MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Maryland its architecture

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From Legacy Frameworks to Living Architectures

Istiak Bhuyan
Alvin Marquess
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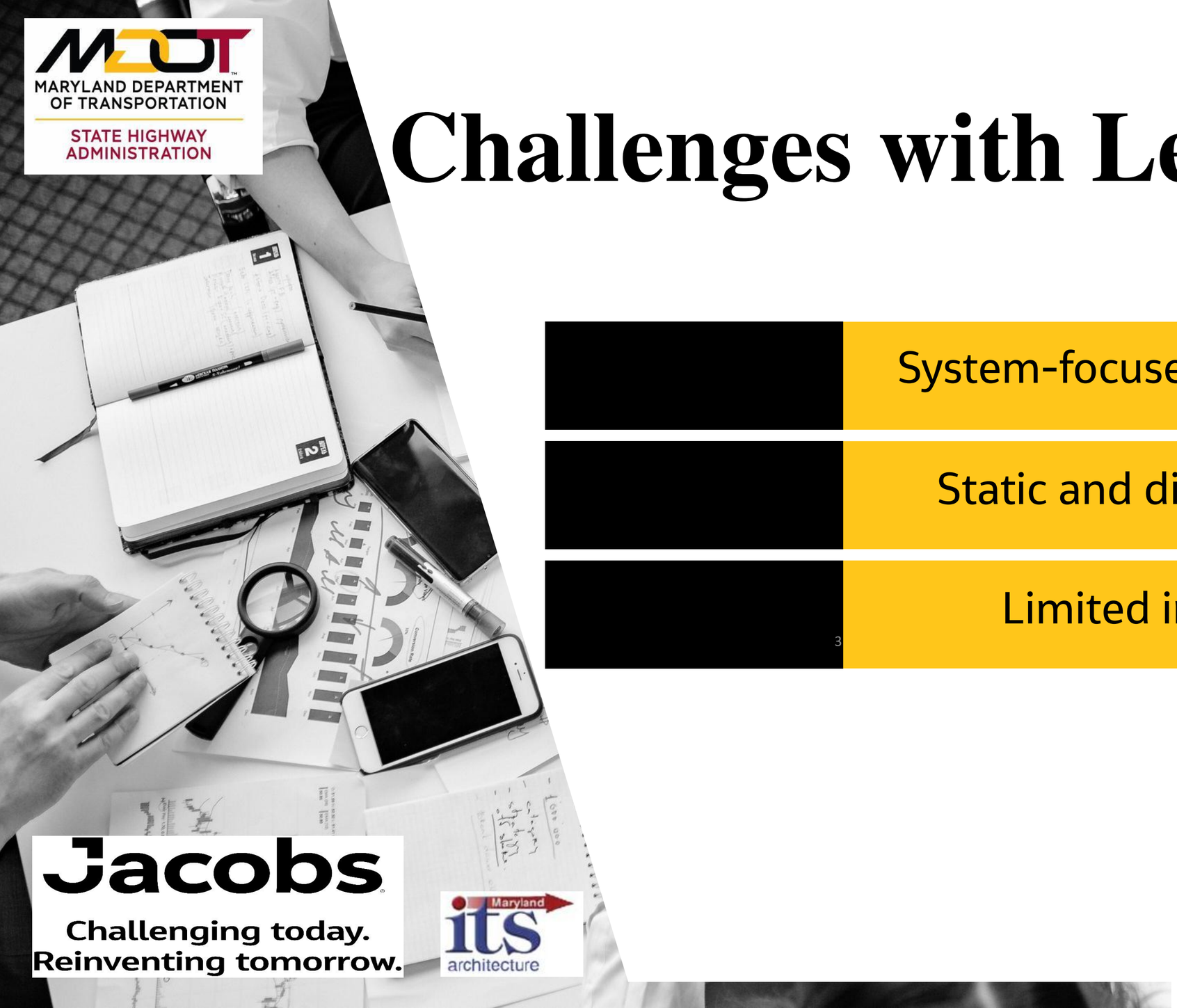
Maryland's Statewide ITS Architecture

The Maryland's Statewide ITS Architecture is a roadmap for transportation systems integration for the state.

The USDOT developed the National ITS Architecture to ensure that intelligent transportation systems deployed around the country can communicate with one another and share information to maximize the return on investment in ITS.

Development of the Regional ITS Architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning.



Challenges with Legacy Systems

- System-focused, not data-focused
- Static and difficult to maintain
- Limited interoperability

Challenges with Legacy Systems

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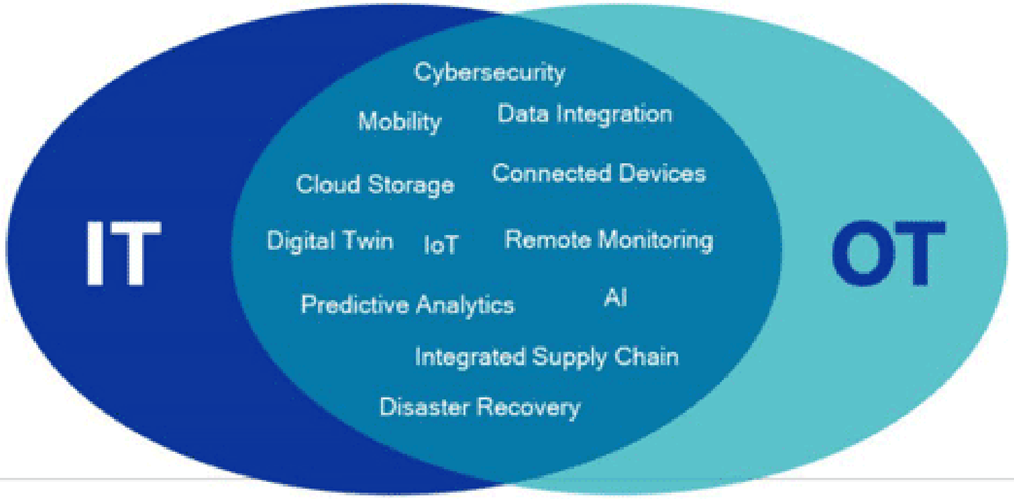
The Past

The Future



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The Road Map

Data-Centric | Interoperable | Future-Ready

01

The architecture is developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region

02

2025 ITS Architecture updates the 2016 Statewide ITS Architecture for the State of Maryland

03

It identifies existing and planned ITS projects for the state and the projects associated with the architecture “elements.”

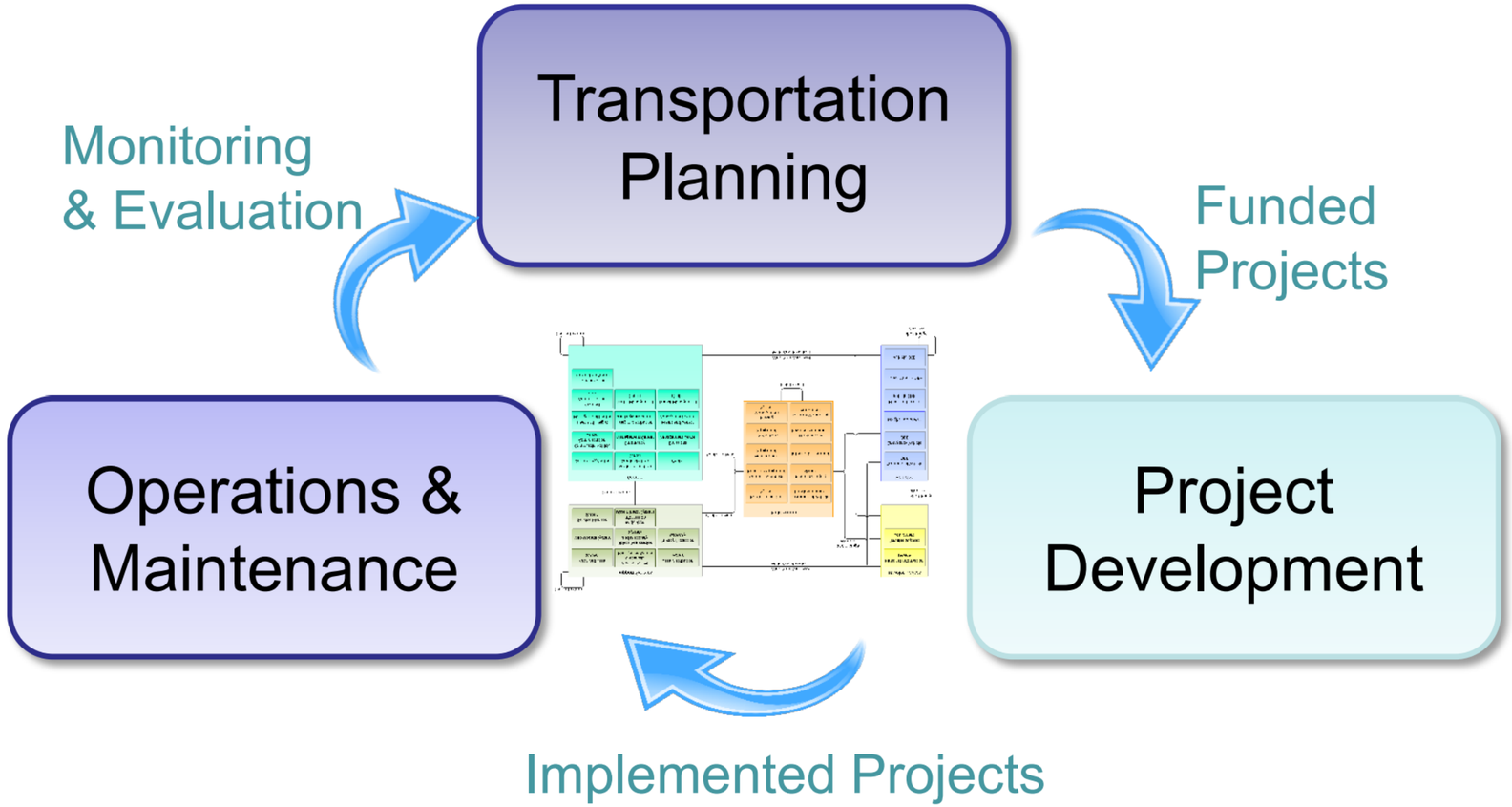
04

It defines the relationships among the elements and how information flows between the elements.

05

The updated 2025 MD Statewide ITS Architecture presents an ITS “operational concept” and identifies key ITS stakeholders and agreements.

Data-Centric | Interoperable | Future-Ready



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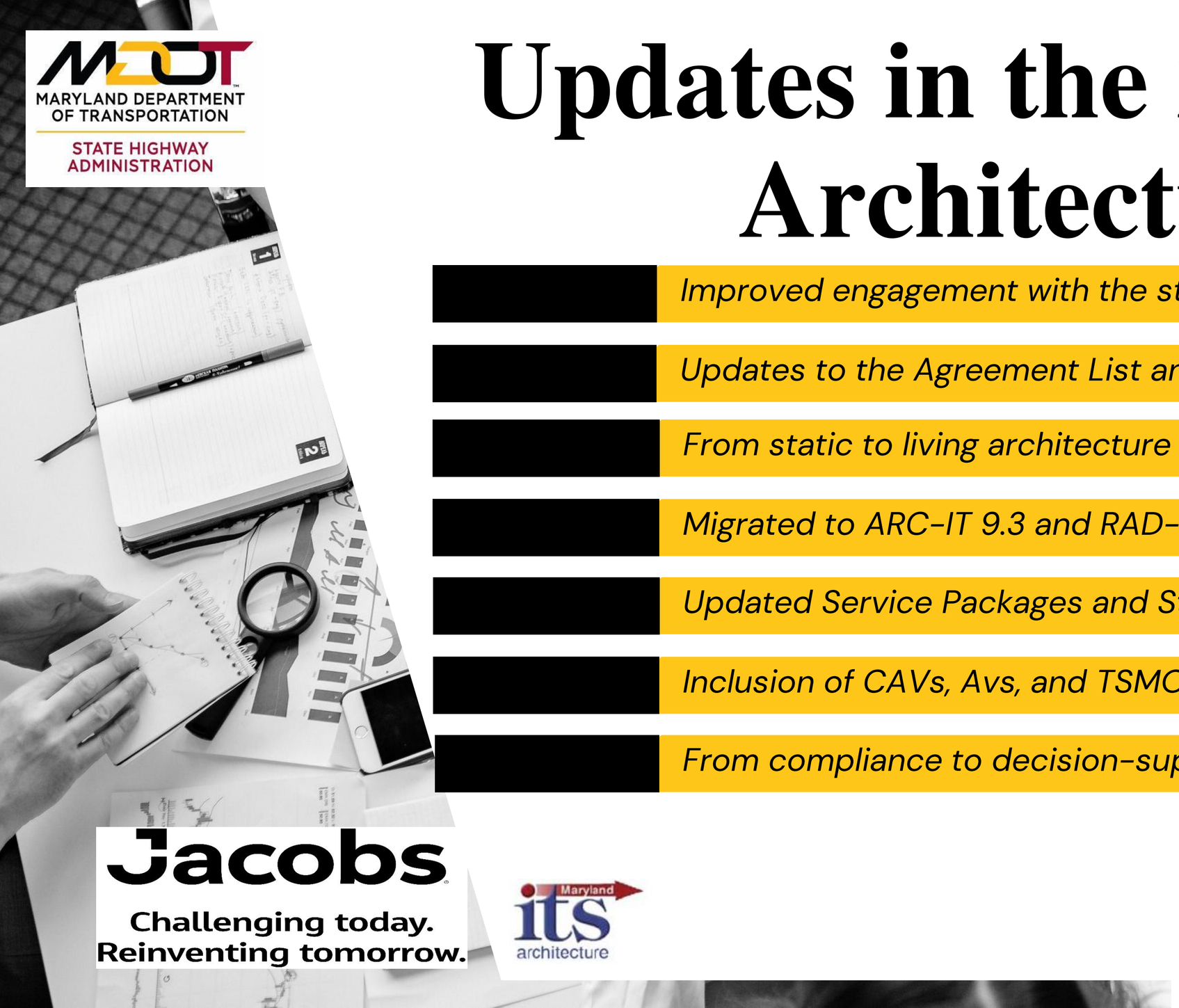
Updates in the 2025 ITS Architecture

- *Improved engagement with the stakeholders*
- *Updates to the Agreement List and Projects Inventory*
- *From static to living architecture*
- *Migrated to ARC-IT 9.3 and RAD-IT 9.3*
- *Updated Service Packages and Standards*
- *Inclusion of CAVs, Avs, and TSMO*
- *From compliance to decision-support*



ITS Architecture Components

Section 1	ITS Architecture Conformity Statement
Section 2	Introduction
Section 3	Architecture Scope
Section 4	Architecture Components
Section 5	Statewide ITS Architecture

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Stakeholders

Additional Stakeholders include:

- Local Government Agencies
- MPO's
- Other State DOTs and Agencies
- Federal Agencies
- Partners
- Universities
- Private Sector Traveler Information and Transportation Companies
- Media Partners

Maryland State Agencies	Maryland Aviation Administration
	Maryland Coordination and Analysis Center
	Maryland Department of Emergency Management
	Maryland Department of the Environment
	Maryland Department of Transportation (MDOT)
	Maryland Institute for Emergency Medical Services Systems
	Maryland Motor Vehicle Administration
	Maryland Port Administration
	Maryland State Highway Administration District Offices
	Maryland State Highway Administration Motor Carrier Division
	Maryland State Highway Administration Office of Communications
	Maryland State Highway Administration Office of Maintenance
	Maryland State Highway Administration Office of Traffic and Safety
	Maryland State Highway Administration Office of Transportation Mobility and Operations (CHART)
	Maryland State Highway Administration Traffic Operations Division
	Maryland State Police
	Maryland Transit Administration
	Maryland Transportation Authority

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Agreements

Types of Agreements:

- Handshake Agreements
- Memorandum of Understandings
- Interagency Agreements
- Inter-government Agreements
- Operational Agreements
- Funding Agreements
- Master Agreements

Title	Status	Type of Agreement	Agencies	Description	Exp. Date
Police for the Liaison Officer					
Amendment I - Interagency Agreement Between MDOT SHA & MD Department of State Police for the Liaison Officer	Existing	Interagency Agreement	SHA & MSP	Agreement for the State Police Liaison Officer assigned to the SOC.	Agreement Term: FY 21 through FY 25
Cooperative Agreement by and between FHWA USDOT & MDOT	Existing	Intergovernmental Agreement	SHA & Federal Highway Administration (FHWA)	Rural Opportunities to Use Traffic Technology Enhancements (ROUTE) on US 50 Project)	Agreement Term: 1/11/24 – 4/11/30
BWI Electronic Sign Replacement Project MOA	Planned	Interagency Agreement	SHA & Maryland Aviation Administration	Planned project agreement for the replacement of Electronic Signs around the BWI airport.	Agreement Term: N/A
MOU Communications Tower and Shelter Shared Usage	Existing	Memorandum of Understanding	SHA & MSP	Agreement for the shared use of communications towers and shelters.	Agreement Term: 11/27/19 - 11/27/29
MOU for Coordination of Traffic Incident Management on Roadways Maintained by the SHA	Existing	Memorandum of Understanding	SHA & MSP	Terms under which MSP will provide tower and shelter space for SHA's CCTV video cameras and ITS devices on MSP premises.	Agreement Term: Indefinite (effective date – 8/13/15)
For Coordination of Traffic Incident Management on Roadways Maintained by the Maryland State	Existing	Memorandum of Understanding	SHA & MSP	Endorsement of the MD/MSP Clear the Road Policy, Delineation of Incident Scene Roles and Responsibilities, Establishment of	Initiated: July 31, 2015

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ITS Projects

Title	Type	Stakeholders	Description
2016 Not Marked Completed			
CHART Area-wide DMS Deployment Phase 5	Existing	SHA	Installation upgrade/replacement of DMS at selected locations.
CHART Arterial Cameras	Existing	SHA	Installation of CCTV cameras along US 1 between MD 100 and MD 32.
Connected/Autonomous Vehicles (CAV) Testbeds in Maryland	In Progress	MDOT	This project will facilitate the testing of private and commercial-type vehicles through CAV Testbeds in Maryland.
Deployment of Real-Time Parking Availability Information Systems at Key Metrorail or Other Publicly Owned Park-and-Ride Facilities	Planned	MDOT, WMATA	Following up on a WMATA study completed in 2009, deploy electronic systems that keep track of parking availability at key facilities and make this information available to commuters in a timely fashion. Estimated funding needed: $1million. This pilot project would follow up on the WMATA real time parking information study to perform real-time parking management at selected Metro stations by taking the parking lot information and identifying how many parking spaces are available at various locations. This information is then distributed to the public via Variable Message Signs (DMS) and traveler information outlets.
Deployment of Roadside Infrastructure to Support In-Vehicle Highway Hazard Alert	In Progress	SHA	LRSD Project 3.9.6.1. This project would include installation of roadside detectors, and short-range radio transmitters and antennas to detect hazardous traveling conditions and alert traveling vehicles via radio. Three (3) pilot sites at various locations, statewide (assume total number of 50 vehicles for all three pilot sites. Each site will require three side-fire detectors spaced at ¼ mile each, wireless communications, and vehicle-equipped radio hazard alert system.
Deployment of Roadside Infrastructure to Support In-Vehicle Highway Signage Systems	Planned	SHA	LSRDP Project 3.9.7.1. This project will include installation of short (medium and high frequencies between 1,800 and 30,000 kHz) and long-range (low frequency between 30-300kHz) radio transmitters along the sides of the highway to broadcast encoded radio signals to in-vehicle sign display systems in order to allow CHART to alert and advise motorists of upcoming roadway and traffic signage and conditions.
Deployment of Integrated Corridor Management	In Progress	SHA	Develop regional and corridor based multi-agency systems to share real-time traffic operations data with bus transit providers and real-time bus transit

Title	Type	Stakeholders	Description
Technologies on Significant Regional Corridors			information with traffic management entities supporting regional dat exchange to achieve coordinated management of key roadway corridor Estimated funding needed: $7 million.
Develop multi-jurisdictional Computer-Aided Dispatch (CAD) Operations Software to Integrate CAD and Incident Information from 911 and In-Vehicle System Centers through RITIS	In Progress	SHA/UMD CATT Lab	LRSDP 2.16.1.1. This project would develop a multi-jurisdictional CA Operations Software that can send, receive, and interpret dispatch requests an incident information sent through RITIS from internal and externa organizations (such as 911 Dispatch Centers) deployed to a incident/emergency location. CAD requests from external organizations will b sent to RITIS, which will subsequently and automatically create an externa event within the CHART system for incident responders to act. The CAD modul will use the Incident Management module (Project 1.16.3.4 in the 2008 NCDP to automatically exchange dispatch information with internal and externa organizations.
Develop Software for In-Vehicle Traveler Information	In Progress	SHA	LRSDP 3.16.2.2 Develop software to send traveler information to in-vehicl traveler information systems. The Traveler In formation module will generat information for the in-vehicle traveler information system tailored to th location of the vehicle. Device drivers will be added to the CHART system t program the transmitters needed to communicate with the in-vehicle travele information systems.
Eastern Shore DMS	In Progress	SHA	Installation of DMS along Lower Eastern Shore of Ocean City.
Enhance Regional Integrated Transportation Information System (RITIS) Capabilities for Intermodal Transportation Operations Data Sharing	Existing	SHA, UMD, WMATA, & Local Transit	Develop a regional system to share real-time traffic operations data with bu transit providers and real-time bus transit information with traffic managemer entities to achieve coordinated and synergistic transportation management c key roadway corridors. Activities include systems engineering for multi-mode coordination data sharing, and real time export of bus data (includin automated vehicle location data) from WMATA and local transit buses for us in overall traffic management. Estimated funding needed $1 million. Implement real-time export of automated vehicle location (AVL) data from (A WMATA buses, and (B) local transit buses via transit management centers t the necessary traffic management center(s)
I-270 Advance Traffic Management	In Progress	SHA	Proposed installation of lane controls, hard running shoulders, or ramp metering, etc., to improve mobility on I 270.

Currently 249 of planned ITS Projects

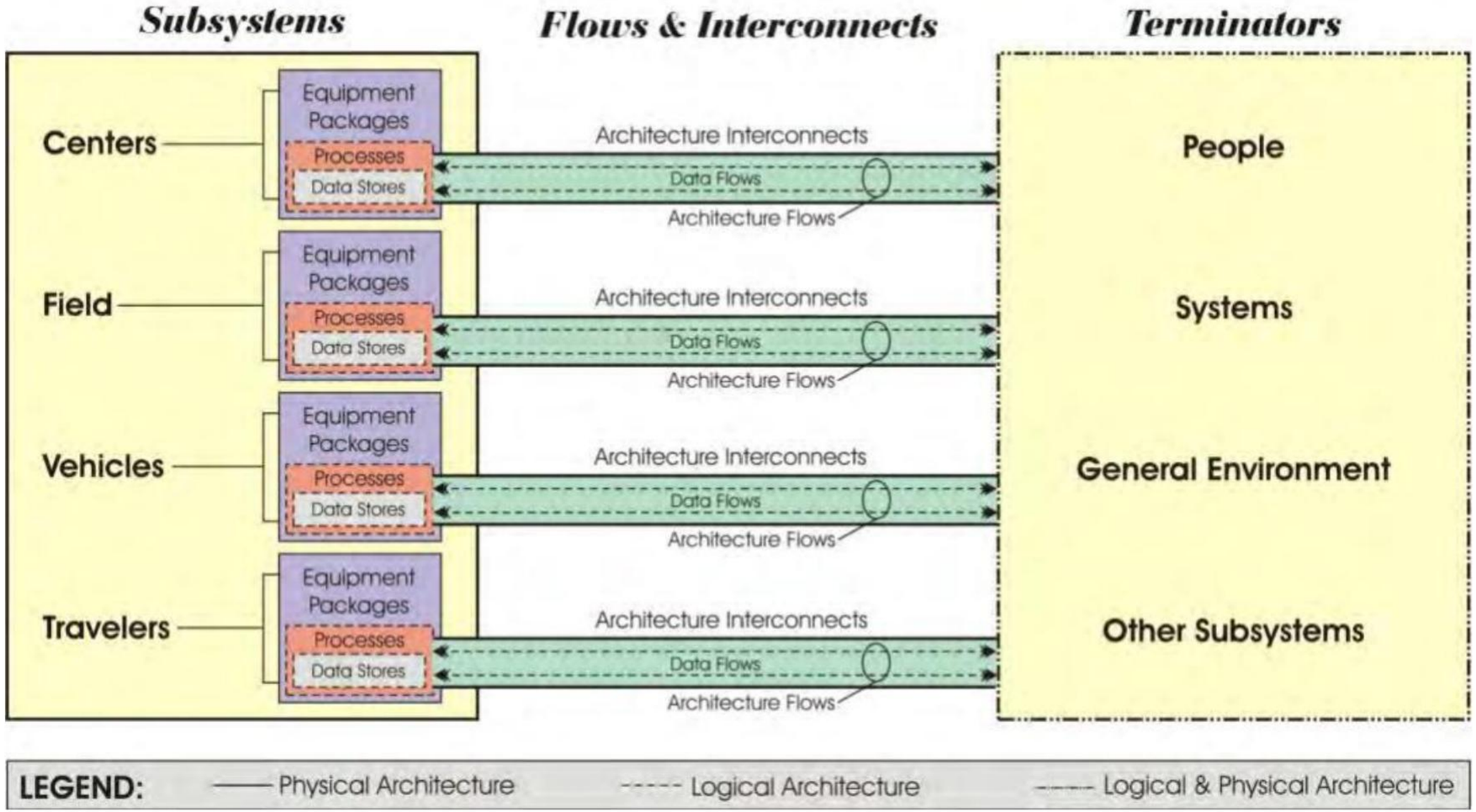
Transformation Approach

- From static to living architecture
- From siloed to interoperable systems
- From compliance to decision-support
- Focus on data flows and governance
- Integration of probe and third-party data
- Supports analytics and decision-making

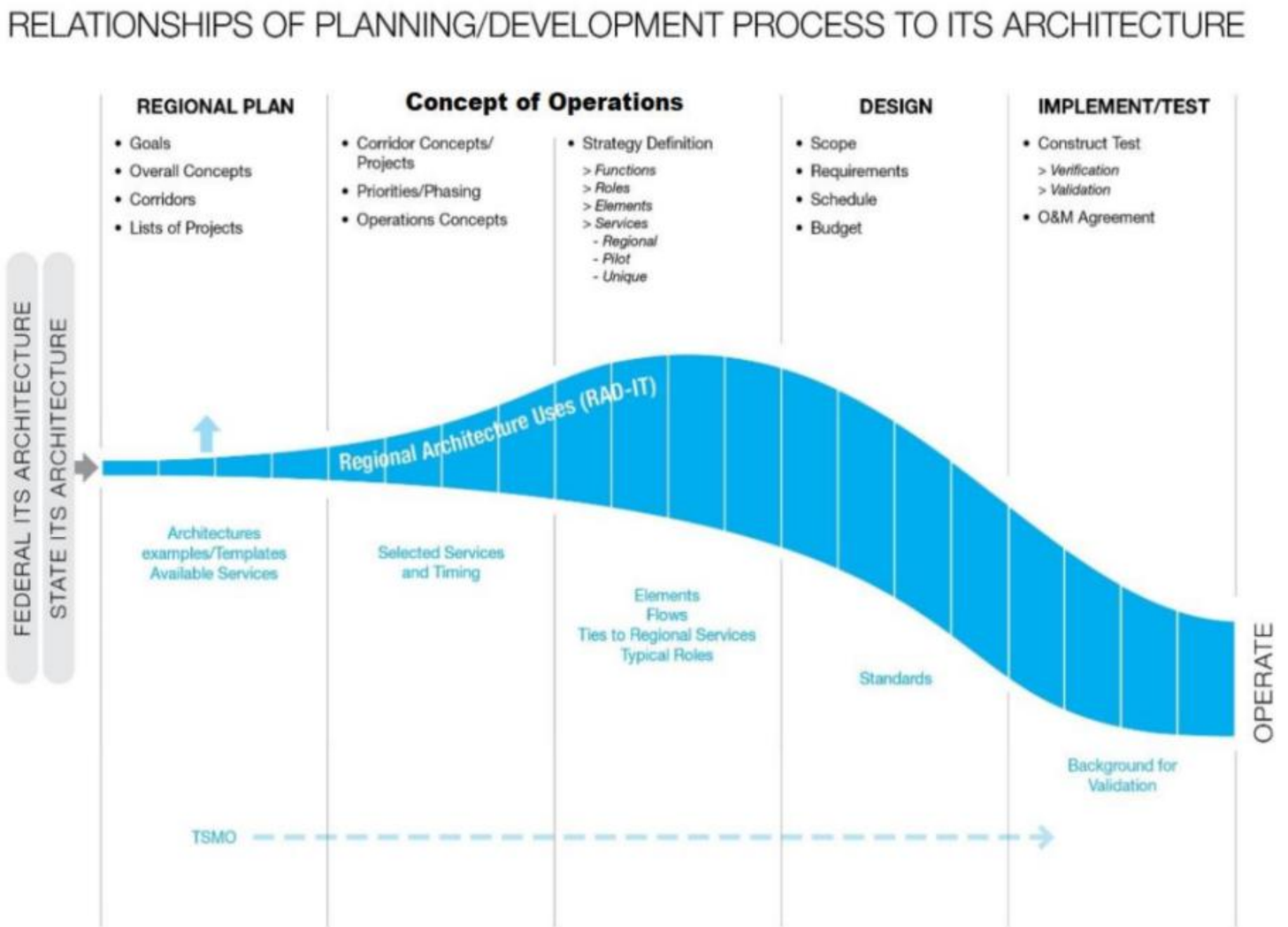
ITS Data Ecosystem

- ❑ Data Sources → Platforms → Applications → Outcomes
- ❑ Includes DOT, private data, and cloud systems
- ❑ Supports dashboards and analytics
- ❑ Supports V2X integration
- ❑ Future-compatible system design
- ❑ Scalable for emerging technologies

ITS Data Ecosystem

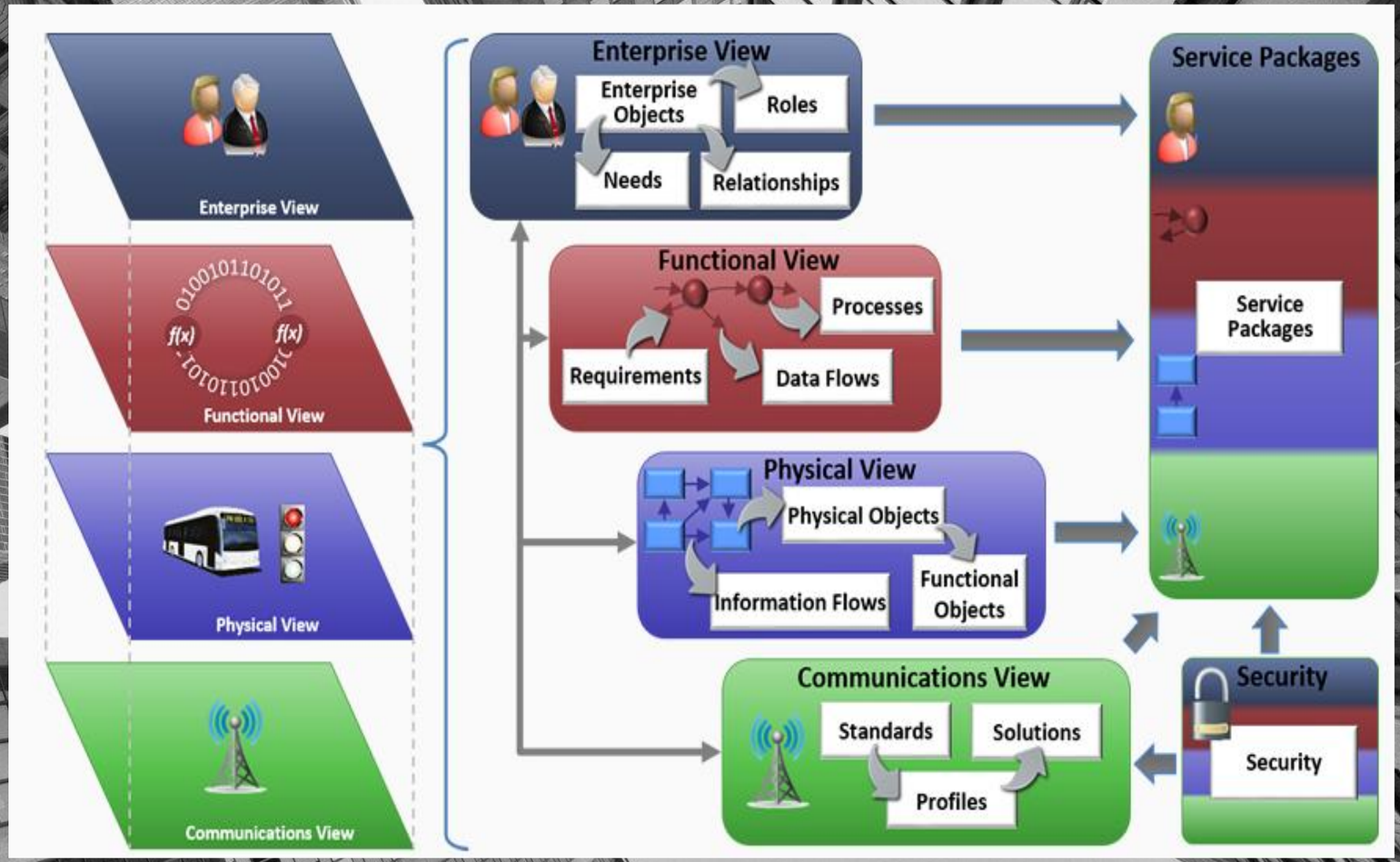


Strategic Implementation and Systems Engineering approach



Architecture Components

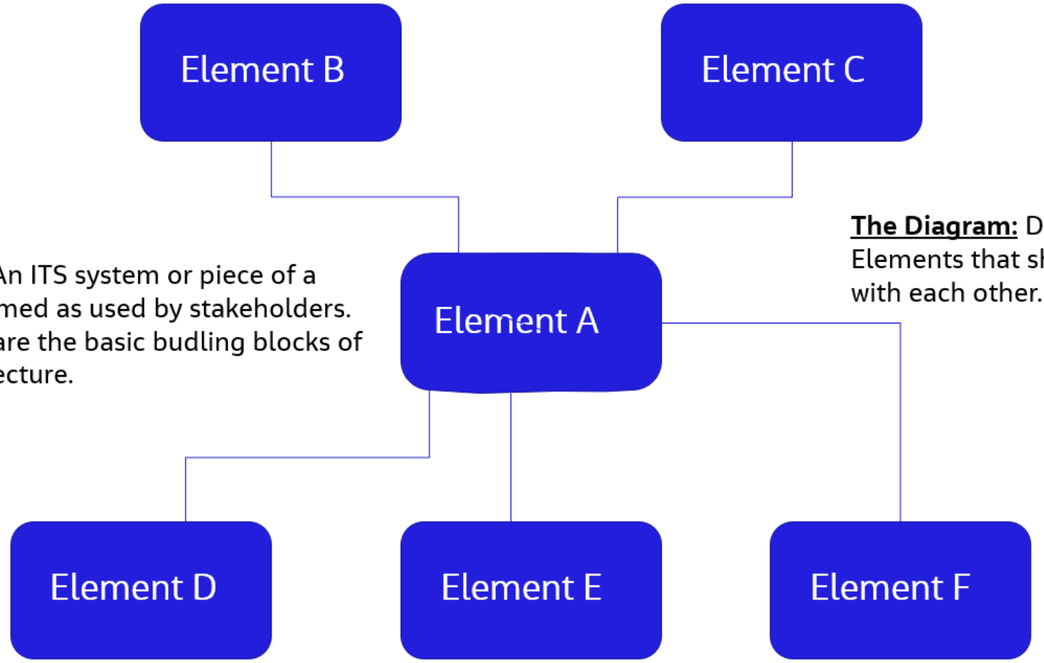
BUILDING BLOCKS



Architecture Components

ITS ELEMENTS

Interconnect Diagrams



Element: An ITS system or piece of a system named as used by stakeholders. Elements are the basic budling blocks of the Architecture.

The Diagram: Displays the Elements that share information with each other.

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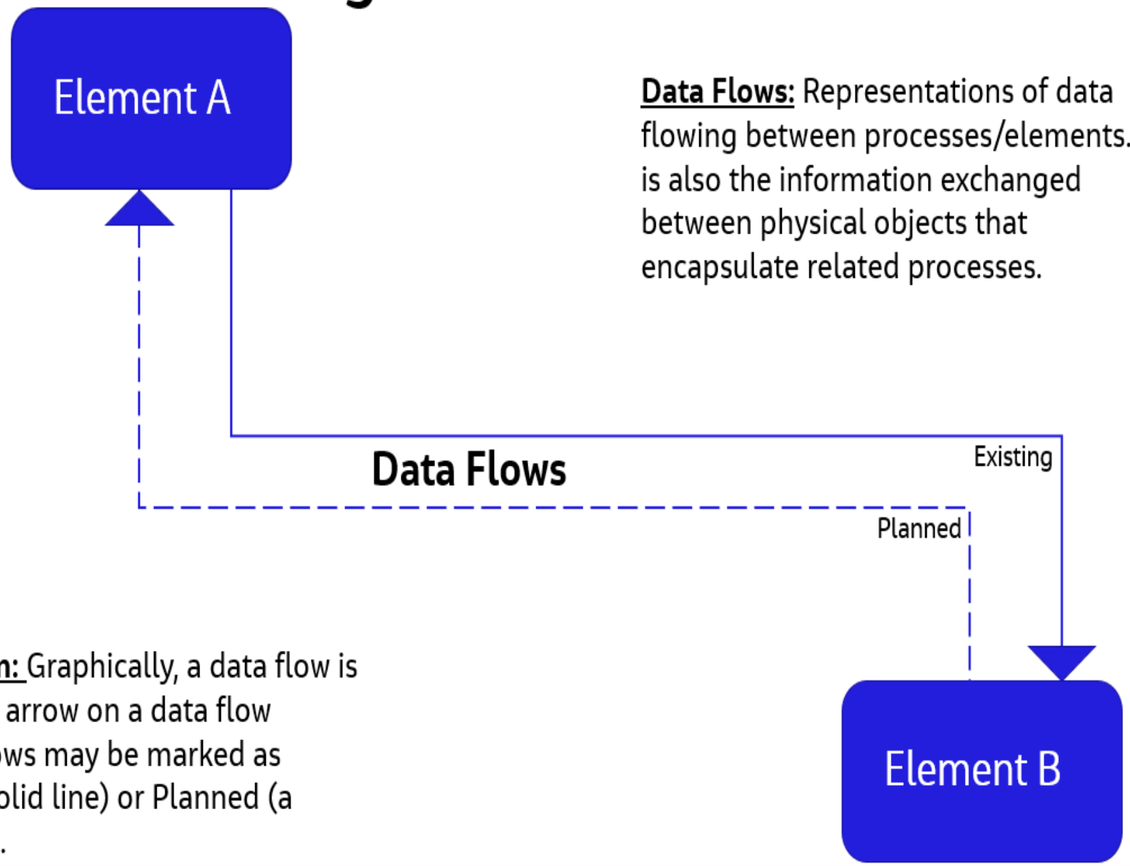
ITS Architecture Diagrams

Information Flow Diagrams



Data Flows: Representations of data flowing between processes/elements. It is also the information exchanged between physical objects that encapsulate related processes.

The Diagram: Graphically, a data flow is shown as an arrow on a data flow diagram. Flows may be marked as Existing (a solid line) or Planned (a dashed line).

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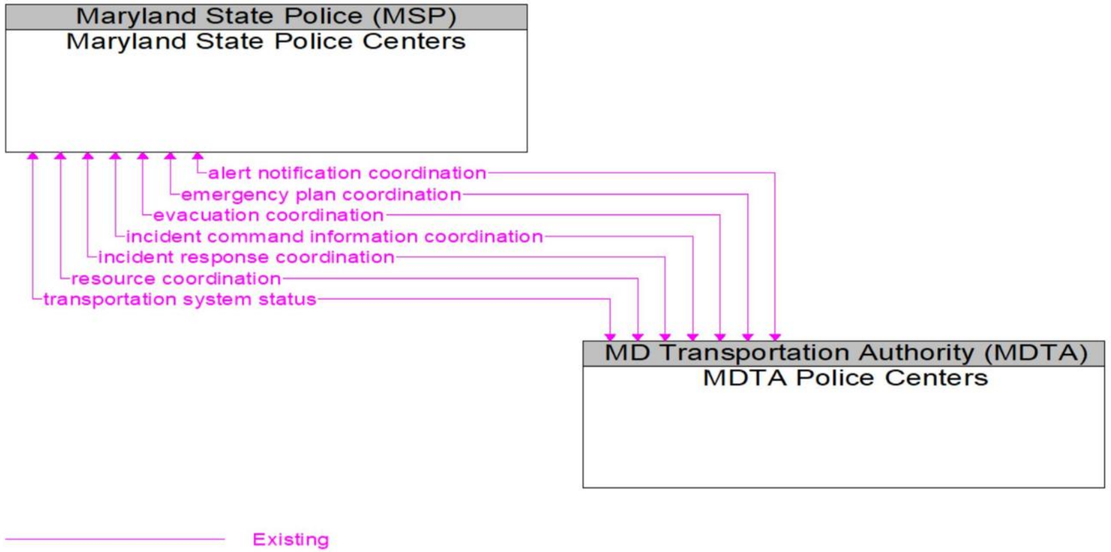
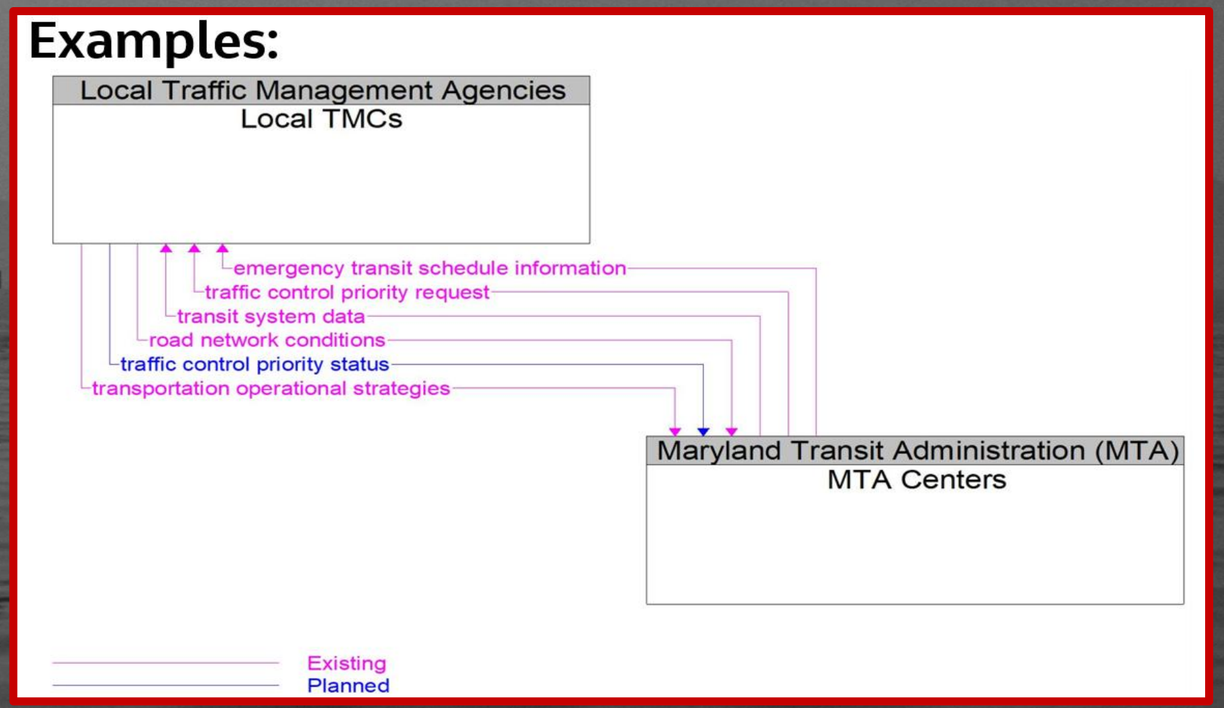
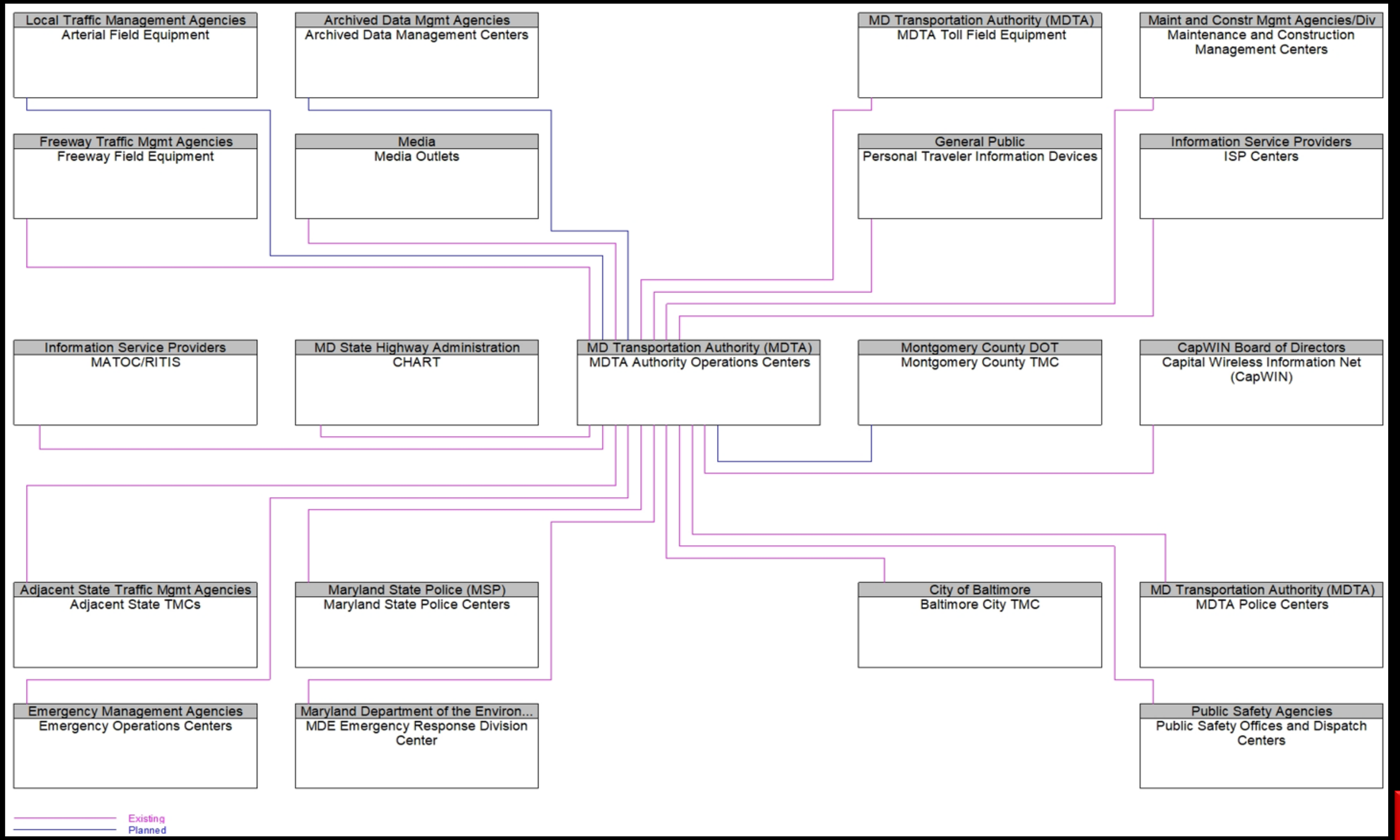
Examples

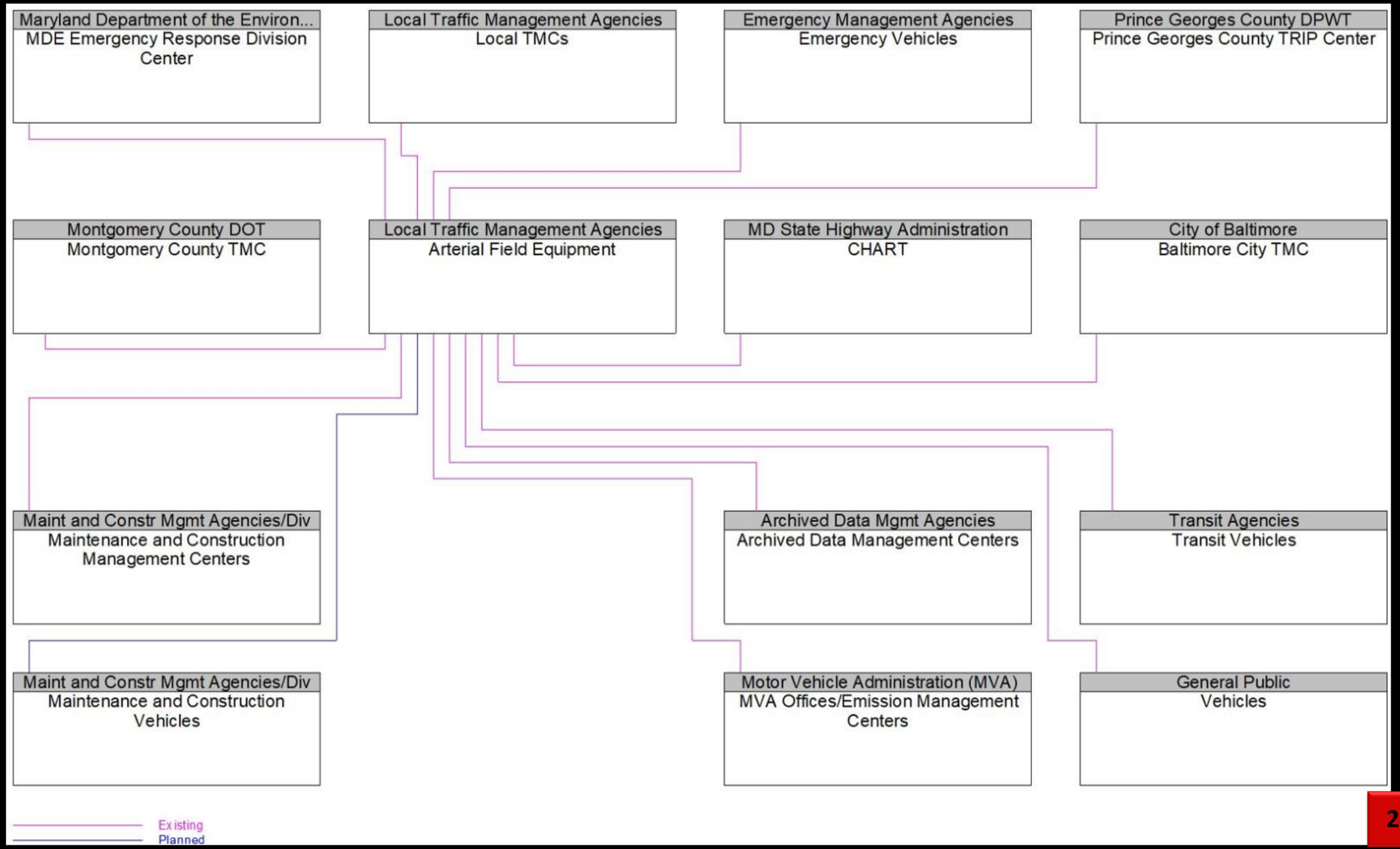
Examples:



Examples:




Local Traffic Management Agencies
Arterial Field Equipment
Archived Data Mgmt Agencies
Archived Data Management Centers
MD Transportation Authority (MDTA)
MDTA Toll Field Equipment
Maint and Constr Mgmt Agencies/Div
Maintenance and Construction Management Centers
Freeway Traffic Mgmt Agencies
Freeway Field Equipment
Media
Media Outlets
General Public
Personal Traveler Information Devices
Information Service Providers
ISP Centers
Information Service Providers
MATOC/RITIS
MD State Highway Administration
CHART
MD Transportation Authority (MDTA)
MDTA Authority Operations Centers
Montgomery County DOT
Montgomery County TMC
CapWIN Board of Directors
Capital Wireless Information Net (CapWIN)
Adjacent State Traffic Mgmt Agencies
Adjacent State TMCs
Maryland State Police (MSP)
Maryland State Police Centers
City of Baltimore
Baltimore City TMC
MD Transportation Authority (MDTA)
MDTA Police Centers
Emergency Management Agencies
Emergency Operations Centers
Maryland Department of the Environ...
MDE Emergency Response Division Center
Public Safety Agencies
Public Safety Offices and Dispatch Centers
Existing
Planned


Maryland Department of the Environ...
MDE Emergency Response Division Center
Local Traffic Management Agencies
Local TMCs
Emergency Management Agencies
Emergency Vehicles
Prince Georges County DPWT
Prince Georges County TRIP Center
Montgomery County DOT
Montgomery County TMC
Local Traffic Management Agencies
Arterial Field Equipment
MD State Highway Administration
CHART
City of Baltimore
Baltimore City TMC
Maint and Constr Mgmt Agencies/Div
Maintenance and Construction Management Centers
Archived Data Mgmt Agencies
Archived Data Management Centers
Transit Agencies
Transit Vehicles
Maint and Constr Mgmt Agencies/Div
Maintenance and Construction Vehicles
Motor Vehicle Administration (MVA)
MVA Offices/Emission Management Centers
General Public
Vehicles
Existing
Planned

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Maryland's ITS Inventory

	DMS	HAR	SHAZAM	Traffic Sensors	CCTV
Allegany County	5	1	2	-	10
Anne Arundel County	42	3	-	26	75
Baltimore City	65	-	-	13	178
Baltimore County	51	-	-	69	105
Calvert County	-	-	-	-	2
Caroline County	2	-	-	1	2
Carroll County	-	-	-	-	0
Cecil County	13	2	1	-	25
Charles County	2	1	-	-	13
Dorchester County	-	1	1	-	2
Frederick County	6	-	-	13	15
Garrett County	2	-	-	-	8
Harford County	14	1	1	-	27
Howard County	21	-	-	25	39
Kent County	-	-	-	1	1
Montgomery County	38	4	3	72	239
Prince George's County	33	1	2	103	73
Queen Anne's County	9	3	4	20	23
St Mary's County	-	-	-	-	6
Somerset County	-	-	-	-	1
Talbot County	1	-	1	1	5
Washington County	3	2	3	1	14
Wicomico County	2	1	2	5	6
Worcester County	6	1	2	4	9
Statewide	288	21	22	354	866

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Proposed TSMO ITS Assets

ITS Device Type	Count
CCTV	292
Detectors	284
DMS	31
RSU	282
Weather Sensors	9
Weigh Station	22
Grand Total	920

How to Access the Maryland Statewide ITS Architecture?

An electronic version of the Maryland Statewide ITS Architecture document can be found on the ITS Maryland website (www.itsmd.org) under the resources tab.

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Thank You

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