April 3, 2025

H-GAC ITS Architecture and Website Update

TSMO Subcommittee Meeting

What is an ITS Architecture

A plan for the **deployment**, **integration**, and **operation** of Intelligent Transportation Systems in a state or region

The plan includes **traffic**, **transit**, **tolling**, **public safety**, and **emergency management** agencies

The plan should be in developed in **coordination** with other **regional planning efforts** including the TxDOT Houston TSMO Program Plan, local ITS plans, and the H-GAC Regional Transportation Plan

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Why an ITS Architecture is Important?

All transportation projects that incorporate ITS elements and are funded through the Highway Trust Fund must conform with an ITS Architecture

An ITS Architectures can also…

- Assist with concept development and design of ITS projects

- Ensure regional interoperability

- Support future grant and other funding opportunities

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Project Goals

H-GAC ITS ARCHITECTURE AND WEBSITE UPDATE

1. Update the **existing H-GAC Regional ITS Architecture** to the current National ITS Architecture (Version 9.2)

2. Develop an ITS inventory software analysis tool that will **assist in transportation project prioritization**, benefit cost analysis, and economic impact analysis

3. Update and advance the existing Transportation Systems Management and Operations (TSMO) website

4. Create a **Geographic Information System (GIS) database of all ITS and signal fiber in the eight-county MPO**

5. Develop a standard method for collecting inventories and implementation plans from each stakeholder agency

6. Meet with all **eight counties and in the region (and cities)** to verify existing inventory and obtain plans for new ITS, signals, TMCs, and other deployments to be implemented over the next seven years

7. Meet with the **TxDOT Houston and Beaumont Districts** to inventory all existing ITS, signal, and tolling facilities and document their implementation plans for the next seven to 10 years

8. Determine which **cities will potentially surpass 50,000 residents** in the 2030 Census **and meet with them** to document their existing ITS and signal inventories and implementation plans leading up to 2030

9. Meet with all **Toll Authorities** in the MPO to inventory all existing ITS, signal, and tolling facilities and document the implementation plans for each for the next seven to 10 years

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Stakeholder Agencies Interviewed

H-GAC Counties	H-GAC Cities	Regional and State Agencies
Brazoria	Baytown	Harris County Toll Road Authority
Chambers	Galveston	Harris County Transit
Fort Bend	Houston	Houston Metro
Galveston	League City	Port Freeport
Harris	Missouri City	Port Houston
Montgomery	Pearland	TxDOT Beaumont District
Waller	Sugar Land	TxDOT Houston District
		The Woodlands Regional Transit Authority

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Regional ITS Architecture
Focus Areas

- **Commercial Vehicles** (Parking Availability, Signal Priority)

- **Data Management** (Data Warehouse)

- **Maintenance and Construction** (Closure Coordination and Information)

- **Parking Management** (Regional Parking Information)

- **Public Safety** (Signal Preemption, Safety Service Patrols, Evacuations)

- **Public Transportation** (Transit Traveler Information, Payment, Signal Priority)

- **Sustainable Travel** (HOV Lanes, EV Charging)

- **Traveler Information** (Broadcast and Personal Information)

- **Traffic Management** (Surveillance, Signals, Incidents, Railroad Crossings)

- **Vehicle Safety**

- **Weather** (Monitoring, Information Distribution)

HOUSTON-GALVESTON REGION
KEY ITS INFRASTRUCTURE AND PROGRAMS

TRAFFIC ITS INFRASTRUCTURE
- Traffic Management Center (TMC)
- Closed Circuit Television (CCTV) Cameras
- Centralized Traffic Signal System
- Comparative Travel Time Signs
- Dynamic Message Signs (DMS)
- Electronic Toll Collection
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- Freeway Safety Service Patrol
- Railroad Detection and Notification
- Transit Signal Priority

TRANSIT ITS INFRASTRUCTURE
- Transit Operations Center (TOC)
- Automated Fare Payment
- Automated Passenger Counters
- Bus Rapid Transit
- Real-Time Traveler Information
- Transit Signal Priority
- Transit Vehicle Tracking

REGIONAL INITIATIVES
- ConnectSmart (TxDOT Houston District)

KEY
Existing System
Planned System

Montgomery
Liberty
Waller
Harris
Chambers
Fort Bend
Galveston
Brazoria

CITY OF HOUSTON
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- DMS
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- Railroad Detection and Notification
- Transit Signal Priority

CITY OF BAYTOWN
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System

MISSOURI CITY
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- DMS
- *Emergency Vehicle Signal Preemption*

CITY OF GALVESTON
- CCTV Cameras
- *Centralized Traffic Signal Control System*
- *Emergency Vehicle Signal Preemption*

CITY OF SUGAR LAND
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- Flood Monitoring
- *Railroad Detection and Notification*

CITY OF PEARLAND
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption

LEAGUE CITY
- *TMC*
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption

TXDOT HOUSTON DISTRICT
- TMC
- CCTV Cameras
- Comparative Travel Time Signs
- Centralized Traffic Signal System
- DMS
- Electronic Toll Collection
- Emergency Vehicle Signal Preemption
- Ramp Metering

TXDOT BEAUMONT DISTRICT
- TMC
- CCTV Cameras
- Centralized Traffic Signal System
- DMS

- Emergency Vehicle Signal Preemption
- Truck Parking Availability Systems

HOUSTON METRO
- TOC
- Automated Fare Payment
- Automated Passenger Counters
- On-Board CCTV Cameras
- Real-Time Traveler Information
- Transit Signal Priority
- Transit Vehicle Tracking

HARRIS COUNTY TRANSIT
- TOC
- Automated Fare Payment

- Automated Passenger Counters
- On-Board CCTV Cameras
- Real-Time Traveler Information
- Transit Signal Priority
- Transit Vehicle Tracking

WOODLANDS REGIONAL TRANSIT AUTHORITY
- TOC
- Automated Fare Payment
- Automated Passenger Counters
- On-Board CCTV Cameras
- Real-Time Traveler Information
- Transit Signal Priority
- Transit Vehicle Tracking

HARRIS COUNTY
- TMC
- CCTV Cameras
- Centralized Traffic Signal Control System
- Emergency Vehicle Signal Preemption
- *Flood Monitoring*
- MAP Safety Service Patrol
- Railroad Detection and Notification

HOUSTON-GALVESTON AREA COUNCIL
- Tow and Go Safety Service Patrol
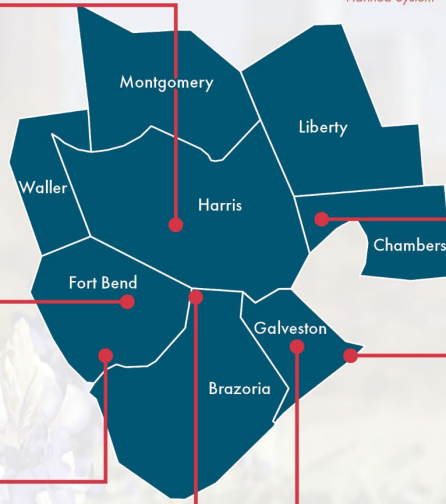
Regional ITS Needs

Primary ITS Needs Areas

Based on Stakeholder Interviews and Workshops

- Data Management
- Public Transportation
- Traffic Management

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Regional ITS Needs

REGIONAL ITS NEEDS
Commercial Vehicle Operations
Deploy freight signal priority
Provide truck drivers with parking information and availability
Data and Information Management
Develop data sharing agreements and expand data sharing capabilities
Improve utilization of data through dashboards, notification, and automation
Develop CCTV camera sharing network to share live video feeds
Expand fiber communications network
Share fiber network where appropriate
Parking Management
Provide parking availability information for vehicles
Public Safety
Expand emergency vehicle preemption
Public Transportation
Install transit signal priority
Develop a regional transit fare application
Traffic Management
Improve traffic signal timing and coordination between jurisdictions
Expand the CCTV camera network
Expand the DMS network (Including color and arterial DMS)
Deploy railroad monitoring system that provides notification of blockages
Deploy wrong-way driving detection and alert systems
Improve traffic incident management
Weather
Deploy road weather information systems (RWIS) for flood monitoring

Regional ITS Service Packages

- ITS service packages represent slices of the ITS architecture that map out specific services that ITS can provide

- National ITS Architecture includes 150 ITS service packages

- Examples include
  - » Infrastructure-Based Traffic Surveillance
  - » Transit Signal Priority
  - » Traffic Information Dissemination
  - » Wrong-Way Vehicle Detection and Warning

- H-GAC ITS Architecture Plan Update includes 58 ITS service packages

- H-GAC ITS Architecture includes
  - Customized ITS service packages for **TxDOT Houston, TxDOT Beaumont, Harris County, HCTRA, City of Houston,** and **Transit Agencies** within the Region
  - **Local Agency** placeholder used for most municipal and county agencies

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Regional ITS Service Package Priority

Commercial Vehicle Operations

- CVO05 Commercial Vehicle Parking *(High)*
- CVO06 Freight Signal Priority *(Medium)*

Data Management

- DM01 ITS Data Warehouse *(High)*
- DM02 Performance Monitoring *(High)*

Maintenance and Construction

- MC06 Work Zone Management *(High)*
- MC08 Maintenance and Construction Activity Coordination *(High)*
- MC05 Roadway Maintenance and Construction *(Medium)*
- MC01 Maintenance and Construction Vehicle and Equipment Tracking *(Low)*
- MC02 Maintenance and Construction Vehicle Maintenance *(Low)*

Parking Management

- PM01 Parking Space Management *(High)*
- PM03 Parking Electronic Payment *(High)*
- PM02 Smart Park and Ride System *(Medium)*
- PM04 Regional Parking Management *(Low)*
- PM06 Loading Zone Management *(Low)*

Public Safety

- PS01 Emergency Call-Taking and Dispatch *(High)*
- PS02 Emergency Response *(High)*
- PS03 Emergency Vehicle Preemption *(High)*
- PS08 Roadway Service Patrols *(High)*
- PS10 Wide-Area Alert *(High)*
- PS13 Evacuation and Reentry Management *(High)*
- PS12 Disaster Response and Recovery *(Medium)*
- PS14 Disaster Traveler Information *(Medium)*

Public Transportation

- PT01 Transit Vehicle Tracking *(High)*
- PT02 Transit Fixed-Route Operations *(High)*
- PT03 Dynamic Transit Operations *(High)*
- PT04 Transit Fare Collection Management *(High)*
- PT05 Transit Security *(High)*
- PT08 Transit Traveler Information *(High)*
- PT09 Transit Signal Priority *(High)*
- PT06 Transit Fleet Management *(Medium)*
- PT07 Transit Passenger Counting *(Medium)*
- PT11 Transit Pedestrian Indication *(Low)*
- PT14 Multi-modal Coordination *(Medium)*

Sustainable Travel

- ST06 HOV/HOT Lane Management *(High)*

Traffic Management

- TM01 Infrastructure-Based Traffic Surveillance *(High)*
- TM03 Traffic Signal Control *(High)*
- TM05 Traffic Metering *(High)*
- TM06 Traffic Information Dissemination *(High)*
- TM07 Regional Traffic Management *(High)*
- TM08 Traffic Incident Management System *(High)*
- TM10 Electronic Toll Collection *(High)*
- TM25 Wrong Way Vehicle Detection and Warning *(High)*
- TM04 Connected Vehicle Traffic Signal System *(Medium)*
- TM13 Standard Railroad Grade Crossing *(Medium)*
- TM16 Reversible Lane Management *(Low)*
- TM17 Speed Warning and Enforcement *(Low)*
- TM20 Variable Speed Limits *(Low)*
- TM24 Tunnel Management *(Low)*

Traveler Information and Personal Mobility

- TI01 Broadcast Traveler Information *(High)*
- TI02 Personalized Traveler Information *(High)*
- TI07 In-Vehicle Signage *(Low)*

Vehicle Safety

- VS08 Queue Warning *(High)*
- VS17 Automated Vehicle Operations *(High)*
- VS07 Road Weather Motorist Alert Warning *(Medium)*
- VS09 Reduced Speed Zone Warning / Lane Closure *(Medium)*

Weather

- WX01 Weather Data Collection *(High)*
- WX02 Weather Information Processing and Distribution *(High)*
- WX03 Spot Weather Impact Warning *(Medium)*

Legend:
- High Priority (red)
- Medium Priority (yellow)
- Low Priority (gray)

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National ITS Architecture Service Package
TM01 Infrastructure-Based Traffic Surveillance
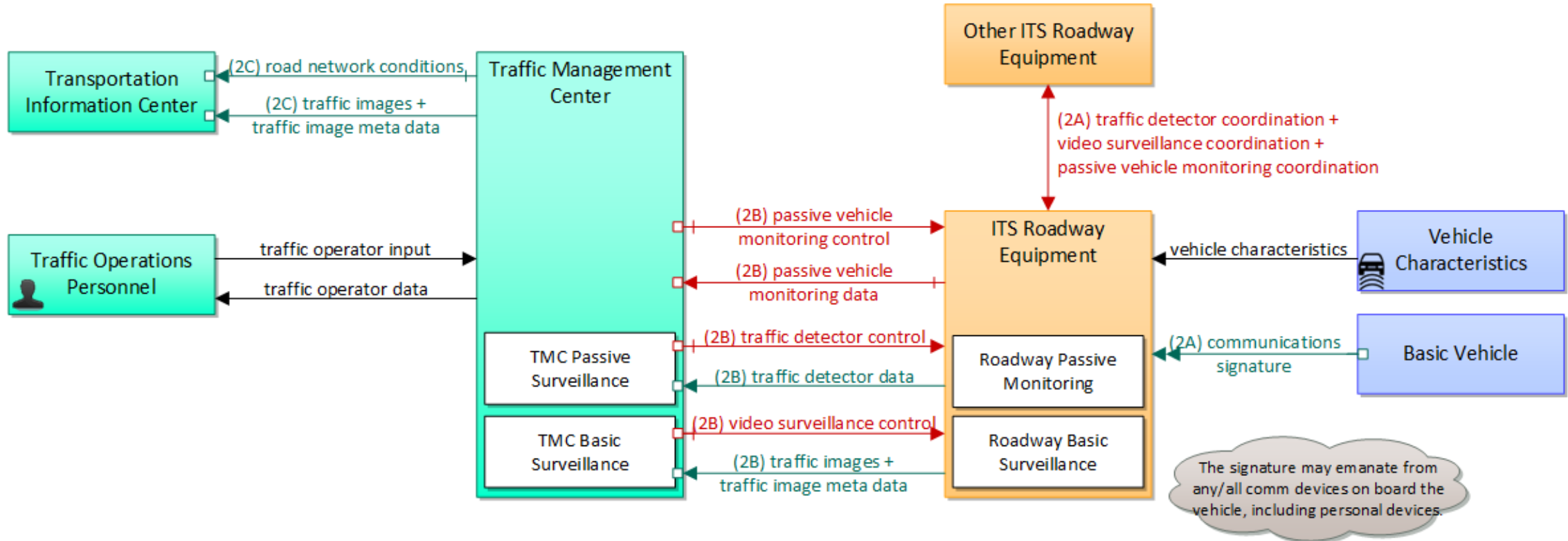
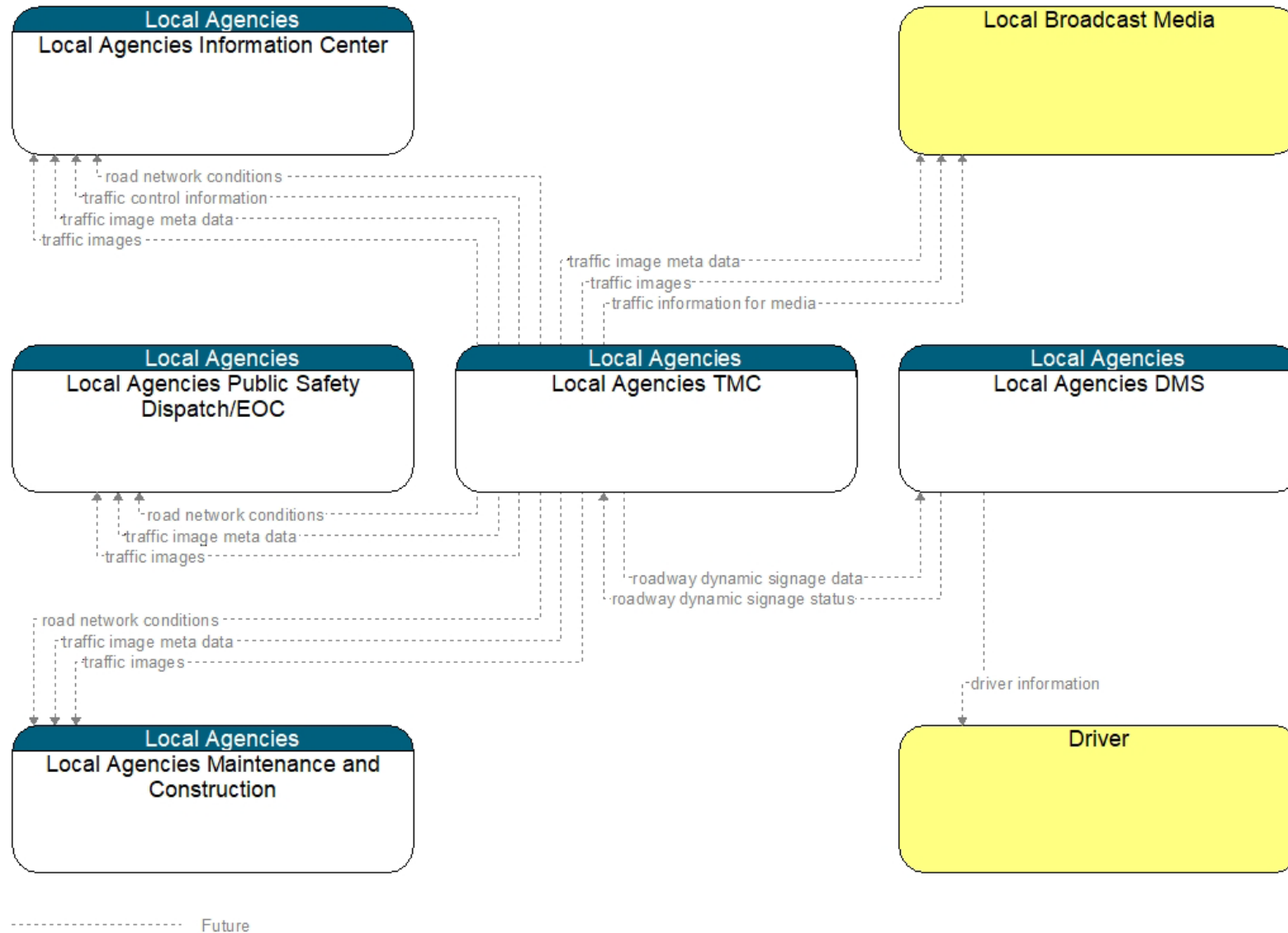# H-GAC ITS Architecture Service Package
TM06 Traffic Information Dissemination – TxDOT Houston District
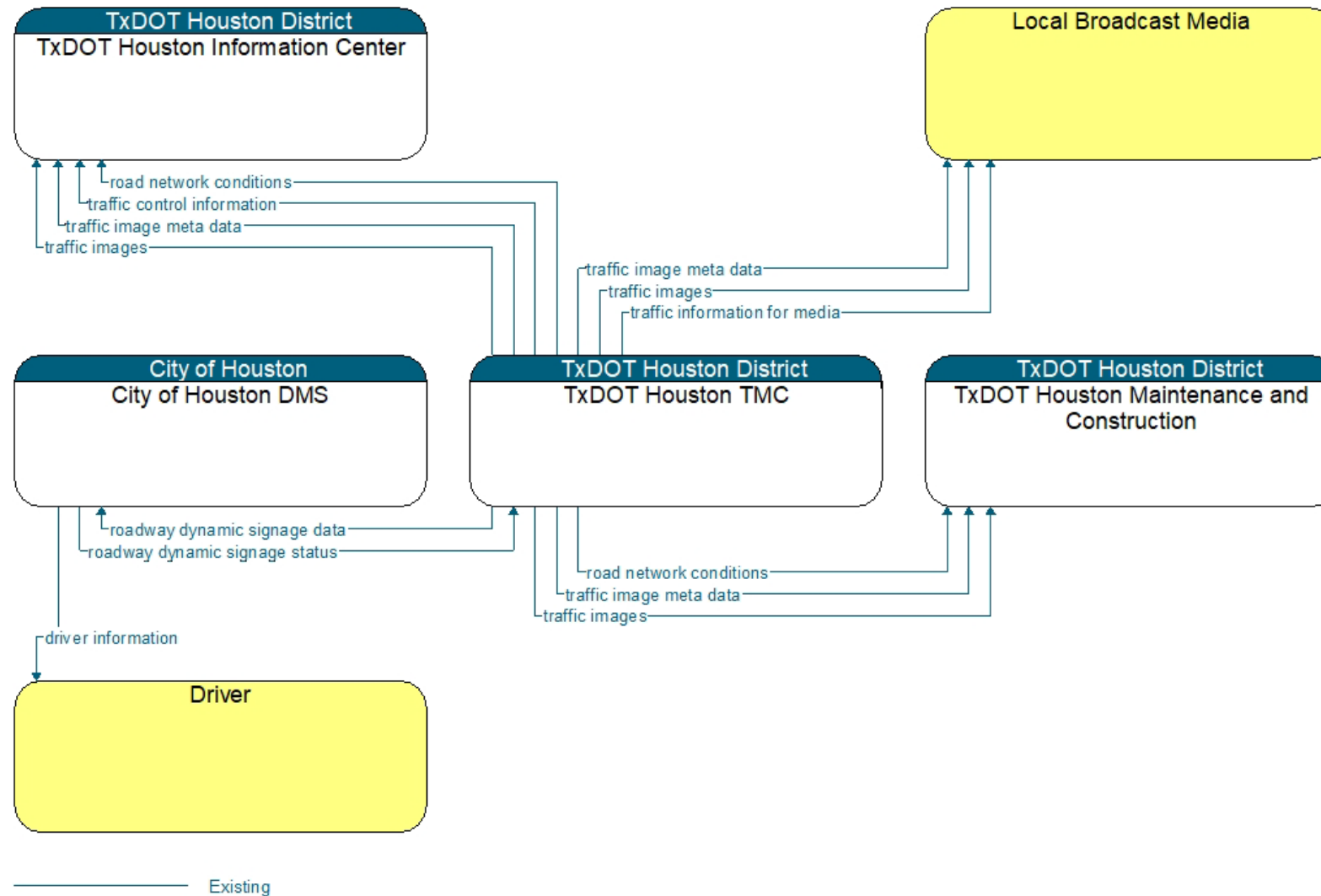
H-GAC ITS Architecture Service Package
TM06 Traffic Information Dissemination – Local Agencies

Regional ITS Service Packages

Summary of **NEW**
ITS Service
Packages in the 2025
H-GAC Regional ITS
Architecture

17 New Service Packages

Commercial Vehicle Operations (2)
- CVO05 Commercial Vehicle Parking
- CVO06 Freight Signal Priority

Data Management (1)
- DM02 Performance Monitoring

Maintenance and Construction (1)
- MC02 Maintenance and Construction Vehicle Maintenance

Parking Management (3)
- PM02 Smart Park and Ride System
- PM04 Regional Parking Management
- PM06 Loading Zone Management

Sustainable Travel (1)
- ST06 HOV/HOT Lane Management

Traffic Management (4)
- TM04 Connected Vehicle Traffic Signal System
- TM20 Variable Speed Limits
- TM24 Tunnel Management
- TM25 Wrong Way Vehicle Detection

Traveler Information and Personal Mobility (1)
- TI07 In-Vehicle Signage

Vehicle Safety (4)
- VS07 Road Weather Motorist Alert and Warning
- VS08 Queue Warning
- VS09 Reduced Speed Zone Warning / Lane Closure
- VS17 Automated Vehicle Operations

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Recommendations

Project Deployments

1. Expand CCTV Camera and DMS Coverage on Freeways and Arterials
2. Develop Regional CCTV Camera Video Sharing System
3. Deploy Railroad Crossing Detection and Notification Systems
4. Develop Regional Transit Rider Application
5. Expand Fiber Optic Communication Network

Operations and Staffing

6. Improve Signal Timing on Arterials and Across Jurisdictional Boundaries
7. Automate Operational Capabilities (Includes Data Sharing)
8. Increase Staffing for ITS

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Communications Scan

Fiber Optic Cable

- City of Houston
- City of Pearland
- Harris County
- Harris County Toll Road Authority
- Houston METRO
- Medical Center
- Rail Companies
- TxDOT Existing
- TxDOT Under Construction
- County Boundary
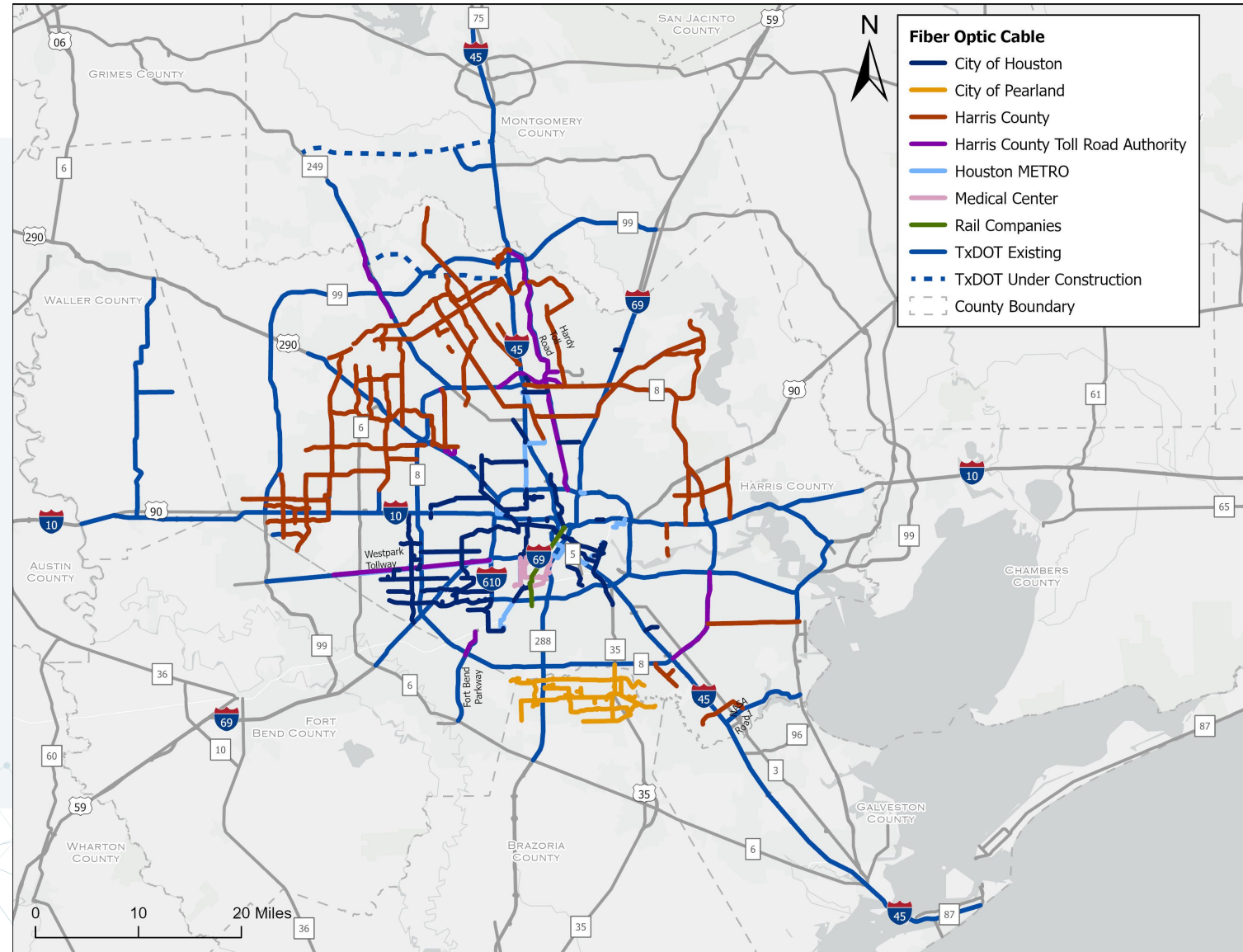
Communications Scan

Documented Existing and Planned Fiber Optic Communications in the H-GAC Region

Examined ITS Communications Options

Created GIS Map of Existing and Planned Fiber

City of Pearland Case Study

- Found fiber to be the most beneficial and reliable form of communications

- Reliability of 14-year period
  - Underground fiber – Three incidents of damage
  - Above ground fiber – Six incidents of damage

- Prioritized installing fiber conduit with all roadway construction projects
  - Cost effective to do concurrently
  - Additional fiber strands installed
  - Allowed for more redundancy in system

- Available for all city departments

- Credited much of the success to relationship of Engineering and Public Works Department with IT Department

ITS Project Selection and Ranking System

Review of Current H-GAC ITS Project Selection and Ranking

Review of National Best Practices Used by Other MPOs

Recommendations for Revised Scoring System for ITS Projects

Deliverables
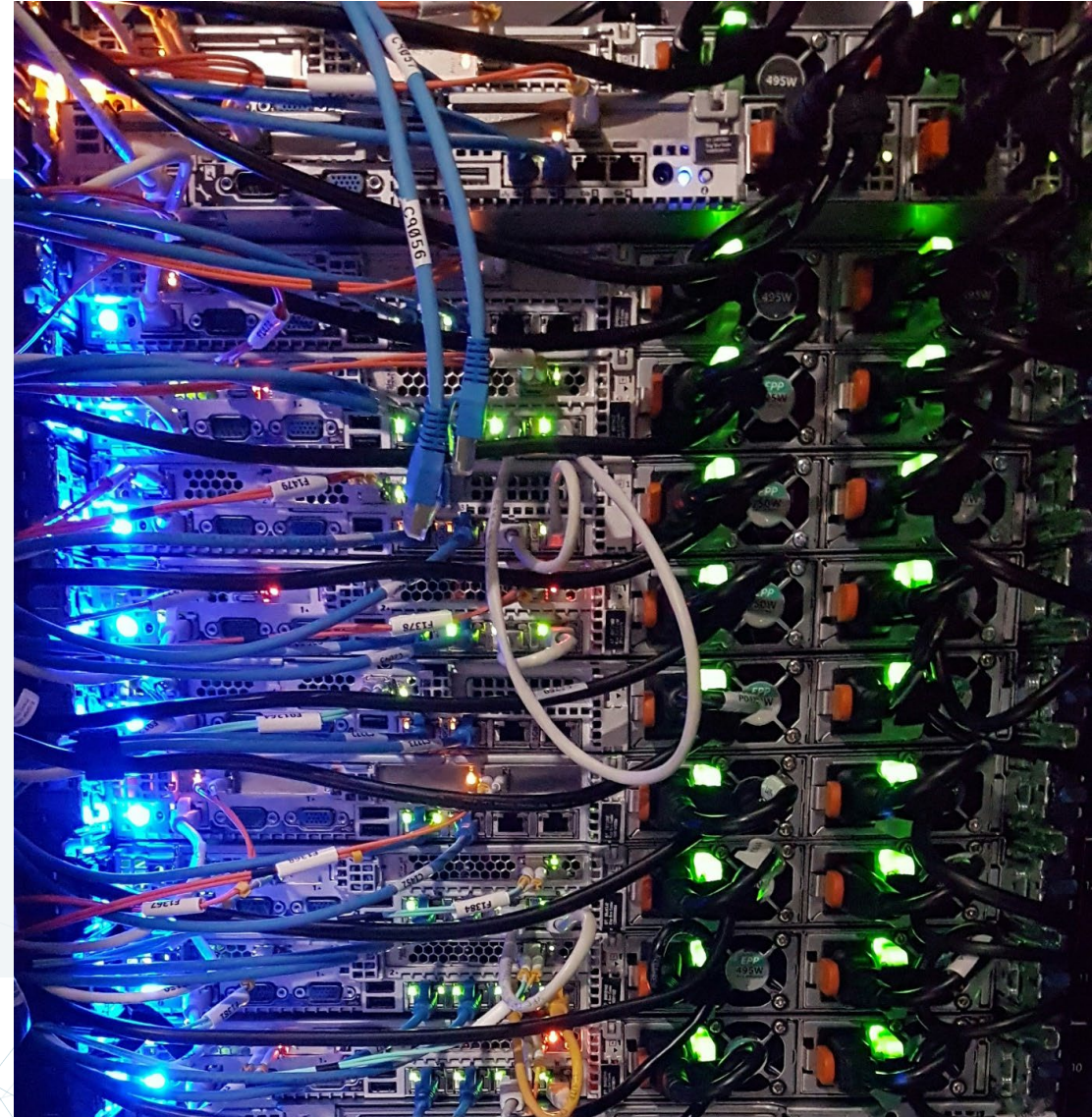
Deliverables
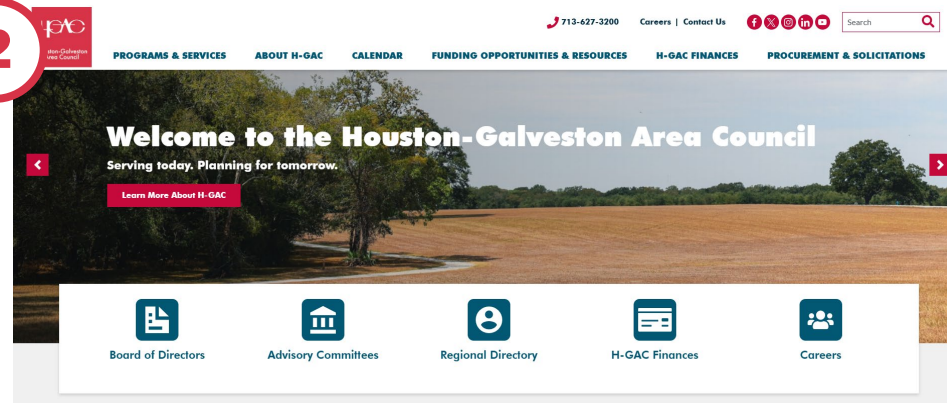
Revised ITS Architecture Web Page
with
Interactive ITS Architecture
and
Training Videos

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Thank You

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