

UTMC is dead! Long Live UTMC!

How valuable is the UTMC standard and how should we use it in the future?

Presented at the JCT Symposium 2021 by Simon Notley

1 Preamble

This paper discusses 'UTMC systems', meaning systems that implement the UTMC Framework including a Common Database as described in the UTMC standard (utmc.uk) such as Dynniq's ImCity. These systems are also sometimes referred to as simply as Common Databases.

These systems are designed to provide a single unified platform from which to monitor and control disparate devices and subsystems on the road network. They owe their existence to the development of the UTMC Framework, which created a standard architecture and common interfaces for such systems, allowing suppliers to develop the systems at reduced cost and risk.

The four UTMC systems developed in the immediate wake of the UTMC Framework remain by far the most popular tools for strategic management of road networks. This is the case despite (or perhaps because of) the UTMC standard not having been updated significantly for many years. It is also notable that no direct competitors to those systems (UTMC-based or otherwise) have gained any foothold in the UK that time.

In this paper, we examine the value of UTMC, what drives its continued popularity and whether we need a replacement.

2 Current Arguments

This paper is motivated by the two opposing arguments below. Both from prominent figures in the community who have previously spoken at JCT (watch the talk to find out who!).

*"The UTMC framework is an **anachronistic relic** based on technologies that are **insecure, out-dated and largely unknown** to anyone graduating as a software engineer in the last decade. By lazily specifying 'UTMC compliant' rather than providing proper functional specifications, buyers are **shutting out modern, innovative products** that would deliver better value."*

*"The UTMC framework is a **triumph of collaboration**. It is a textbook example of how the government-led development of standards can lead to the **creation of valuable products** that would not have emerged otherwise. Technically it is without competition, by specifying the transport layer, data model and architecture it **guarantees plug-and-play interoperability** in a way that no 'modern' alternative can."*

3 What systems are authorities buying?

Let's look at current market trends – are customers buying UTMC Systems or something else? Certainly from Dynniq's perspective, customers are buying UTMC systems. Derbyshire County Council, West Yorkshire Combined Authority, Derby City Council and Transport Scotland have all recently purchased ImCity and in all cases, UTMC compliance was part of their specification.

Perhaps more tellingly, the two largest UK transport authorities, both known for their tendency toward bespoke systems, Transport for London and Highways England, have recently served indicative notices or tenders for UTMC Systems.

In the case of Highways England they have purchased a system and are now actively engaging with local authorities and other suppliers to create interfaces between their UTMC and local authority UTMC systems in a programme known as Collaborative Traffic Management (CTM).

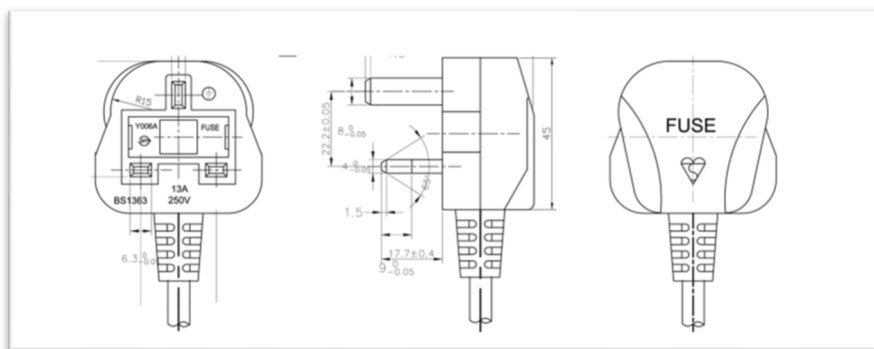
In the case of Transport for London, they were looking for a UTMC system to control Variable Message Signs in order to remove the burden of maintaining a proprietary VMS protocol.

The common thread here is *interoperability*. All these authorities chose UTMC as a way of providing off-the-shelf interoperability. So what makes UTMC so appealing from an interoperability point of view?

4 Plug and play

We often use the term 'plug and play' when describing UTMC. But what does that mean in practice?

A standard 13-amp plug is a great example, because it is exactly that, a *standard* 13-amp plug. There is a publically available and widely adopted specification that tells us everything we need to know to make a plug or a socket from the shape of the connectors, to the voltage and amperage to be supplied and the dimensions of the fuse it must support. We know that if we make a device with a plug, end users will be able to power it, they won't need to hire an electrical engineer to make a special one-off connection from the national grid to their new bedside lamp.



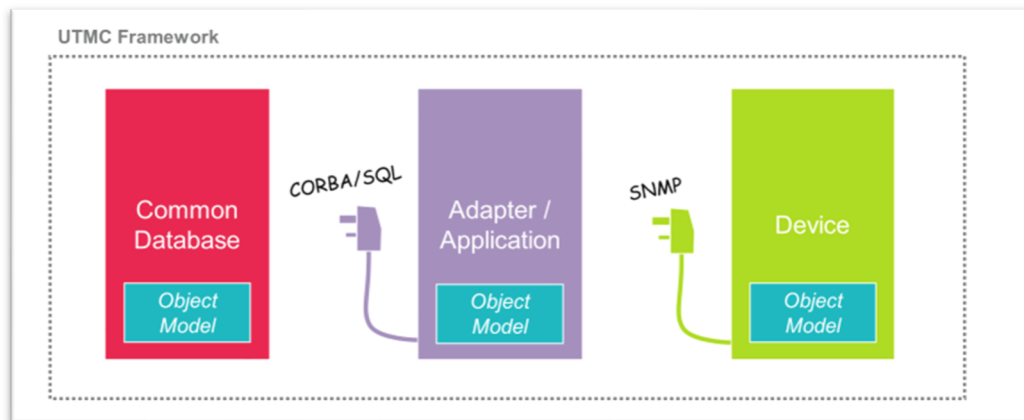
UTMC is similar, it offers public, open standards for connecting sub-systems or field devices together. So what plugs does UTMC offer?

There are four key elements of the UTMC standard:

- > The Framework describes an architecture featuring applications and a Common Database – it's not so much a plug as laying the ground work
- > The Object Model describes how devices and sub-systems from the world of traffic are to be represented as data. For example a Variable Message Sign has a standard model regardless of make or model. This is key to how systems like ImCity can offer a standard user interface and user experience for disparate devices.

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- > The CORBA/SQL interface between applications (often called adapters) and the Common Database provides a complete definition of how an application connects to the database. Any application that conforms to this standard can be attached to any Common Database. For example, this is how ImCity receives data from a Siemens UTC and vice-versa.
- > The SNMP interface between devices and applications (adapters) completely specifies how a given type of device should communicate from the roadside. If you are familiar with UG405, then just think UG405 for VMS, CCTV and Journey Time. This interface is widely supported by VMS in the UK which means a single 'standard' adapter can handle most VMS with no development.



So far, so good. So why was the first person we quoted at the start of the paper so pessimistic? Let's dig a little deeper into some of our examples

5 Plug and play?

It is true that the majority of VMS in the UK support the UTMC SNMP protocol, but this protocol doesn't support colours, graphics, text-boxes or paging. Therefore VMS manufacturers are working around this by embedding formatting codes inside the standard message. On the one hand, this 'breaks' the standard as the SNMP payload no longer unambiguously defines the message. On the other hand the fact that this solution was selected is an endorsement of UTMC, or at least an acknowledgement of its ubiquity in this area.

Furthermore, it is really only VMS where UTMC has achieved this level of penetration. UTMC-compliant detectors, car park counters or air-quality stations were never ubiquitous and are becoming rarer by the day.

An argument made passionately by our first quote is that CORBA and SNMPv1 are insecure, and virtually unknown to developers leaving university today. This is also absolutely true. We always wrap these interfaces inside a secure layer and CORBA is largely unknown even amongst more experienced developers.

It is also true that Highways England chose to procure their own UTMC system in order to integrate with local authority UTMC systems. This is clearly an endorsement of UTMC as an enterprise platform and a recognition of its importance and continued adoption in local authorities. However, rather than use the existing CORBA/SQL interface for exchange of data between systems, Highways England designed a new interface that uses HTTP and DATEXII. So clearly interoperability was a motivator, but the interfaces themselves were not a driver.

Taking our new ImCity deployment in Derbyshire as an example, we've made some use of CORBA and SNMP, but most sub-systems are connected to ImCity via adapters developed for that specific sub-system alone, using a proprietary protocol.

So if the 'plugs' aren't the most appealing interoperability feature what is?

6 Plug and play for humans

Perhaps it is not so much technical interoperability that is key, but rather *user* interoperability. The UK is fragmented into many different transport authorities and in many authorities you could count the size of the team on one hand, or indeed one finger, or occasionally none. These team members sometimes move between authorities so having familiar tooling with a predictable feature set is valuable. You could say that we need a tool that is *plug-and-play* for the technical team.

There are also commercial and financial pressures to consider. The need for government to procure value-for-money solutions that fit the skills of the available team tends to favour proven 'off-the-shelf' solutions that are recognised in the traffic industry (as opposed to more generic solutions from the world of IT or enterprise for example). The budget-holders favour a *plug-and-play* business case and the procurement team favour a *plug-and-play* technical specification.



The flipside of this appealing plug-and-play-for-everyone situation is that it makes it difficult for the industry to collectively move forward. The fragmentation of the market actually means that a significant proportion of each project is consumed in procurement, bidding costs and project management. Contingent with very limited revenue budgets, this means that comparatively little is left to invest in any major evolution of the technology, and anyone that did invest might find themselves isolated: the 'odd-one-out' using a platform that no-one else knows or supports.

7 Do we need a replacement for UTMC?

It's clear from the cases that we've looked at so far that we still need some of the things that UTMC gives us; interoperable technical standards, common operational practices and a shortcut to procure known-good systems. It's equally clear that we cannot continue indefinitely using obsolete technology, indeed the shift away from the original UTMC technologies has already begun.

There's no shortage of exciting, scalable, modern software frameworks that an enthusiastic young(ish) product manager might pick from to reinvent an aging UTMC system. Likewise there are plenty of big IT companies promising to operate your 'smart city' from their big data cloud enterprise asset management platform. But ultimately technology must be driven by practical utility. Unless we can collectively identify and articulate the value of such software then the era of UTMC will pass and we will be left with a patchwork of disparate software platforms. Is this a good thing or a bad thing? We can only answer that question if we understand the problem we are trying to solve and the value we are trying to deliver.

We collaborated to define the needs that created UTMC decades ago. We must be prepared to collaborate now to better understand and redefine those needs today. Then, the solution can follow.

So, which of the quotations we started with was correct? I think perhaps both. Who said them? Find out at JCT 2021!