Gateway Cities
Traffic Signal Synchronization and Bus Speed Improvement Project
I-5/Telegraph Road Corridor

Project Status Update
June 19, 2003
Progress Update

Today’s Agenda

- Review of Overall Project
- Project Status
- LCC Recommendations
- ATMS Analysis
- Communications Analysis
- Next Steps

I-5/ Telegraph Road Corridor
Progress Update

Original Project Area

I-5/Telegraph Road Corridor
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Expanded Project Area

Figure 4: I-5 / Telegraph Road Expanded Project Area Showing Signalized Intersections

I-5 / Telegraph Road Arterial
1-105 Project Arterial
I-710 Project Arterial

- Commerce
- Montebello
- Pico Rivera
- Santa Fe Springs
- La Mirada
- Norwalk
- Downey
- Whittier
- County

I-5/Telegraph Road Corridor
Project Focus – Implementing the IEN at the Local Level

COUNTY MANAGEMENT LEVEL
- Regional Monitoring
- Incident Response Coordination

CORRIDOR MANAGEMENT LEVEL
- Sub-region Monitoring
- Inter-agency timing coordination
- Incident Response Selection
- Inter-agency coordination

LOCAL CONTROL AND MONITORING
- Traffic Signal Operations
- Traffic Signal Maintenance
- Equipment Monitoring

INTERSECTION

I-5/Telegraph Road Corridor
Progress Update

Relationship with Other Projects

I-5/Telegraph Road Corridor
Work Flow Plan

PHASE 1
Task 2. Preliminary/Conceptual Design
- Identification of stakeholders
- Review Project Scope & Identify Deficiencies
- Develop User and System Functional Performance Requirements
- Perform an Alternative Analysis and Provide Recommendations
- Conceptual Design Master Plan
- Strategic Implementation Plan
- Develop O&M Plan

PHASE 2
Task 1. Project Management
Task 3. Detailed System Design
- E-Mail System
- ATMS
- Communications
- Integration System

Before Study
Task 4. System Implementation
Task 5. Construction Inspection
Task 6. System Acceptance Testing
Task 7. Documentation and As-Builds
Task 8. Training

Task 9. Before and After System Evaluation
Task 10. Start-up & On-going System Maintenance

Quality Assurance

I-5/Telegraph Road Corridor
Progress Update

Project Status

- Web Page: On-Going
- Agency Interviews: Complete
- Field Surveys: Complete
- Operational Objectives and City Reports: Complete
- ATMS User Requirements: Complete
- ATMS Functional Requirements: Complete
- System Integration Requirements: Complete
- Communication System Requirements: Complete
- Final System Requirements: Complete
- High Level Design: Complete
- LCC Recommendations: Complete
- Communications Analysis:
  - General: In Review
  - Location Specific: On Going
- ATMS Analysis (Draft): In Review
- Conceptual Design: On Going

I-5/Telegraph Road Corridor
Progress Update

Corridor Architecture

Communication Network for the IEN

- County TMC
- Sub-Regional TMC
- County Server
- Corridor Server

Caltrans CTNet
- City of Commerce
- City of Downey
- City of Santa Fe Springs
- City of Norwalk
- County DPW

Field Equipment
- Caltrans
- Commerce
- Montebello
- Pico Rivera
- Santa Fe Springs
- Whittier
- Norwalk
- La Mirada
- County

I-5/Telegraph Road Corridor
LCC Recommendations

- Originally Presented in October, 2002 to PWD Meeting
- Recently updated to incorporate expanded area
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Commerce LCC Location

Existing TCS in 19" Rack

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Norwalk LCC Location

LCC Site

Remote LCC Site

Server Location

I-5/Telegraph Road Corridor
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Downey Host

Downey LCC

Montebello LCC

I-5/Telegraph Road Corridor
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Santa Fe Springs Host

Santa Fe Springs LCC Site

Whittier LCC Site

Whittier Remote LCC Site

I-5/Telegraph Road Corridor
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La Mirada LCC Location

LCC Site (DPW)

Remote LCC Site Resource Center

I-5/Telegraph Road Corridor
LCC
Recommendations
Commerce
LCC Recommendations
Norwalk
LCC Recommendations
Santa Fe Springs

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**Server Monitor**

**KVM Switch**

**ATMS Database Server**

**ATMS Application Server**

**ATMS Communication Server for SFS**

**Field Communication Device for SFS**

**Firewall**

**UPS**

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**Rack 1 Frontview**
(City of Santa Fe Spring)

**Rack 2 FrontView**
(Whittier)

**Rack 3 FrontView**
(Pico Rivera)
Progress Update

LCC Recommendations – Downey 2nd Floor
LCC Recommendations
Downey
Progress Update

Corridor Architecture

Communication Network for the IEN

I-5/Telegraph Road Corridor
ATMS Analysis: Starting Point

- A set of requirements (from the ESGV Pilot Project)
- The County's ATMS selection process (which currently has eliminated all but two systems).
- Pomona Valley ATMS Alternative Analysis Report
Progress Update

Project Specific Information

• An expanded set of requirements which we have prepared for the I-5/Telegraph Road project which incorporates all of the Pilot project requirements.

• An initial systems architecture which identifies the following systems:
  (*Indicates no ATMS analysis needed)

  *Caltrans: CTNet
  *Commerce - BiTrans upgrade
  *Montebello (on another System e.g. Downey)
  *Pico Rivera (ditto or SF Springs)
  Downey
  Santa Fe Springs
  *La Mirada (on another system - County's)
  Norwalk
  *Whittier
Progress Update

Issues

• Identify a relevant sub-set of the requirements rather than an exhaustive list for comparison at this stage

• Additional Requirements that may be key selection criteria:
  – Downey: Multi-jurisdictional
  – SF Springs Traffic diversions due to rail closures
  – Commerce: Open protocols?
  – General: Integrating CCTV and CMS in the traffic control system.
ATMS Analysis Process

- SGY Pilot Requirements
  - Initial County ATMS Evaluation
    - Down-select to:
      - i2TMS
      - KITS
      - Pyramids
      - QuicNet
      - Series 2000/TranSuite

- Gateway Cities Requirements
- Information Collected Through Pomona Valley ITS Project
- Siemens ITS ATMS Analysis
- County Demo Evaluations
  - Down-select to:
    - KITS
    - Pyramids
## ATMS Recommendations

<table>
<thead>
<tr>
<th>City</th>
<th>Hosting ATMS Server For</th>
<th>Controllers to be supported</th>
<th>Recommended ATMS Options*</th>
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</thead>
<tbody>
<tr>
<td>Commerce</td>
<td>Commerce</td>
<td>Type 170</td>
<td>Upgrade existing QuicNet II to QuicNet IV</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Change out the system to one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• icons™/i2TMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• KITS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• TranSuite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Pyramids</td>
</tr>
<tr>
<td>Downey</td>
<td>Downey</td>
<td>Type 170</td>
<td>icons™/i2TMS</td>
</tr>
<tr>
<td></td>
<td>Montebello</td>
<td>Type 2070 (Downey future)</td>
<td>KITS</td>
</tr>
<tr>
<td>Santa Fe Springs</td>
<td>Santa Fe Springs</td>
<td>Type 170</td>
<td>TranSuite</td>
</tr>
<tr>
<td></td>
<td>Pico Rivera</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Whittier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norwalk</td>
<td>Norwalk</td>
<td>Econolite ASC/2</td>
<td>icons™/i2TMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TranSuite</td>
</tr>
</tbody>
</table>

I-5/Telegraph Road Corridor
Communications Analysis

Progress Update

Collect Requirements

Define Categories for Comparison

Allocate Requirements to Categories

Assess Technologies against Categories

Identify Recommended Solutions

Apply Recommendations to the Project Area

Communications Analysis

Recommendations

Conceptual Design

I-5/Telegraph Road Corridor
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Physical Communication Architecture

Layer #3
Sub-Regional TMS

TMC to TMC (IEN) Network

Layer #2
LCC City #1
LCC City #2
LCC City #3

Layer #1
CCTV
Controller
CMS
Field Devices
City #1
City #2
City #3

ATMS Connections

IEN as a Virtual Private Network “backbone”

I-5/Telegraph Road Corridor
Conclusions:

• Main points:
  – IEN as a Virtual Private Network “backbone”
  – Individual links (LCC to LCC) may be leased or agency owned depending upon:
    • the logical communications links to be supported on that physical link
    • Geographic situation
  – Field Network
    • Backbone with last mile circuits
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Field Communication Architecture

Legend
- Low speed cable-based or wireless Connections
- High Speed Backbone Connection

I-5/Telegraph Road Corridor
Recommendations

- **Field to Central Communication (CCTV Video Images)**
  - **Scenario # 1:** Hardwire cable media exists or will be installed
    - Fiber: Ethernet IP
    - TWP: DSL
  - **Scenario # 2:** No existing communication and distance greater than 300 feet
    - Fiber: Ethernet IP or DSL (cost issue)
  - **Scenario # 3:** No existing communication and distance to closest Hub or LCC is less than 300 feet
    - Ethernet IP over SSR
Recommendations

- **Field to Central Communication (controller data, CMS, and CCTV control)**
  
  - **Scenario # 1:** Hardwire cable media exists or will be installed
    
    Fiber: Ethernet IP
    
    TWP: Analog modems
  
  - **Scenario # 2:** No existing communication and distance greater than 300 feet
    
    Fiber: Fiber analog (serial devices) or Ethernet IP
    
    Leased analog or wireless IP
  
  - **Scenario # 3:** No existing communication and distance to closest Hub or LCC is less than 300 feet
    
    Ethernet IP over SSR
Recommendations

- **LCC to LCC (IEN Network) Communication**
  - **Scenario # 1**: High Speed connection (e.g. intranet) exists between two LCC locations
    Use if >1.5Mps
  - **Scenario # 2**: Hardwire cable media exists or will be installed between two LCC locations
    - Fiber: Ethernet
    - TWP: Private DSL
  - **Scenario # 3**: High Speed Internet connection exists to one or more LCC locations
    Use if >1.5Mps
  - **Scenario # 4**: Distance between two LCC’s is less than 5 miles and there is no existing communication infrastructure.
    - Fiber Ethernet or
    - Frame Relay
Communications Analysis (2)

Objective:
- Identify communications technologies specific to the project components
  - Field Communications
  - Center-to-Center
Location Specific

• Starting Point
  – Scenario Recommendations from Communications Analysis Report
  – Sub-regional TMC link excluded

• Assumptions
  – Field Communications (Data and Video)
    – Fiber backbone with tail circuits
  – Center-to-Center Communications (Data)
    – Frame Relay (if no fiber available)
  – Center-to-Center Communications (Video)
    – Internet Technology Based
Progress Update

Field Communication Architecture

Legend
- Low speed cable-based or wireless Connections
- High Speed Backbone Connection

I-5/Telegraph Road Corridor
Design Approach

• Use common fiber cable infrastructure across jurisdictions
  • Provides for redundancy
  • Provides path for center-to-center communications
  • Anticipated reductions in installation costs

• Communications technology to be selected per Agency
  • Assign individual fiber pairs to each jurisdiction
  • Field devices directly interconnected to parent LCCs
Design Methodology

- Route fiber-optic cable to CCTV and LCC locations
  - Connect both signals and cameras to fiber at these locations
  - Maximize number of LCCs connected
- Use tail circuits off above fiber to provide communications to other intersections
- For Tail Circuits, use the following selection priority order:
  1. Existing TWP
  2. SSR for locations with clear line of sight
  3. Wireless data services if service is available
  4. Leased telephone lines
Design Methodology (Cont.)

- Define two primary technology solutions per LCC
  - Serial (Analog)
  - Ethernet (Digital)
- Cost out the above two solutions per LCC
- Make recommendations per intersection per LCC
  - Connection method recommendation per intersection
  - Single technology recommendation per LCC
- Recommendation Criteria
  - 10 Year life cycle costs
  - Existing/planned infrastructure
  - Future expansion
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I-5/Telegraph Road Corridor

Proposed Fiber Backbone
Progress Update

Field Equipment Scenarios

• Serial Analog (Controller Only)
  – Fiber
  – Copper
  – Wireless Serial (SSR)
  – Leased Lines Digital
  – Leased Wireless (3G Digital)
Field Equipment Scenarios

- Serial Analog (Controller and CCTV)
  - Fiber
  - Copper
  - Wireless (SSR)
  - Leased Line Digital
Field Equipment Scenarios

- Ethernet (Controller Only)
  - Fiber
  - Copper
  - Wireless (SSR)
  - Leased Line Digital
  - Leased Wireless (3G Digital)
Field Equipment Scenarios

- Ethernet (Controller and CCTV)
  - Fiber
  - Copper
  - Wireless (SSR)
  - Leased Line Digital
Next Steps

• Finalize Device Locations
• Complete Communications Analysis
• Develop Conceptual Design
• Develop Operations and Management Plan
Progress Update

Gateway Cities
Traffic Signal Synchronization and
Bus Speed Improvement Project

The County of Los Angeles Department of Public Works’ Traffic Signal Synchronization, Operations and Maintenance (SOM) Program has proven successful in creating an institutional infrastructure to coordinate the activities of the agencies responsible for traffic signal operations in the County. A key feature of this infrastructure is the Formas – sub-regional grouping agencies created to encourage and promote inter-agency cooperation. These Formas have enabled funding to be targeted at infrastructure improvements along arterial and arterial-freeway corridors throughout the County. These projects are a critical part of what will eventually be a network of integrated ITS systems in Los Angeles County and in Southern California.

The I-5 Telegraph Road Corridor is one such project, which will result in arterial infrastructure improvements along Telegraph Road in the Gateway Cities Forma. The I-5 Telegraph Road Corridor contains 45 intersections in 7 different jurisdictions, including 5 cities, the County and Caltrans.

The objective of this project is to design, develop and deploy traffic control systems in the corridor such that the signals along the I-5 Telegraph Road can be synchronized across the jurisdictional boundaries. This project will concentrate on the need of the agencies in this corridor with respect to signal synchronization along the Telegraph Road and economical improvements to field infrastructure (including controllers, loops, detectors, communications) and central traffic control systems to meet these needs.

When successfully completed, each of the agencies responsible for traffic signal operations in the I-5 Telegraph Road Corridor will have full access to a TCS that provides monitoring and control of the traffic signals under its jurisdiction. Agencies will be able to synchronize their signals with neighboring agencies and exchange traffic information in real-time. Agencies will also be able to exchange data with other agencies in the Gateway Cities region. This will allow the agencies to respond to incidents and unforeseen congestion in a coordinated fashion across the jurisdictional boundaries.

The project will be implemented in the following phases:

- Phase 1: Formulation of Plans
- Phase 2: Construction
- Phase 3: Testing and Commissioning

www.itssiemens.com

I-5/Telegraph Road Corridor