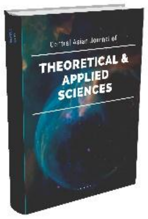

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Architecture and Standards of Intellectual Transportation Systems

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Abstract: *The word architecture can be defined as a framework that specifies the definitions of systems, their structure and components, and what products are to be developed and used for the system. As with other complex systems, strategic framework, so the ITS architecture should be defined in the stages of design, implementation and investment decisions for ITS applications.*

Keywords: *architecture, ITS, standard, integration, transport, urban, planning.*

INTRODUCTION

The ITS architecture provides a high-level framework for implementing ITS's application integration plans and covers organizational, legal and commercial issues as well as technical information. ITS architectures can be created at the national, regional or city level, or by sector or service. Integration with AUS architectures and other systems is facilitated, desired performance levels can be defined, logic is exposed, applications are easier to manage, monitor, and extend, and better meet user expectations.

ITS architecture designed to plan, define, deploy, and integrate ITS must define the user services expected to be performed by ITS applications, the objects on which these services reside, and the data and information flows between these objects and services. In its simplest form, the ITS architecture describes what an ITS does, describes where it works and how data is transferred between ITS components. Examples of user services include providing travel information, traffic management, electronic toll collection, traffic incident monitoring, and commercial fleet monitoring. Assets are physical locations where user services are provided, such as the traffic control center, public transportation vehicles, and users or system administrators who interact with AUS applications. Other systems that provide information to these systems, such as GPS (Global Positioning System), are also assets. Information and data flows participate in this structure as an element connecting user services and assets to the system. For example, an electronic toll collection system cannot function without data flow from a physical asset, a vehicle toll collection system, to a central billing system. The real value created by ITS applications lies in their ability to collect, analyze, and disseminate information about transportation systems. Although some information is transmıtted on paper or by voice, today the physical transmission of information is done through wired or wireless communication systems.

As with any system that uses a wide range of information and communication technologies, ITS requires compatibility, extensibility, interoperability, should include features such as integration and standardization. Compatibility here refers to the system 's ability to continue to function when software or hardware components in the system are changed. Having interfaces and functionality between components clearly and consistently defined in the system architecture helps compatibility. Scalability, on the other hand, means that a system can be designed to do more work, work in additional locations, or successfully handle new tasks added. Interoperability also refers to the ability to connect two separate systems to work together without interfering with each other.

An architecture for ITS Help create a national or regional ITS vision, It has the advantage of defining the main components of planned ITS implementation in a country and the interfaces between these components, and defining the appropriate framework for the development of these systems. Having a high-level architecture is important because it can be a reference point when a country wants to develop a new ITS application. The process of developing a national ITS architecture is as important as the outcome of the architecture and requires planners and decision-makers to comprehensively consider all the assets that should be included in the implementation of ITS in the country. Implementing this process with the needs and views of stakeholders across the country will ensure a stronger and more useful architecture, it also helps these stakeholders become partners in the process by securing political and financial support for dissemination. Many developed countries of the world have started research on the creation of ITS architecture, and it is observed that developed countries such as the USA, European Union countries, Japan and South Korea, especially the architectures created in the 1990s, are being used by other countries. example In addition, a working group (WP1) was established by the TC204 AUS Technical CommITSee of the International Organization for Standardization (ISO) established in 1992 to define the ITS architecture. The architecture defined by this working group as the ISO 14813 codified standard became the basis for other AUS architectures because it is less complex and it is an architecture that integrates user services.

Service areas	Service groups
l. Information about the passenger	1.1 Information before the trip 1.2 Information during the trip 1.3 Information about travel services 1.4 Pre-trip route guide and navigation 1.5 Route guidance and navigation during the trip 1.6 Travel planning support
2.Traffic management and transactions	2.1 traffic control 2.2 Transport incident management 2.3 Demand management 2.4 Transport infrastructure maintenance management
3. In-vehicle systems	3.1 Improve visibility in transport 3.2 Autonomous vehicle performance 3.3 Collision avoidance 3.4 safety training 3.5 Setting pre-collision restrictions
4. Shipping	4.1 Pre-authorization of commercial vehicles 4.2 Administrative procedures for commercial vehicles 4.3 Automatic monitoring of traffic safety 4.4 Security monitoring inside a commercial vehicle 4.5 Transport fleet management 4.6 Intermodal information management 4.7 Management and control of intermodal centers 4.8 Dangerous goods management

5. Public transport	5.1. management of public transport 5.2. Demand sensitive and shared public transport
6. Emergency situation	6.1 Transportation and personal safety emergency announcement 6.2 Management of emergency vehicles 6.3 Hazardous substance and incident notification
7. Electronic payment related to transportation	7.1 Electronic financial transactions related to transport 7.2 Integration of electronic payment services related to transport
8. Personal safety in connection with motor transport	8.1 Public transport safety 8.25 Improving the safety of vulnerable road users 8.26 Improving the safety of road users with disabilities 8.27 Smart intersections and connecting roads
9. Monitoring of weather and environmental conditions	9.1 Weather monitoring 9.2 Monitoring of environmental conditions
10. Disaster response and coordination	10.1 Disaster Information Management 10.2 Disaster response management 10.3 Coordination with emergency centers
11. national security	11.1 Monitoring and control of suspicious vehicles 11.2 Monitoring of power plants or pipelines

1-table. ISO AUS architecture service fields and groups

In the ISO work mentioned above, the country that was the inventor and created the first national ITS architecture was the USA. Architectural development began in 1994. Research is being conducted within the National ITS Architecture and Standards Program of the US Department of Transportation (USDOT - United States Department of Transportation) Research and Innovation Technology Administration (RITA - Research and Innovation Technology Administration). The US National IT Architecture provides a framework for the necessary functions for ITS, the physical subsystems on which these functions are implemented, and the information exchange linking the functions and subsystems, and is updated by the US Department of Transportation with relevant ITS stakeholders. Version 7.0 is the final version of the architecture, which was last updated in January 2012, and provides integration with the Canadian ITS architecture for transportation planning and project management, active traffic management, connected vehicles, commercial vehicle operations, tolling and includes. The US national ITS architecture consists of three architectural layers, such as enterprise, transport, and communication layers, as shown in Table 1.

The institutional layer includes the institutions, policies, financing mechanisms, and processes necessary for the effective implementation, operation, and maintenance of an intelligent transportation system, and this layer addresses the needs of the users of the transportation system and supports the planning and design of ITS. In this layer, there are 8 service packages consisting of travel and traffic management, public transport management, e-payment, commercial transport operations, emergency management, advanced vehicle safety systems, information management, maintenance and construction operations. There are a total of 33 user services.

As you know, air, rail transport is becoming more and more intelligent and advanced electronic systems have been available for many years, especially for air and rail systems. Electronic systems have long been used for purposes such as position determination, obstacle avoidance and collision avoidance during ship navigation. However, the reasons for ITS's focus on road transport and its interaction with rail and other modes can be interpreted in two ways. In practice, rail, air and road are largely mutually exclusive mechanisms and each has its own system solutions and areas of expertise. While the overlapping systems of these modes are increasing, it is a long shot that aircraft will use the same systems as ships, or that car traffic in transport and train traffic on rails will be the same. On the basis of institutions, if we look at the historical process, it is known that the standardization work on the use of technologies was started a long time ago by organizations that develop standards in the field of aviation, railway and road transport network organizations.

In line breaking systems; the driver is alerted verbally, visually or by vibration if the vehicle deviates from its lane by monitoring video images of white lines in the middle of the road or on the side of the road. On the other hand, ACC monitors the vehicle's distance from the vehicle in front and if the vehicle in front slows down, it slows down the speed of the following vehicle to maintain a safe distance. Although such systems are common even in inexpensive cars, there are applications of AUS, in such systems there is a two-way communication not _ Trunk the way collect the fee in systems two bilaterally contact determining the presence of a vehicle and it is done by identifying him. In addition, information can be uploaded to devices in the vehicle and this information can be retrieved at later stages of the journey. Satellite navigation systems and fare collection systems using the mobile network perform more complex two-way operations. This of systems all of them today's in the day work issued and commerce purposes are examples of ITS applications used. On the other hand, with the commercialization of many ITS systems in the safety and security R &D phase, these systems are expected to use wireless communication capabilities between vehicles and infrastructure, as well as between vehicles and infrastructure. For toll collection systems, point -to- point communication that can identify a vehicle at a precise point was initially required, but now seamless communication with vehicles is required. There are two main criteria for the implementation of ITS services, namely communication environment and service quality (performance). Therefore, it is determined standards, that two taking into account the criteria should get From this except, above telling passed car inside systems, navigation systems, radar systems, optics systems, ultrasound and sonar systems, infrared systems, wireless networks, personal network and such as sensors technologies re- standardization there is a need. Own in AUS applications there are standards. For example, in-car systems TC22 digital path established by ISO for transport technician IT standardization performs the process. Usually all types of technologies defined for 4 types of standards are for ITS only developed technologies for created.

These are *de facto* standards, voluntary standards, industry cooperation standards and regulatory standards being their _ each one occurs in different ways. Real standards market leaders effective in areas where there are few have been are standards. As in the case of computer operating systems, a company that is the market leader can determine the standards for other software or hardware to be produced. Volunteer-based standards usually like IEEE as a result of the volunteer-based work of professional organizations appear will be In addition, standards created by organizations established to develop standards such as ISO or ITU (International Electrical Telecommunication Union) are such standards. Industry cooperation standards are a combination of actual standards and optional standards, which are standards agreed upon by manufacturers, as in the case of bluetooth, which provides wireless communication between electronic devices and computers. Normative standards are standards created by states by passing laws or requiring the use of other existing standards. Since there are not many leading companies in the global ITS market around the world, it is impossible to talk about the actual ITS standards, but it can be said that there are standards set by various organizations that work for other organizations. 3 types of technological standards. On the other hand, it is observed that standards are developed only after such technologies are widely available, especially for technologies produced by intensive R&D research by automobile companies.

As of 2014, the ISO 14904 standard defines network interfaces in electronic toll collection systems and the ISO 15628 standard (Dedicated Short Range Communication) defines the common message structure and data elements used for these interfaces, or DSRC-based applications..There are 181 AUS standards created by TC204 technical commITSee.

CEN (CommITSee for European Standardization - European CommITSee for Standardization), which was established in Europe in 1974 as a non-profit organization working through a joint technical commITSee with ISO, established the TC278 technical commITSee for ITS research in 1992. The number of ITS standards developed by this commITSee is 128 as of June 2013 (CEN, 2014). The list of working groups (WP) working on ITS standards according to ISO and CEN is presented in Table 1.2. CommITSee CENTC278	ISOTC204 CommITSee
WP 1: Collection of electronic tariffs	WP 5: Collection of fees and duties
WP 2: Cargo, logistics and commercial transport operations	WP 7: General fleet management and commercial cargo operations
WP 3: Public transport	WP 8: Public transport
WP 4: Traffic and passenger information	WP 10: Passenger Information Systems
WP 8: Traffic data	WP 9: Integrated transport information, management and control
WP 10: Human-Machine Interface	WP 4: Identification of autonomous vehicles and equipment
WP 13: Architecture	WP 1: Architecture
	WP 3: Database Technology
	WP 14: Vehicle/Vehicle Warning and Control Systems
	WP 16: CALM (On Earth mobile devices for contact login)
	WP 17: Mobile devices
WP 14: Post-theft systems for the recovery of stolen vehicles	
WP 15: eSecurity/eCall	
WP 16: Interoperable systems	WP 18: Collaborative Systems

2-Table. Coordination of CEN and ISO AUS working groups

ETSI (European Telecommunications Standards Institute) and CENELEC (European CommITSee for Electrotechnical Standardization) define the required standards. To support the deployment of cooperative ITS in Europe, the European Commission Directive M/453 provided these institutions with specifications, standard sets and specifications for systems operating in the 5 GHz (Gigahertz) frequency band within a specified period. in the guideline. In addition to international and regional standards in this field, national standards that must be implemented according to the country's conditions, work with national standardization organizations in countries such as the United States and Japan. Institute of Transportation Engineers (ITE - Transportation Engineers) within the AUS standards program of the US Department of Transportation Institute), American Association of State Highway and Transportation Officials (AASHTO), American public Transportation Association (APTA - American Public transport association) and IEEE between various ITS applications interface requirements satisfy for is working

CONCLUSIONS

The project of the Smart City Concept Document in Uzbekistan, some actions were planned, such as "Determining common standards for products used within the framework of ITS, which should be implemented through working groups that include all interested parties." Also Uzbekistan standard agency by following studies conducted by ISO and CEN will be done and some standards of these organizations by TSE original in their languages is sold.

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