Smart Cities & Integrated Corridors: from Automation to Optimization

Presentation to the National Rural ITS Conference
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Smart Mobility for Smart Cities
Agenda

● Smart Cities & Smart Communities – Market Drivers
● Technology as an Enabler
● USDOT Integrated Corridor Management (ICM) Program
● Automation to Optimization
● Q&A
Schneider Electric – the global specialist in energy management

22.4 billion € sales (last twelve months)

39% of sales in new economies (last twelve months)

137,000+ people in 100+ countries

4–5% of sales devoted to R&D

Balanced geographies – FY 2011 sales

North America 23%
Western Europe 32%
Rest of World 18%
Asia Pacific 27%

Diversified end markets – FY 2011 sales

Utilities & Infrastructure 24%
Industrial & machines 22%
Data centres 16%
Non-residential buildings 29%
Residential 9%
The Global Energy challenge...

CITIES TODAY...

- Earth’s surface: 2%
- World population: 50%
- Global energy consumption: 75%
- Global CO₂ emissions: 80%

...AND BY 2050

- World population: 70%
- Years to double the urban capacity developed over the past 4000 years: 40

... will take place in Cities
As cities grow, so do their challenges…

- Scarcity of resources
- Aging and overloaded infrastructure
- Traffic congestion
- Environmental targets & pollution
- Crimes

...of long term sustainability!

- Reduce costs & manage debt
- Attract global investment, jobs, talent
Mobility Challenges - By the Numbers

34 hours of delay per commuter per year
(14 hours more than 1982)

$100 billion
cost of delay per year
($750 per commuter and growing; by 2015 will be
$133B total and $900 per commuter)

40%
of total delay outside of “typical rush hours”
(making it harder to avoid congestion)

Source: 2011 Urban Mobility Report, Texas Transportation Institute

10.5 billion
world population by 2050

By 2050, cities will be home to an astounding 70 per cent of our population, necessitating more urban infrastructure.
Cities need to become smarter

Urban efficiency delivers liveability and sustainability

- Delivering clean, connected growth
- Improving the efficiency of the city’s underlying urban infrastructures
- Improving competitiveness
- Improving attractiveness for residents, citizens and visitors
- Becoming a better place to live, work and play
- Improving public services: schools, safety, transportation...
- Creating jobs
5 steps to ‘smart’

1. Set the vision: an efficient + liveable + sustainable city.

2. Combine hardware + software solutions to improve the efficiency of urban operating systems.

3. Bring in integration to improve overall city efficiency (operation & information).

4. Add innovation to make a holistic sustainable future a reality.

5. Drive collaboration between best-in-class global and local players across the whole Smart City value-chain.
6 areas of infrastructure…

**Smart Energy**
- Smart Grid Automation & Flexible Distribution
- Smart Metering Management & Demand Response
- Renewables Integration & Micro Grid
- Real-Time Smart Grid Software Suite
- Gas Distribution Management

**Smart Mobility**
- EV Charging Infrastructure & Supervision Services
- Traffic Management
- Tolling & Congestion Charging
- Integrated Mobility • Public Transit • Traveler Information

**Smart Water**
- Distribution Management & Leak Detection
- Power, Control & Security Systems integration
- Stormwater management and Urban Flooding

**Smart Public Services**
- Public Safety • Video Surveillance • Emergency management
- Digital City Services • eGovernment • Education • Healthcare • Tourism
- Street Lighting management

**Smart Buildings & Homes**
- High-performance Buildings* • Energy Efficiency & Security solutions • Energy Services
- Efficient Homes • Home Energy management
- Connection to the Smart Grid

**Smart Connections**
- • Power, Security, Building, IT, & Process Management Systems integrated Architecture
- • Integrated Mobility Management Platform
- • Security Systems & Management
- • Energy & Environment Management Information System
- • Weather Intelligence

* Hospitals, industrial facilities, datacenters and commercial buildings
Smart City Architecture

Systems Engineering Process

- People
- Processes
- Technologies

- City Protocol
- Standards
- Performance Metrics
Blazing Trails in Congestion Management

Blazing Trails in Congestion Management

ICM will help manage congestion by:

• Optimizing existing transportation infrastructure along a corridor.
• Enabling travelers to make informed travel decisions and dynamically shift mode.
• Reducing travel times, delays, fuel consumption.
• Increasing travel time reliability and predictability.
U.S.DOT’s Integrated Corridor Management Initiative

Pioneer Sites:
- Dallas, TX (US 75)
- San Diego, CA (I-15)
- Dallas, TX
- Houston, TX
- Minneapolis, MN
- Montgomer County, MD
- Oakland, CA
- San Antonio, TX
- San Diego, CA
- Seattle, WA
Dallas ICM – Project Scope

- US 75 - Freeway with Frontage Roads
- Managed HOV lanes
- Dallas North Tollway
- 167 Miles of Arterials
- DART Bus Network
- DART Light Rail
- DART Park & Ride Lots
- 900+ Signals
- Multiple Agencies / TMCs
- Regional ATIS / 511
- Decision Support System
Dallas ICM Strategies

● Advanced Traveler Information (all scenarios)
  ▪ Better pre-trip, en-route, and multi-modal information
● Route Diversion Strategy (minor incident)
  ▪ Diverts traffic to parallel frontage roads
● Route Diversion Strategy (major incident)
  ▪ Diverts traffic to frontage road and strategic arterials
● Mode Diversion Strategy (major incident)
  ▪ Diverts travelers to DART Red Line
● Combined Route and Mode Diversion Strategy
  ▪ Diverts travelers to frontage roads, strategic arterials, and DART Red Line
# ICM Benefits

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<thead>
<tr>
<th></th>
<th>Minneapolis</th>
<th>Dallas</th>
<th>San Diego</th>
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<tbody>
<tr>
<td>Annual Travel Time Savings (Person-Hours)</td>
<td>740,000</td>
<td>132,000</td>
<td>246,000</td>
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<tr>
<td>Improvement in Travel Time Reliability</td>
<td>3%</td>
<td>4.4%</td>
<td>10.6%</td>
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<tr>
<td>Gallons of Fuel Saved Annually</td>
<td>981,000</td>
<td>17,600</td>
<td>323,000</td>
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<tr>
<td>Tons of Mobile Emissions Saved Annually</td>
<td>9,400</td>
<td>175</td>
<td>3,100</td>
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<tr>
<td>10-Year Net Benefit</td>
<td>$104M</td>
<td>$264M</td>
<td>$82M</td>
</tr>
<tr>
<td>Benefit-Cost Ratio</td>
<td>20:1</td>
<td>22:1</td>
<td>10:1</td>
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Source: USDOT; AMS Results
Smarter Mobility Solutions

Solution Categories
- Traffic Management
- Electric Vehicle Charging Infrastructure
- Tolling & Pay-As-You-Drive
- Traveler Information
- Transit Management

Key Benefits
- Better City Management: Better management of multi-modal transit network and increased resiliency to disruptions
- Increased Sustainability: Reduction of traffic congestion, increased public transit use & lower emissions
- Improved City Services: Better transit information and facilitation of easier travel across modes of transport
Multi-Agency Collaboration

- Smarter Cities; Smarter Communities; Smarter States
- Mobility management is inherently multi-agency
- Collaboration is better than centralized control
- Areas of Responsibility – fixed & dynamic
- Work Flow Management for optimal group decision making & response
Proactive Mobility Management

Operational Strategies based on Regional Goals & Policies

- Arterial Management
- Expressway Management
- Public Transport Priority Management
- Predictive Analytics
- Traveler Information Dissemination
- Managed Lanes: HOV HOT ATM
- Weather Forecasts & Air Quality Alerts

Performance Monitoring for Optimal Results
Decision Support System

Integrated Corridor Management (ICM) Decision Support System (DSS)
Alternatives for Agencies, Options for Commuters When Incidents Occur on US 75

**THE PROCESS**

- An incident occurs on US 75 and is entered into SmartNET by agency staff
- SmartNET relays the incident information to DSS
- DSS evaluates the incident and commuting alternatives using expert rules
- DSS recommends solutions to multiple operating agencies
- ICM coordinator recommends DSS solution implementation
- Commuters receive information and make alternative travel choices
- DSS reevaluates solution based on roadway conditions and incident status

- Examines current roadway conditions such as: incident location, light rail utilization, lanes blocked, available capacity of alternative routes
- Forecasts 30-minute impact of implementing the recommendation to ensure value added
- Agency implements the recommended solution

**THE BENEFITS**

- Improved travel time reliability for commuters
- Enhanced decision making support for operating agencies
- Achieves a 20:1 return ($278.8 million) on the project’s cost over 10 years
- Less pollution from idling vehicles in congested traffic
Business Intelligence – Dashboards

> Real-time status & trend data – visible to all
> Can only manage what you can measure
> Continuous improvement in key performance indicators (KPIs)
> Optimal use of limited resources
Questions?
Make the most of your energy™