11 SUSTAINABLE CITIES AND COMMUNITIES

CASE STUDY TITLE

Interoperability of Intelligent Transportation System (ITS) Services and Systems

AT A GLANCE

COUNTRY

- Egypt

LEVEL

- National

SDG ADDRESSED

- SDG 11 - Sustainable Cities and Communities

SUMMARY

The case study shows how the Government of Egypt has used standards such as the ISO 14813-1:2015 on "Intelligent transport systems" to enhance transport safety, security and mobility on a total of 6000KMs of key highways and transportation routes in the country.

This was the first phase of nationwide safety control applications and supports the achievement of SDG Goal 11.2: "By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety". Egypt has been suffering from some challenges with respect to high levels of congestion and occasional safety-related incidents.

The Egyptian government has set an ambitious target of enhancing the road network infrastructure and implementing ITS to enhance transport safety, security and mobility on a total of 6000 KMs (1st phase) of key highways and transportation routes in the country. In principle, the system architecture involves the deployment of field equipment (sensors, cameras, RFID readers, and other nodes with edge analytics capabilities); all interconnected through a highly reliable and resilient communication infrastructure, to the backend system, a central command and control centre employing traffic management applications.

A common pitfall for cities and countries implementing such systems is to go by a specification or a proprietary protocol locked by a single vendor. To avoid vendors lock-in, standardised solutions are key to ensure interoperability and decrease TCO.This case study demonstrates key challenges facing governments in achieving interoperability between different ITS components, and the key approaches done to alleviate such problems.

That usually includes the implementation of a standardized service and functional architecture, standardized communication protocols and interfaces between the field equipment and the backend, and center to center data exchange.

BACKGROUND

ITS entail the integration of many different technologies, and systems from many vendors and technology providers. Typical objectives include increasing roads transportation safety and security along with enhancing mobility and transport efficiency.

BACKGROUND

This in turn requires the design and implementation of many integrated modules. Examples include enforcement applications (e.g. speeds detectors systems, weigh in motion, and other traffic violations detection), tolling, passenger information systems, and traffic management. There are different approaches of integration depending on the required level of monitoring and control. Options include integration at the field devices level, or the aggregation nodes, or at the control center levels or a hybrid approach. Adopting an open architecture and choice of optimal integration points is the recommended approach.

STRATEGY

Implementing a standardised architecture facilitates the process of laying down the required functionalities for the system to operate effectively and efficiently. Using a standardised communication infrastructure facilitated the aspect of integrating different types of equipment from different vendors. The communication infrastructure can use a wide range of standards depending on requirements analysis. These include, for example, ITU-T G.651: Characteristics of a 50/125 micrometres multimode graded-index optical fibre cable, ITU-T G.652: Characteristics of a single-mode optical fibre cable, and other ITU-T G series Recommendations. The IEEE has also a suitable standard for the Gigabit Ethernet cases, there is the IEEE 802.3-2005 standards.

On the other hand, specialised urban traffic controllers following some specifications like Open Communication Interface for Road Traffic Control Systems (OCIT), Sydney Coordinated Adaptive Traffic System (SCATS), Split Cycle Offset Optimisation Technique (SCOOT), can be difficult to integrate, given the legacy nature of these systems. Using the American NTCIP is a widely used standard though in the industry for connecting to field devices, and especially for the variable message signs. But NTCIP devices are not compatible with some of the major urban traffic controllers.

This issue complicates the integration process a little bit. Special measures need to adopted either at the aggregation level, or the back end level to mitigate these issues. ETSI EN 300 220 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD) is a possible option for short-range wireless communications devices. For the RFID use cases, the EN 302 208 ultra-high frequency radio frequency identification (UHF RFID) up to 2W effective radiated power (ERP) is adopted.

Depending on the scope and requirements of the project, realising nationwide safety control applications require continuous (quasi-continuous) communications with the vehicles.

This might be difficult to realise given the heterogeneity of the infrastructures deployed over a country. Forums like CALM forum could help to solve these problems along with their requirements and interfaces to and from different technology stacks. For example, the ISO 25111 provides the architecture and common requirements for connection of "continuously on'' systems and ''connection time managed'' of public wireless communications systems. Additionally, ISO 21212, and ISO 21213 specifies air interface requirements for interfacing 2G and 3G systems with CALM respectively. It is clear that the industry is yearning for standards that would unify, or better inter operate and inter work different systems together.

STRATEGY

The proliferation of IoT and other commonly used IoT platforms make things even rather complicated. Efforts to standardise IoT platforms that can also serve ITS applications can be found in ITU-T Y.4200 and Y.4201 on Requirements for the interoperability of smart city platforms; and High-level requirements and reference framework of smart city platforms, respectively. The ITU-T SG20 is also currently working on developing a framework of cooperative intelligent transport systems based on the Internet of things (Y.IOT-ITS-Framework).

RESULTS & IMPACT

Standards allow for: (I) high level of interoperability between different systems; and (ii) the avoidance of vendors lock-in and hence better services, higher quality and better performance versus costs options • Future scalability, by adopting a modular approach based on a standardised architecture • Better maintenance planning • Lower overall TCO

CHALLENGES & LESSONS LEARNED

Perhaps the main challenges lie in the difficulty of selecting the standards at the different levels of the system. Standards themselves, especially on regional levels entail differences that are triggered in principle by competing industry ecosystems. Perhaps, this highlights the importance of international SDOs like the ITU, IEC, ISO to develop an internationalised set of standards or at least principles that would unify requirements and/or architectures to realise interoperability.

Another important challenge is on drafting the RFPs, requirements, and specifications of such complex system, with a future-looking eye on the technological advances in the field, and the intersection of emerging new technologies like the IoT, AI, big data, and cloud. Designing, and implementing a system with no future outlook could cost a country millions of investments costs, to upgrade, or interoperate with newly required features or functionalities.

POTENTIAL FOR REPLICATION

The experience presented in this case study can be replicated in almost all domains which require the integration of many complex subsystems on a rather national level. Examples include smart cities operation and management, utilities, and security-related use cases.

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