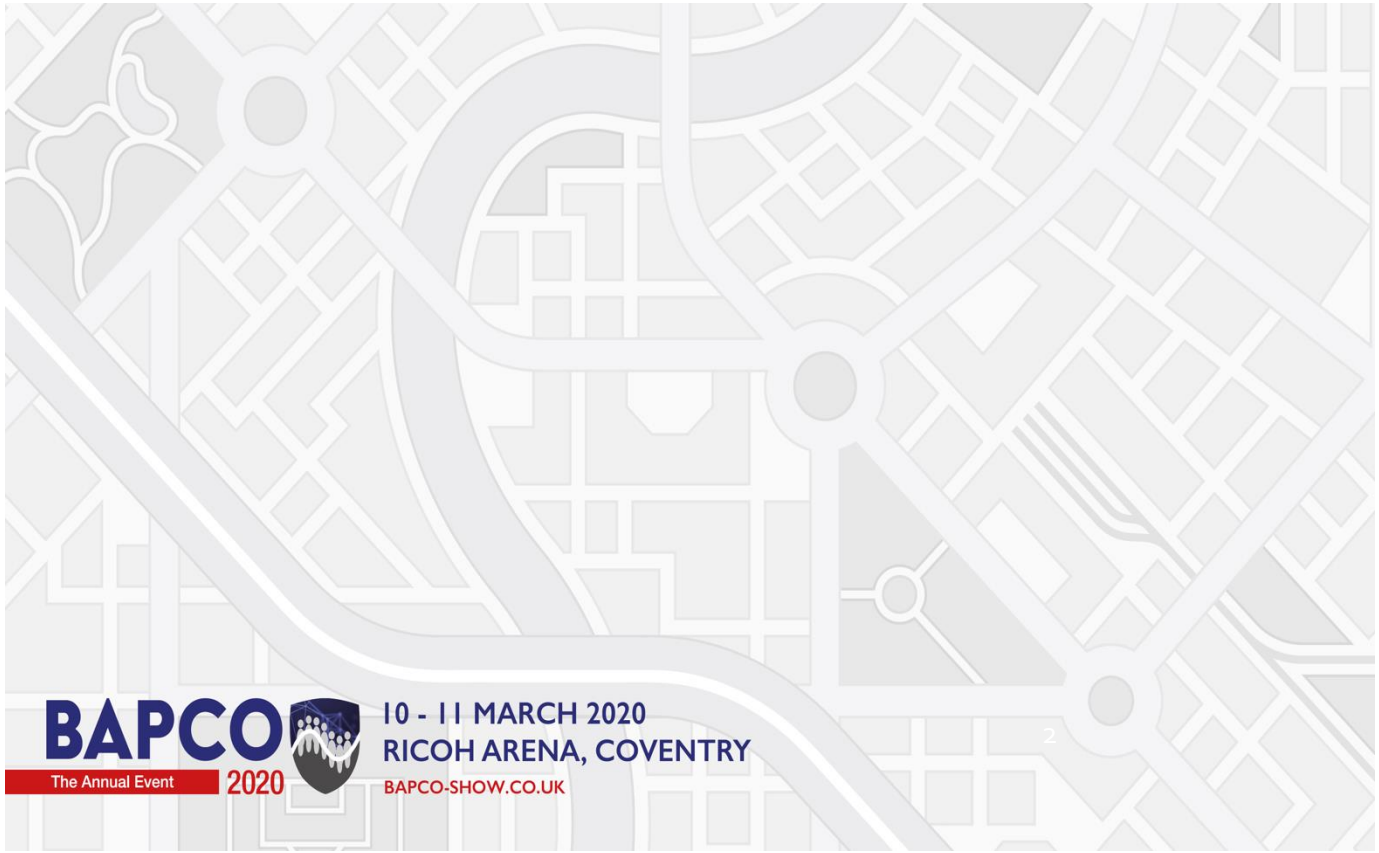
Introduction to the Partners:
- EMRTS Cymru
- Tactical Wireless Ltd

Equipment Used - Reasons

Paediatric Cardiology Ultrasound – the Challenges

Results – To date

Conclusions



Project Objectives

- TO DEMONSTRATE SIGNIFICANT IMPROVEMENTS TO THE REMOTE CONNECTIVITY FOR HEALTH AND SOCIAL CARE WORKERS – EMERGENCY AND NON-EMERGENCY SCENARIOS
- To enhance the levels of connectivity for mobile health and social care, in selected areas of Wales (insufficient time to cover all Wales and starting point is “not-spots” where incidence levels are high, as supplied by EMRTS):
  - Cellular only.
  - Satellite only.
  - Hybrid.
- To transmit data, reliably and securely, from remote medical devices, using compression, frame rate and resolution tools, where required. The devices will include ultrasound (eg SonoSite) and life monitors (eg RDT Tempus Pro), to improve pre-hospital diagnosis and care.
- To demonstrate resilient connection of laptops, smart phones, tablets, voice over IP radios and cameras.
- To optimise the operation of the communications hub, inside and outside of the vehicle, for peripatetic health and social care workers.

Success Criteria

- There is a significant and measurable improvement in the probability of connection.
- The output from medical devices can be transmitted to and remotely managed by specialists.
- User acceptability. The use of the hardware and software is straightforward.
- Peripatetic workers can achieve reliable and resilient connectivity, with the hub out of the vehicle, to improve productivity and patient outcomes, based on different disciplines and different use scenarios.
- The systems can be rolled out in a cost-effective manner.

Tactical Wireless OMNI-HUB®

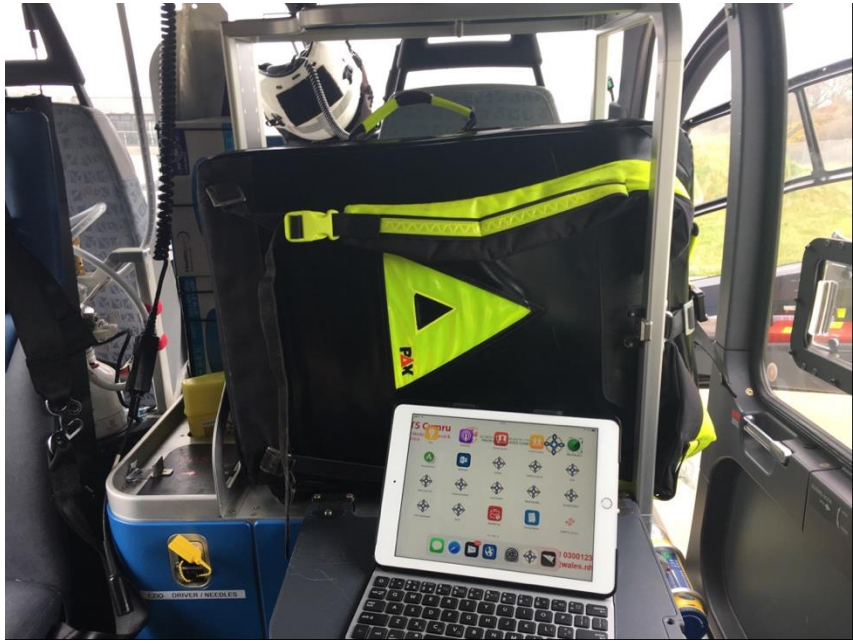
UK SPACE AGENCY

EMRTS Cymru
Emergency Medical Retrieval & Transfer Service

Mobilisation with EMRTS Cymru

On call consultants
Control room
Rapid Response Vehicles
Air Ambulance

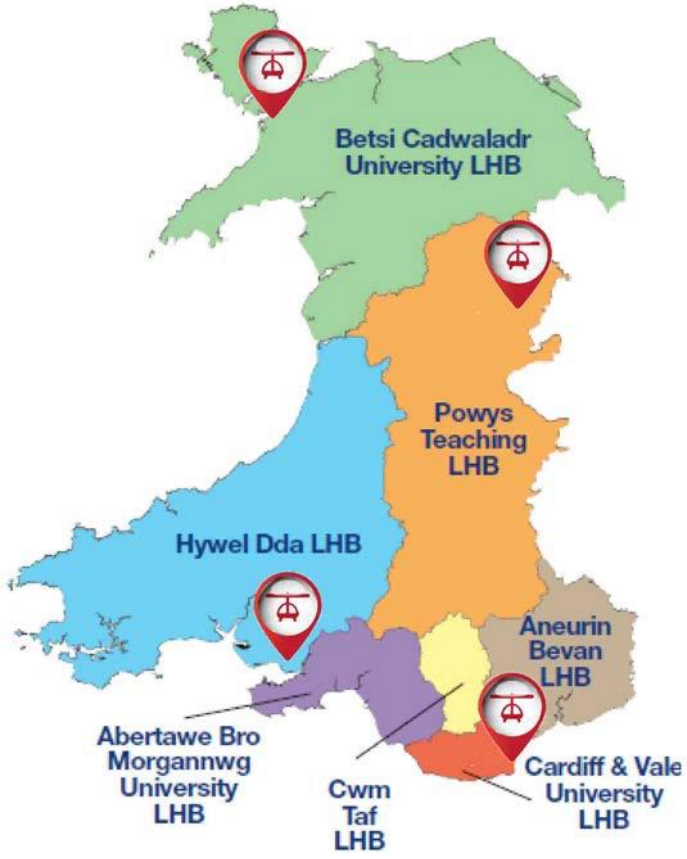
- Access to
  - 999 control system
  - Welsh Clinical Portal
  - EMRTS “APP”
    - Drug & Equipment calculator
    - Location tracking
    - Guidelines/ SOP’s
    - Checklists



EMRTS Cymru
Emergency Medical Retrieval & Transfer Service

People and Logistics

- **Who?**
  - Consultants from critical care background
  - Critical Care Practitioner (CCPs)
  - Helicopter Transfer Practitioners (HTPs)
  - Air Support Desk (ASD)
- **How?**
  - Air (4 Wales Air Ambulance Charity helicopters)
  - Road (5 specially converted Audi Q7 RRVs)
- **From?**
  - Caernarfon
  - Welshpool
  - Dafen (Llanelli)
  - Cardiff Heliport
  - Cwmbran: WAST Contact Centre (ASD)



Tactical Wireless OMNI-HUB®

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EMRTS Cymru
Emergency Medical Retrieval & Transfer Service

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in partnership with

ELUSEN AMBIWLANS AWYR CYMRU
WALES AIR AMBULANCE CHARITY

GIG CYMRU NHS WALES

GIG CYMRU NHS WALES
Ymddiriedolaeth GIG
Gwasanaethau Ambiwlans Cymru
Welsh Ambulance Services
NHS Trust

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol
Abertawe Bro Morgannwg
University Health Board

Gwasanaeth Gwaed Cymru
Welsh Blood Service

Unique Collaborative Partnership

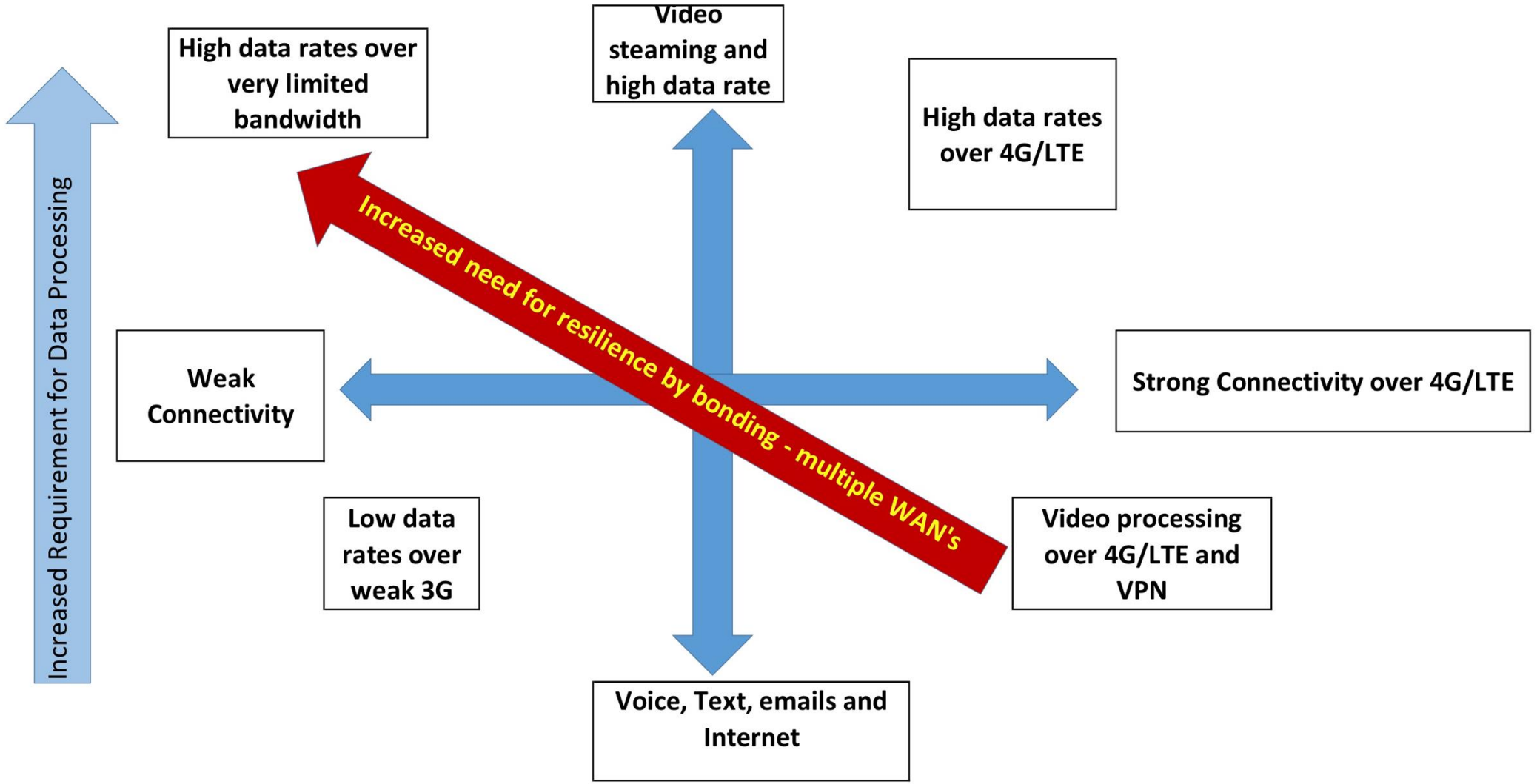
Services

- **Pre-Hospital Critical Care**
- **Paediatric Retrieval**
- **Adult Retrieval**
- **Neonatal/Maternity Care “999”**
- **Air Support for all land-based retrieval teams**
- **Major Incident Response**

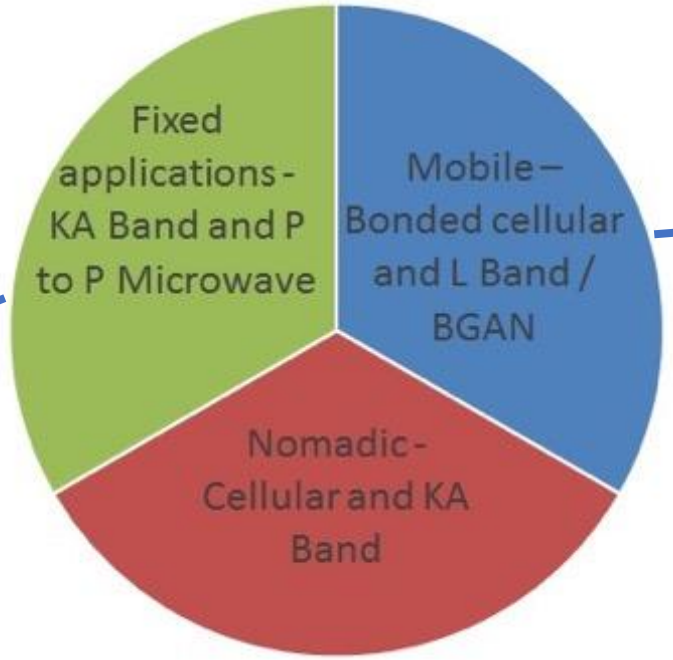
Tactical Wireless Ltd

Tactical Wireless Ltd provides bespoke solutions, based on an analysis of the application and its operational area, to provide secure, resilient and reliable communications in poorly connected areas.

- TWL's range of products:
  - integrate the processing of video and other data, to reduce bandwidth demand, with:
  - a smart, bonded router to provide increased bandwidth, by simultaneously using multiple cellular networks, WiFi WAN, ADSL and Satellite.
- Satellite solutions can make a significant contribution but all routes are essential in mission critical applications.
  - Satellite communications can be provided at near cellular airtime costs.
  - The use of all available WAN's (multiple cellular, WiFi, satellite and wired connections provides a method of controlling costs and requires optimisation of router algorithms.



Scenarios



Note:
Tactical Wireless is working with Heriot Watt University to develop a Satellite on the Move antenna technology which can link to terrestrial 3/4/5G networks and low orbit satellites to enable 'always connected' broadband communications.

Key Components of the Project:

The following **technologies have been incorporated:**

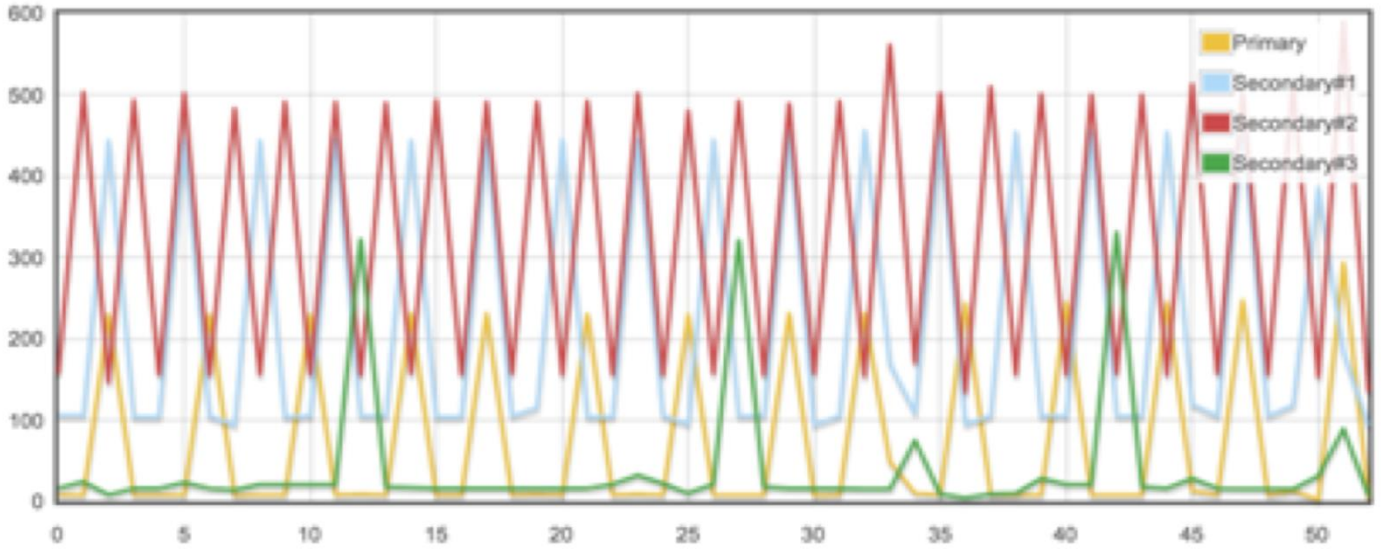
- **Smart, bonded routers** configurable for Multi-Cellular, WiFi, WLAN, and satellite networks that can operate over a **secure, private network.**
- **A long range WiFi access point (WiFi LAN).**
- Omni-Serve, **video encoder** that provides compression, frame rate and resolution management, to enable high quality video to be transmitted over limited and / or unreliable networks
- A highly flexible **video management system, CrossFire**, with the capability to distribute video streams via Apps on smart phones and tablets and via Remote Client software on pc's.
- **High-gain antennas**: MiMo cellular and WiFi, to provide a long range WiFi hotspot for client devices.
- A nomadic KA-band satellite dish, mounted on a self-acquiring system.
- A carefully designed, safe battery and power management system for robust mobile applications, as the core kit is designed to be used in or out of the vehicle.

Encoder Pre-Sets

- The presets are easily amended but are based on different connectivity scenarios.
- Ultrasound requires streams 2s or 3s.
- The IP address can be directly accessed via a second connected device on the private, secure network or via a secure VPN connection.

Nomenclature	fps	Compression	Resolution	Named	Indicative bandwidth required Mbps	IP Address for VLC access
Stream 1	8	H264	1080P	Full HD	0.50	rtsp://192.168.40.20/video1
Stream 1s	10	H264	720P	HD	1.00	rtsp://192.168.40.20/video1s
Stream 2s	15	H264	1080P	Full HD	2.50	rtsp://192.168.40.20/video1s2
Stream 3s	25	H264	1080P	Full HD	4.10	rtsp://192.168.40.20/video1s3

1080P is 1920 X 1080
720P is 1280 x 720



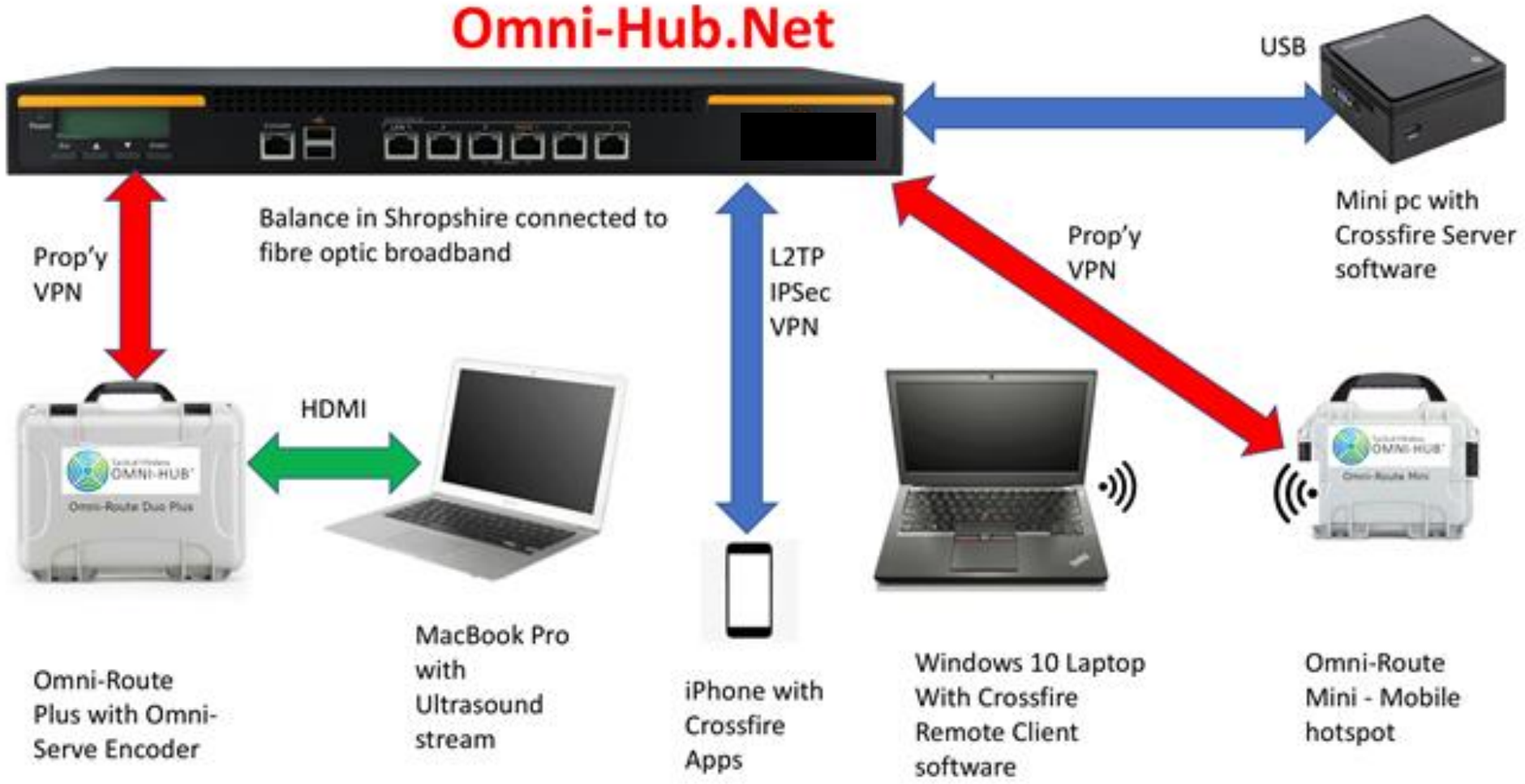
Integrated software & hardware incorporated into the Project

- Basic services:
  - Voice over IP, emails, messaging, video conferencing.
- Radio Messaging Systems – iCOM with central server.
- Server based Codec – Omni-Serve, with 4 pre-sets.
- Various video conferencing packages, including NHS approved systems.
- Cameras, including body worn badge or head mounted cameras, to allow the images from a consultation to be shared across the private network.
- A video management system.
- NHS approved clinical systems.
- Life monitors – such as RDT Tempus.
- Various ultrasound machines.

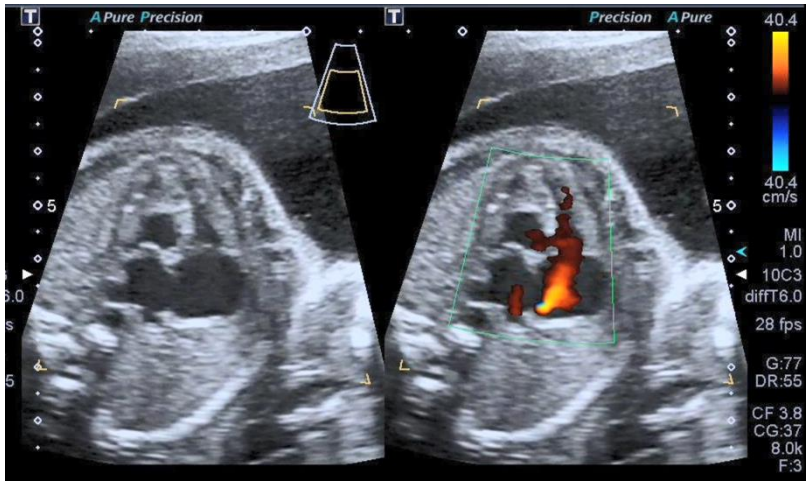
Project Equipment

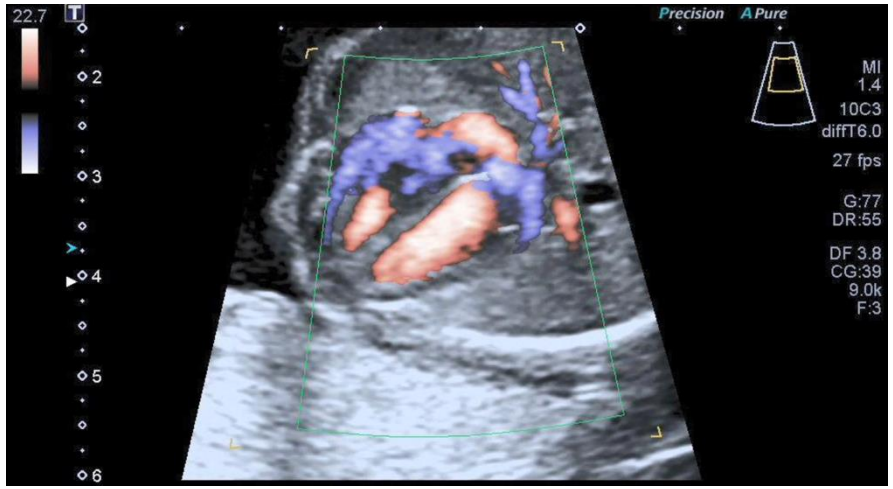
- A self-acquiring KA-band satellite system, installed on a HCS/NHS van.
- A mobile unit, Omni-Route Duo Plus, to be used in and out of the van - 2 cellular modems with 2 SIM cards per modem, pluggable satellite WAN and video encoder – designed for 8 hours use when not connected to power.
- Five Omni-Route Minis – single cellular modem with 2 SIM cards. Ability to connect a satellite WAN or ADSL line. Designed for 8-12 hours use when not connected to power – to collect data for peripatetic health and social workers.

Simple Demonstration of the System



Ultrasound Challenges





The project team selected a particularly difficult medical application:

- New-born children have a significantly higher heart rate than adults.
- Video can be managed, to reduce bandwidth demand, by the use of compression and frame rate or resolution adjustment. For new-borns, the flexibility is reduced.
- The images may need to be transmitted in areas of very limited connectivity and the output from high resolution ultrasound machines invariably exceeds the available bandwidth.
- The system for viewing the transmitted ultrasound needs to as simple as possible. The receiving specialist needs to concentrate on an often life-threatening condition, without the distraction of having to manage the technology.
- A great deal of effort has gone into the above and a range of solutions has been successfully developed during the project.

Example of Mobile Data

- Tracking the Omni-Routes during routine deployments of HCS/NHS vans.
- Streaming data at not-spots and measuring broadband speed.
- Continuous cellular connectivity achieved on routes that contain not-spots for single cellular and standard inbuilt phone antennas.
- Project runs to end March and all data hasn't yet been collated but results to date are excellent.
- Most areas have ben covered and gaps will be surveyed in the next 2-3 weeks.

Conclusions

- Medical and other applications in remote and rural areas are a challenge.
- The solutions depend on:
  - The location and its connectivity limitations.
  - The type and size of data to be transmitted.
  - The mission criticality.
- Bespoke solutions are required for specific projects across an entire range of scenarios.
- Cellular, with the right antenna design and multi-network routers, can deliver connectivity almost everywhere (eg 85% ish, by area, in the Scottish Highlands).
- Satellite is required for mission criticality - KA-band can't be used on-the-move and L-band has insufficient bandwidth for high data rate requirements.
- On-the-move KA and KU band antennas are being developed and TWL is embedded in one such project.
- An integrated approach is beneficial to end users – resilience, flexibility, cost management.
- Communications that are built into robust cases, with onboard power, provide a flexible capability – paramedics often work well away from their connected vehicle and enhanced, lightweight communications, for peripatetic health and social workers, improve efficiency and contribute to beneficial economic and social outcomes.

Contacts and Further Information

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