Operating Signals
IS
Important!

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Poor Operations

• Increased Crash Frequency
• Increased Travel Times…. 
• Economic Impacts
• Traffic Diversion to Side Streets
• Citizen Complaints
• Non-Compliance
• Viscous Circle of Congestion
Better Operations

- Delay would decrease by 15 to 40%
- Travel time would reduce up to 25%
- Emissions would reduce up to 22%
- Fuel use would reduce up to 10%
- B/C ratios up to 40:1

Your Mileage May Vary!

What does this all mean?

- How do these numbers relate?
  - 30 minute travel time => 7 min saved
  - 20 MPG => 22 MPG
- Do you individually measure these?
- Can drivers recognize these savings?

Public perception is key!
However……

- We can’t make cars disappear
- Traffic volumes will still increase
- We can’t fix poor land use decisions
- Our duty to achieve maximum benefit?

No Silver Bullet!
Not a one shot deal!

So what do we do?

- National Transportation Operations Coalition Traffic Signal Self Assessment
- Leads to others looking for help
- http://www.ite.org/selfassessment
- http://www.ite.org/reportcard/
- Update will be out this summer.
National Traffic Signal Report Card

- Overall score is low (D-)
- Management & detection scored lowest
- Individual intersections scored highest
- Large systems scored higher than national average

Why such a low score?
- Signals turn green, yellow and red
  - BUT,
- Not operating as an efficient, well-integrated system
- Proactive management is limited
- Limited resources spent fighting fires
And Now for Something Completely Different

Adaptive Signal Control Myths

- Silver Bullitt
- Reduce staff requirements
- Is “Set and Forget?”
- Will cure oversaturated conditions
- Requires high quality Communications
- Requires high quality Detection
- Not Traffic Responsive Selection of Preset Plans
A Bit of History

Open Loop System With Traffic Detection 

Closed Loop Control Central 
Timing Plan selection by Field Master 

Centralized Control 
UTCS Central Control Interval or Phase Control

Traffic Responsive / Adaptive Control 
SCAT 
SCOOT 
ATCS

Adaptive Control 
RHODES 
OPAC

Potential Benefits

- Responsive to traffic conditions
  - Reduce traffic delay
  - Delays onset of saturated conditions

- Reduces or eliminates the need to retime traffic signals
  - $1800 – $3500 / intersection

- Improvements over Time Of Day plans
  - Travel time
  - Delay
  - Stops
  - Fuel consumption

- Data collection and archiving
Disadvantages

- High capital cost $$$
- Requires extensive calibration & monitoring
- Requires active maintenance of traffic detectors
- Communications overhead
- More technical staffing

FHWA Goals for ACS-Lite

- Low cost
- Leverage existing infrastructure
  - Standard US-style actuated controllers and logic (rings, phases, splits, barriers, gap-out/extension, etc.)
  - Typical agency detector layouts
  - Typical communications
  - “Retro-fit” with major US signal system vendors
- Reduce agency expenditure for adaptive control
- Operate without connectivity to a TMC
- Use NTCIP
Adaptive Control Software – Lite (Outcome)

• Based on Rhodes

• TOD Plans for base signal timing

• Closed Loops Field Master Based Architecture
  • Target Market
    – 20,000 Systems
    – 200,000 Intersections

• Minimizes Traffic Detection needs
ACS-Lite System Architecture

- Optional Protocol Translation
- NTCIP
- Vendor Specific or NTCIP
- 9600bps, up to 12 controllers
- NTCIP + ACS-Lite firmware upgrade

ACS-Lite Algorithms Architecture

- Time-of-Day Tuner
  - cycle, splits, offsets
  - pattern switch times
- Run-time Refiner
  - cycle, splits, offsets
  - active pattern
- Transition Management
  - transition method
- TOD Plans
  - cycle, splits, offsets
  - pattern switch times
- Active Plan
  - cycle, splits, offsets
  - active pattern
- Plan Changes
  - transition method

Day-by-Day / Month-Month
- Cycle by cycle
- 2007

Second-by-second actuated control handled by local controller

Arterial
- Master Controller
- local
- local
Web-based User Interface

- Configuration / Setup
  - Communications
  - Adaptive Settings
  - Links
  - Detectors
  - TOD Schedule
  - Archive data retrieval

- Status
  - Split tuning status
  - Offset tuning status
  - Pattern history
  - Phase timing data
  - Event log
  - Detector status

ACS-Lite Detection Layout

Need detectors at stop-bar of coordinated phases for split tuning

Set-back loops for coordinated phases can also be used for split tuning AND offset tuning (<100’ from stop bar)
Future Enhancements FY 2007

- Time of Day Tuner
  - Long Term Timing Plan Maintenance
  - Time of Day Schedule Switch Points
- Run Time Refiner
  - Cycle length tuning
- Transition Manager
  - “Best Way”

Field trials

- McCain
  - El Cajon (San Diego), California
- Econolite
  - Gahanna (Columbus), Ohio
- Eagle/Siemens
  - Houston, Texas
- Peek/Quixote
  - Bradenton (St. Petersburg/Tampa), Florida
Benefits

- Reduces the need for traffic signal retiming

- Reduces
  - Travel Time
  - Delay
  - Fuel consumption

- Low Cost

Summary

- ACS-Lite may represent the next evolution of traffic control
- Designed for Close-Loop-Systems
- Works with 9600bps / IP network communications
- NTCIP compliant controllers with ACS-Lite firmware upgrade
- Controllers
  - Eagle M52/SEPAC, Econolite ASC2, Peek ,3000E
  - McCain 170 233 (special) + Master
- “Web-based configuration & status interface
NEXT Steps

• Complete El Cajon Test Site

• 5 Early Adopters

• Workshop for evaluating Adaptive Traffic Signal Control Needs

• Support Deployments

QUESTIONS??

http://www.ops.fhwa.dot.gov/arterial_mgmt/index.htm

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