Many languages, one voice

In Thinking Highways' third in-depth analysis of the FRAME Architecture

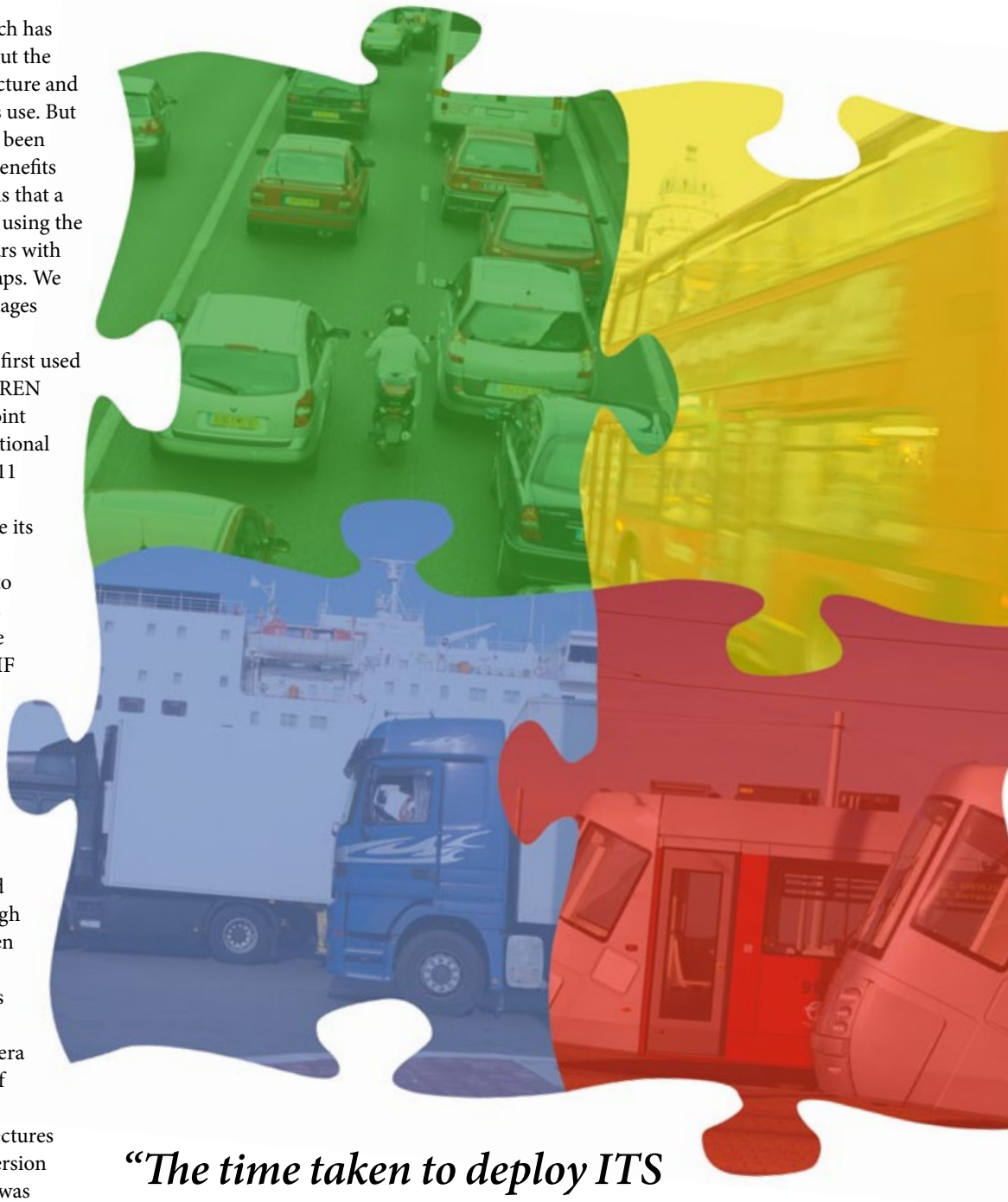
Over the years much has been written about the FRAME Architecture and the benefits of its use. But who has actually been using it, and what are the main benefits they have achieved? The answer is that a wide spectrum of users has been using the Architecture over the last ten years with great success, as shown in the maps. We look below at some of the advantages they have drawn from it.

The FRAME Architecture was first used in 2000 before the end of the KAREN project to provide the starting point for the creation of the French National ITS Architecture, ACTIF. In the 11 years since then ACTIF has been refined and developed to improve its ease of use.

There have also been changes to the scope and content of services it supports that have reflected the continual evolution of ITS. ACTIF has been used in several case studies in France that have helped in the implementation of ITS services across the country.

Experience gained from using ACTIF has shown that it enables the system boundary and functionality to be defined through the building of consensus between the Stakeholders. As a result the time taken to deploy ITS services has been substantially reduced, which in the case of a speed camera project, probably led to dozens of lives being saved.

Two other national ITS architectures were developed from the early version of FRAME and ACTIF. The first was for Italy and called ARTIST and using FRAME saved a large amount of time and money. It has been used in case studies of ITS implementations at various Italian locations and also in calls for tender



"The time taken to deploy ITS services has been substantially reduced, which in the case of a speed camera project, probably led to saving dozens of lives"

Richard Bossom and **Peter Jesty** answer some burning questions

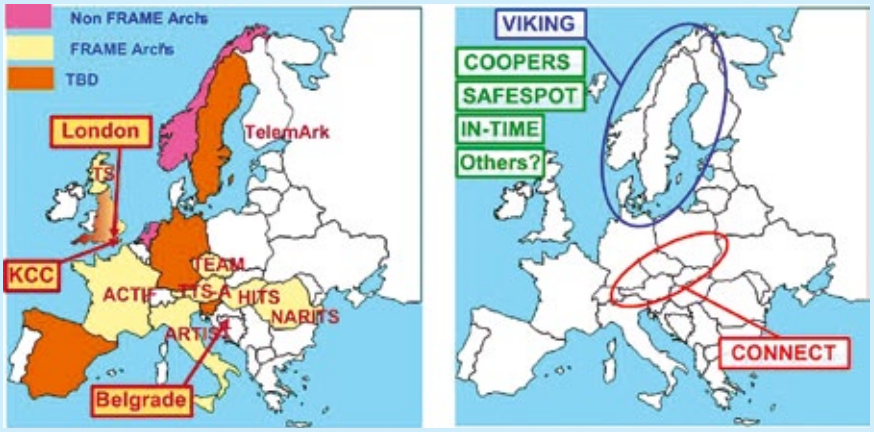
for major ITS initiatives, including a multimodal "freight village" near Naples. The other national ITS architecture was for the Czech Republic. It was called TEAM and was completed by 2005.

RECENT USERS – NATIONS, REGIONS AND CITIES

Within the UK, given the absence of a National Architecture or Framework, Transport for London (TfL) has taken the lead and developed an ITS Architecture for London, based on an up-to-date version of the FRAME architecture. It was initially developed in 2009, and following a recent expansion within the Traffic Directorate, TfL has refreshed its architecture to represent the required changes in functionality. This refreshed architecture now enables TfL to consider future ITS developments, including Vehicle to Infrastructure (V2I) functionality, and allows it to move towards a full Enterprise Architecture for ITS. As a result of this work, TfL found that the main benefits of creating the ITS architecture were that it was possible to put the scope of the services that the Traffic Directorate provides into the context of ITS as a whole.

In addition, other potential TfL stakeholders could be identified by looking at the interaction with entities outside the Traffic Directorate ITS architecture. The FRAME Architecture also provided a terminology for the User Needs and a standard set of functionality to which future reference can be made to aid future investment decisions.

Other ITS architectures that have been developed more recently from later versions of the FRAME Architecture include those for Transport Scotland, Hungary (HITS) and for the City of Belgrade, Serbia. The latter provided a unique opportunity for its Stakeholders to study an integrated system that represented the functionality required to support the ITS services they wanted to implement.



Countries and cities involved with FRAME (left) and (right) EC projects using FRAME

A national ITS architecture for Romania is currently being developed from the latest version of the FRAME Architecture and other European nations such as the Germany, Spain and Slovenia are considering, or are actively following, these other examples. The Architecture has also been selected by ITS Arab as the starting point for development of ITS architectures in the Middle East and North Africa.

A different approach to national ITS architecture development has been adopted by Austria. Its relatively central geographic position in Europe with major transport corridors passing through it, means that there is a need for many interfaces and links between the ITS implementations involved.

So rather than develop its own national ITS architecture, Austria is actively contributing to the future development of the FRAME Architecture. The use of the FRAME Architecture has also been promoted as part of national ITS implementations within the Austrian Telematics Master Plan and at R&D project level.

RECENT FRAME USERS – PROJECTS

The COOPERS project was one of the three Integrated Projects launched as part of the EC funded Framework 6 Programme in February 2006 to provide "proof of concept" for cooperative systems deployment, plus user acceptance testing. It used the FRAME Architecture as the starting point for the development of the functionality needed to demonstrate its cooperative systems services for the inter-urban road environment.

The FRAME Architecture provided the "common language and the tool to discuss state of the art system functionalities" that gave the project partners big advantages when they were adapting their ITS reference architecture to the demonstration sites. It also supported the identification and definition of new functions, which will be integrated into the future products of some of its industrial partners..

Other projects such as VIKING, IN-TIME and CONNECT are also using the FRAME Architecture. These three projects are each at a different stage in their life-cycles, so as yet no additional benefits to those already mentioned can be reported. >>>

	ASPIRATION	
	There is a need to make better use of the existing road network and reduce congestion by providing improved traffic management, e.g. street enforcement, improved traffic information and signage and reviewing parking restrictions.	There is a need to optimise the use of the existing road infrastructure, improve Public Transport services, and other road users.
Manage Traffic	Y	Y
Provide Planning	Y	
Provide Trip Planning	Y	
Manage PT Vehicles		Y
Produce PT Information		Y
Provide Tunnel Management	Y	
Provide Environmental Data		
Display Current Status	Y	Y
Provide On-Trip Information	Y	Y
Provide Pre-trip Information	Y	
Provide Book Ahead		
Collect Traffic Data	Y	Y
Collect Car Park Occupation	Y	
Assess Car Park State	Y	
Detect Traffic Violations	Y	
Provide Emergency Services		
Provide Interurban Traffic Control	Y	Y
Process Violations	Y	

USING THE ARCHITECTURE

So what does it take to use the FRAME Architecture as the starting point for the creation of a particular ITS architecture? To start with a clear goal is needed for ITS services that the ITS architecture is to support. This can be provided in the form of a "vision for ITS", which can be a single statement or a series of statements for different aspects of ITS. One of a series of vision statements created for the forward planning of ITS implementation in a region of England is:

"Improve communication and co-operation between the various organisations and institutions associated with the Transport Infrastructure and the delivery of more demand responsive services through the development of a Regional Communications and Information Centre. This Centre will collect data that enables the use of the infrastructure to be optimised, particularly when incidents occur on major links, such as the Motorway network."

The vision statement(s) are then augmented by Stakeholder Aspirations that describe in more detail the services that the Stakeholders want ITS to deliver. As noted in a previous article, aspirations are the starting point for creating an ITS architecture. The end result is a set of physical components and communications links needed to implement the services wanted by the Stakeholders

One of the main benefits that Stakeholders can get from their ITS architecture is the ability to identify the physical components needed by each aspiration. This can be done by creating a "look-up" table in which each component has a column and each aspiration a row. A "Y", or similar indication, against a component means it is required for the particular aspiration as illustrated by the table above.

Other aspirations may require different selections of components. Using such a table it is possible to build up a picture of the components needed by the most important aspirations and those that should be considered for implementation at the start of the deployment programme. The table can also be used in other ways: for example if it is known that particular aspiration must be implemented first, then it is possible to see if its components can also provide other services for "free".

The FRAME Architecture is not based on the Object Orientated (OO) methodology and is not written using UML, which has sometimes been seen as a drawback. However both COOPERS and SAFESPOT (another cooperative systems Integrated Project) have demonstrated that it is possible for ITS architectures created from the FRAME Architecture to be used as input for OO and UML based system design processes.

SUMMARY OF BENEFITS

In conclusion it is fair to say that the FRAME Architecture has provided benefits to the wide spectrum of organisations that have used it. These benefits include providing an integrated approach that uses a common language and definitions for the functionality that will be needed to provide the services that the Stakeholders want from ITS. This has enabled ITS architectures to be used as the platform from which the procurement and/or development of the actual functional components can start.

But it is true that in order to realise the full benefits from the Architecture some Stakeholders (including the eventual system owners) have to be educated in the advantages of system integration and the need sometimes to "think outside the box" about options for system configuration.

THE FUTURE

The E-FRAME project has expanded the Architecture to include the services available through cooperative systems and made it available for testing. For the future it is planned that its continued support and maintenance will be provided by the FRAME Forum. The Forum is expected to assume responsibility for the Architecture when the E-FRAME project finishes later in 2011 and will update the Architecture as ITS services continue to evolve.
This is another lesson learned – an ITS architecture must be kept up to date with the continued evolution of ITS services.

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Richard Bossom is Manager, ITS Design Services at Siemens; Peter Jesty is an independent consultant

info@frame-online.net

www.frame-online.ne

See Thinking Highways Europe/Rest of the World Nov/Dec 2010 for Bossom and Jesty's two-article feature on the FRAME ITS Architecture