ITE- North Dakota State University Chapter

Presenting

Enhancing Network Traffic Flow by Connecting Railroad Preemption with Advanced Traveler Information System

Organized by NOCoE and U.S. DOT ITS JPO PCB
The Problems

22 At Grade Rail Crossings

Four Options for Drivers:

i. Find an Alternative Route
ii. Abrupt Lane Change
iii. Wait for the Train to Leave
iv. Block the Principal Arterial
Response Times

- 11th St
- 3rd St Underpass
- 21st St Underpass

Sources:
- Bogstad, Concordia College: 0:02:22
- Eventide Living Center: 0:03:23
- Evergreens Senior Housing: 0:02:14
- Hornbachers Foods: 0:00:58
- South Snarr Hall, MSUM: 0:02:24

Source: City of Moorhead Fire Department 2015
Proposed Solution

- Provide Travelers Information
  - Pre-trip
  - En-route
- Web application
- Mobile Application
  - Android
  - IOS
Enterprise Architecture

BNSF

Shunt → Bungalow → Roadside Cabinet → Controller

City Of Moorhead

App Developer

Road Users → Web app, Mobile App → Agency Server → MN DOT

MN DOT

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MN DOT
Enterprise Architecture (Cont.)

- Road Users
  - Car User
  - Emergency Vehicle
  - City Transit Department
Physical Architecture

Shunt → BNSF Bungalow → Cabinet

App ← Server ← Controller
Physical Architecture (Cont.)

- Location
  - Select
  - Use my current location

Settings
- Location
- Off | On
- Notification
- Background Operation
- Version
Physical Architecture (Cont.)

Mobile App

Manual Settings

1. Push Notification
2. Background Operation

Asking Location/ Set Base location

Showing location with tracks, streets, Aves, underpass

Map

Green circle – gate open
Red circle - gate close
Green Square - Underpass

Map

Showing location with tracks, streets, Aves, underpass
Physical Architecture (Cont.)

= Closed Gate
= Open Gate
= Underpass
Functional Architecture

- Shunt
  - Track Circuitry
  - Train incoming Relay

- Roadside Cabinet
  - Advance Preemption Relay
  - Controller notification

- Agency Server
  - TMC
  - Wireless ISP

- Application
  - RESTful API
## Work and Budget Estimation

<table>
<thead>
<tr>
<th>ITS Device Type</th>
<th>Installation Cost ($)</th>
<th>O&amp;M Cost ($ per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Management Center</td>
<td>2,471,000</td>
<td>371,000</td>
</tr>
<tr>
<td>Wireless ISP (for each)</td>
<td>2,500</td>
<td>200</td>
</tr>
<tr>
<td>Strip heater</td>
<td>200</td>
<td>500</td>
</tr>
</tbody>
</table>

Adaptability, Flexibility, and Utility of the System

- Use of Existing Structure
- Deals with Real-time Data
- Cost Effective (Access with a Smartphone)
- Minimum Physical Maintenance
- Safe One-way Communication
- Environment Friendly
- Potential for Future Integration
Question