District Five - Active Arterial Management Strategies and Initiatives

FSITE Winter Workshop
February 28, 2020

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FMS/AMS Engineer
1. Background
2. Current and Future Retiming Process
3. Current and Future Tools
4. Active Arterial Management/Integrated Corridor Management
• Approximately 1600 signalized intersections on state roadways
• Retiming studies are data-driven, as well as request-driven
• Annual retiming funding of $800k
• Multiple corridors are running adaptive signal control systems
  – Future locations: SR 44, SR 421, SR 40
• Majority of corridors operate by time-of-day coordination
• Coordinated signal systems require routine operation and maintenance
• Coordinate with local agencies on operation and maintenance
• District 5 currently follows a traditional retiming program
  – 3 years for coordinated systems
  – 5 years for isolated intersections

• Follow current industry practice

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**D5 Retiming Process**

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**Tru-Traffic**

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**Synchro**
D5 Retiming Process Cont.

- Identify Existing Conditions (Includes Kickoff Meeting)
- Collect Existing Data
- Field Reviews
- Obtain Local Timings and Signal Groupings
- Prepare a Preliminary Report
- Implement New Signal Timings
- Field Evaluation & Fine Tuning
- Final Report
- 30-Day Adjustment Period
Transit Signal Priority (TSP)

- Currently deploying TSP throughout the District
- Component to review during retiming studies
- TSP ensures on-time transit service
- Uses Opticom GPS
- Arterial Corridor Manager monitors requests and keeps records of transit calls
  - Central Management Software (CMS)
Transit Signal Priority (TSP) Cont.

<table>
<thead>
<tr>
<th>Status</th>
<th>Selected Location</th>
<th>Device Type</th>
<th>Primary</th>
<th>Last Update</th>
<th>Details</th>
<th>Start Path</th>
<th>End Code</th>
<th>Device Name</th>
<th>Heartbeats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>City of Milwaukee</td>
<td>North Ave</td>
<td>Yes</td>
<td>3/15/2010</td>
<td>Yes</td>
<td>200</td>
<td>0E</td>
<td>North Ave</td>
<td>200</td>
</tr>
</tbody>
</table>

Central Management System
Technology Enhancements

- Evaluating current traditional retiming methodology
- Transitioning from reactive to proactive analysis
- Ongoing arterial retiming practices study
- Technology enhancements provide data sets in real-time
- New software systems/databases will be available to provide performance measures and additional information
  - SunStore Data Picker Phase II (RTMC Map)
  - Cloud ATSPM
  - Signal Optimization Tool (SOT)
  - Signalized Intersection Inventory Application (SIIA)
Phase II adds the capability of identifying performance measures
Uses HERE data
Phase II will provide speeds, travel times, travel time index and planning time index
Users will have ability to perform before and after reviews
https://sunstore.cflsmartroads.com/datapicker/
SunStore Data Picker Phase II Cont.

STEP 3: MAP SELECTOR

1. Select Roadway From The Map By Clicking On The Desired Roads Or Selecting From The Drop Down


**NAME** | **BMP** | **EMP**
--- | --- | ---

3. Once Road Is Selected From The Above Grid. The Option To Select A Sub-Segment Of Roadway Will Become Active. Use The Tool To Refine Roadway Selection. By Drawing A Polygon, Use The Tool To Clear And Reset The Roadway Selection.

SunStore Data Picker Phase II Cont.

**STEP 1: DATA SETS**
1. **CHOOSE DATA SET(S):**
   - Crash X CRC X

**STEP 2: DATE/TIME**
1. **CHOOSE DAY(S) OF THE WEEK:**
   - S M T W T F S
2. **CHOOSE DATE(S):**
   - 31
3. **CHOOSE TIME(S):**

**DATE RANGES:**
- 10/14/2019 - 10/19/2019
- 02/17/2020 - 02/21/2020

**TIME RANGES:**
- 07:00 - 18:00


5. Once Road Is Selected From The Above Grid The Option To Select A Sub-Segment Of Roadway Will Become Active. Use The Tool To Refine Roadway Selection By Drawing A Polygon. Use The Tool To Clear
And Reset The Roadway Selection.
STEP 3: MAP SELECTOR

1. Select Roadway From The Map By Clicking On The Desired Roads Or Selecting From The Drop Down

SELECT BY ROADWAY NAME:

ALTAMONTE DR


<table>
<thead>
<tr>
<th>NAME</th>
<th>B</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTAMONTE DR</td>
<td>000</td>
<td>1159</td>
</tr>
</tbody>
</table>

3. Once Road Is Selected From The Above Grid, The Option To Select A Sub-Segment Of Roadway Will Become Active. Use The Tool To Refine Roadway Selection By Drawing A Polygon. Use The Tool To Clear And Reset The Roadway Selection.

Travel Time Index (Oct 2019)
Travel Time Index (Feb 2020)
SunStore Data Picker Phase II Cont.
Automated Traffic Signal Performance Measures (ATSPM)

- Cloud ATSPM is in development
- Web-based application using high-resolution data logging
- Shows real-time and historical functionality at signalized intersections
- Provides continuous data
  - Manually collected data will not be necessary
  - Can transition D5 from traditional retiming practice
  - Will provide automated evaluation of signals to address the worst locations first
Signal Optimization Tool (SOT)

- Signal Optimization Tool (SOT)
  - Part of Integrated Corridor Management (ICM)
  - Queries across stored movement counts for corridors
  - Develops representative TMC
  - Optimizes corridor with HCS software
  - Allows results to be sorted by linear distance
  - Data is exportable to Synchro
  - Provides benefit to partner agencies to use software
- Expected completion in Fall 2020
Signal Optimization Tool (SOT) Cont.

Integrated Corridor Management System

Corridor Recommendation – US 17-92 – by System – 24/7 all days from 11/1-1/19

Percent change in performance metric: **FIT Improvement %**

Day/Time Pattern: **M-AM**

Legend:
- Improvement
- No Change
- Worse

TOD Pattern Details
- Time Window: Monday 6:00AM-10:00
- Plan Sets
  - 7Y
  - 8X

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Fit Improvement</th>
<th>Applicability</th>
<th>LOS AVG LOS WORST</th>
<th>Delay Delay WORST (min)</th>
<th>Agencies</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 17-92 (Aggregated)</td>
<td>9%</td>
<td>58%</td>
<td>B → A</td>
<td>34.4 → 28.3</td>
<td>(multiple)</td>
<td>OFFSETS</td>
</tr>
<tr>
<td>Fairbanks (Master)</td>
<td>7%</td>
<td>70%</td>
<td>C → B</td>
<td>7 → 3.3</td>
<td>FDOT</td>
<td>DETAILS</td>
</tr>
<tr>
<td>N Kentucky Ave</td>
<td>11%</td>
<td>68%</td>
<td>B → B</td>
<td>9 → 7.2</td>
<td>City of Orlando</td>
<td>DETAILS</td>
</tr>
<tr>
<td>Aragon Ave</td>
<td>8%</td>
<td>81%</td>
<td>A → A</td>
<td>14 → 13.2</td>
<td>City of Orlando</td>
<td>DETAILS</td>
</tr>
<tr>
<td>Minnesota Ave</td>
<td>9%</td>
<td>45%</td>
<td>B → A</td>
<td>4.4 → 4.6</td>
<td>Orange County</td>
<td>DETAILS</td>
</tr>
</tbody>
</table>

BACK  REJECT  APPROVE
Signal Optimization Tool (SOT) Cont.

Corridor Offset Recommendation – US 17-92 – 24/7 all days from 11/1-1/19

Corridor Timing Plan Set: Plan Set 8X

Plan Set 8X Details
Cycle Length: 120 Sec
Master Controller: Fairbanks
Active times:
- MTW 6:30AM – 9:30AM
- TF 6:00AM-9:00AM

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Offset (second)</th>
<th>Fit Improvement</th>
<th>Applicability</th>
<th>Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairbanks (Master)</td>
<td>0</td>
<td>7%</td>
<td>70%</td>
<td>FDOT</td>
</tr>
<tr>
<td>N Kentucky Ave</td>
<td>10</td>
<td>11%</td>
<td>68%</td>
<td>City of Orlando</td>
</tr>
<tr>
<td>Aragon Ave</td>
<td>25</td>
<td>8%</td>
<td>81%</td>
<td>City of Orlando</td>
</tr>
<tr>
<td>Minnesota Ave</td>
<td>15</td>
<td>9%</td>
<td>45%</td>
<td>Orange County</td>
</tr>
</tbody>
</table>

Comments
17:21 11/21/2016
@James Smith
Added 10 sec to the suggested offset for Aragon Ave....
Signal Intersection Inventory Application (SIIA)

• Primary purpose is to facilitate and streamline inventorying and auditing of signalized intersections
• Other attributes and devices are also included within the Application
• The Application will provide maintenance staff with a mechanism to update signalized intersections
• Data from Application will be sent to MIMS central system
• Application has been deployed and is being tested by staff
## Signal Intersection Inventory Application (SIIA)

### Controllers

![Image of the SIIA application interface with a table of signal intersection data.]
Integrated Corridor Management (ICM)

- D5 AAM has transitioned to Integrated Corridor Management
- Focuses on the **whole** transportation network
- Freeway and Arterial work together for the benefit of system mobility **as a whole**
- Purpose of ICM:
  - Improve travel time efficiency
  - Ensure travel time reliability
  - Perform incident management
ICM Region

- D5 has 2 ICM Contracts
  - I-4 Corridor
  - I-75 and I-95 Corridors
- Orlando, FL region
  - FDOT (Freeways and Active Arterial Mgmt)
  - MetroPlan (MPO)
  - 2 Toll Authorities (FTE, CFX)
  - LYNX (Bus)
  - SunRail (Commuter Rail)
  - 3 County Signal Systems (Orange, Seminole, Osceola)
  - 4 Cities (Orlando, Winter Park, Maitland, Kissimmee)
Active Arterial Management (AAM)

- District 5 currently actively manages about 20% of our arterial corridors
  - Approximately 300 traffic signals
- Bluetooth Readers and CCTV cameras are deployed
- Arterial Corridor Manager can adjust intersections as needed
- TMC staff use a variety of tools and resources

### ICM Corridors

<table>
<thead>
<tr>
<th>Corridor Description</th>
<th>Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 17/92 (Segment 1) 9 Signals</td>
<td>10.1 miles</td>
</tr>
<tr>
<td>Airport Boulevard ↔ SR 40 (1st Street)</td>
<td>3.0 miles</td>
</tr>
<tr>
<td>US 17/92 (Segment 2) 24 Signs</td>
<td>10.1 miles</td>
</tr>
<tr>
<td>Airport Boulevard ↔ Spartan Drive</td>
<td>10.1 miles</td>
</tr>
<tr>
<td>US 17/92 (Segment 3) 22 Signs</td>
<td>8.1 miles</td>
</tr>
<tr>
<td>Mayo Avenue ↔ SR 90 (Colonial Drive)</td>
<td>6.1 miles</td>
</tr>
<tr>
<td>SR 46 (12 Signals)</td>
<td>5.4 miles</td>
</tr>
<tr>
<td>CR 411 (Orange Boulevard) ↔ US 17-92</td>
<td>5.4 miles</td>
</tr>
<tr>
<td>SR 50 (Colonial Drive) 35 Signals</td>
<td>12.1 miles</td>
</tr>
<tr>
<td>SR 50 (Kirkman Road) ↔ SR 430 (Semoran Boulevard)</td>
<td>4.1 miles</td>
</tr>
<tr>
<td>SR 414 (Maitland Boulevard 9 Signals)</td>
<td>0.6 miles</td>
</tr>
<tr>
<td>Bear Lake Road/Ross Avenue ↔ CR 427 (Maitland Avenue)</td>
<td>0.6 miles</td>
</tr>
<tr>
<td>SR 423/CR 423 (JYP/Lee Road) 30 Signals</td>
<td>2.5 miles</td>
</tr>
<tr>
<td>Wymore Road ↔ 35th Street</td>
<td>2.5 miles</td>
</tr>
<tr>
<td>East SR 434 (16 Signals)</td>
<td>5.0 miles</td>
</tr>
<tr>
<td>US 17/92 ↔ SR 417</td>
<td>5.0 miles</td>
</tr>
<tr>
<td>West SR 434 (Forest City Road) 26 Signals</td>
<td>25.0 miles</td>
</tr>
<tr>
<td>US 17/92 ↔ SR 414</td>
<td>0.6 miles</td>
</tr>
<tr>
<td>SR 435 (Kirkman Road) 18 Signals</td>
<td>0.6 miles</td>
</tr>
<tr>
<td>SR 50 (Colonial Drive) ↔ Carter Drive</td>
<td>0.6 miles</td>
</tr>
<tr>
<td>SR 436 (Segment 1) 10 Signals</td>
<td>2.5 miles</td>
</tr>
<tr>
<td>SR 436 ↔ Line Drive</td>
<td>2.5 miles</td>
</tr>
<tr>
<td>SR 436 (Segment 2) 23 Signals</td>
<td>4.8 miles</td>
</tr>
<tr>
<td>SR 436 ↔ US 17/92</td>
<td>4.8 miles</td>
</tr>
<tr>
<td>SR 436 (Segment 3) 14 Signals</td>
<td>4.1 miles</td>
</tr>
<tr>
<td>US 17/92 ↔ Casselton Drive</td>
<td>4.1 miles</td>
</tr>
<tr>
<td>SR 436 (Segment 4) 28 Signals</td>
<td>10.0 miles</td>
</tr>
<tr>
<td>Casselton Drive ↔ TG Lee Boulevard</td>
<td>10.0 miles</td>
</tr>
<tr>
<td>US 441 (Orange Blossom Trail) 18 Signals</td>
<td>5.4 miles</td>
</tr>
<tr>
<td>County Club Drive ↔ Americana Boulevard</td>
<td>5.4 miles</td>
</tr>
<tr>
<td>SR 482 (Sand Lake Road/McCoy Road) 8 Signals</td>
<td>3.5 miles</td>
</tr>
<tr>
<td>Turkey Lake Road ↔ CR 423 (John Young Parkway)</td>
<td>3.5 miles</td>
</tr>
</tbody>
</table>
ICM Performance Measures

• ICM team prepares Monthly and Quarterly Performance Reports
• Arterial Reports Include:
  – Travel Time Reliability
  – Arterial Issues
  – Arterial Equipment Status
  – Preemption/TSP
  – Throughput Volume
ICM Performance Measures Cont.

Snapshot from Monthly Report

Arterial Issues Reported and Resolved

Arterial Issues

Average Travel Time Index

Blue: below 1.25
Green: 1.25 - 1.75
Yellow: 1.75 - 2.25
Red: above 2.25
ICM/AAM Response to Reoccurring Congestion

- ICM team monitors equipment issues
- ICM team alerts maintaining agency of any equipment issues
- Maintaining agency is aware of issues and can quickly respond
- ICM team reviews Monthly and Quarterly Performance Reports to identify hotspots
ICM/AAM Reoccurring Congestion Example

- US 17/92 (Mayo Ave to Colonial Dr)
  - 22 traffic signals
  - 6.1 miles length
  - 3 jurisdictions (Maitland, Winter Park, Orlando)
- Used Monthly Performance Report
- Identified intersections which needed signal timing modifications
- Able to adjust signal timings immediately
ICM/AAM Reoccurring Congestion Example Cont.

### Travel Time Index and Planning Time Index

**Camellia Ave to Colonial Dr, 2.2 miles length, 7 traffic signals**

<table>
<thead>
<tr>
<th></th>
<th>Travel Time Index (TTI)</th>
<th>Planning Time Index (PTI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6:00-9:00am</td>
<td>4:00-7:00pm</td>
</tr>
<tr>
<td></td>
<td>6:00-9:00am</td>
<td>4:00-7:00pm</td>
</tr>
<tr>
<td>Northbound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 2019</td>
<td>1.44</td>
<td>1.70</td>
</tr>
<tr>
<td>Nov 2018</td>
<td>1.49</td>
<td>1.78</td>
</tr>
<tr>
<td>Oct 2019</td>
<td>1.52</td>
<td>1.81</td>
</tr>
<tr>
<td>Sep 2019</td>
<td>1.49</td>
<td>1.74</td>
</tr>
<tr>
<td>Dec 2018</td>
<td>1.42</td>
<td>1.94</td>
</tr>
</tbody>
</table>

|               |                         |                           |
| Southbound    |                         |                           |
| Dec 2019      | 1.48                    | 1.79                      |
| Nov 2018      | 1.51                    | 1.84                      |
| Oct 2019      | 1.54                    | 1.91                      |
| Sep 2019      | 1.53                    | 1.89                      |
| Dec 2018      | 1.34                    | 1.90                      |

**Origin-Destination**
ICM Non-Reoccurring Strategies

• Allows ICM team to get the most out of each corridor’s available capacity
• ICM Components
  – Alternate arterial routes (diversion routes)
  – Alternate modes of transportation
  – Data Management
  – Traveler Information
  – Intelligent infrastructure
ICM Diversion Routes and Response to Incidents

• Diversion Routes
  – Signal timing plans have been created for various incident locations
  – Diversion Route Process
    » Start from Interstate
    » Inventory existing plans and characterize them
    » Investigate Plan Utilization
    » Inventory Infrastructure and Identify Constraints

Response Plan w/ Diversion Route
• Implementing Diversion Routes
  – Utilized when there is a Level 3 incident on the Interstate
    » Level 3: impact is expected to be more than 2 hours or the roadway is fully closed in a single direction
  – Decision to implement a diversion route timing plan is based on comparison of advantages and disadvantages
Conclusions/Lessons Learned

• Traditional retiming process is evolving
• New tools and applications will enhance arterial management
• Since implementing ICM, D5 has:
  – Built stronger relationships between freeway and arterial agencies
  – Created safer roadways
  – Improved traveling efficiency
• Coordination with local partners is key to success
Questions?

For additional information, please contact:
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Tricia.Labud@dot.state.fl.us
or visit
www.CFLSmartRoads.com