Northwest Indiana Regional Intelligent Transportation Systems (ITS) Architecture 2015 Update

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I.   Introduction:

Achieving a more regionally cohesive transportation system and increasing the user responsiveness of the transportation system are two goals transportation planners and policymakers have pursued for decades. As the Metropolitan Planning Organization for Northwest Indiana, the Northwestern Indiana Regional Planning Commission (NIRPC) has been the leader in convening regional transportation stakeholders to draft plans and fund projects that pursue these goals. On the one hand, federal legislation has emphasized the general importance of regionalism in transportation, with regional intelligent transportation system (ITS) architectures fitting in the context of this regionalism. On the other hand, users of the transportation system have adapted increasingly advanced technology that interfaces more seamlessly with transportation. These trends highlight the importance of NIRPC championing the development of an updated Northwest Indiana Regional ITS Architecture.

In 1997, Congress ushered in a new era of regionally integrated transportation systems with its passage of the Transportation Equity Act for the 21st Century (TEA-21). In January 2001, an FHWA rule/FTA policy aimed at implementing section 5206(e) of TEA-21 was published titled "ITS Architecture and Standards" that established the requirement that any Transportation Management Area, meaning Metropolitan Planning Organization overseeing transportation planning for an urbanized area of greater than 200,000 people, adopt a regional ITS architecture. The "ITS Architecture and Standards" rule/policy also required that a regional ITS architecture conform to the National ITS Architecture. In other words, a regional ITS architecture is essentially the National ITS Architecture tailored and scaled to the region's unique assets. This also limits a regional ITS architecture to a finite number of systems, subsystems, services, functional requirements of the services, and standards that are a subset of those exact ones appearing in the National ITS Architecture. In contrast, the stakeholders, operational concept of the stakeholders, agreements that the stakeholders make to execute ITS, the ITS elements in the region, and the sequencing of ITS projects are allowed to be unique to the region.

While a trend toward regionally integrated transportation systems has fueled the rise of ITS architectures, so also has the trend of adapting increasingly advanced technology. Interoperable

electronic toll collection, in-vehicle GPS devices, Bluetooth-enabled personal electronic devices that transmit unique MAC addresses, private information service providers such as INRIX, Google, and TomTom that provide probe data from the traffic stream, Vehicle-to-Vehicle (V2V) communications, and even autonomous vehicles are just some of the technologies that have penetrated the transportation market in the last quarter century. With the rapid pace of adapting such technology comes the need to ensure that the technology is interoperable. Interoperability is in the definition of National ITS Architecture according to the 2001 rule/policy. A regional ITS architecture is still needed to ensure that technology interfaces with the transportation system in an interoperable manner at the regional level.

NIRPC sets out to update its Northwest Indiana Regional ITS Architecture with addressing the transportation trends of increasing regional integration and advanced technology in mind. The updated Northwest Indiana Regional ITS Architecture builds upon the previous 2005 update with the overarching goals of achieving a more regionally cohesive transportation system and making the transportation system more responsive to users with increasingly advanced technology. These two goals are what FHWA and FTA called attention to in the 2001 rule/policy that defines Regional ITS Architecture as "a *regional* framework for ensuring *institutional agreement* and *technical integration* for the implementation of ITS projects or groups of projects."

II. Development of the Regional Architecture:

NIRPC first developed a regional ITS Architecture in 2001 to comply with the FHWA Rule/FTA Policy "ITS Architecture and Standards." That version of the regional ITS architecture was the first examination of how NIRPC as the Metropolitan Planning Organization for Northwest Indiana convened regional transportation stakeholders to identify the ITS elements in the region and needs ITS might offer solutions to. In 2005, NIRPC unveiled an update to the ITS architecture by transferring all of the information into the Turbo Architecture software and adding additional stakeholders and elements. This current update to the ITS architecture is the culmination of about three years of work from 2011 to 2014 identifying additional stakeholders, elements, and services and needs for the region. In January 2012, FHWA hosted a Turbo Architecture refresher workshop to help NIRPC master the technical procedures necessary for entering in the ITS architecture update into the Turbo Software and to get acquainted with the stakeholders and technical resources available to NIRPC. This current architecture update is also a response to a corrective action administered to NIRPC by the FHWA/FTA in the *Planning Certification Review of the Northwestern Indiana Regional Planning Commission* (December 20, 2013).

Throughout the process of updating the ITS architecture, NIRPC has repeatedly both formally briefed its Transportation Policy Committee (the chief technical committee within the NIRPC organizational structure responsible for transportation-related matters) and informally visited and contacted the stakeholders identified in this document as important to ITS in Northwest Indiana. Additionally, NIRPC has coordinated the update to the ITS architecture with the Chicago Metropolitan Agency for Planning, Michiana Area Council of Governments, and the Northeast Indiana Regional Coordinating Council, all nearby Metropolitan Planning Organizations. Several staff members at these agencies, ITS services and needs identified by these agencies, and formatting decisions about the architectures have influenced NIRPC.

NIRPC is especially appreciative of the ongoing reviewing efforts of the FHWA in its professionalism and willingness to not only accept drafts of the architecture update material, but also visit with NIRPC in August 2014 in order to offer NIRPC technical feedback. This written

document is not meant to be the complete version of what has been updated in the NIRPC ITS architecture, but rather a written explanation of updates that have been made in the Turbo Architecture Software. The Maintenance Plan of the ITS Architecture (Section XIII) describes the timetable and resources NIRPC is committing to ensure that its ITS architecture remains compliant and useful.

III. Description of the Region and Definition of Scope:

Description of the Region:

NIRPC is the Metropolitan Planning Organization that conducts transportation planning and programming pursuant to 23 C.F.R. § 450 for the Indiana Portion of the Chicago-Joliet-Naperville IL-IN-WI Metropolitan Statistical Area and the Michigan City-LaPorte Urbanized Area defined by the U.S. Census Bureau. This region is comprised of three counties in Northwest Indiana: Lake, Porter, and LaPorte. The region is known for its primary metal manufacturing, particularly steelmaking, and also increasingly for a viable residential location for Chicago commuters and their families.

The region is rich in transportation assets. An industrial lakefront legacy, commuting routes to and from Chicago, and a bottleneck of freight traffic navigating around the southern tip of Lake Michigan are just a few explanations of demand for a robust transportation system. Spanning the approximately 50-mile east to west and 30-mile north to south region, there are four Interstate Highways, eight US-Route Highways, 16 State Roads, eight railroads, 10 transit operators, 20 airports, and one international seaport. While the population of the region has grown substantially from 668,659 in 1960 to 771,815 in 2010, congestion experienced has grown much more rapidly.

Differentiating this region from the regions of most other Metropolitan Planning Organizations is there is no single dominant city within the region. While Chicago is symbolically the focal city in terms of driving the region's economy, only 25 percent of all work trips in Lake County (the closest Indiana county to Chicago) go to Chicago, and as a whole, 79 percent of work trips within the three-county region stay within the three-county region (2006-2010 American Community Survey). Hammond is the largest of the 41 municipalities in the three counties, but with 80,830 people in 2010 it amounts to a mere 10.5 percent of the region's population. Instead, the region could best be described as a diverse mixture of urban core communities, suburban communities, and rural areas with several small towns breaking up the rural landscape.

Definition of Scope:

This ITS architecture covers stakeholders, elements, services, and projects deemed by the development process described in the previous section as being important for documenting the ITS opportunities in the Northwest Indiana NIRPC region and offering solutions that could fit those opportunities. Many possible stakeholders, elements, services, and projects are not included in this ITS architecture because the ITS architecture should be focused enough to provide meaningful solutions to ITS opportunities that are clearly linked to ITS issues. Many of the ITS entities that are identified in this architecture do in fact interact with entities outside the architecture. Wherever possible, NIRPC has attempted to categorize those ITS entities in the most inclusive manner. For example, the element "Local Emergency Services" element includes Prompt Ambulance, a prevalent ambulance service in the region one might expect to have its own entry, and yet the choice of a more inclusive name allows for other ambulance services, any local fire department, etcetera to be identified in the same element.

The ITS architecture has a 10-year horizon given that in the rapidly changing world of transportation technology and communications, it is difficult to realistically offer solutions more than 10 years into the future. 10 years is also a sufficiently long horizon to plan for ITS solutions that might not yet be through the planning stage and ready for implementation today. This ITS architecture contains three statuses of elements, services, and the information flows between the elements. The "Existing" status indicates that the element already exists, the service has already been deployed, or that the information flows already occur. The "Planned" status indicates that the element has already been planned to be in place, the service has been planned to be deployed, or that the information flows have been planned to occur within the next 10 years. The "Potential" status indicates that in the development process of the architecture as described in the previous section, the element has been identified to potentially be in place, the service could be potentially deployed, or the information flow could potentially occur within the next 10 years.

It is important to note that this ITS architecture has been tailored to NIRPC's perspective of ITS in the region because NIRPC will be the designated maintainer and should not necessarily be interpreted by all of the stakeholders in the same manner, as each will have a unique role to play in maintaining and implementing the ITS architecture. One of the key requirements that ITS

architecture must address is that all ITS projects using federal funding undergo a Systems Engineering Analysis (23 C.F.R § 940). Since NIRPC will not be the lead project sponsor or engineer on any ITS projects that will be implemented, NIRPC will not be the entity conducting the Systems Engineering Analysis. Nevertheless, NIRPC has a role to explain the requirement of a Systems Engineering Analysis and what will be expected from an ITS project in order for that project to move through the NIRPC programming process to be funded.

Sec 940.11 Project implementation.

(a) All ITS projects funded with highway trust funds shall be based on a systems engineering analysis.

(b) The analysis should be on a scale commensurate with the project scope.

(c) The systems engineering analysis shall include, at a minimum:

(1) Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture);

(2) Identification of participating agencies roles and responsibilities;

(3) Requirements definitions;

(4) Analysis of alternative system configurations and technology options to meet requirements;

(5) Procurement options;

(6) Identification of applicable ITS standards and testing procedures; and

(7) Procedures and resources necessary for operations and management of the system.

Figure 1: Systems Engineering Analysis Requirements from 23 C.F.R. § 940

Once NIRPC receives a Systems Engineering Analysis by a project sponsor or a project engineer under contract with a project sponsor for an ITS project, NIRPC will update the regional ITS architecture by adding a project ITS architecture for the particular project, and send the information to (and receive feedback from) the project sponsor so that the implementation of the project best accords with the Northwest Indiana Regional ITS Architecture. Further resources about conducting a Systems Engineering Analysis can be found on the FHWA's Office of Operations website at http://ops.fhwa.dot.gov/int_its_deployment/sys_eng.htm.

IV. Stakeholder Identification:

In conducting the regional ITS architecture development process as described in Section II, NIRPC has identified 54 stakeholders in eight stakeholder groups. NIRPC's regional ITS architecture development process first identified the stakeholders, then categorized the stakeholders into stakeholder groups as identified in Table 1. Table 2 shows the stakeholders identified by the stakeholder group (text before the hyphens in the Stakeholder Name field).

Table 1: Stakeholder Groups Identified in the Northwest Indiana Regional ITS Architecture

Stakeholder Group Name	Stakeholder Group Description
Activity Center	These are the major activity centers in the region, such as tourist destinations and employment centers that attract a lot of trips
Fleet and Freight Operators	Operators of fleet and freight transport in the region
Other	Agencies that do not fit into any of the other categories, but that may be involved in ITS
Other Public Sector	All public sector organizations or agencies not directly involved in public safety or transit
Private Sector	Agencies usually in the private sector that have a significant stake in transportation
Public Safety	Public Safety Agencies in Lake, Porter, and LaPorte Counties
Transit	This is the stakeholder group for transit operators in Lake, Porter, and LaPorte Counties as well as neighboring areas
Transportation	This is the stakeholder group that represents agencies (except public transit agencies) whose express mission and purpose is driven by providing transportation services to travelers or potential travelers

Table 2: Stakeholders Identified in the Northwest Indiana Regional ITS Architecture

Stakeholder Name	Stakeholder Description
Activity Center - Hospitals	These are the hospitals in NW Indiana and nearby that are able to treat victims of transportation incidents requiring medical attention.
Activity Center - Indiana Dunes National Lakeshore	The Indiana Dunes National Lakeshore stretches along 15 miles of the southern shore of Lake Michigan in Northwest Indiana, with a total area of more than 15,000 acres, and 45 miles of trails over dunes and rivers, through wetlands, prairies, and forests.
Fleet and Freight Operators - Commercial Vehicle Operators	Operators of commercial vehicles in the region, including any size from companies that operate large commercial vehicle fleets to independent owner operators.
Fleet and Freight Operators - Freight Railroads	The freight railroads that operate along tracks and/or freight yards in NW Indiana.
Fleet and Freight Operators - Intermodal Freight Shippers	Shippers that move freight by multiple modes including truck, rail, maritime vessels, and air.
Fleet and Freight Operators - Ports of Indiana Commission	The Ports of Indiana Commission is a seven member bipartisan board appointed by the governor to serve as the board of directors for the Ports of Indiana, one of which is Port of Indiana-Burns Harbor.
Other - Academic and Research Organizations	Includes Universities and their research initiatives such as Purdue Univ. Center for Regional Development as well as other research entities such as Conexus Indiana.
Other - Area Media Outlets	TV, radio, online, and print media networks and their affiliates operating in, out of, or nearby with occasional reporting from, NW Indiana.
Other - National Weather Service	The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service is the sole official weather service administered by the federal government and provides information to many organizations including Transportation-related agencies in NW Indiana.

Stakeholder Name	Stakeholder Description
Other - Non-Profits and Advocacy Groups	501 3(c) Organizations with a stake in ITS such as South Shore Clean Cities, Indiana Dunes National Park Association, and Indiana Operation Lifesaver.
Other - Traveling Public	Members of the Traveling Public in NW Indiana or who have an interest in the Traveling Public in NW Indiana.
Other Public Sector - City of Gary	Includes the mayor, civic and municipal departments for the City of Gary supervised by the mayor, and other staff working for the City of Gary.
Other Public Sector - City of Hammond	Includes the mayor, civic and municipal departments for the City of Hammond supervised by the mayor, and other staff working for the City of Hammond.
Other Public Sector - Indiana Department of Environmental Management	State of Indiana Department in charge of administering the Vehicle Inspections and Maintenance (I/M) program and emissions testing, as well as monitoring environmental sensors and stations and providing technical expertise on on-road mobile source emissions.
Other Public Sector - Indiana Department of Revenue	Motor Carrier Services Division has permitting authority for transport of hazardous material as well as IFTA, state fuel tax permits, UCR, and USDOT numbers.
Other Public Sector - Indiana Finance Authority	The statewide agency responsible for overseeing the issuance and collection of State-related debt, as well as authorizing effective finance solutions to facilitate both public and private sector investment in Indiana.
Other Public Sector - Lake County	All government units under Lake County except the Sheriff's Department.
Other Public Sector - LaPorte County	All government units under LaPorte County except the Sheriff's Office.
Other Public Sector - Municipalities/Townships	Local government units and their associated departments in the 41 municipalities and the 44 townships in NW Indiana.

Stakeholder Name	Stakeholder Description
Other Public Sector - Northwestern Indiana Regional Planning Commission (NIRPC)	The Metropolitan Planning Organization (MPO) for Lake, Porter, and LaPorte Counties in NW Indiana is the developer, maintainer, and updater of the Regional ITS Architecture and serves as a data repository and services provider.
Other Public Sector - Porter County	All government units under Porter County except the Sheriff's Department.
Other Public Sector - State Tourism Agency/Bureau	Includes the South Shore Convention and Visitors Authority and the Northern Indiana Tourism Development Commission
Private Sector - Construction and Maintenance Contractors	The Construction and Maintenance Contractors who participate in maintenance and construction activities on transportation facilities in NW Indiana.
Private Sector - Event Promoters	Private Event Promoters who plan and organize events that affect transportation movements through NW Indiana.
Private Sector - Financial Institutions	Financial Institutions that circulate funding for transportation projects, are involved in collecting revenues and payments from transportation users, or otherwise active in procuring goods or services that affect the transportation system in NW Indiana.
Private Sector - HAZMAT Agencies	Private companies or teams trained in managing hazardous material (HAZMAT) and capable of providing HAZMAT response to incidents.
Private Sector - Information Service Providers	Private (perhaps regulated) Information Service Providers that provide transportation users or potential transportation users information about the transportation system.
Private Sector - Towing Companies	Private Towing Companies that participate in towing and recovery of vehicles or spilled vehicle material at transportation incident sites.
Public Safety - Indiana Department of Homeland Security	Oversees county-administered Emergency Management Agencies. Regulates transporters of hazardous materials.

Stakeholder Name	Stakeholder Description
Public Safety - Indiana State Police - Districts 13, 21 and Commercial Vehicle Enforcement Division	Includes District 13 (Lowell) in charge of Interstate Highway patrol in Lake, Porter, LaPorte, Newton, Jasper, Starke, and Pulaski Counties; District 21 (Toll Road) in charge of Indiana Toll Road patrol; and the Commercial Vehicle Enforcement Division in charge of Commercial Vehicle Enforcement throughout Indiana.
Public Safety - Lake County Sheriff	The Lake County Sheriff (including the Lake County Sheriff's Department) overseeing public safety, including public safety on transportation facilities, in Lake County.
Public Safety - LaPorte County Sheriff	The LaPorte County Sheriff (including the LaPorte County Sheriff's Office) overseeing public safety, including public safety on transportation facilities, in LaPorte County.
Public Safety - Porter County Sheriff	The Porter County Sheriff (including the Porter County Sheriff's Department) overseeing public safety, including public safety on transportation facilities, in Porter County.
Public Safety - US Coast Guard	District Nine (Great Lakes) with a Station in Michigan City responsible for maritime transport law enforcement, safety, and incident response.
Transit - Amtrak	The National Railroad Passenger Corporation (Amtrak) is the national passenger rail service for the United States.
Transit - East Chicago Transit (ECT)	East Chicago Transit (ECT) provides free transit service in East Chicago.
Transit - Gary Public Transportation Corporation (GPTC)	The Gary Public Transportation Corporation (GPTC) operates local bus service in Gary and regional bus service in Gary, Hammond, East Chicago, and Merrillville. GPTC also provides complementary paratransit services.
Transit - Michigan City Transit (MCT)	Michigan City Transit (MC Transit) operates fixed route bus and dial-a-ride services in Michigan City.
Transit - North Township Dial-a-Ride	North Township (Lake County) provides free dial-a-ride services to North Township residents. http://www.northtownshiptrustee.com/

Stakeholder Name	Stakeholder Description
Transit - Northern Indiana Commuter Transportation District (NICTD)	The Northern Indiana Commuter Transportation District (NICTD) operates the South Shore interurban line between South Bend, Indiana, and Chicago, Illinois, with 10 stations in Lake, Porter, and LaPorte Counties.
Transit - Opportunity Enterprises	Opportunity Enterprises provides dial-a-ride paratransit services in Porter County, as well as portions of Lake and LaPorte Counties. http://www.oppent.org/transportation/
Transit - Porter County Aging and Community Services (PCACS)	Porter County Aging and Community Services (PCACS) provides demand-response transportation services to senior citizens and people with disabilities in Porter County. http://www.portercountyacs.org/transportation-program
Transit - Regional Transportation Authority (RTA)	The Regional Transportation Authority (RTA) oversees 3 fixed-route transit services in the Chicagoland area: Chicago Transit Authority (CTA) busses and rail, Metra Commuter Rail, and Pace Suburban Bus Service.
Transit - South Lake County Community Services (SLCCS)	South Lake County Community Services (SLCCS) provides demand-response transportation services to southern Lake County citizens.
Transit - TransPorte	TransPorte provides demand-response bus transit for City of LaPorte citizens to and from locations in LaPorte and the nearby urban fringe.
Transit - Triangle Transit	The proposed Transit Operator, planned as a partnership between Michigan City Transit, TransPorte, and Purdue University Northwest, that will operate a fixed route service between the 2 cities and the Purdue University Northwest Westville Campus.
Transit - Valparaiso Transit	Valparaiso Transit operates V-Line services in Valparaiso and ChicagoDash commuter bus service between Valparaiso and Chicago.

Stakeholder Name	Stakeholder Description
Transportation - Gary/Chicago Airport Authority	The public sector portion of the Public-Private Partnership between the City of Gary and AvPorts that operates the Gary Chicago Airport. 4 members of the Gary/Chicago Airport Authority are appointed by the Mayor of Gary, 1 is appointed by the Board of Commissioners of Lake County, 1 by the Board of Commissioners of Porter County, and the president is appointed by the Governor of Indiana.
Transportation - Illiana Corridor Concessionaire	The concessionaire selected by the Illinois Department of Transportation and the Indiana Department of Transportation to operate the planned Illiana Corridor.
Transportation - Illinois Department of Transportation (IDOT)	The Illinois Department of Transportation (IDOT) is the State of Illinois' transportation department.
Transportation - Indiana Bureau of Motor Vehicles (BMV)	The Indiana Bureau of Motor Vehicles (BMV) is the state agency that oversees vehicle registrations and special permits in the State of Indiana.
Transportation - Indiana Department of Transportation (INDOT)	The Indiana Department of Transportation (INDOT) is the State of Indiana's transportation department.
Transportation - Indiana Department of Transportation (INDOT) - Northwest District	The Indiana Department of Transportation (INDOT) Northwest District is INDOT's local district for Northwest Indiana. There are five sub-districts (Gary, LaPorte, Monticello, Rensselaer and Winamac) and 13 counties (Carroll, Cass, Fulton, Jasper, Lake, LaPorte, Marshall, Newton, Porter, Pulaski, St. Joseph, Starke and White) within the Northwest District. The Northwest District is responsible for maintaining 5,668 lane miles of state roads, 560 lane miles of interstate, 892 large culverts 824 state bridges, 173 snow routes, 618 traffic signals, 234 flashers, and 58,600 road signs.

Stakeholder Name	Stakeholder Description
Transportation - Indiana Toll Road Concession Company (ITRCC)	The Indiana Toll Road Concession Company (ITRCC) is responsible for construction, maintenance, repair and operation of Indiana Toll Road projects within Indiana. It is charged with formulating, developing and recommending a continuing long-range toll road plan and short-term improvement programs. ITRCC is also responsible for communicating planning information to the public, interested agencies and organizations.
Transportation - Lake Michigan Interstate Gateway Alliance (LMIGA)	The Lake Michigan Interstate Gateway Alliance is a voluntary organization with active member participation from the Illinois Department of Transportation, the Illinois Tollway, the Indiana Department of Transportation, the Indiana Toll Road Concession Company LLC, the Michigan Department of Transportation, the Skyway Concession Company LLC, and the Wisconsin Department of Transportation. The goal of LMIGA is to focus on operations along the corridor to ensure that traffic moves safely and efficiently. This goal is realized by interagency communication and coordination, improvement projects, training efforts, and region-wide planning.

V. Operational Concept:

An operational concept identifies each stakeholder's current and future roles and responsibilities in operating the Northwest Indiana Regional ITS Architecture. In the Operational Concept Report in Table 3, there are three statuses used as explained in Section III: "Existing" meaning the stakeholder has already (or has expected to have already) undertaken the role/responsibility, "Planned" meaning there are plans for the stakeholder to undertake the role/responsibility within the next 10 years, and "Potential" meaning the architecture development process has identified the potential for the stakeholder to undertake the role/responsibility within the next 10 years. Table 3 is long so a Table of Contents follows that shows which page of Table 3 the operational concepts for a given stakeholder start on.

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