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MTP 2050

Appendix G
Regional ITS Architecture

Appendix G: Regional Intelligent Transportation Systems Architecture

January 2025

WHAT IS ITS

Intelligent Transportation Systems (ITS) is the use of electronic devices integrated with communication technologies and management strategies to improve the efficiency and safety of a transportation network. ITS is meant to be a relatively low-cost solution for increasing mobility on the transportation system compared to traditional pavement actions.

> *"ITS technologies augment traditional infrastructure improvement approaches by integrating advanced communications technologies into vehicles and existing infrastructure to improve transportation operations, efficiency, and reliability."* (USDOT FHWA)

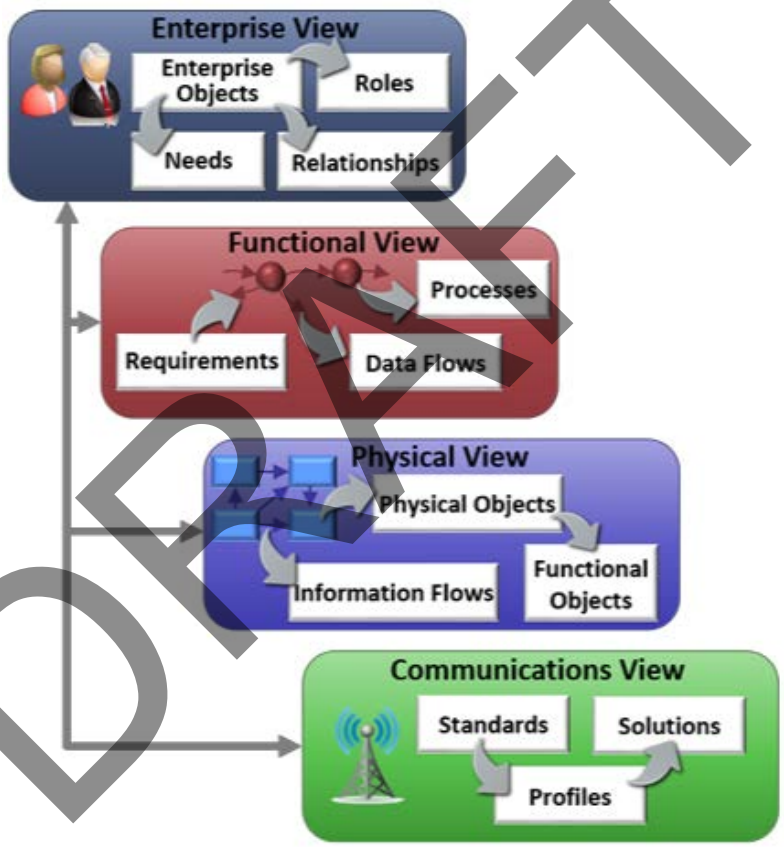
https://highways.dot.gov/research/laboratories/saxton-transportation-operations-laboratory/ITS-technologies

By monitoring traffic through cameras, sensors, vehicle data, and applications in real time, operators are able to inform the traveling public of current conditions along anticipated routes allowing advanced decisions in travel either through websites, applications, or direct to driver roadside devices like dynamic message signs. This strategy and others are leveraged to improve the transportation network in the following areas:

- Safety – Drivers equipped with knowledge of conditions ahead, including incidents, can anticipate delays and avoid secondary incidents either by slowing down or considering alternative routes.
- Efficiency – As drivers understand changes to transportation, like a construction zone, they increase their awareness of abnormal driving patterns and avoid crashes.
- Data – With the use of ITS strategies comes the benefit of data, both in real time and historic, allowing planners and engineers the ability to identify opportunities for transportation network improvements including ITS solutions and traditional transportation approaches.

WHAT IS ITS ARCHITECTURE

ITS Architecture describes how people, devices, and data interact at at various levels with the goal of understanding how changes will be assimilated by the system or how the system must change to accommodate advancement in technology while meeting the needs of those involved. These various levels are described in four categories including the enterprise, functional, physical, and communications as illustrated below.



https://www.arc-it.net/

The enterprise level includes a scroll of stakeholders along with their roles and responsibilities to, and needs of, the transportation system. At the functional level; data flows, requirements, and various processes are mapped out for the system environment. A physical view illustrates the devices and objects in the field and must prescribe the interoperability of those technologies along with any constraints. Finally, the communications level highlights the view between devices and transportation management centers.

The United States Department of Transportation (USDOT) has created a national-level architecture designed to provide common ground for all ITS deployments. They also produced a software platform called Architecture Reference for Cooperative and Intelligent Transportation, or ARC-IT, that scales for any depth of architecture. Concordantly, each state typically follows up with an architecture unique to the environment of that state. Narrowing one additional level provides the regional-level architecture consistent with an area with unique properties including metropolitan planning organizations like WAMPO.

Each level down from National to State to Regional increases the specificity and definition within the architecture while staying consistent with the levels above. This nested framework provides the opportunity for interoperability between the levels for mutual benefit especially when it comes to data sharing.

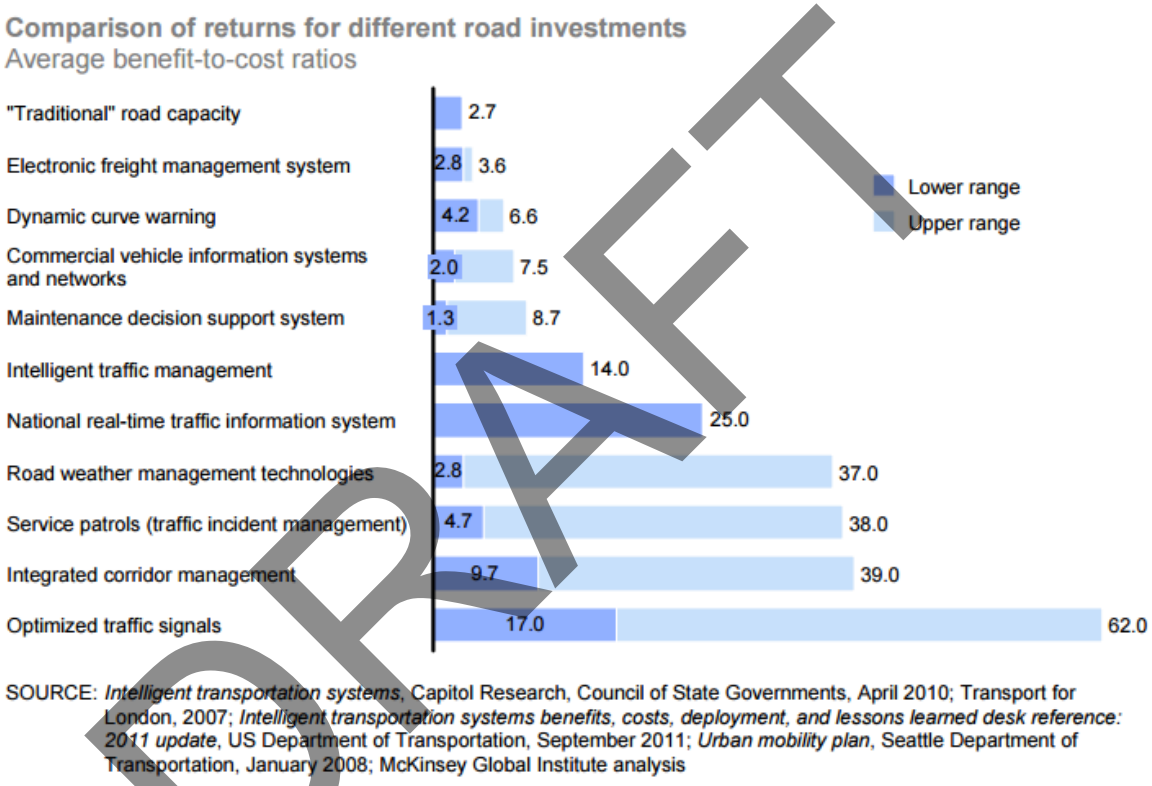
The architecture can vary in detail level as well. At a high level, relationships are addressed between stakeholders, devices, and data centers. Only at a lower, more detailed level, will exact components and connections be mapped. This detail is usually examined further when deployment strategies are executed and a systems engineering evaluation uncovers those details required for project success.

> *"In the context of Intelligent Transport Systems, a high level architecture is the conceptual design that defines the structure and/or behaviour of the system. It specifies the functionality needed to provide ITS user services – the specifications are technology independent and the selection of individual components and communications are left open. This technology independence means that suppliers have freedom to choose a technical solution that is most appropriate for the client, whilst still complying with the overall architecture.*
>
> *Low-level (or component) architectures, by contrast, contain the actual designs for hardware, software, data exchange and communications. They define more narrowly the technologies required including the use of ITS standards."*
>
> https://rno-its.piarc.org/en/systems-and-standards-its-architecture/what-its-architecture

WHY IS REGIONAL ITS ARCHITECTURE IMPORTANT

At a regional high level, ITS deployment strategies tend to address specific needs of the stakeholders. The regional ITS architecture must address subjects including services, components, communications, management, and locations. The value of each of these subjects is only realized through their relationships with each other. The objective of leveraging these

relationships is risk mitigation. Risk mitigation is important with technology as advancements can out-pace deployments leading to risk of having outdated technology that may be difficult to maintain or is no longer supported. Therefore, agencies place focus, through an ITS architecture, on identifying opportunities for low risk–high reward projects that address stakeholder needs. These opportunities often have a better benefit to cost ratio over traditional road investments as illustrated below:



SOURCE: *Intelligent transportation systems*, Capitol Research, Council of State Governments, April 2010; Transport for London, 2007; *Intelligent transportation systems benefits, costs, deployment, and lessons learned desk reference: 2011 update*, US Department of Transportation, September 2011; *Urban mobility plan*, Seattle Department of Transportation, January 2008; McKinsey Global Institute analysis

An example within the WAMPO region that illustrates the importance of the regional architecture is traffic signals at intersections. Signals exist throughout the WAMPO region. In the past, agencies may do things differently with components and communications. However, common ground exists with the need to maintain operating signals at key locations and keep congestion managed to reasonable driver expectations.

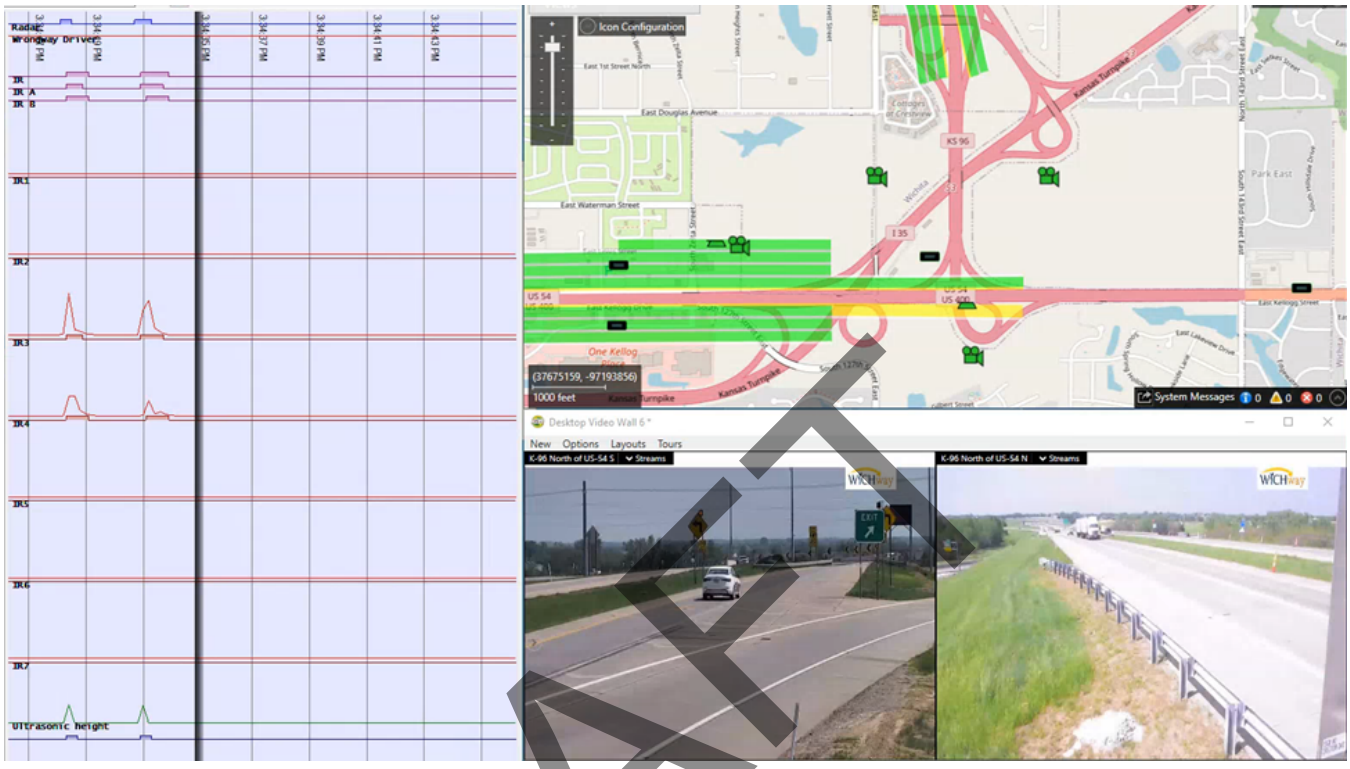
https://www.miamitodaynews.com/2021/08/03/central-command-system-will-help-traffic-signals-get-smarter/

To meet both of these needs, ITS advancements can be leveraged. Newer signal technologies include interoperability and connected capabilities allowing intersections to communicate, leading to a corridor-based approach to traffic management. The results produce a reduction of congestion as the signals no longer act independently.

As signals become outdated and replacement is the only option, cities have agreed through the ITS Architecture and Strategic Deployment Plans to standardize the purchasing of new signal components and methods of communication between signals. Over time, corridor management will become possible regardless of city boundaries. Common deployment and communication strategies will also prove beneficial during maintenance as cities can pool resources when repair is needed without cross-training. This construct is embedded within the region's ITS Architecture.

THE ROLE OF ITS IN THE WAMPO REGION

ITS is under the umbrella of Transportation Systems Management and Operations (TSMO). TSMO includes ITS, Traffic Incident Management, and Traffic Management Centers, among other subjects. ITS architecture connects the stakeholders of all of these with their roles and responsibilities, so what is the real life impact of ITS in the WAMPO region right now and what is planned in the future?

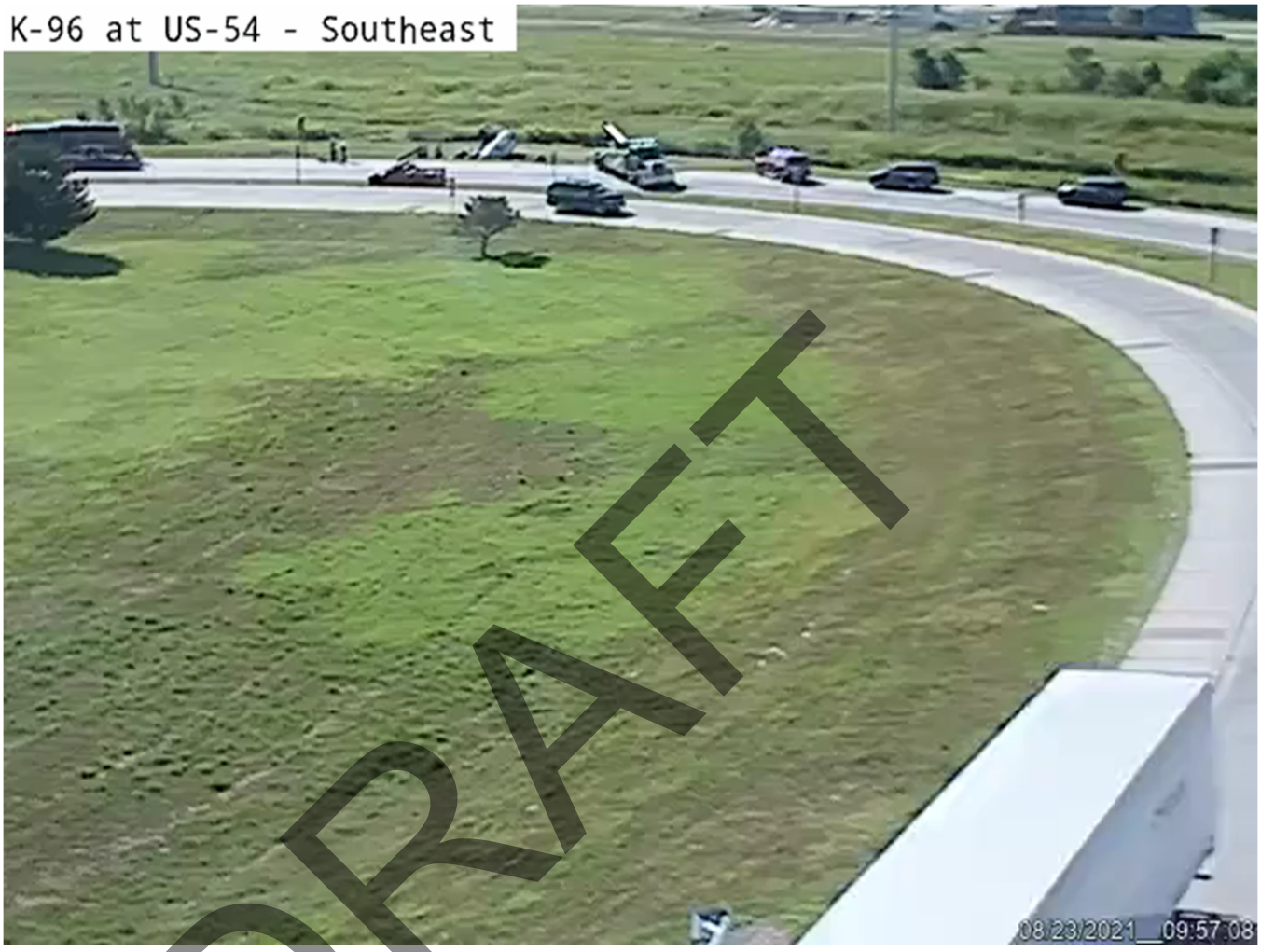


WICHway screen shot of active traffic management.

One impact the WAMPO region has benefited from is the WICHway Traffic Management Center. The center has a focus of reduced incident clearance time. Any time normal traffic flows are disrupted in an unexpected scenario like a crash, the time it takes to clear and return to normal operations results in exposure to the potential of a secondary crash that usually is worse than the original crash. Through procedures with first responders, ITS devices in the field, and traffic data, the center has been able to reduce the average clearance time from 177 minutes down to 55 minutes in less than a decade.

The WAMPO region also benefits from the Kansas Department of Transportation's traveler information website KanDrive. The site includes feeds from highway cameras, dynamic message signs, and traffic management centers with the desire to increase awareness among travelers, commuters, and truck drivers leading to improved safety and mobility state wide.

Live Traffic Feed Available at https://kandrive.gov



Ramp of K-96 at US-54 where trucks have turned over due to excess speed.

Another example of a successful ITS deployment is the Truck Overturn Prevention System (TOPS). At the K-96 and US-54 interchange, there was a history of trucks taking a ramp at unsafe speeds causing them to tip over as they navigated the curve. An ITS solution, TOPS, was deployed that actively monitors speeds and activates dynamic signs when excessive speeds are detected. The ramp has not experienced a turnover crash since it was installed.

So, what is on the horizon in WAMPO with ITS? WAMPO published a TSMO Strategic Plan in 2019 to help guide all TSMO subjects in the next 5-10 years. An update will be finalized in 2025 that includes strategies like:

> *DATA REPOSITORY*: WAMPO is dedicated to creating a transportation data repository for the benefit of stakeholders on either traffic operations or planning.

SIGNALS: The region plans to establish a standard for ITS and signal deployments in the future for interoperability and sharing resources. This includes considering Advanced Traffic Management Systems and Automated Traffic Signal Performance Measures.

COMMUNICATION INFRASTUCTURE: Through a regional fiber plan and agreements, continued investment in communication infrastructure will connect and improve ITS deployments around the region.

TRAFFIC INCIDENT MANAGEMANT: The region will continue to invest in the TIM program and efforts to bring first responders together.

ITS DATA SENSORS: Expansion of the KDOT sensor deployments to key arterial and local roads, with technology that makes sense for those facilities, will help to broaden the reach of direct traffic data for users.

There are additional strategies included within the 2025 TSMO Strategic Plan and updated ITS Architecture. The success of these strategies is dependent on and propelled by the updated, comprehensive, and maintained ITS Architecture along with the stakeholders' relationships with each other and to the system.