CULVER CITY
ADAPTIVE TRAFFIC CONTROL SYSTEM

Presented by
Jose Guedes, TE
Advantec Consulting Engineers

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Monterey, California
BACKGROUND

• Map
• Traffic conditions
• Existing system
• City objectives
TRAFFIC CONDITIONS

- Congested freeway (I-405 and I-10)
- Pass-through traffic bypassing freeway
- Freeway incidents
- Unpredictable congestion patterns
EXISTING TRAFFIC SIGNAL INFRASTRUCTURE

- 106 signals – Type 170 controllers
- Vehicle Detection – Most are loops not separated by lane
- Signal Communications – Copper interconnect
- Traffic Signal Central System - KITS
- Traffic Management Center – at City Hall
- Synchronized Roadway Network with 2 TOD plans
CITY OBJECTIVES

• Upgrade Signal System and ITS infrastructure
• Upgrade Vehicle Detection and Signal Controllers
• Deploy Adaptive Traffic Control System (ATCS)
  ▪ dynamically control 106 signals in real-time to improve mobility at all times
  ▪ allow more automated operations with minimal manual intervention that will result in consistent operations and enhanced overall performance.
ADVANTEC’ SCOPE OF WORK
PHASE 1

• Evaluate existing Adaptive System software
• Develop “Concept of Operations”
• Develop “System Requirements”
• Develop Performance Specifications
• Assist the City with RFP and selection of ATCS that meets specs
EVALUATE EXISTING ADAPTIVE SYSTEM SOFTWARE

- SCOOT - Siemens
- SCATS - Transcore
- ATCS7 – LA DOT
- ACS Lite - Econolite
- QuicTrak – McCain (pre-Transparity)
- InSync – Rhythm Eng.
- Kadence – Kimley-Horn
- SynchroGreen – Trafficware
- ACDSS – KLD/Transcore
EVALUATE EXISTING ADAPTIVE SYSTEM SOFTWARE

• System Architecture and Central hardware needs
• Communication needs
• Detectorization needs
• Local controller needs
• Graphical User Interface (GUI)
• Algorithm and control strategy
• Frequency of timing parameter changes
• Incremental changes
• Responsive Adaptive vs. Real-Time Adaptive
• Predictive algorithm using historical data
• Ease of operations
• Typical system cost
DEVELOP "CONCEPT OF OPERATIONS" AND "SYSTEM REQUIREMENTS"


- City Guidelines: “ATCS Signal System Timing Guidelines for City of Culver City”
ATCS shall achieve:

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Target Average Improvement</th>
<th>Minimum Acceptable Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Delay (Travel Delay)</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Number of Stops</td>
<td>30%</td>
<td>20%</td>
</tr>
</tbody>
</table>

- Target Average = average of all peak periods (AM, MD, PM).
- Minimum Acceptable applies to each peak period.
- Should the MOEs not be achieved, the Consultant Team shall continue to provide traffic engineering assistance on-site to further fine tune and improve the operational parameters until the MOEs are achieved.
REQUEST FOR PROPOSAL

Scope of Work:

• Update signal timing parameters (CA-MUTCD and City guidelines)
• Upgrade of Vehicle detection, separated by lane.
• Upgrade Signal controllers to 2070 ATC.
• Upgrade Signal Communications to Ethernet-over-Copper
• Deploy new ATMS and Adaptive Traffic Control System.
• System Acceptance (Factory and Final System Acceptance)
• Before and After Studies
• Training and Documentation
• Warranty and Technical Support (5 years)
Two companies submitted proposals:

- McCain – Transparity Adaptive - $1.8M

- Rhythm Eng – InSync - $6.9M (no new controllers)
Serve as system manager for ATCS deployment:

✓ Assist in reviewing new signal timing development
✓ Assist in fine-tuning of adaptive system
✓ Conduct acceptance tests
✓ Participate in training sessions
✓ Oversee operations manuals and documentation
CULVER CITY ADAPTIVE SYSTEM

- MAP
- SYSTEM COMPONENTS
- PARAMETERS
ADAPTIVE CORRIDOR SYSTEM
ADAPTIVE SYSTEM COMPONENTS

• **Corridors:** 12 independent arterials (with spurs on peer-to-peer)

• **Critical Intersection:** pre-designated, used to determine corridor cycle length.

• **System Detection:**
  - One per corridor.
  - One loop per lane, both directions.
  - Measure volumes used in determining coordination mode (Balanced, Preferential, Semi-preferential)
  - Measures speeds used in synch. progression speeds
ADAPTIVE CORRIDOR SYSTEM

Adaptive Traffic Control System (ATCS) Corridors
- Corridor
- Corridor Links
- System Detection
- Rest in Red Signal
- Free Running Signal
- Critical Corridor Intersection
- Directional Progression of Corridor Link

Map Updated on 4/15/2019
**ADAPTIVE PARAMETERS**

- **Min and Max Cycle Length:** 120 sec to 150 sec
- **Cycle Length change:** 5 sec increments
- **Critical Lane:** Lane with highest volume in Sys.Det.
- **Sample Period:** 5 cycles
- **Split/Green Allocation changes:**
  - Only Through phases w/ advance detection and Protected LT phases
  - Phases with no Force-offs during sample period are eligible to a decrease in split (up to 5 sec)
  - Phases with 3 or more Force-offs during sample period are eligible to a increase in split (up to 5 sec)
ADAPTIVE PARAMETERS

• Synchronization Offsets:
  ▪ Based on speed from System Detector
  ▪ Progression Strategies based on Critical Lane volumes
    1. Preferential (One way progression)
    2. Semi-preferential (60/40)
    3. Balanced (50/50)
  ▪ Bandwidth optimization algorithm by Tru-Traffic software
FINE-TUNING

• Monitoring cycle length and split adjustments
• Monitoring synchronization offsets and progression directional priority
• Issues:
  ▪ System Detection
  ▪ Detection problems
  ▪ Detection configuration
  ▪ Saturated/congested conditions
FINE-TUNING

• Adjustments:
  ▪ Fix detection issues!
  ▪ Decrease sample period (from 5 to 3 cycles)
  ▪ Limit Progression Strategies to Preferential and Balanced
  ▪ Allow higher cycle lengths (up to 180 sec)
  • Set Progression Speed to posted/design speed (instead of measured speed during congested conditions)
PROJECT STATUS

• Currently in Fine-tuning phase
• System Acceptance Test schedule for July
• After-Study scheduled for September
THANK YOU!

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