ITS Communication Master Plan
Urban-Rural & In-Between

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October 22, 2018
Project Area Map
About Maricopa County

- **Population:** 4 Million People
- **Land Area:** 9,200 Square Miles
- **Incorporated Cities & Towns:** 23
- **5,000 +/- Traffic Signals**
  - Unincorporated Areas: 158
  - In Cities & Towns: 4,800 +/-
Unincorporated Areas
Urban, Rural & In-Between

- Unincorporated Geographic Regions: 17
- Distance to MCDOT TMC_{Minimum}: 3 Miles
- Distance to MCDOT TMC_{Maximum}: 60 Miles
- 158 Traffic Signals
Existing Traffic Signal Communications

- None
- Leased T-1
- Fiber Optic
Benefits of Real-Time Traffic Signal Communications

- Better Traffic Signal Synchronization
- Real Time Integrated Corridor/Incident Management
- CCTV Observations
- Fewer Maintenance Vehicle Dispatches
- ARID Travel Time Monitoring
- Connected Vehicle Support
Plan History

- ITS Business Plan Developed in 2005
- Plan 95% Implemented
  - Modern TMC Constructed
  - Fiber Trunks on Key MCDOT
    - Bell Road
    - Olive Ave
    - Wireless Extension to Fiber Trunk
    - Leased T-1 Communications
- Regional Community Network Built to Link Transportation Agencies
- ADOT Fiber Deployed on Most Urban Freeways
Technical Objectives

- Reliably Communicate with 100% of MCDOT Signals
- Use Improved Communications to Reduce Maintenance Vehicle Dispatches
- Provide Bandwidth to Take Advantage of Recent Technology
  - High quality CCTV/Detection
  - ARID
  - Connected Vehicles
  - Battery Backups
  - EVP
  - MMU
- 95% to 99.9% Network Availability
Policy Objectives

- Participate and lead in regional partnerships to keep traffic moving efficiently and safely in a multi-jurisdictional environment.

- Maintain a skilled and highly trained staff to effectively maintain and operate the system.

- Develop a fault tolerant communications network where economically feasible.
Plan Phases

- **Short-Term**
  - Wireless Connectivity
  - Low Cost

- **Mid-Term**
  - Focus on Efficiency
  - Focus on Remote Diagnostics
  - Cabinet Hardware Upgrades and Connectivity Investment

- **Long-Term**
  - Work with Partner Agencies
  - Fiber to Intersections with < One-Mile Spacing
Short Term Plan Goals (2-3 Years)

- Establish Real-Time Communications to Every MCDOT Intersection
- De-commission Leased T-1 Circuits to Reduce On-Going Costs
- Take Advantage of Regional Investments in Fiber Optics
  - ADOT Freeway Management System Fiber Optics
  - Regional Community Network
Wild Horse Pass Area Example

- No Existing Connectivity
- Rapidly Urbanizing Area in South-East Area of the County
- Low Cost Wireless Solution
- Backhaul via RCN Connection in Chandler Short-Term
- Last Mile Fiber Connection Long Term to I-10
Line of Sight Radios

Non-Line of Sight Radios
Wireless Path Study

Performance Summary (ITU-R)

Performance to 49,401:

- Predicted Receive Power: -75 dBm ± 11 dB
- Mean IP Predicted: 46.98 Mbps
- Mean IP Required: 5.0 Mbps
- % of Required IP: 94.0%
- Min IP Required: 2.0 Mbps
- Min IP Availability Required: 99.9900 %
- Min IP Availability Predicted: 99.9981 %

Performance to SunLakes_Riggs:

- Predicted Receive Power: -75 dBm ± 11 dB
- Mean IP Predicted: 46.98 Mbps
- Mean IP Required: 5.0 Mbps
- % of Required IP: 94.0%
- Min IP Required: 2.0 Mbps
- Min IP Availability Required: 99.9900 %
- Min IP Availability Predicted: 99.9981 %
La Veen Area

LTE Cellular Router

67th Ave & Broadway
Isolated Intersection

67th Ave & Southern
Isolated Intersection

51st Ave & Komatke
Isolated Intersection
La Veen Area
Mid-Term Plan Goals (3+ Years)

- Make the intersection as operationally efficient and easy to maintain as possible.

- Connect video detection, Smart Monitor, High Definition CCTV, Battery Back-up, ARID readers and all Ethernet capable cabinet technology for remote diagnostics and monitoring. Establish Real-Time Communications to Every MCDOT Intersection.

- Change business practices to performing remote diagnostics before sending a tech.
Mid-Term Plan
Short Term Plan Goals (2-3 Years)

- Establish Real-Time Communications to Every MCDOT Intersection
- De-commission Leased T-1 Circuits to Reduce On-Going Costs
- Take Advantage of Regional Investments in Fiber Optics
  - ADOT Freeway Management System Fiber Optics
  - Regional Community Network
Long Term Plan Goals

- Establish last mile connections between MCDOT fiber and partner agency fiber to complete connections and rings.
  Recent Examples:
  - Anthem
  - Indian School Road
  - Mc Dowell

- Connect all intersections within one mile spacing via a fiber optic network.

- Potential to re-assess needs when 5G networks become widely available and reliable.

- Increase network availability to 99.99% or 99.999%
Long Term Plan

- 70 Miles of MCDOT arterials Fiber
- 100 New Fiber Drops
- 15 New Connection Points to ADOT FMS Fiber
- 119 Wireless Nodes Replaced with Fiber  Increase network availability to 99.99% or 99.999%
- $20,000,000 Investment Required
Plan Implementations

• **ITS Business Plan Developed in 2005**
  - Federally funded projects from the original plan

• **MC85 - El Mirage to 83rd Ave.**
  - 5 Miles, 9 County Maintained Intersections
  - Pre-Existing Communications: Radios, 3 Leased Line T1’s
  - Post-Existing Communications: 144-count SMFO Backbone, 9-12 strand SMFO drop cables from backbone. 1 PTP cambium radio
  - TMC Connectivity Via ADOT FMS fiber

• **RH Johnson Bell to Granite Valley/Meeker – Rh Johnson to Granite Valley**
  - 5 Miles, 16 County Maintained Intersections
  - Pre-Existing communications: Radios, 5 Leased line Ti’s
  - Post-Existing communications: 144-count SMFO Backbone, 13-12 strand SMFO drop cables from Backbone.
  - TMC Connectivity Via Regional Community Network (RCN)
Plan Implementations

• Riggs Rd Sun Lakes to Alma School, Alma School to Champagne
  • 3 Miles, 7 County Maintained Intersections
  • Pre-Existing Communications: Radios, 1 Leased Line T1
  • Post-Existing Communications: 96-count SMFO Backbone, (6) 12-count SMFO drop cables from Backbone.
  • TMC Connectivity Via City of Chandler Fiber to their TMC then to RCN

• Last Mile Project – Indian School/99th, Anthem/I-17, McDowell/92nd St.
  • 3 corridors 5.5 Miles, 12 County Maintained Intersections
  • Pre-Existing communications:
    • Indian School: 96-count SMFO Fiber, 1 Leased Line T1
    • Anthem: 96-count SMFO Fiber, Radios, 1 Leased Line T1
    • McDowell: 96-count SMFO Fiber, Radios, 2 Leased Line T1’s
  • Post-Existing communications: 96-count SMFO Backbone, (12) 12-count SMFO drop cables from Backbone.
  • TMC Connectivity Via ADOT FMS fiber
Moving Forward

- **MCDOT ITS Communications Plan Developed in 2018**
  - Use updated Plan to fund and design Anthem Short Term plan
  - MCDOT Connected Vehicle Testbed
  - Currently split into two different networks/areas
  - Goal: Merge Daisy Mountain side and The Anthem Side
Moving Forward
Moving Forward
Questions

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