Adopting new approaches to UTMC communication networks - the benefits and the pitfalls

Following a successful pilot project to upgrade M4 Junction 11, providing Internet Protocol (IP) connectivity, the ITS communication experts at IT4Automation were approached by Reading Borough Council to develop the future UMTC communications strategy.

This paper and related presentation highlight new approaches for UTMC communications through the Reading Borough Council (RBC) case study.

Reading Council's principal objectives were to review the communication needs of the ITS systems, assess the changing networking requirements and identify potential operational cost savings by deploying alternative communication strategies. Finally, consider those opportunities where improvements could be employed for increased robustness and reliability through system optimisation.

IT4Automation's approach was to determine the range of ITS applications in use at Reading Borough Council (RBC) and gain an understanding of the existing communications systems that support them. Then focus upon the UTMC application as it was typical of many ITS systems implemented, and undertake testing to ascertain IP performance. On completion, incorporate the findings into the report alongside a detailed analysis and recommendations for RBC's future strategy.

Initial discussions with Reading Borough Council determined the majority of existing ITS applications use low speed serial communication systems, with communications being provided by:

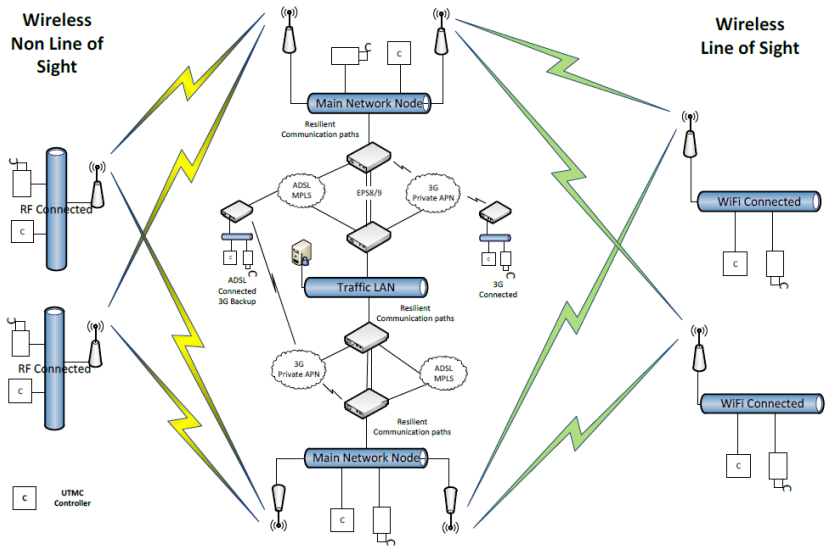
- Analogue Copper Leased Lines - EPS8 2 Wire, EPS9 4 Wire or EPS 42 Multi-drop circuits.
- Digital private circuit - Fibre RS1000 Video Circuits with RS232/485 telemetry
- Digital Packet based services - Internet ADSL services and 3G based services (public / private APN)
- Private Wireless Infrastructure - Wireless WiMax

The following ITS applications utilised the communication systems identified:

- Traffic Control
- CCTV
- Variable Message Signage
- VMS Car Park Loops
- Car Park Counts
- Real Time Passenger Information
- RTPI On Bus Signage
- Digital Media (Town Centre)
- On Bus CCTV
- Video Cam Jackets
- Street Lighting Control
- Asset Management Emissions Sensors
- MOAT Bus Ticket Machines
- OBU ANPR Cameras
- ANPR Bus Lane Enforcement
- Near Field Communications
- Car Park Signage

Presently RBC has multiple discrete communication services originating from the Traffic Management offices at the Civic Centre. Newer technologies such as WiMax, 3G and ADSL are currently tactical solutions providing high-speed network services for the modern ITS applications. These disparate platforms could be incorporated into an integrated strategic ITS network infrastructure. To address migration from serial to IP communications across Ethernet interfaces, a hybrid communication approach was suggested.

The hybrid approach would use the existing EPS circuits where they provide suitable communication paths. The savings realised from the cessation of expensive leased lines would permit the use multiple resilient paths to be created from a node to the central server. This would result in greater reliability as the network will automatically recover for any single point of failure. Some UTMC locations would become main nodes on the Traffic Management network. These nodes would communicate to other controllers using wireless.



Proposed hybrid network architecture

The Civic Centre would have multiple and diverse connections to access network. The access networks are protected with redundant firewalls into a Demilitarised Zone (DMZ). The ITS Servers would be located in an internal network that access remote data across the DMZ again protected by firewalls. Remote locations would access one or more of the access networks, this typically would be ADSL and communication would automatically fail over to 3G should the primary ADSL path fail.

The principal benefit of this hybrid approach is the management of risk in the necessary transition from serial to IP communications to support modern controller technology. Further risk mitigation is achieved by initially deploying the architecture at a set of sites, which would enable services to be thoroughly tested prior to role out.

Further benefits include moving to a more robust and secure architecture with redundant communications, removing potential single points of failure. Whilst deploying the proposed hybrid solution, RBC would achieve operational cost savings by optimising their leased line provision.

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