Transit Signal Priority Program for Six County Suburban Region of Chicago, IL

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About Pace

• Pace is suburban transit agency for Chicago's suburbs.
• Pace serves tens of thousands of daily riders with fixed bus routes, vanpools and Dial-a-Ride programs.
• Pace covers 3,500 square miles and is the one of the largest bus services in North America.
VISION 2020

Pace’s long-range response to:

• Rapid suburban employment growth
• Rapid suburban population growth and shifts
• Aging of America (number of retirees growing)

And the challenges that these trends create:

• Increased congestion
• Longer travel times
• Decline in air quality
• New types of service
Preferential Treatments

- **Transit Signal Priority Initiative**
  - Cermak TSP ‘loop’ demonstration
  - Harvey Transportation Center TSP Project
  - Regional TSP Corridors- Engineering and Design
- **Queue Jump Bypass Lane Project**
  - Regional Queue Jump Bypass Lane Feasibility
- **Integrated Express Way Corridor**
  - Shoulder Riding along I-55
  - Implemented by IDOT and Pace
  - Pace initiated TCRP Study – Design Guidelines
What is Transit Signal Priority?

Transit Signal Priority (TSP) facilitates the movement of transit vehicles through traffic signal controlled intersections.

Typically, a transit vehicle sends a signal to a traffic signal controller, which will give the transit vehicle priority by extending the green phase, shortening the red phase/early green, and/or providing for a queue jump.
Legacy Systems

Cermak TSP ‘Loop’ demonstration

- Implemented in Summer of 1997
- Collaborative effort between IDOT, CTA & Pace
- 2.5 mile corridor and 3 bus routes
- LoopComm vehicle id system selected
- Bus mounted Model 600 A transmitter & Model 613 A receiver/detector amp.
- Results include: 7 to 20% travel time savings were reduced
TSP Needs Assessment

Questions
- Why and Where to implement TSP
- What are the benefits.

Answer:
- Identified 27 Major Bus corridors (2005)
- Reviewed AVL Data for schedule adherence issues.
- Collected and analyzed delay to buses due to red signal and intersection clearance time.
TSP Needs Assessment

Pace TSP Bus Service

Service Analysis
Department of Planning Services
GIS
June 2006

Legend
- US. Hwy. 45, 1
- IL. Hwy. 1 (Halsted St.), 2
- US. Hwy. 6 (183rd St.), 3
- US. Hwy. 20 (39th St.), 4
- IL. Hwy. 50 (Cicero Ave.), 5
- IL. Hwy. 43 (Harlem Ave/Whitney Ave), 6
- Cerro Rd. BRT, 7
- J Line BRT, 8
- IL. Hwy. 83 (Dupage/Cook/Lake), 9
- IL. Hwy. 38 (Roosevelt Rd.), 10
- IL. Hwy. 52 (Algonquin Rd.), 11
- IL. Hwy. 65 (Gurnee Rd.), 12
- IL. Hwy. 19 (Ivyling Pl.), 13
- IL. Hwy. 50 (Goft Rd.), 14
- IL. Hwy. 84 (North Ave.), 15
- Ransdall Road, 16
- IL. Hwy. 59, 17
- Dempster, 18
- IL. Hwy. 211 (Milwaukee Ave.), 19
- IL. Hwy. 130 (Waukegan/Crystal Lake), 20
- US. Hwy. 30 (Lincoln Hwy.), 21
- Touhy, 22
- US. Hwy. 12 (Rand Rd.), 23
- Washington St. (Lake County), 24
- Lewis Street (Lake County), 25
- H 122 Grand Ave., 26
- Lake Cook Rd., 27

Based on TIGER Roads.
TSP Corridors Prioritization Process

• Collection of traffic and transit data
• Assembly of all data in GIS to visually display and analyze the information
• The prioritization of TSP Corridors based on all the transit and traffic data collected.
• Three different scenarios were developed that account for changing conditions with respect to funding and levels of transit service
Prioritization of TSP Corridors

• The prioritization results provide the Pace with a mile-by-mile analysis of where the greatest need exists for TSP deployment along each of the 27 TSP Corridors.

• Presented paper at 89th TRB Annual Meeting in Year 2010
  • “Pace Bus Transit Signal Priority Plan for Chicagoland and Suburbs’
  • TRB web link: http://trid.trb.org/view.aspx?id=910612
Deployment Plan

- Demonstration Project – Phase 1 Completed
- Identified multiple corridors for TSP Deployments
- Federal Funds (FTA) and Regional Funds (RTA)
- Systems Engineering Approach
- Mapped into Regional and National ITS Architecture
- Regional Interoperable Requirements
Design and Engineering Steps

- Needs Assessment
- Signal Timing Optimization
- Design of TSP Timing Strategies
- Communication Systems Design
- Backhaul Communication Systems Design
- Equipment Requirements and specifications
- As-Built Drawings for Installation and Permits
Design and Engineering Steps

- Currently there are eight corridors with 226 signals under engineering phase including signal timing optimization and TSP timing design.
- Completed design results are in process of IDOT approval.
- Additional segments of corridors with 143 signals are planned as part of Regional TSP Deployment.
Harvey Demonstration Project

- Around the Vicinity of Harvey Transportation Center-City of Harvey, IL
- Along Halsted Street, US 6/159th Street, Park Avenue & 147th/83/ Sibley Blvd
- Phase 1 TSP Deployment: 20 Signalized Intersections & 55 buses
TSP System Components

• On-board
  – Priority Request Generator (PRG)
  – Position Determination System (PDS)
  – Mobile Mesh Network Communication Router

• Wayside
  – Priority Request Server (PRS)
  – Fixed Mesh Network Communication Router (Access Points, Nodes)

• Central
  – Novax Elements Management System (NEMS)
  – Communications Elements Management Server (CEMS)
Summary Evaluation Results (Quantitative)

- Bus Travel time was **reduced** by a range from 2% (25 sec) to 15% (3.3 min).
- Travel time variation was **reduced** by a range of 14% (12 sec) to 66% (4 min).
- Cumulative Daily TSP Intersection Delay During AM and PM Peak Periods is **reduced** by 27 minutes.
- Average general traffic travel time **reduced** by of 39 seconds to 6 minutes.
Lessons Learned

• The evaluation results indicate the TSP benefits and provide positive evidence in supporting future decision making.
• Continue to coordinate and collaborate with IDOT-Dist1 and other stakeholders
• Bus Schedules should be Optimized for TSP by use of Internal Time Points, Running Time Adjustments and Schedule Tightening to realize enhanced benefits of TSP.
• Far side stops should be considered wherever the geometric and safety conditions permit.
• Bringing Operations and Maintenance staff onboard is very crucial.
• System Integration: Integration of TSP system with IBS was crucial. Plan for future ITS systems integration such as ATIS, Electronic payment system, localized V2I (Bus to Rider) communications with TSP communication system.
Questions?

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