

Regional
Intelligent Transportation Systems
Architecture

Adopted
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I. Introduction

Rapid advances in technology have created many new opportunities for transportation professionals to deliver safer and more efficient transportation services. However, many of these new opportunities are predicated upon effective coordination between organizations - at both an institutional and technical level. To encourage this coordination, the USDOT developed the National Intelligent Transportation Systems (ITS) Architecture to help identify and exploit these opportunities for cost-effective cooperation.

In 1997, Congress passed the Transportation Equity Act for the 21st Century (TEA-21) to address the need to begin to work toward regionally integrated transportation systems. In January 2001, FHWA published a rule (ITS Architecture and Standards) and the FTA published a companion policy to implement section 5206(e) of TEA-21. This Rule/Policy seeks to foster regional integration by requiring that all ITS projects funded from the Highway Trust Fund be in conformance with the National ITS Architecture and appropriate standards. "Conformance with the National ITS Architecture" is defined in the final Rule/Policy as using the National ITS Architecture to develop a "regional ITS architecture" that would be tailored to address the local situation and ITS investment needs, and the subsequent adherence of ITS projects to the regional ITS architecture.

The Bloomington/Monroe County Metropolitan Planning Organization's (BMCMPPO) Regional ITS Architecture has been developed to serve as a roadmap for transportation systems integration for the BMCMPPO's Metropolitan Planning Area (MPA) over the next 5 years. The architecture is a cooperative effort by the transportation and public safety agencies that provide service within Metropolitan Planning Area. The architecture illustrates how each agency's systems will work together in the future to provide a safer and more efficient transportation system for the traveling public in the BMCMPPO's Metropolitan Planning Area.

II. Development of Regional Architecture

The development of the Regional ITS Architecture was initiated as early as 2004. Development of a regional architecture was trumped by other higher priority issues which took precedent and an absence of additional funding to implement ITS projects. However, development of the Regional ITS Architecture is of increasing importance because ITS-type technologies are becoming increasingly affordable and more obtainable to smaller local public agencies, thus enabling them to achieve increased safety and efficiency of the transportation network.

The Bloomington/Monroe County Metropolitan Planning Organization, which serves the metropolitan area of Bloomington, took the lead role in the development of the architecture. The BMCMPPO took responsibility for the creation of the regional architecture database, which was done using Turbo Architecture Software, and the regional architecture document (this document). The development of the regional architecture was done through coordination with numerous stakeholders.

III. Description of the Region and the Scope of the Architecture

Description of the Region

The Metropolitan Planning Area is the region that the Bloomington/Monroe County Metropolitan Planning Organization Regional ITS Architecture serves (refer to Appendix B). The region encompasses approximately 57 square miles including all of the City of Bloomington, all of the Town of Ellettsville, and parts of Monroe County. The population of this area is estimated to be nearly 98,500 based upon the 2000 Census.

Definition of the Scope

The Regional ITS Architecture provides a five year look at the ITS activities in the Bloomington Monroe County Metropolitan Planning Area. The architecture addresses the ITS systems that currently exist and those that are planned for development over the next five years. It should be noted however, that this architecture also identifies ITS elements which may be planned beyond this five year horizon if they are specifically identified by a stakeholder in official documents.

This architecture will provide a look at anticipated projects based on information from identified stakeholders. Frequent administratively processed updates will be required to maintain an accurate representation of the region. The ITS services covered in this architecture include those associated with freeway management, maintenance and construction operations, arterial/traffic management, emergency management, and public transportation.

IV. Identification of Stakeholders

Stakeholders are essential to a regional architecture. The architecture represents how the ITS systems that the stakeholders operate (both existing and planned) are linked together to provide safe and efficient transportation. The regional architecture for Bloomington/Monroe County Metropolitan Planning Area consists of seven (7) stakeholders that represent the area transportation departments, public transportation services, and public safety agencies. It is important to note that in order to simplify the architecture, certain stakeholders were grouped together. In particular, public safety agencies and transit were identified as groups of stakeholders. Table 1 identifies and provides a description of the stakeholders that are included in the architecture.

Table 1: Stakeholders

Stakeholder Name	Description
Bloomington/Monroe County Metropolitan Planning Organization	The BMCMPPO is the Metropolitan Planning Organization that provides regional transportation planning to the City of Bloomington, the Town of Ellettsville, and parts of Monroe County.
City of Bloomington	The City of Bloomington is the stakeholder that consists of all City departments that provide transportation related services for all physical transportation infrastructure in Bloomington.
Indiana Department of Transportation	The Indiana Department of Transportation (INDOT) is the stakeholder responsible for the State's transportation infrastructure including state roads, US routes, and interstate routes within Monroe County. This includes all divisions of INDOT that serve BMCMPPO.

Table 1: Stakeholders (continued)

Stakeholder Name	Description
Monroe County	Monroe County is the stakeholder responsible for all bridges in the BMCMPPO as well as the physical transportation infrastructure in unincorporated areas. This includes all divisions within Monroe County Government associated with transportation, such as Highways and Highway Maintenance.
Public Safety Agencies	Public Safety Agencies includes stakeholders from police, fire, EMS, and Emergency Management, including but not limited to Indiana State Police, Monroe County Sheriff, Bloomington Police Department, Town of Ellettsville Police Department, Indiana University Police Department, Bloomington Fire Department, Ellettsville Fire Department, Bloomington Hospital Ambulance Service, Monroe County Emergency Management, Monroe County Central Dispatch. This group of public safety agencies has emergency response protocols as coordinated by Monroe County Emergency Management.
Town of Ellettsville	The Town of Ellettsville is the stakeholder responsible for roads within town limits. This includes Streets & Planning Depts. which are charged with maintenance and construction operations.
Transit Agencies	Transit agencies are the stakeholders responsible for all mass transit in the BMCMPPO metropolitan planning area. This includes Bloomington Transit, Rural Transit, and IU Campus Bus Service.

V. Operational Concept

An Operational Concept identifies each stakeholder’s current and future roles and responsibilities in the operation of the regional ITS system. The operational concept documents these roles and responsibilities across a range of transportation services. The services covered are:

- **Emergency Management:** the development of systems to provide emergency call taking, public safety dispatch, and emergency operations center operations.
- **Freeway Management:** the development of systems to monitor freeway (or toll way) traffic flow and roadway conditions, and provide strategies such as ramp metering or lane access control to improve the flow of traffic on the freeway. Includes systems to provide information to travelers on the roadway.
- **Incident Management:** the development of systems to provide rapid and effective response to incidents, crashes, accidents, or other situations which may cause a threat to life or property. Includes systems to detect and verify incidents, along with coordinated agency response to the incidents.
- **Maintenance and Construction Management:** the development of systems to manage the maintenance of roadways in the region, including winter snow and ice clearance. Includes the managing of construction operations.
- **Surface Street Management:** the development of systems that provide surveillance of the network, manages traffic, and disseminates information to network users.
- **Transit Management:** the development of systems to more efficiently manage fleets of transit vehicles or transit rail. Includes systems to provide transit traveler information both pre-trip and during the trip.
- **Traveler Information:** the development of systems to provide static and real time transportation information to travelers.

The following table illustrates the operational concept for the regional architecture.

Table 2: Operational Concept

Transportation Service	Stakeholder	Role/Responsibility
Emergency Management	Public Safety Agencies	▶ Provide emergency call taking
		▶ Dispatch appropriate agency(s) to incidents
		▶ Coordinate various systems and agencies during emergencies
Freeway Management	INDOT	▶ Operate traffic information devices (DMS, HAR)
		▶ Monitor traffic conditions
Incident Management	INDOT	▶ Operate Freeway Service Vehicles
		▶ Provide information to travelers using traffic information devices (DMS, HAR)
		▶ Provide assistance to Public Safety Agencies responding to incidents on roads under INDOT's jurisdiction
	Public Safety Agencies	▶ Receive emergency calls for incidents
		▶ Dispatch appropriate agency(s) to incidents
Maintenance and Construction Management	INDOT	▶ Provide maintenance of State Roads, US Routes, and Interstate Routes
		▶ Coordinate with other agencies that provide maintenance and construction
	Monroe County	▶ Provide maintenance of County Roads and bridges.
		▶ Coordinate with other agencies that provide maintenance and construction
	City of Bloomington	▶ Provide maintenance of City streets
		▶ Coordinate with other agencies that provide maintenance and construction
	Town of Ellettsville	▶ Provide maintenance of Town streets
		▶ Coordinate with other agencies that provide maintenance and construction
Surface Street Management	City of Bloomington	▶ Collect data using roadside devices
	INDOT	▶ Collect data using roadside devices
	Monroe County	▶ Collect data using roadside devices
Transit Management	Transit Agencies	▶ Provide fixed route bus service
		▶ Provide demand response (paratransit) bus service
		▶ Monitor transit assets (vehicle locations, video surveillance)
Traveler Information	INDOT	▶ Provide information to drivers (DMS, HAR)

VI. Inventory

Each Stakeholder is responsible for ITS systems in the region. A regional ITS architecture inventory is a list of the elements that represent the existing and planned ITS systems in the region as well as non-ITS systems that provide information to or get information from the ITS systems. An element is the basic building block of the Regional ITS Architecture and describes a system or piece of a system. The Regional ITS Architecture for Bloomington/Monroe County metropolitan planning area contains twenty-one (21) elements. These elements are listed below and explained further in Tables 3 and 4:

Elements:

- Bloomington Maintenance & Construction
- Bloomington Roadside Equipment
- Bloomington Vehicles
- Ellettsville Maintenance and Construction
- Emergency Dispatch Center
- Emergency Personnel
- Emergency Vehicles
- INDOT Operations and Construction
- INDOT Personnel
- INDOT Roadside Equipment
- INDOT Vehicles
- INDOT Traffic Management Center
- Monroe County Maintenance & Construction
- Monroe County Roadside Equipment
- Monroe County Vehicles
- Transit Operations
- Transit Operations Kiosks
- Transit Personnel
- Transit Vehicles
- Remote Traveler Support
- Security Monitoring Field Equipment

The inventory has been presented in two different manners. Table 3 sorts the inventory by stakeholder. The table lists the stakeholders, their associated elements, an element description, and whether the element exists or is planned. Table 4 sorts the inventory by entity. Each element in the regional architecture is mapped to one or more entities from the National ITS Architecture. The table lists the entity, the element and stakeholder, and whether the element exists or is planned.

Table 3: Inventory Sorted by Stakeholder

Stakeholder	System/Element	Description	Status
INDOT	INDOT Operations and Construction	INDOT Operations and Construction coordinates maintenance and construction activities on roads under INDOT's jurisdiction in Monroe County.	Existing
	INDOT Personnel	Personnel represent the people who directly interface with an element of the ITS infrastructure. They provide operator data and command inputs to direct systems operations to varying degrees, depending on the type of system and the deployment scenario.	Existing
	INDOT Roadside Equipment	Roadside Equipment includes any and all equipment distributed on and along the roadway which monitor and control traffic.	Planned
	INDOT Traffic Management Center	INDOT's Indianapolis Traffic Management Center coordinates ITS activities associated with freeways within the BMCMPPO in association with INDOT's Seymour District Office.	Planned
	INDOT Vehicles	Vehicles include ITS devices that provide the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction.	Existing

Table 3: Inventory Sorted by Stakeholder (continued)

Stakeholder	System/Element	Description	Status
Monroe County	Monroe County Maintenance and Construction	Monroe County Maintenance and Construction coordinates all construction and maintenance activities on roads under Monroe County's jurisdiction.	Existing
	Monroe County Roadside Equipment	Roadside Equipment includes any and all equipment distributed on and along the roadway which monitor and control traffic. This can include sensors, displays, and cameras for operational purposes of maintenance and construction.	Planned
	Monroe County Vehicles	Vehicles include ITS devices that provide the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction.	Existing
City of Bloomington	Bloomington Maintenance & Construction	Coordinates all construction and maintenance activities on roads under the City's jurisdiction.	Existing
	Bloomington Roadside Equipment	Roadside Equipment includes any and all equipment distributed on and along the roadway which monitor and/or control traffic. Bloomington Roadside Equipment includes sensors, displays, and cameras for operational purposes of maintenance, operation, construction, and data collection.	Existing
	Bloomington Vehicles	Vehicles include ITS devices that provide the sensory, processing, storage, and communications functions necessary to support highway maintenance and construction.	Existing
Town of Ellettsville	Ellettsville Maintenance and Construction	Ellettsville coordinates all construction and maintenance activities on Town streets.	Existing
Public Safety Agencies	Emergency Dispatch Center	Monroe County Central Dispatch receives 911 calls in Monroe County and is responsible for the deployment of the appropriate emergency response personnel.	Existing
	Emergency Personnel	Personnel represent the people who directly interface with an element of the ITS infrastructure. They provide operator data and command inputs to direct systems operations to varying degrees, depending on the type of system and the deployment scenario.	Existing
	Emergency Vehicles	Emergency vehicles include ITS equipment that provides the sensory, processing, storage, and communications functions necessary to support safe and efficient emergency response.	Existing

Table 3: Inventory Sorted by Stakeholder (continued)

Stakeholder	System/Element	Description	Status
Public Transit Agencies	Remote Traveler Support	Remote traveler support provides access to traveler information at transit stations, transit stops, other fixed sites along travel routes (e.g., rest stops), and major trip generation locations.	Planned
	Security Monitoring Field Equipment	Security monitoring field equipment includes sensors and surveillance devices that monitor transportation infrastructure and public areas.	Existing
	Transit Operations	This element includes the systems necessary to run Bloomington Transit, Rural Transit, and IU Campus Transit.	Existing
	Transit Operations Kiosks	Kiosks are public informational displays supporting various levels of interaction and information access. Currently information kiosks for BT are staffed, as opposed to automated.	Planned
	Transit Personnel	Personnel represent the people who directly interface with an element of the ITS infrastructure. They provide operator data and command inputs to direct systems operations to varying degrees, depending on the type of system and the deployment scenario.	Existing
	Transit Vehicles	Transit vehicles include ITS devices that support the safe and efficient movement of passengers. These systems collect, manage, and disseminate transit-related information to the driver, operations and maintenance personnel, and transit system patrons.	Existing

Table 4: Inventory Sorted by Entity

Entity	Systems/Element	Stakeholder	Status
Emergency Management Subsystem	Emergency Dispatch Center	Public Safety Agencies	Existing
Emergency Vehicle Subsystem	Emergency Vehicles	Public Safety Agencies	Existing
Maintenance and Construction Management	Bloomington Maintenance and Construction	City of Bloomington	Existing
	Ellettsville Maintenance and Construction	Town of Ellettsville	Existing
	INDOT Operations and Construction	INDOT	Existing
	Monroe County Operations and Construction	Monroe County	Existing
Maintenance and Construction Vehicle Subsystem	Bloomington Vehicles	City of Bloomington	Existing
	INDOT Vehicles	INDOT	Existing
	Monroe County Vehicles	Monroe County	Existing
Remote Traveler Support Subsystem	Remote Traveler Support	Transit Agencies	Planned
	Transit Operations Kiosks	Transit Agencies	Planned
Roadway Subsystem	Bloomington Roadside Equipment	City of Bloomington	Existing
	INDOT Roadside Equipment	INDOT	Existing
	Monroe County Roadside Equipment	Monroe County	Planned
Security Monitoring Subsystem	Security Monitoring Field Equipment	Transit Agencies	Existing
Traffic Management Subsystem	INDOT Traffic Management Center	INDOT	Planned
Transit Management Subsystem	Transit Operations	Transit Agencies	Existing

Table 4: Inventory Sorted by Entity (continued)

Entity	Systems/Element	Stakeholder	Status
Transit Vehicle Subsystem	Transit Vehicles	Transit Agencies	Existing
Emergency System Operator	Emergency Personnel	Public Safety Agencies	Existing
Traffic Operations Personnel	INDOT Personnel	INDOT	Existing
Transit Operations Personnel	Transit Personnel	Transit Agencies	Existing

VII. Needs and Services

The ITS systems in the region provide a variety of transportation services that address the transportation needs of the region. These services will continue to grow as more systems are developed and upgraded. The regional needs include the need for safe and efficient transportation on the transportation network, the need for safe and efficient maintenance and construction activities, a need for safe and efficient public transit, a need for efficient and comprehensive emergency management, and the need for coordination between all of the needs listed above.

The services that address these needs are described by the market packages that are associated with each element. The market packages provide an accessible, service-oriented perspective to the regional architecture. They are tailored to fit, separately or in combination, with real world transportation problems and needs. Market packages identify the pieces of the architecture that are required to implement a particular transportation service.

Table 5 identifies the market packages for the region. The table identifies the market package, the associated element, and whether it is planned or existing [note: the code in (parentheses) under the market package column is the National ITS Architecture ID# for this market package].

Table 5: Market Packages

Market Package	Description	Element	Status
Transit Vehicle Tracking (APTS01)	Monitors current transit vehicle location using Automated Vehicle Location (AVL) System. Location data may be used to determine schedule adherence and update the schedule in real-time. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. The Transit Management Subsystem processes the information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.	Transit Operations	Existing
		Transit Vehicles	Existing
Transit Fixed-Route Operations (APTS02)	Performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes to provide the public with integrated and personalized dynamic schedules.	Transit Operations	Existing
		Transit Personnel	Existing
		Transit Vehicles	Existing

Tale 5: Market Packages (continued)

Market Package	Description	Element	Status
Demand Response Transit Operations (APTS03)	Performs automated dispatch and system monitoring for demand responsive transit services such as scheduling activities and operator assignment. This market package supports dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing enabling optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem; operated by either the transit management center or an independent service.	Transit Operations	Existing
		Transit Personnel	Existing
		Transit Vehicles	Existing
Transit Fare Collection Management (APTS04)	Manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem.	Transit Operations	Planned
		Transit Operations Kiosks	Planned
		Transit Vehicles	Planned
Transit Security (APTS05)	Provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. Transit user or transit vehicle operator activated alarms are provided on-board. Public areas are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. This market package provides surveillance and sensor monitoring of non-public areas of transit facilities and transit infrastructure. The surveillance equipment includes video and/or audio systems.	Security Monitoring Field Equipment	Existing
		Transit Operations	Existing
		Transit Personnel	Existing
Transit Fleet Management (APTS06)	Supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The market package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.	Transit Operations	Existing
		Transit Vehicles	Existing
Transit Traveler Information (APTS08)	Provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.	Transit Operations	Existing
		Transit Operations Kiosks	Planned
		Transit Vehicles	Existing

Table 5: Market Packages (continued)

Market Package	Description	Element	Status
Transit Signal Priority (APTS09)	Determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. Signal priority may result from coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination is intended to improve on-time performance of transit if it can be accommodated without degrading overall performance of the traffic network.	Bloomington Roadside Equipment	Planned
		Transit Vehicles	Planned
Broadcast Traveler Information (ATIS01)	Collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and/or weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers.	INDOT Traffic Management Center	Planned
		User Personal Computing Devices	Existing
Network Surveillance (ATMS01)	Includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning.	INDOT Personnel	Planned
		INDOT Roadside Equipment	Planned
		INDOT Traffic Management Center	Planned
Surface Street Control (ATMS03)	Provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.	Bloomington Roadside Equipment	Existing
		INDOT Roadside Equipment	Planned
		Monroe County Roadside Equipment	Planned
Freeway Control (ATMS04)	Provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls.	INDOT Roadside Equipment	Planned
		INDOT Traffic Management Center	Planned

Table 5: Market Packages (continued)

Market Package	Description	Element	Status
Traffic Information Dissemination (ATMS06)	Provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media, Transit Management, Emergency Management, and Information Service Providers.	INDOT Personnel	Planned
		INDOT Traffic Management Center	Planned
Regional Traffic Management (ATMS07)	Provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies such as coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	INDOT Personnel	Planned
		INDOT Traffic Management Center	Planned
Traffic Incident Management System (ATMS08)	Manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents.	Emergency Dispatch Center	Existing
		Emergency Personnel	Existing
		Emergency Vehicles	Existing
		INDOT Personnel	Existing
		INDOT Roadside Equipment	Existing
		INDOT Traffic Management Center	Planned
Standard Railroad Grade Crossing (ATMS13)	Manages highway traffic at highway-rail intersections where operational requirements do not dictate more advanced features. Both passive and active warning systems (e.g., flashing lights and gates) are supported. These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train.	Monroe County Roadside Equipment	Existing
Emergency Call-Taking and Dispatch (EM01)	Provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies.	Emergency Dispatch Center	Existing
		Emergency Personnel	Existing
		Emergency Vehicles	Existing

Table 5: Market Packages (continued)

Market Package	Description	Element	Status
Emergency Routing (EM02)	Supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions, and suggested routing information are provided to enhance emergency vehicle routing. Special priority or other specific emergency traffic control strategies can be coordinated to improve the safety and time-efficiency of responding vehicle travel on the selected route(s).	Bloomington Roadside Equipment	Existing
		Emergency Dispatch Center	Existing
		Emergency Personnel	Existing
		Emergency Vehicles	Existing
Disaster Response and Recovery (EM08)	Enhances the ability of the surface transportation system to respond to and recover from natural and man-made/ technological disasters. The market package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. This market package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities.	Emergency Dispatch Center	Existing
		Emergency Personnel	Existing
Evacuation and Reentry Management (EM09)	Supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. This market package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes.	Emergency Dispatch Center	Existing
		Emergency Personnel	Existing
		Transit Operations	Existing
		Transit Personnel	Existing
Maintenance and Construction Vehicle Maintenance (MC02)	Performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.	Bloomington Maintenance and Construction	Existing
		Bloomington Vehicles	Existing
		INDOT Operations and Construction	Existing
		INDOT Vehicles	Existing
		Monroe County Maintenance and Construction	Existing
		Monroe County Vehicles	Existing
Road Weather Data Collections (MC03)	Collects current road and weather conditions using data collected from environmental sensors deployed on the roadway or from Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution Market Package to process the information and make decisions on operations. The market package may also request and receive qualified data sets from meteorological systems.	Bloomington Maintenance and Construction	Existing
		Bloomington Roadside Equipment	Existing

Table 5: Market Packages (continued)

Market Package	Description	Element	Status
Winter Maintenance (MC06)	Supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.	Bloomington Maintenance and Construction	Existing
		Bloomington Vehicles	Existing
		INDOT Operations and Construction	Existing
		INDOT Vehicles	Existing
		Monroe County Maintenance and Construction	Existing
		Monroe County Vehicles	Existing
Roadway Maintenance and Construction (MC07)	Supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.	Bloomington Maintenance and Construction	Existing
		Bloomington Vehicles	Existing
		Ellettsville Maintenance and Construction	Existing
		INDOT Operations and Construction	Existing
		INDOT Vehicles	Existing
		Monroe County Maintenance and Construction	Existing
		Monroe County Vehicles	Existing
Work Zone Management (MC08)	Manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Work zone information is coordinated with other groups. Work zone speeds and delays are provided to the motorist prior to the work zones. This market package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.	INDOT Operations and Construction	Planned
		INDOT Roadside Equipment	Planned
		INDOT Traffic Management Center	Planned
Maintenance and Construction Activity Coordination (MC10)	Supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.	Bloomington Maintenance and Construction	Existing
		Ellettsville Maintenance and Construction	Existing
		INDOT Operations and Construction	Existing
		Monroe County Maintenance and Construction	Existing

VIII. Interconnections and Information Flows

Regional Architecture Interconnections

The regional architecture has a total of 41 interconnections between the 21 elements that comprise it. Diagram 1 (below) illustrates the regional architecture interconnections - the general relationships that exist between elements. The interconnections are broken down as follows:

Bloomington Maintenance and Construction – 9 total interconnections with:

Bloomington Roadside Equipment, Bloomington Vehicles, Emergency Dispatch Center, INDOT Operations and Construction, INDOT Traffic Management Center, Media, Monroe County Maintenance and Construction, Transit Operations, and Weather Services

Ellettsville Maintenance and Construction – 5 total interconnections with:

INDOT Operations and Construction, Media, Monroe County Maintenance and Construction, Transit Operations, and Weather Services

Emergency Dispatch Center – 4 total interconnections with:

Emergency Personnel, Emergency Vehicles, Media, and Security Monitoring Field Equipment

INDOT Operations and Construction – 6 total interconnections with:

INDOT Roadside Equipment, INDOT Traffic Management Center, INDOT Vehicles, Media, Monroe County Maintenance and Construction, and Weather Services

INDOT Personnel – 1 interconnection with:

INDOT Traffic Management Center

INDOT Roadside Equipment – 2 total interconnections with:

INDOT Traffic Management Center and INDOT vehicles

INDOT Traffic Management Center – 4 total interconnections with:

INDOT Traffic Management Center Personnel, Media, Monroe County Maintenance and Construction, and Weather Services

Monroe County Maintenance and Construction – 4 total interconnections with:

Monroe County Roadside Equipment, Monroe County Vehicles, Transit Operations, and Weather Services

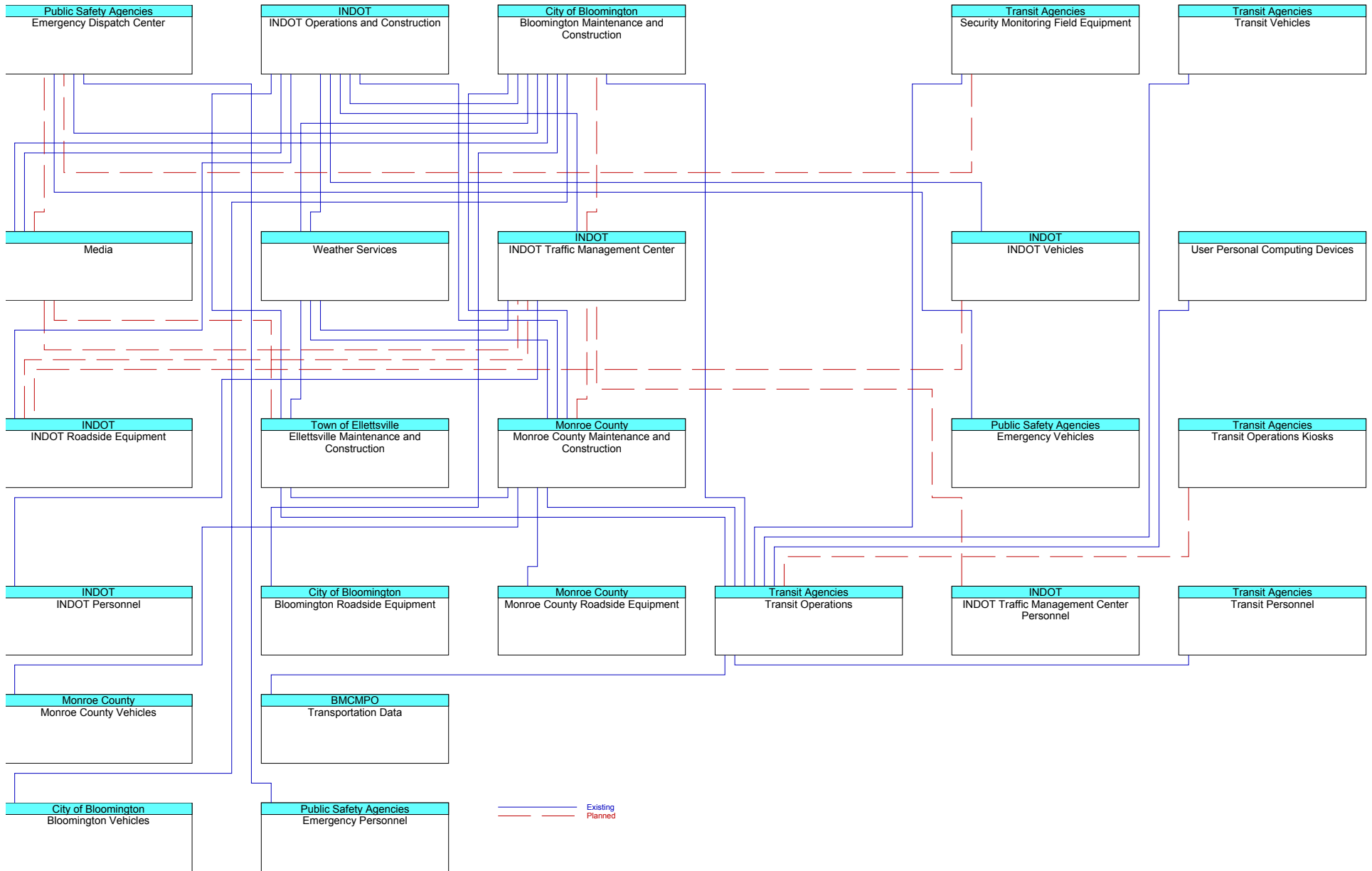
Security Monitoring Field Equipment – 1 interconnection with:

Transit Operations

Transit Operations – 5 total interconnections with:

Transit Operations Kiosks, Transit Personnel, Transit Vehicles, Transportation Data, and User Personal Computing Devices

Diagram 1: Regional Architecture Interconnections



Regional Architecture Information Flows

The regional architecture has a total of 117 information flows between the 21 elements that comprise it. The information flows entering and exiting each of the major systems are illustrated below followed by the information flow for the entire regional architecture. The following diagrams illustrate in greater detail the particular relationships between each of the elements (the element being illustrated is centrally located in the diagram).

Diagram 2: Bloomington Maintenance and Construction Information Flow Diagram

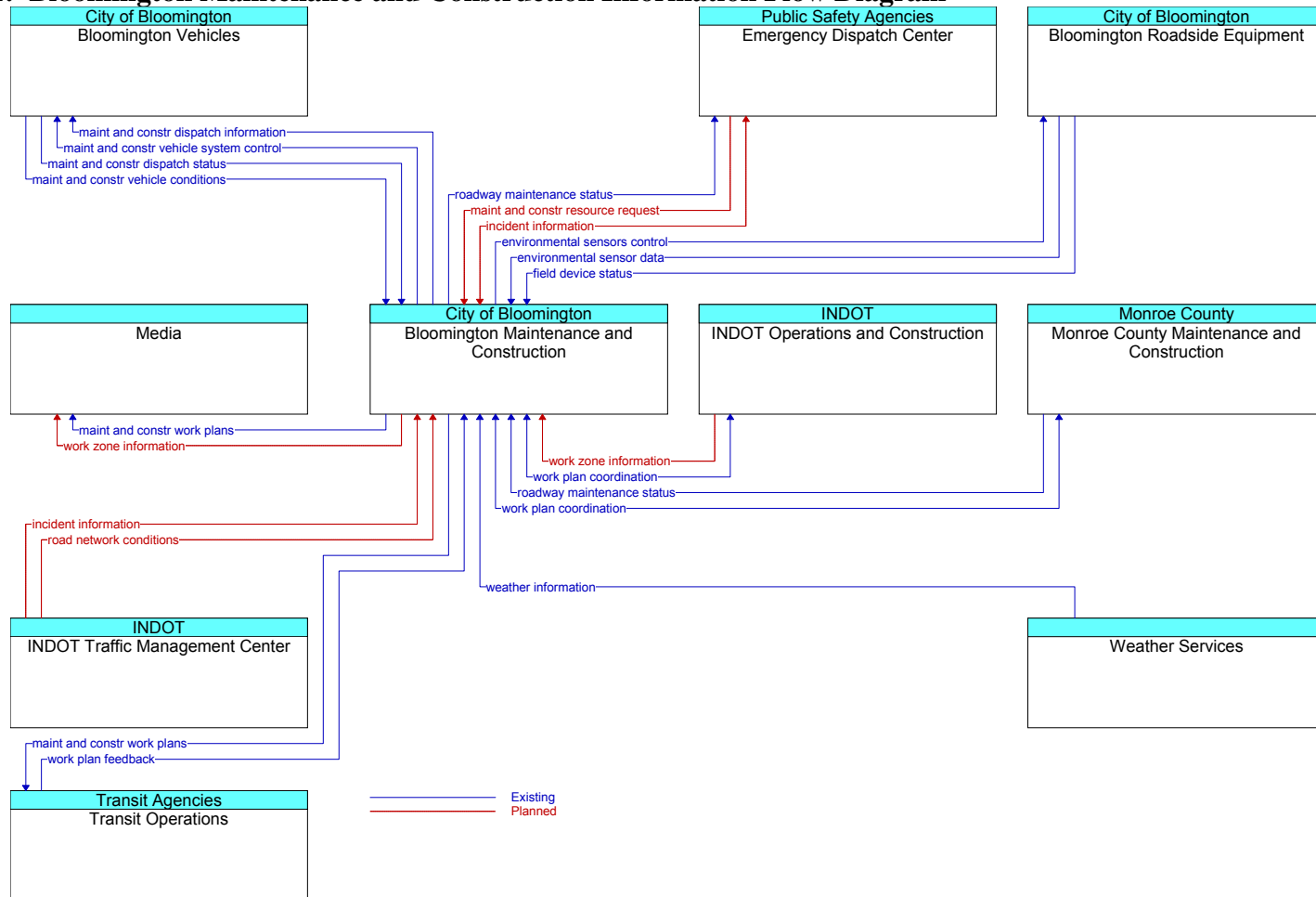


Diagram 3: Ellettsville Maintenance and Construction Flow Diagram

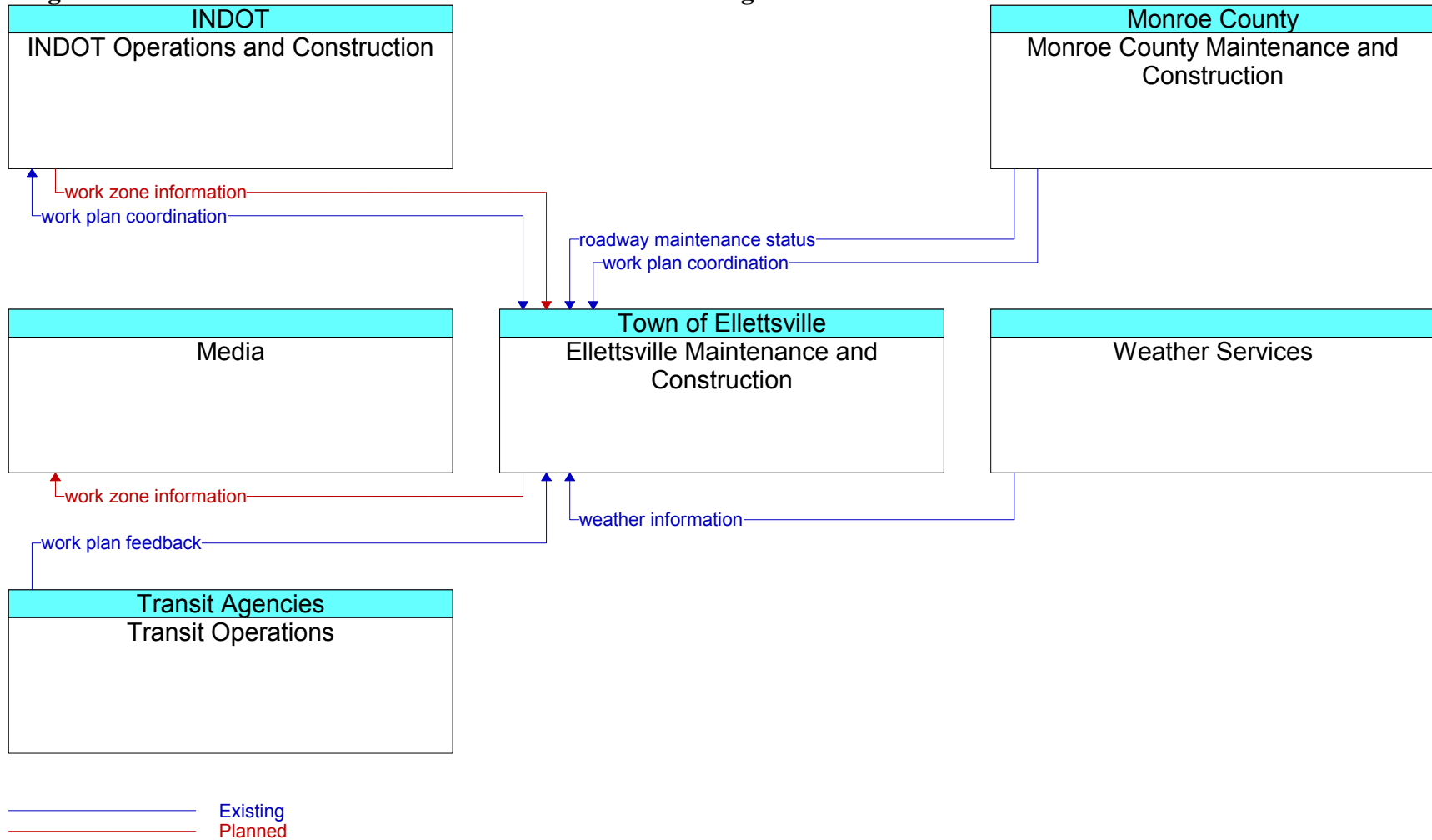


Diagram 4: Emergency Dispatch Center Flow Diagram

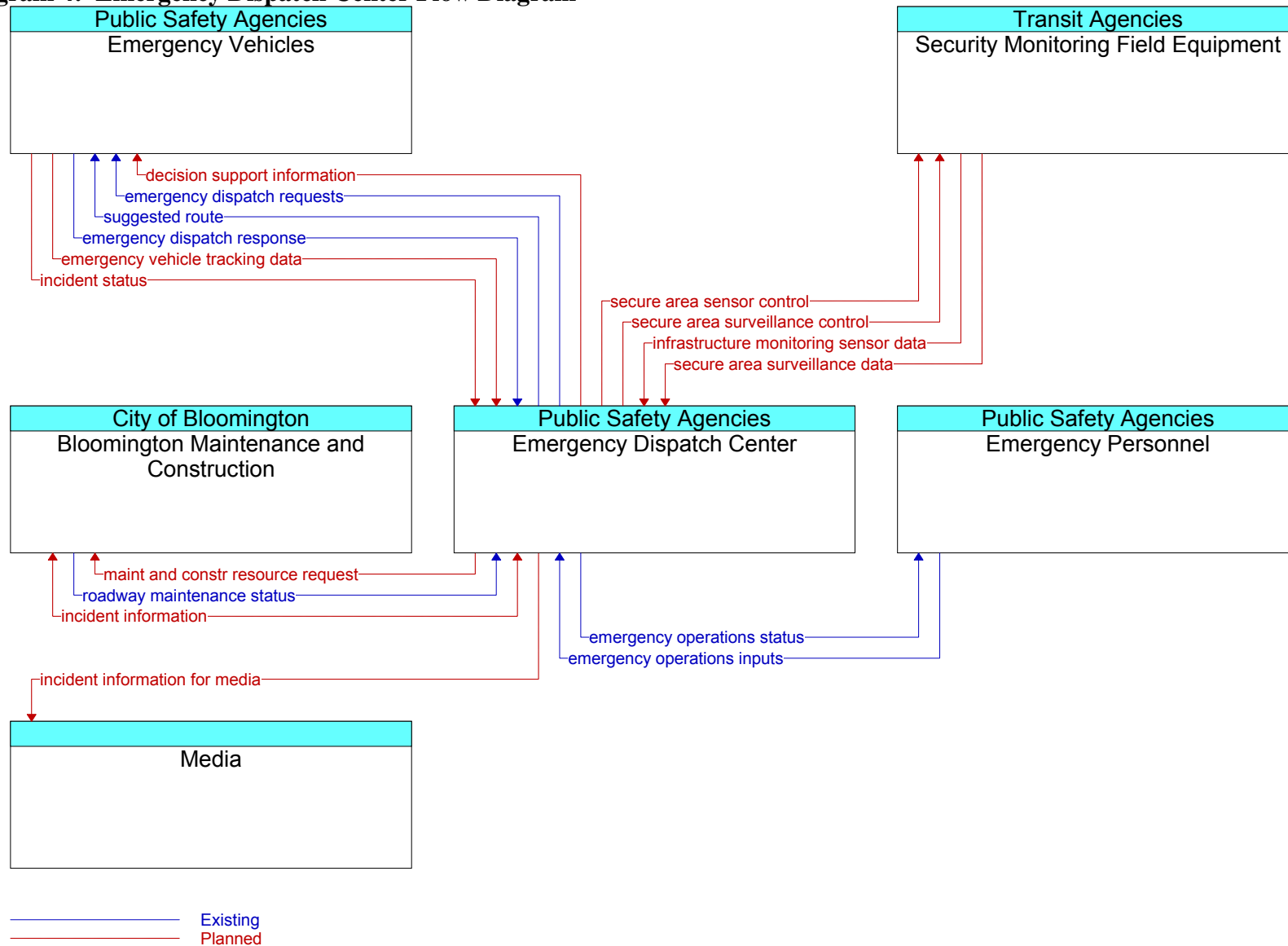


Diagram 5: INDOT Operations and Construction Flow Diagram

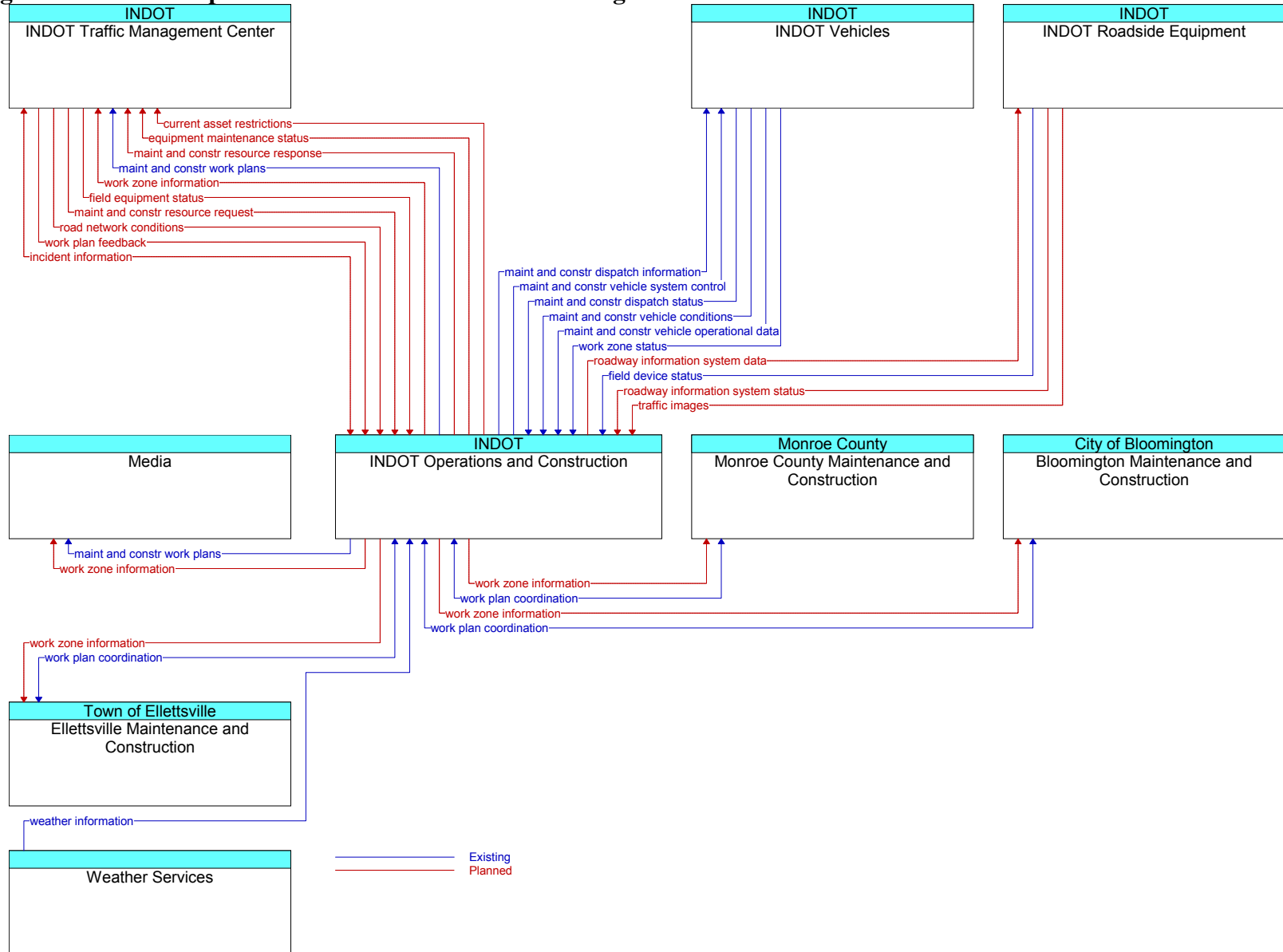


Diagram 6: INDOT Traffic Management Center Flow Diagram

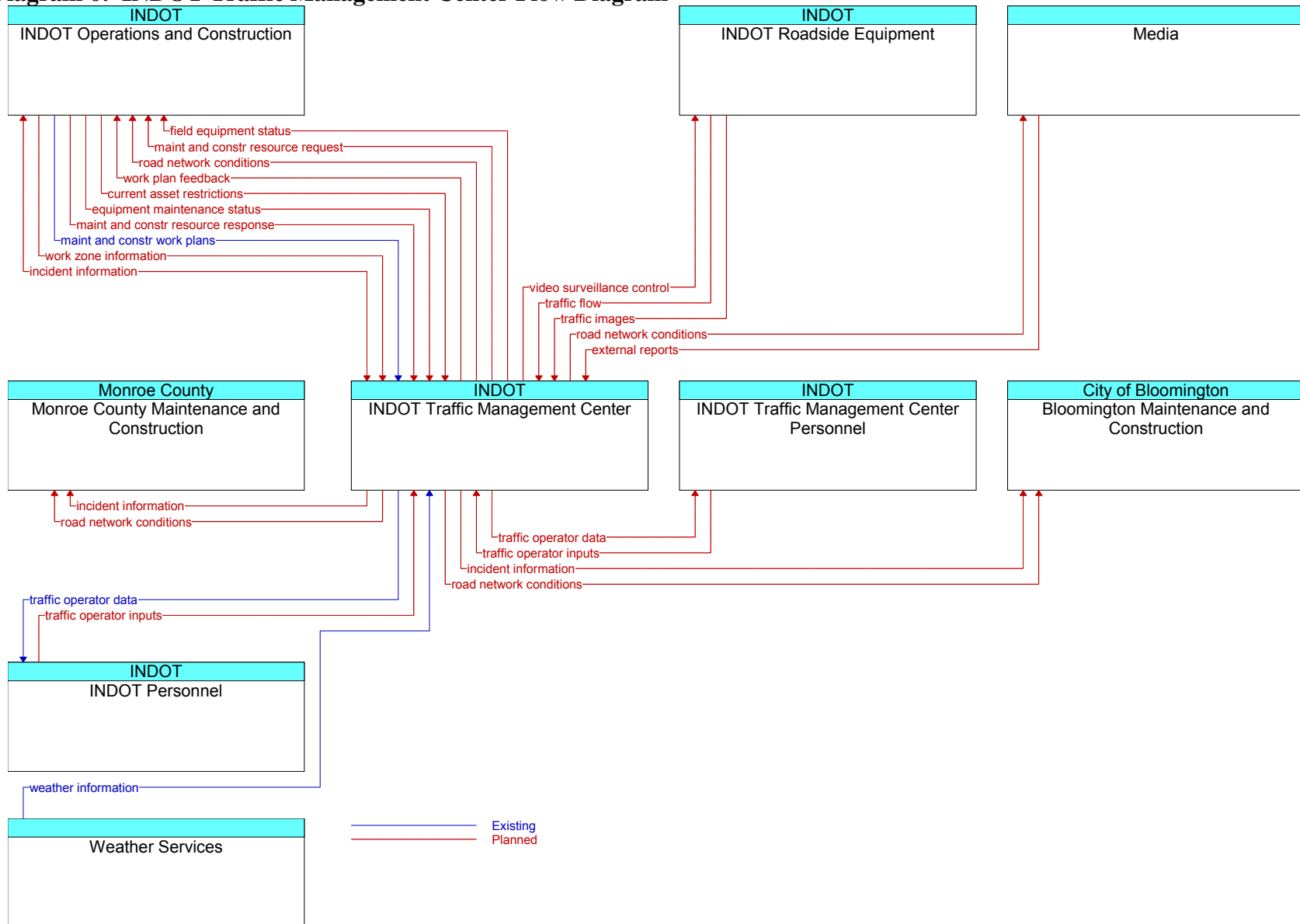


Diagram 7: Monroe County Maintenance and Construction Flow Diagram

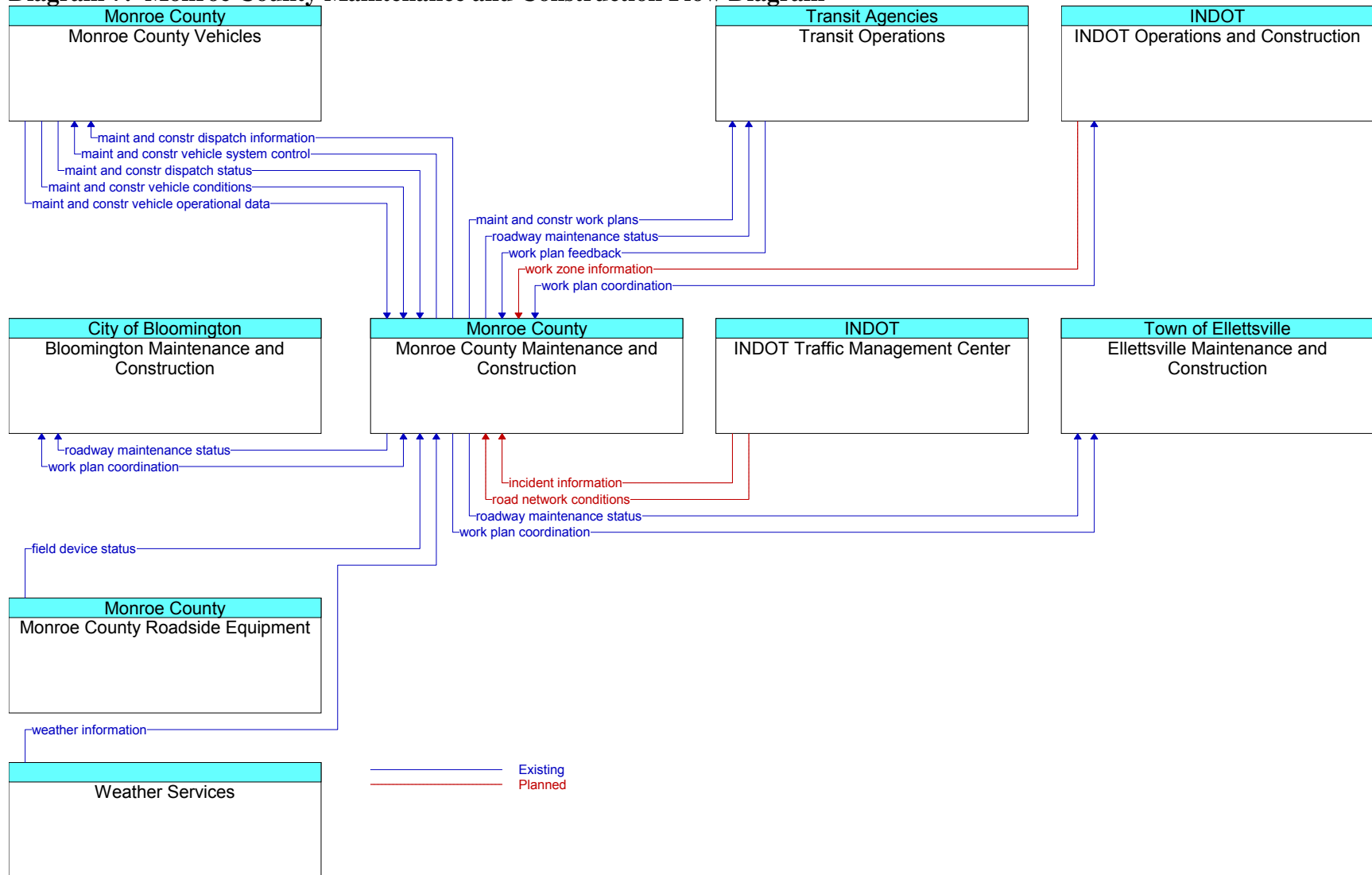


Diagram 8: Transit Operations Flow Diagram

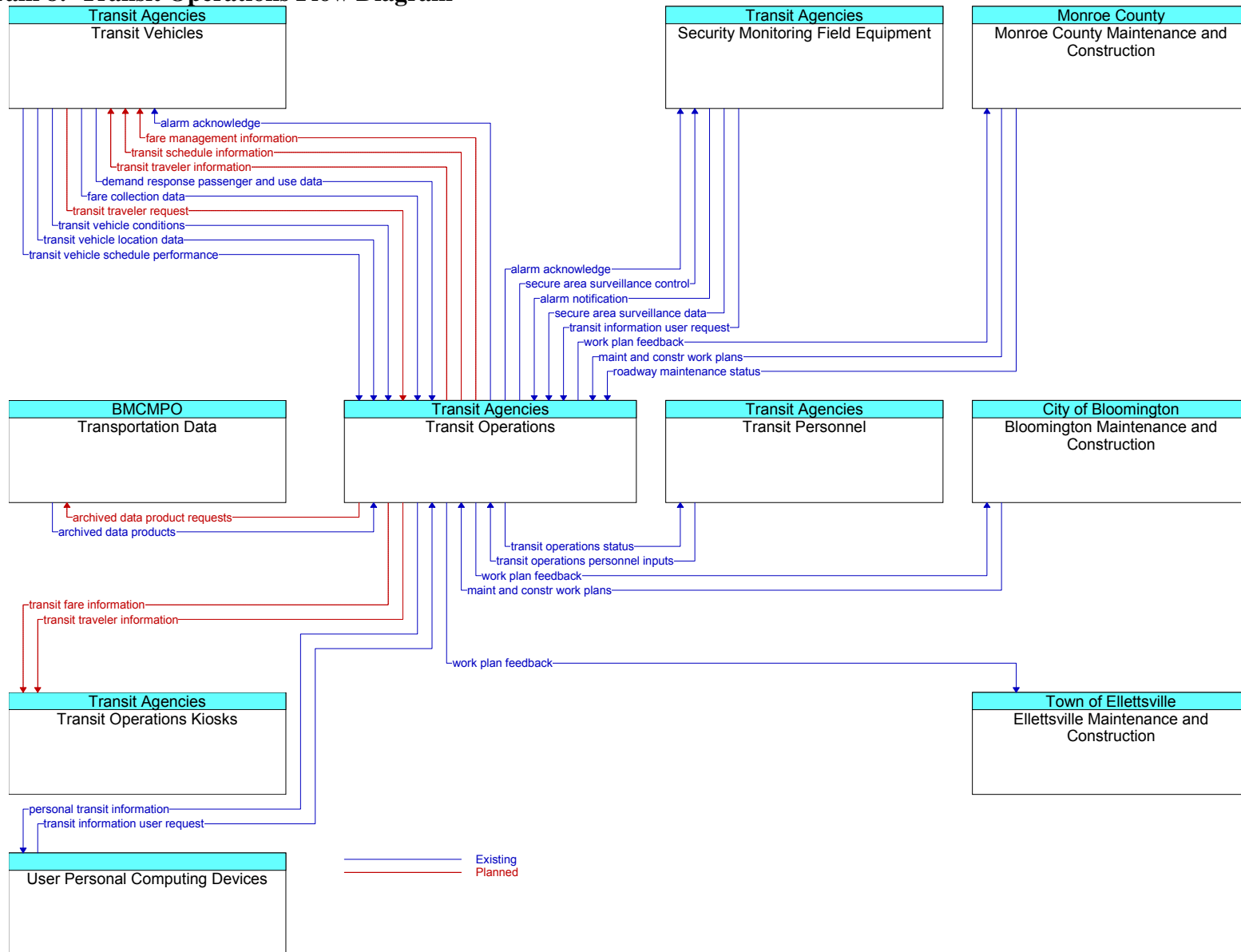
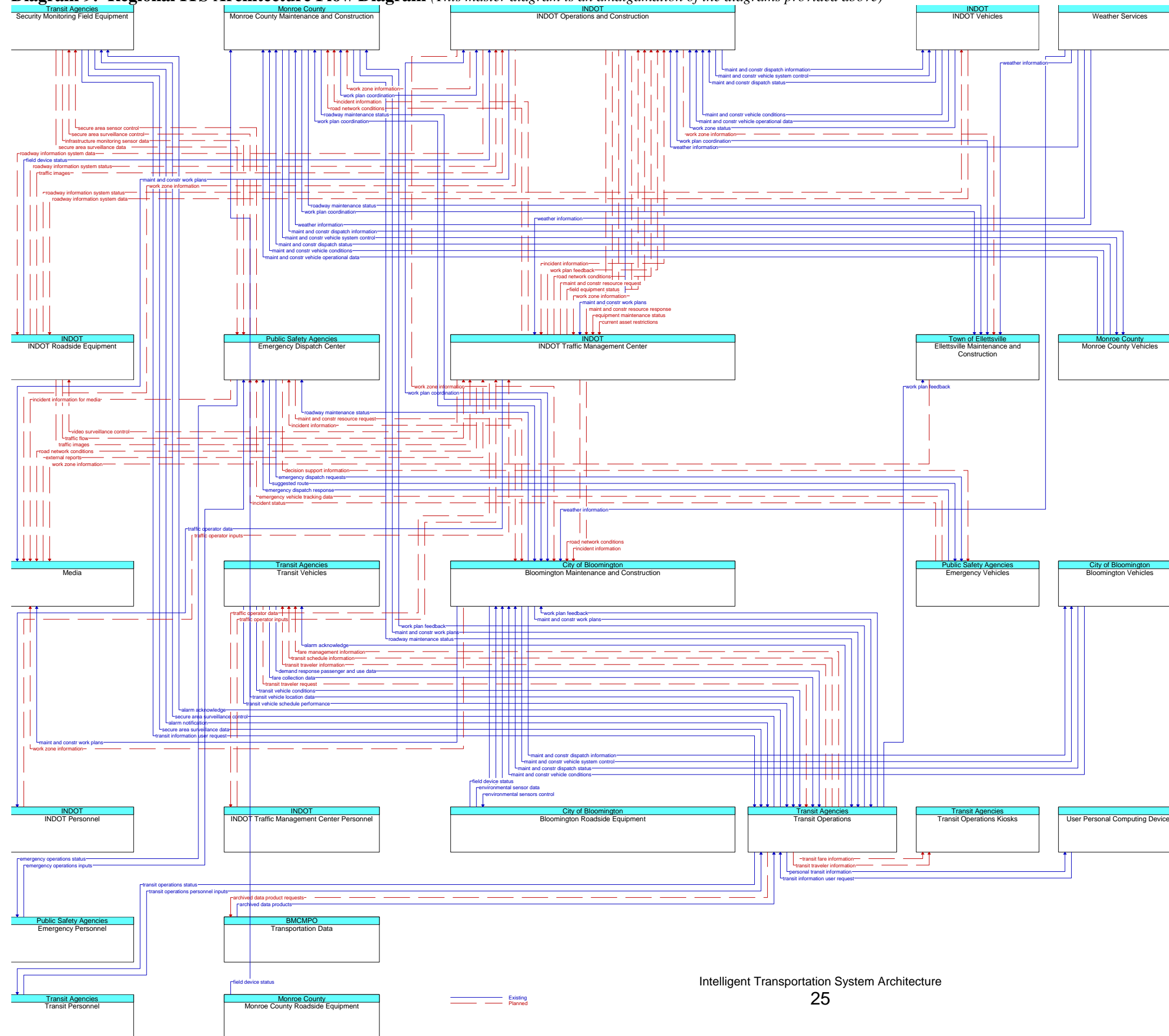


Diagram 9: Regional ITS Architecture Flow Diagram (This master diagram is an amalgamation of the diagrams provided above)



IX. Functional Requirements

The functional requirements describe the tasks or activities that are performed by each system in the region. This documents the share of work that each system in the region will do to provide services. The following lists identify the functional requirements of each of the major systems (and the associated stakeholder in parentheses) in the ITS Architecture.

Bloomington Maintenance and Construction Functional Requirements (City of Bloomington):

- Provide weather and road condition information to personnel;
- Collect operational status for the roadside environmental sensor equipment;
- Provide dispatch information to maintenance and construction vehicles based on the outputs of the decision support system, including recommended roadway treatment actions;
- Maintain an interface with asset management systems to track the inventory, restrictions, repair needs and status updates of transportation assets;
- Respond to requests from emergency management and traffic management centers for hazard removal, field equipment repair, and other roadway maintenance, including winter maintenance;
- Exchange information with administrative systems to support the planning and scheduling of maintenance and construction activities;
- Provide emergency management and traffic management centers with information about scheduled maintenance and construction work activities;
- Collect current and forecast traffic and weather information;
- Schedule preventive and corrective vehicle maintenance with the repair facility based on fleet health reports, maintenance records, vehicle utilization, and vehicle availability;
- Exchange information with administrative systems to support the planning and scheduling of winter maintenance activities;
- Provide status information about scheduled winter maintenance activities including anticipated closures, and impact to the roadway, alternate routes, anticipated delays, closure times, and durations;
- Dispatch and route winter maintenance vehicle drivers and support them with route specific environmental, incident, advisory, threat, alert, traffic information;
- Determine the need for roadway treatment based on current and forecasted weather information, current usage of treatments and materials, available resources, requests from other agencies, and recommendations from the maintenance decision support system under winter conditions;
- Provide dispatch instructions for vehicle operators based on input parameters from center personnel under winter conditions;
- Assess the status of winter maintenance activities; and
- Provide status information about scheduled maintenance and construction activities.

Ellettsville Maintenance and Construction (Town of Ellettsville)

- Provide dispatch information to maintenance and construction vehicles based on the outputs of the decision support system, including recommended roadway treatment actions

- Maintain an interface with asset management systems to track the inventory, restrictions, repair needs and status updates of transportation assets ;
- Respond to requests from emergency management and traffic management centers for hazard removal, field equipment repair, and other roadway maintenance;
- Exchange information with administrative systems to support the planning and scheduling of maintenance and construction activities.
- Provide emergency management and traffic management centers with information about scheduled maintenance and construction work activities;
- Collect current and forecast traffic and weather information; and
- Exchange information with administrative systems to support the planning and scheduling of maintenance and construction activities.

Emergency Dispatch Center (Public Safety Agencies)

- Support the interface to the Emergency Telecommunications System (911) to receive emergency notification information and provide it to the emergency system operator;
- Receive emergency call information from 911 services and present the possible incident information to the emergency system operator;
- Receive emergency notification information from other public safety agencies and present the possible incident information to the emergency system operator;
- Dispatch emergency vehicles to respond to verified emergencies under center personnel control;
- Relay location and incident details to responding vehicles;
- Store and maintain the emergency service responses in an action log;
- Manage inter-agency coordination of evacuation operations, from initial planning through the evacuation process and reentry;
- Develop and exchange evacuation plans with allied agencies prior to the occurrence of a disaster;
- Request resources from transit agencies as needed to support the evacuation;
- Monitor the progress or status of the evacuation once it begins and exchange tactical plans, prepared during the incident, with allied agencies;
- Monitor the progress of the reentry process;
- Manage coordinated inter-agency responses to and recovery from large-scale emergencies; and
- Develop, coordinate with other agencies, and store emergency response plans.

INDOT Operations and Construction (INDOT)

- Provide the center personnel with tailored external information, including weather or road condition observations, forecasted weather information or road conditions, current usage of treatments and materials, available resources, equipment and vehicle availability, road network information, and source reliability information;
- Provide dispatch information to maintenance and construction vehicles based on the outputs of the decision support system, including recommended roadway treatment actions;

- Respond to requests from emergency management and traffic management centers for hazard removal, field equipment repair, and other roadway maintenance, including winter roadway maintenance;
- Exchange information with administrative systems to support the planning and scheduling of maintenance activities, including winter maintenance;
- Receive equipment availability and materials storage status information from storage facilities to support the scheduling of winter maintenance activities;
- Provide work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact on the roadway, expected times and duration of impact, anticipated delays, alternate routes, and suggested speed limits; and
- Control traffic in work zones by providing remote control of dynamic message signs and highway advisory radio systems located in or near the work zone.

INDOT Traffic Management Center (INDOT)

- Monitor, analyze, and store traffic sensor data collected from the field elements under remote control of the center;
- Monitor, analyze, and distribute traffic images from CCTV systems under remote control of the center;
- Distribute road network conditions data based on collected and analyzed traffic sensor and surveillance data to other centers;
- Maintain a database of surveillance and sensors and the freeways, surface street and rural roadways where they are located, to which parts of the network their data applies, the type of data, and the ownership of each link in the network;
- Receive inputs from the Alerting and Advisory System concerning the possibility or occurrence of severe weather, terrorist activity, or other major emergency, including information provided by the Emergency Alert System;
- Collect and store traffic flow and image data from the field equipment to detect and verify incidents;
- Exchange incident and threat information with emergency management centers as well as maintenance and constructions centers;
- Provide video and traffic sensor control commands to the field equipment to detect and verify incidents;
- Exchange alert information and status with emergency management centers;
- Remotely control dynamic messages signs for dissemination of traffic and other information to drivers;
- Remotely control driver information systems that communicate directly from a center to the vehicle for the dissemination of traffic and other information to drivers;
- Collect operational status for the driver information systems equipment; and
- Remotely control driver information systems to advise drivers of activity around work zones.

Monroe County Maintenance and Construction (Monroe County)

- Provide the center personnel with tailored external information, including weather or road condition observations, forecasted weather information or road conditions, current usage

of treatments and materials, available resources, equipment and vehicle availability, road network information, and source reliability information;

- Maintain an interface with asset management systems to track the inventory, restrictions, repair needs and status updates of transportation assets ;
- Respond to requests from emergency management and traffic management centers for hazard removal, field equipment repair, and other roadway maintenance (including winter maintenance);
- Exchange information with administrative systems to support the planning and scheduling of maintenance and construction activities;
- Provide emergency management and traffic management centers with information about scheduled maintenance and construction work activities;
- Receive equipment availability and materials storage status information from storage facilities to support the scheduling of roadway maintenance and construction activities;
- Collect current and forecast traffic and weather information from traffic management centers and weather service providers;
- Exchange information with administrative systems to support the planning and scheduling of winter maintenance activities;
- Provide status information about scheduled winter maintenance activities including anticipated closures and impact to the roadway, alternate routes, anticipated delays, closure times, and durations;
- Receive equipment availability and materials storage status information from storage facilities to support the scheduling of winter maintenance activities;
- Determine the need for roadway treatment based on current and forecasted weather information, current usage of treatments and materials, available resources, requests for action from other agencies, and recommendations from the Maintenance Decision Support system under winter conditions;
- Provide work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected times and duration of impact, anticipated delays, alternate routes, and suggested speed limits; and
- Provide status information about scheduled maintenance and construction activities including anticipated closures and the impact to the roadway, alternate routes, anticipated delays, closure times, and durations.

Transit Operations (Transit Agencies)

- Process requests for transit fares to be paid in advance;
- Generate transit routes and schedules based on such factors as parameters input by the system operator, road network conditions, operational data on current routes and schedules, and digitized map data;
- Dispatch fixed route or flexible route transit vehicles;
- Collect transit operational data for use in the generation of routes and schedules;
- Provide transit information to the media including details of deviations from schedule of regular transit services;
- Process trip requests for demand responsive transit services (paratransit);
- Monitor the operational status of the demand response vehicles including status of passenger pick-up and drop-off;

- Dispatch demand response transit vehicles;
- Monitor the locations of transit vehicles within its network;
- Manage the use of transit resources to support evacuation and subsequent reentry of a population in the vicinity of a disaster or other emergency;
- Coordinate regional evacuation plans with emergency management – identifying the transit role in an evacuation and the transit resources that would be used;
- Generate transit vehicle maintenance schedules that identify the maintenance or repair to be performed and when the work is done;
- Generate transit vehicle availability listings, current and forecast, to support transit vehicle assignment planning based, in part, on the transit vehicle maintenance schedule;
- Generate transit vehicle availability listings, current and forecast, to support transit vehicle assignment planning; and
- Assign transit vehicle operators to transit schedules based on their eligibility, route preferences, seniority, and transit vehicle availability.

X. Standards

Standards are documented technical specifications sponsored by a Standards Development Organizations (SDO) to be used consistently as rules, guidelines, or definitions of characteristics for the interchanged data. The standards specifically define the interfaces identified in the National ITS Architecture. The following tables identify the standard name, the SDO, and the associated source element, destination element, and information flows.

American Public Transportation Association (APTA) Transit Communications Interface Protocol (TCIP) [APTA TCIP-S-001 3.0.0]

SDO: APTA

Source Entity	Flow Name	Destination Entity
Personal Information Access	Transit Information User Request	Transit Management
Transit Management	Fare Management Information	Transit Vehicle Subsystem
	Personal Transit Information	Personal Information Access
	Transit Fare Information	Remote Traveler Support
	Transit Traveler Information	Remote Traveler Support
Transit Vehicle Subsystem	Fare Collection Data	Transit Management
	Transit Vehicle Location Data	Transit Management
	Transit Vehicle Schedule Performance	Transit Management

American Society for Testing and Materials (ASTM) [ASTM E2468-05]

SDO: ASTM

Source Entity	Flow Name	Destination Entity
Archived Data Management Subsystem	Archived Data Products	Transit Management

Advanced Traveler Information Systems General Use Standards Group [ATIS General Use]

SDO: Society of Automotive Engineers (SAE)

Source Entity	Flow Name	Destination Entity
Personal Information Access	Transit Information User Request	Transit Management
Transit Management	Personal Transit Information	Personal Information Access
	Transit Fare Information	Remote Traveler Support
	Transit Traveler Information	Remote Traveler Support

Incident Management Standards Group [IEEE IM]

SDO: Institute of Electrical and Electronics Engineers (IEEE)

Source Entity	Flow Name	Destination Entity
Emergency Management	Incident Information	Maintenance and Construction Management
	Incident Information for Media	Media
	Maintenance and Construction Request	Maintenance and Construction Management
Maintenance and Construction Management	Incident Information	Emergency Management
	Incident Information	Traffic Management

Institute of Transportation Engineers (ITE) Traffic Management Data Dictionary (TMDD) [ITE TMDD 2.1]

SDO: American Association of State Highway and Transportation Officials (AASHTO),
Institute of Transportation Engineers (ITE)

Source Entity	Flow Name	Destination Entity
Maintenance and Construction Management	Incident Information	Traffic Management
Media	External reports	Traffic Management
Traffic Management	Field Equipment Status	Maintenance and Construction Management
	Incident Information	Maintenance and Construction Management
	Road Network Conditions	Maintenance and Construction Management
	Road Network Conditions	Media

National Transportation Communications for ITS Protocol (NTCIP) Global Object Definitions [NTCIP 1201]

SDO: AASHTO, ITE, National Electrical Manufacturers Associations (NEMA)

Source Entity	Flow Name	Destination Entity
Emergency Management	Secure Area Surveillance Control	Security Monitoring Subsystem
Maintenance and Construction Management	Environmental Sensors Control	Roadway Subsystem
	Roadway Information System Data	Roadway Subsystem
Roadway Subsystem	Environmental Sensors Control	Maintenance and Construction Management
	Field Device Status	Maintenance and Construction Management
	Roadway Information System Status	Maintenance and Construction Management
	Traffic Flow	Traffic Management
	Traffic Images	Maintenance and Construction Management
Security Monitoring Subsystem	Secure Area Surveillance Data	Emergency Management
	Traffic Images	Traffic Management
Traffic Management	Video Surveillance Control	Roadway Subsystem

NTCIP Object Definitions for Dynamic Message Signs [NTCIP 1203]

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Maintenance and Construction Management	Roadway Information System Data	Roadway Subsystem

NTCIP Object Definitions for Environmental Sensor Stations and Roadside Weather Information System [NTCIP 1204]

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Roadway Subsystem	Roadway Information System Status	Roadway Subsystem
Maintenance and Construction Management	Environmental Sensors Control	Roadway Subsystem

NTCIP Object Definitions for Closed Circuit Television Camera Control Standard Activity [NTCIP 1205]

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Roadway Subsystem	Traffic Images	Maintenance and Construction Management
	Traffic Images	Traffic Management
Security Monitoring Subsystem	Secure Area Surveillance Data	Emergency Management
Traffic Management	Video Surveillance Control	Roadway Subsystem
Emergency Management	Secure Area Surveillance Control	Security Monitoring Subsystem

NTCIP Object Definitions for Closed Circuit Television Switching Standard Activity [NTCIP 1208]

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Emergency Management	Secure Area Surveillance Control	Security Monitoring Subsystem
Roadway Subsystem	Traffic Images	Maintenance and Construction Management
	Traffic Images	Traffic Management
Security Monitoring Subsystem	Secure Area Surveillance Data	Emergency Management
Traffic Management	Video Surveillance Control	Roadway Subsystem

NTCIP Transportation System Sensor Objects [NTCIP 1209]

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Roadway Subsystem	Traffic Flow	Traffic Management

NTCIP Center to Field Standard Group (NTCIP C2F)

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Emergency Management	Secure Area Sensor Control	Security Monitoring Subsystem
	Secure Area Surveillance Control	Security Monitoring Subsystem
Maintenance and Construction Management	Environmental Sensors Control	Roadway Subsystem
	Roadway Information System Data	Roadway Subsystem
Roadway Subsystem	Environmental Sesor Data	Maintenance and Construction Management
	Field Device Status	Maintenance and Construction Management
	Roadway Information System Status	Maintenance and Construction Management
	Traffic Flow	Traffic Management
	Traffic Images	Maintenance and Construction Management
Security Monitoring Subsystem	Infrastructure Monitoring Sensor Data	Emergency Management
	Secure Area Surveillance Data	Emergency Management
Traffic Management	Video Surveillance Control	Roadway Subsystem

NTCIP Center to Center Standards Group (NTCIP C2C)

SDO: AASHTO, ITE, NEMA

Source Entity	Flow Name	Destination Entity
Archived Data Management Subsystem	Archived Data Products	Transit Management
Emergency Management	Incident Information	Maintenance and Construction Management
	Incident Information for media	Media
	Maintenance and Construction Requests	Maintenance and Construction Management
Maintenance and Construction Management	Current Asset Restrictions	Traffic Management
	Equipment Maintenance Status	Traffic Management
	Incident Information	Emergency Management
	Incident Information	Traffic Management
	Maintenance and Construction Response	Traffic Management
	Maintenance and Construction Work Plans	Media
	Maintenance and Construction Work Plans	Traffic Management
	Maintenance and Construction Work Plans	Transit Management
	Roadway Maintenance Status	Emergency Management
	Roadway Maintenance Status	Other Maintenance and Construction Management
	Roadway Maintenance Status	Transit Management
	Work Plan Coordination	Other Maintenance and Construction Management
	Work Zone Information	Media
	Work Zone Information	Other Maintenance and Construction Management
	Work Zone Information	Traffic Management
Media	External Reports	Traffic Management
Other Maintenance and Construction Management	Roadway Maintenance Status	Maintenance and Construction Management
	Work Plan Coordination	Maintenance and Construction Management
	Work Zone Information	Maintenance and Construction Management
Traffic Management	Field Equipment Status	Maintenance and Construction Management
	Incident Information	Maintenance and Construction Management
	Maintenance and Construction Requests	Maintenance and Construction Management
	Road Network Conditions	Maintenance and Construction Management
	Road Network Conditions	Media
Transit Management	Work Plan Feedback	Maintenance and Construction Management
	Work Plan Feedback	Maintenance and Construction Management
Weather Service	Weather Information	Maintenance and Construction Management
	Weather Information	Traffic Management

XI. Regional Projects

It is important to identify the ITS projects in the region that are planned within the next five years. There exists a significant interest among stakeholders to implement ITS projects. Unfortunately, due to the lack of funding to implement ITS projects, it is not anticipated that any new projects will be implemented in the next five years. However, several stakeholders will continue to support existing ITS projects:

Public Transit Agencies

Bloomington Transit will continue to support its automatic vehicle locator (AVL) technology on some of its busses and security surveillance of its fleet maintenance yard, administrative building, and some of its busses.

Public Safety Agencies

Monroe County Emergency Management will continue to coordinate public safety agencies through the Comprehensive Emergency Management Plan for Monroe County and all individual public safety agencies are committed to assisting in disaster response and recovery, evacuation, and subsequent reentry. Bloomington's Police and Fire Departments will continue to use traffic signal pre-emption devices mounted in some of their vehicles. Indiana University Police will continue to support text messaging and email emergency notification.

Bloomington Maintenance and Construction

Bloomington Public Works will continue to support groundhog traffic counting units which provide real-time traffic counts and weather information to a central database, automate vehicle maintenance scheduling, use dynamic message signs in work zones, control signalized intersections, and share maintenance and construction information with other organizations.

INDOT Operations and Construction

INDOT will continue to use AVL technology in some of its vehicles, automate vehicle maintenance scheduling, collect road and weather condition data, use dynamic message signs and closed circuit television in work zones, control signalized intersections, and share maintenance and construction information with other organizations.

Monroe County Maintenance and Construction

Monroe County will continue to automate vehicle maintenance scheduling, monitor speeds in work zones, control signalized intersections, and share maintenance and construction information with other organizations.

XII. Agreements

There exists a strong level of coordination and cooperation among the different stakeholders within Bloomington, Ellettsville, and Monroe County. Monroe County Emergency Management supports the network of communication among public safety agencies while the MPO Committees represent the interests of the transportation network. However, the majority of agreements are not formalized but rather mutual understandings that coordination and cooperation are required to provide safe and efficient transportation within the metropolitan planning area. As outlined above and in the regional architecture, many flows currently exist before this formal ITS Architecture was implemented illustrating that the relationship among different stakeholders has long been established.

The only notable agreements that exist are those outlined in the Comprehensive Emergency Management Plan. The Comprehensive Emergency Management Plan provides Monroe County the basis for a systematic approach to the resolution of problems created by the threat or occurrence of significant emergencies or disasters. It identifies the responsibilities, functions, operational tasks and the working relationships within and between the various governmental entities and their various departments and agencies, private support organizations, and private citizens.

XIII. Implementation of the Regional Architecture

The Bloomington Monroe County Metropolitan Planning Organization's Regional ITS Architecture is a significant transportation planning document. It will be used as a key reference in the transportation planning process and the allocation of resources. The architecture will be used to ensure all proposed ITS projects are consistent with the regional ITS architecture and additional integration opportunities are considered, leading to more efficient implementations.

It should be noted that this document is not intended to compel any identified stakeholder to implement an ITS project in any given time. Instead, the Regional ITS Architecture is meant to provide stakeholders an opportunity to implement ITS projects that are consistent with the Architecture when funds and buy-in are garnered.

XIV. Maintenance of the Regional Architecture

The Bloomington Monroe County Metropolitan Planning Organization will assume the responsibility of maintaining the Regional ITS Architecture. Any maintenance and updates that are required to be done to the architecture will be done through coordination and consensus with stakeholders.

It is anticipated that a complete review and update of the regional architecture will be conducted at five year intervals. At such time, stakeholders will be engaged and a new ITS Architecture will be presented to each of the Advisory Committees for review and comment and the Policy Committee for their adoption.

However, modifications to the architecture will need to be made periodically to reflect new opportunities. The various reasons for updates within the five year intervals include, but are not limited to, new projects, project implementation, additional stakeholders, new technology, additional needs in the region, changes to the National ITS architecture, and changes in the planning process.

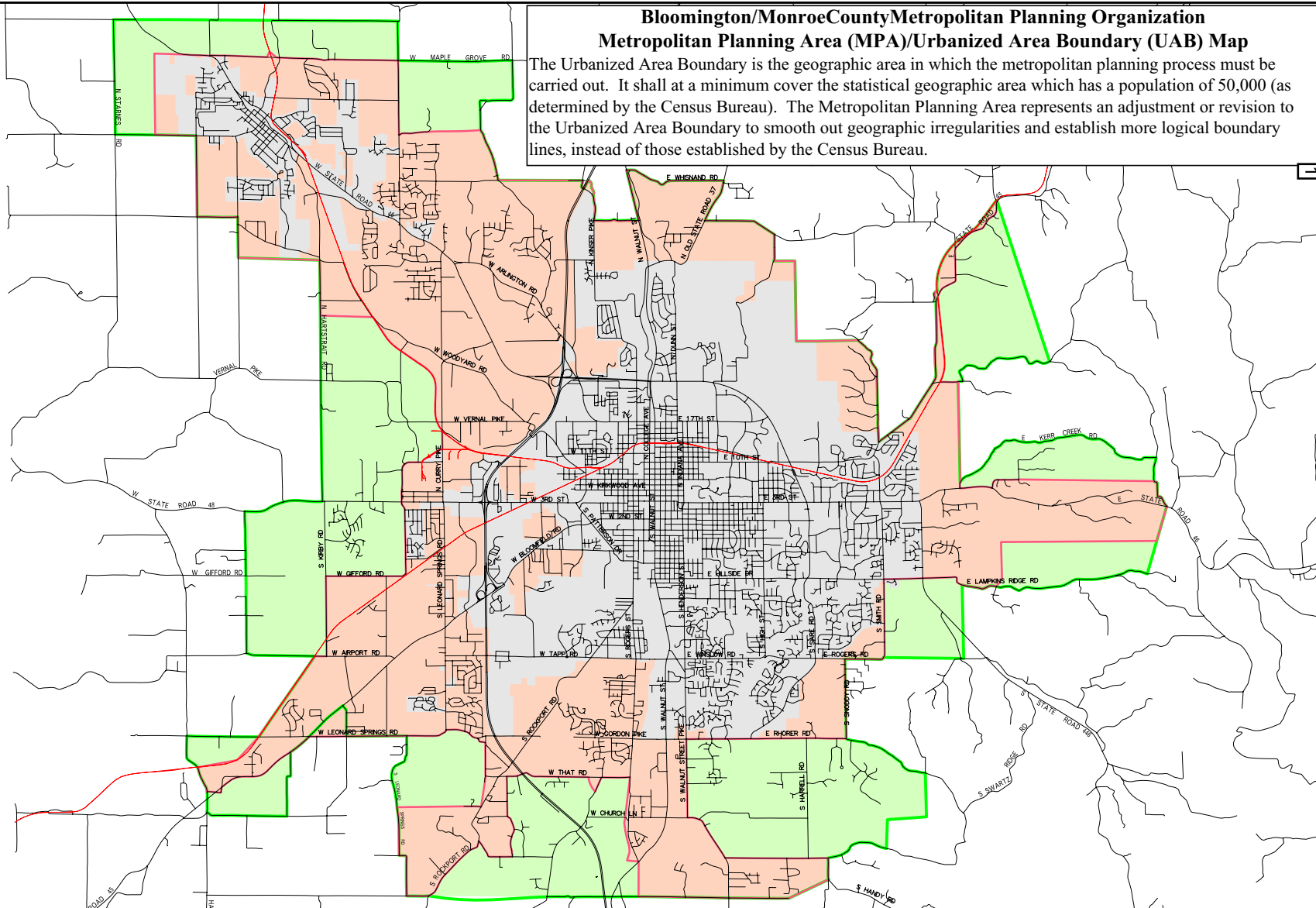
Since maintenance of the Regional ITS Architecture is ongoing and dynamic, the current Architecture and its complimentary database will be maintained administratively so that changes can be made quickly in response to needs that may arise. Since the Transportation Improvement Program or the Unified Planning Work Program would need to identify an ITS project before its implementation, there is assurance that ITS projects will not get implemented unknowingly.

The most up-to-date version of this document will also be made available on the web (www.bloomington.in.gov/mpo), the City of Bloomington Planning Department, and the Indiana Room of the Monroe County Public Library Main Branch.

Appendix A

Acronym List

AASHTO	American Association of State Highway and Transportation Officials
APTA	American Public Transportation Association
APTS	Advanced Public Transportation System
ASTM	American Society for Testing and Materials
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Locator
BMCMPO	Bloomington/Monroe County Metropolitan Planning Organization (also MPO)
CCTV	Closed Circuit Television
DMS	Dynamic Message Signs
EM	Emergency Management Subsystem
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
IEEE	Institute of Electrical and Electronics Engineers
IM	Incident Management Standards Group
INDOT	Indiana Department of Transportation
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
MC	Maintenance and Construction Subsystem
MPA	Metropolitan Planning Area
MPO	Metropolitan Planning Organization (used synonymously with BMCMPO)
NEMA	National Electrical Manufacturers Associations
NTCIP	National Transportation Communications for ITS Protocol
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Affordable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SDO	Standards Development Organizations
TEA-21	Transportation Equity Act for the 21 st Century
TCIP	Transit Communications Interface Protocol
TIP	Transportation Improvement Program
TMDD	Traffic Management Data Dictionary
UAB	Urbanized Area Boundary
UPWP	Unified Planning Work Program
USDOT	United States Department of Transportation



**Bloomington/Monroe County Metropolitan Planning Organization
Metropolitan Planning Area (MPA)/Urbanized Area Boundary (UAB) Map**

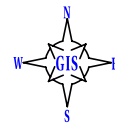
The Urbanized Area Boundary is the geographic area in which the metropolitan planning process must be carried out. It shall at a minimum cover the statistical geographic area which has a population of 50,000 (as determined by the Census Bureau). The Metropolitan Planning Area represents an adjustment or revision to the Urbanized Area Boundary to smooth out geographic irregularities and establish more logical boundary lines, instead of those established by the Census Bureau.



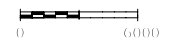
City of
Bloomington

- 2000 MPA
- 2000 UAB
- Incorporated Areas

Feb 13, 2007



Scale: 1" = 6000'



This map was produced by the City of Bloomington GIS for use as map information only. Map is NOT warranted.

Tmpopa05pB



Bloomington/Monroe County Metropolitan Planning Organization

ADOPTION RESOLUTION FY 2009-04

RESOLUTION ADOPTING A REGIONAL INTELLIGENT TRANSPORTATION SYSTEMS ARCHITECTURE as presented to the Policy Committee of the Bloomington/Monroe County Metropolitan Planning Organization (MPO) on September 12, 2008.

WHEREAS, the Bloomington/Monroe County Metropolitan Planning Organization (MPO) is the organization designated by the Governor of Indiana as the Metropolitan Planning Organization responsible for carrying out, with the State of Indiana, the provisions of 23 U.S.C. 134, and capable of meeting the requirements thereof for the Bloomington, Indiana urbanized area; and

WHEREAS, development of a Regional Intelligent Transportation Systems (ITS) Architecture has been mandated in national transportation legislation in an effort to integrate technological solutions into the transportation network to alleviate congestion and improve safety and efficiency; and

WHEREAS, the Technical Advisory Committee recommended adoption of the draft regional ITS architecture at their meeting on August 22, 2008 as did the Citizens Advisory Committee on August 27, 2008.

NOW, THEREFORE, BE IT RESOLVED:

- (1) That the Bloomington/Monroe County Metropolitan Planning Organization hereby adopts a Regional Intelligent Transportation Systems Architecture for the Bloomington urbanized area; and
- (2) That the adopted guidelines shall be forwarded to all relevant public officials and government agencies, and shall be available for public inspection during regular business hours at the City of Bloomington Planning Department, located in the Showers Center City Hall at 401 North Morton Street, Bloomington, Indiana.

PASSED AND ADOPTED by the Policy Committee by a vote of 8 - 0, upon this 12th day of September, 2008.

Kent McDaniel
Chair, Policy Committee
Bloomington/Monroe County MPO

Attest: Josh Desmond
Director
Bloomington/Monroe County MPO