Morgantown, West Virginia

Adaptive Control
Evaluation, Deployment, & Management

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Traffic Signal Timing Process... applied in Morgantown, WV

I. Define Objectives, Assess and Prioritize activities by Time of Day and location

II. Assembly relevant data to support timing and documentation objectives

III. Software Modeling

IV. Timing Design and Documentation

V. Deployment

VI. Assess
Presentation Outline

Traffic Signal Systems in WV

Study Corridor in Morgantown, WV
  Traffic Generators
  Traffic Flow Characteristics

Adaptive Control Project Overview
  Objectives
  Strategy
  Scope of Work

Performance Measure Examples
West Virginia Traffic Signals

- WV Division of Highways (WVDOH) operates and maintains all traffic signals within the state
  - ~1,900 traffic signals
  - ~107 closed loop systems
  - Very limited resources
- RTI tasked with managing major systems
  - Morgantown, Huntington, Charleston, adaptive systems
  - Host computing cluster
  - Assist with system integrations
  - Traffic Engineering (initial signal timings)
  - Performance Monitoring and Tuning
Morgantown, WV

- **Population**
  - City = 30,000 people
  - Metro = 120,000 people

- **West Virginia University**
  - 30,000 students
  - 3 separate campuses

- **Home of the PRT system**

- **Traffic Problems**
  - Downtown
  - 705 corridor
  - No “off-peak”
WV 705 Signalized Intersections

- 16 Mainline
- 3 Side-street
- 4 Systems

~5.2 miles end-to-end
Existing stopbar detection
Fire Dept Preemption
WV 705 Traffic Generators
WV 705 Corridor

WVU Stadium
WV 705 Corridor

WVU Coliseum
Focus Area of This Presentation

- Daily Commuter Route
- Major Seasonal Destinations

![Map with marked points and labels](Image)
WV 705 Corridor

- Outbound
- Inbound

Sections B and C are indicated on the image.
Cycle Flow Rates @ Int. B
Tuesday (12/6)

Inbound

Outbound
Wednesday (12/7)
Thursday (12/8)
Saturday (12/10)

Is this a “typical” Saturday?
Saturday (11/5)

Is this a “typical” Saturday?
Saturday (11/12)

Is this a “typical” Saturday?
GPS Travel Time
“Inbound” AM Period

Month 1: August (8/5/10)
Month 2: October (10/21/10)

Focus Area

August (8/5/10)       October (10/21/10)
GPS Travel Time
“Inbound” Mid-Day

Focus Area
GPS Travel Time
“Inbound” PM Period

Focus Area

[Graph showing travel time data with labeled axes and markers for different locations like University Towne Center, US-19/WV-7 (Sheetz), Boyers Ave., Patteson Dr., Burger King/Kroger, University Ave., Elmer Prince Dr., Chesnut Ridge Rd., North Elementary School, Pineview Dr., Don Hehlen Dr., Suncrest Town Centre & WVU Research Park, Stewartstown Rd., US 119 (Mileground).]

August (8/5/10)  October (10/21/10)
GPS Travel Time
“Outbound” AM Period

Focus Area

August (8/5/10) October (10/21/10)
GPS Travel Time
“Outbound” Mid-Day

August (8/5/10)                   October (10/21/10)
GPS Travel Time
“Outbound” PM Period

Is this a bad offset?

Focus Area
Project Objectives defined by WVDOH

- Improve the flow of traffic (progression) along the 705 corridor mainline
- Reduce vehicle delay and minimize vehicle queue lengths, thereby improving air quality and motorist safety
- Monitor the system performance continuously
Project Definition

} Requirements

} “Dynamic” control adapting to varying demand

} Throughout the day and day of week

} In the future (minimize “retiming” effort)

} Relatively low cost to deploy

} Utilize performance measures for ongoing monitoring

} Strategy

} Install additional detection and communication

} Deploy central system management software

} Evaluate and deploy ACS-Lite & Traffic Responsive

} Deploy probe-based travel time data collection
Why Traffic Responsive?

Recall the “Typical” Saturday?
Why ACS-Lite?

“Typical” Saturday

AM offset preference IN or OUT?

Favor Outbound!
Project Scope of Work

} Evaluate Control Strategy
} Model system in VISSIM with Software-in-the-Loop
} Use Central-System-in-the-Loop (with performance measures) to design & evaluate
} Time-of-Day plans
} ACS-Lite
} Traffic Responsive

} Implementation
} Mainline advance vehicle detection
} High bandwidth wireless communication
} Reconfigure intersection phase numbering
} Deploy new TOD plans, then ACS-Lite & TR
Project Status

} Hardware & Software
  } Detection installation 98% complete
  } Communication 98% complete
  } Central System Software fully operational
  } Bluetooth Deployment 80% complete

} Signal Control
  } New TOD plans deployed in August 2011
  } ACS-Lite and TR evaluated and parameters defined
  } ACS-Lite and TR running in “analysis” mode
  } Turn-on anticipated in early 2012
Realized Performance Measure Benefits

System Configuration

- Detector mapping problems
- Detection failures
- Communication problems
- Identify opportunities to improve TOD plans

Traffic Conditions

- Response to citizen complaints
- Document the traffic variations we thought existed
- Understanding of data consumed by ACS-Lite & TR
- Accountability to WVDOH and public
Outbound PCD @ Intersection B
Tuesday (12/6)

Plan 1
Plan 2
Plan 3

No Early Return to Green
No Vehicle Arrivals?
End of Platoon Cut off
Wednesday (12/7)

Less traffic on Wednesday eve?
Thursday (12/8)

Should we still be running coord @ 9pm?
Friday (12/9)

The peak starts during mid-day plan.
Saturday (12/10)

We still need coord after 9pm sometimes!

So what do we do to “fix” it??
V/C Ratios @ Intersection B
Tuesday (12/6)

Steal more green time from here?

Or perhaps here?

Volume exceeds capacity
Summary

- All of the data in this presentation (except GPS) are field conditions from last week.
- What cost and effort would have been required to collect this data and turn it into useful information?
- Concentrating on learning how to use the MOEs.
- MOEs have been essential to understanding the signal system performance as we prepare to turn on ACS-Lite and TR.
- MOEs give us the ability to monitor the performance of any signal control system or strategy.