US 75 Integrated Corridor Management System

“Using Technology and Partnership to Maximize Transportation System Capacity”
What is ICM?

• The integrated management of freeway, arterial, transit, and parking systems within a corridor

• Management of the corridor as a system, rather than the more traditional approach of managing individual assets
US 75 ICM Vision

Operate the US 75 Corridor in a true multimodal, integrated, efficient, and safe fashion where the focus is on the transportation customer.
US 75 Corridor Networks

- Freeway with continuous Frontage Roads
- Managed HOV lanes
- Dallas North Tollway
- 167 Miles of Arterials
- DART Bus Network
- DART Light Rail
- 900 Signals
- Multiple TMCs
- Regional ATIS
ICM Applications

- Responsive Traffic Signal System
- Arterial Street Monitoring System
- Third Party Data
- Parking Management
- Real-Time Transit Vehicle Information
- Freeway & HOV Systems
- Weather
- SmartNET
- Decision Support System
- Regional Transit Schedule & Trip Planner
- 511
Responsive Traffic Signal System

- Cluster Analysis of Intersections with impact
- Modeling of Arterials using macro-scopic model for initial plans
- Develop new Traffic Signal Timing Plans for Greenville Ave using Synchro
Responsive Traffic Signal System

- Develop Event Specific Timing Plans
- Provide Timing Plans in Decision Support System
  - Incident Response Plans can include signal timing plans for diversion
Arterial Street Monitoring System

- Blue Tooth Deployed in 40 Locations along four diversion routes:
  - US 75 frontage roads (NB and SB)
  - Greenville Avenue.
  - Coit Rd.
NAVTEQ Traffic Data

• Provides real-time and archived traffic data
• Major arterials in Plano, Richardson, and Dallas
Parking Management

- 5 Park & Ride lots along LRT Red Line
- Monitor availability at each Park & Ride lot
- Publish to 511 System
- Publish to TxDOT DMS
- Integrate with DSS
Real Time Transit Vehicle Information

• Key information supporting ICM
  Include:
  – Vehicle location
  – Time to arrival at next stop
  – Transit schedule
  – Available capacity to carry additional passengers
Real Time Transit Vehicle Information

- Install APC on all Red Line cars.

- Transmit and integrate real time AVL and APC data to ICM System.
Real Time Weather Information

- Provide current weather conditions
- Provide 5-day forecast
- Weather alerts by roadway for weather impacts
ICMS - SmartNET/ SmartFusion

• Information Exchange Tool & Backbone of ICM Network
  – Web Based Interface to ICM System
  – Data Fusion Engine
  – Allows entry and management of Incidents, Construction, Planned Events
  – Receives and Publishes data to the Regional C2C System & Other External Systems
  – Feeds Data to the 511 System, Decision Support System and Public
ICMS - Decision Support System

- Will assist operating ICM agencies with responding to incidents in a coordinated manner
- Multiple stage implementation
  - Manual Interaction – use developed response plans
  - Real-time Data Integration
  - Predictive Model Integration - Utilize Model to Predict 30 minutes into future
Role of DSS in ICMS

- Receives data from SmartNET/SmartFusion
- Evaluates various response plan options
- Provides recommended plan to ICM Coordinator and partner agencies via SmartNET
DSS Concept

Monitor US 75 Congestion

Divert to Frontage Road

Divert to Frontage Road and Greenville Ave

Divert to Frontage Road and Greenville Ave and Transit
Creation of a Response Plan

Frontage Road Diversion Response Plan

Strategies

- Traveler Info
  - Do Nothing
  - Comparative TT
  - DMS Plan #1
  - DMS Plan #2
  - DMS Plan #3
  - 511 Mobile Alert

- Frontage Rd Diversion
  - Do Nothing
  - Timing Plan #1
  - Timing Plan #2
  - Timing Plan #3
  - Timing Plan #4

- Arterial Street Diversion
  - Do Nothing
  - Timing Plan #11
  - Timing Plan #12
  - Timing Plan #13
  - Timing Plan #14
  - Timing Plan #15
  - Timing Plan #16

- Mode Diversion
  - Do Nothing
  - Timing Plan #20
  - Timing Plan #21
  - Timing Plan #22

Actions
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
Typical Day – Morning AM

- TxDOT is monitoring and controlling US-75 for traffic going to downtown for work
- City Traffic Signal Systems are optimized for East-West traffic flow across the city and to the major North-South freeways (including US-75)
- DART is providing transit services on bus and light rail to include express bus routes from suburban locations to downtown and major LRT stations.
Traffic Flowing to Downtown
Signals Optimized for East-West Flow

Greenville Ave. Flow is not priority
Light Rail
7 minute headways

Parking at Station
60% availability
Accident US-75 Southbound
TxDOT CCTV

TxDOT CCTV Monitors Area

US75 @ Spring Valley
Last Updated: Aug 21 2013 7:20AM

US75-Spring Valley
SOUTH
TxDOT ATMS Creates Incident – Available through C2C
## DSS Rules for Response Plan Development

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Incident: Short Diversion to FR</td>
<td>0.5 &lt; Q &lt; 1</td>
<td>&lt; 30</td>
<td>&lt; 2</td>
<td>&gt; 20</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Major Incident: Long Diversion to FR</td>
<td>1 &lt; Q ≤ 4</td>
<td>&lt; 30</td>
<td>≥ 2</td>
<td>&gt; 20</td>
<td>N/A</td>
<td>?</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Major Incident: Diversion to FR. &amp; GV.</td>
<td>1 &lt; Q ≤ 4</td>
<td>&lt; 30</td>
<td>≥ 2</td>
<td>&gt; 20</td>
<td>&gt; 20</td>
<td>?</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Major Incident: Diversion to FR. &amp; GV., Transit</td>
<td>Q &gt; 4</td>
<td>&lt; 30</td>
<td>≥ 2</td>
<td>&gt; 20</td>
<td>&gt; 20</td>
<td>?</td>
<td>&lt;90%</td>
<td>&lt;90%</td>
<td></td>
</tr>
</tbody>
</table>

**Alert (Send Heads Up Notification to ICM Coordinator, “N-1”)**

FR = Frontage Rd.
GV = Greenville
Q = Queue in US-75 main lanes
<table>
<thead>
<tr>
<th>Time Stamp</th>
<th>Rule ID</th>
<th>Facility ID</th>
<th>Incident ID</th>
<th>Incident Status</th>
<th>Num Affected Lanes</th>
<th>Queue Length (miles)</th>
<th>Avg Arterial Link Speed (mph)</th>
<th>Avg Frontage Road Link Speed (mph)</th>
<th>Rail Utilization (%)</th>
<th>Park and Rde Utilization (%)</th>
<th>Cross Street Proximity</th>
<th>Response Status</th>
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</thead>
<tbody>
<tr>
<td>Wed, Apr 24, 06:00 AM</td>
<td>J75N262</td>
<td>1014</td>
<td>201304...</td>
<td>Closed</td>
<td>0</td>
<td>0.6</td>
<td>29</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td>Approaching</td>
</tr>
<tr>
<td>Wed, Apr 24, 06:00 AM</td>
<td>J75N263</td>
<td>1014</td>
<td>201304...</td>
<td>Closed</td>
<td>0</td>
<td>0.6</td>
<td>29</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td>Approaching</td>
</tr>
<tr>
<td>Wed, Apr 24, 06:00 AM</td>
<td>J75S250</td>
<td>1013</td>
<td>201304...</td>
<td>Updated</td>
<td>3</td>
<td>0.6</td>
<td>29</td>
<td>At</td>
<td></td>
<td></td>
<td></td>
<td>At</td>
</tr>
<tr>
<td>Wed, Apr 24, 06:00 AM</td>
<td>J75S250</td>
<td>1013</td>
<td>201304...</td>
<td>Updated</td>
<td>2</td>
<td>0.6</td>
<td>29</td>
<td>At</td>
<td></td>
<td></td>
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<td>At</td>
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<td>1013</td>
<td>201304...</td>
<td>Updated</td>
<td>3</td>
<td>0.6</td>
<td>29</td>
<td>At</td>
<td></td>
<td></td>
<td></td>
<td>At</td>
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<td>J75S251</td>
<td>1013</td>
<td>201304...</td>
<td>Open</td>
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<td>At</td>
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<td>J75S251</td>
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<td>201304...</td>
<td>Open</td>
<td>1</td>
<td>0.6</td>
<td>29</td>
<td>At</td>
<td></td>
<td></td>
<td></td>
<td>At</td>
</tr>
</tbody>
</table>
TTI.Tmc.Providers.ResponseManager 1.0.4861.41920

File View Log

Rules executed in 38 milliseconds


Parsing new NMS data


Parsing new link data

Rules executed in 40 milliseconds

Archiving link data...

Rules executed in 24 milliseconds

Archiving link data complete.


Parsing new event data


Parsing new link data

Wrote performance record for rule J75S350 facility 1013


Publishing response

Wrote performance record for rule J75S351 facility 1013

Wrote performance record for rule N75S300 facility 1013

Rules executed in 238 milliseconds


Parsing new MCP data


Parsing new user data


Responses

<table>
<thead>
<tr>
<th>ID</th>
<th>Last Updated</th>
<th>Status</th>
<th>Event ID</th>
<th>Recommended By</th>
<th>Plan Name</th>
<th>Plan URL</th>
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</thead>
<tbody>
<tr>
<td>f5e8b217-0ed5-4a4a</td>
<td>4/24/2013 7:41...</td>
<td>Recommended</td>
<td>2013042407322</td>
<td>RulesEngine</td>
<td>J75S351</td>
<td><a href="http://icmresp">http://icmresp</a>...</td>
</tr>
</tbody>
</table>
DSS Plan is generated based on location and conditions.

<table>
<thead>
<tr>
<th>Type</th>
<th>Location/Roadway</th>
<th>Description</th>
<th>County</th>
<th>Last Update Time</th>
<th>Organization</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident</td>
<td>US 75 Southbound</td>
<td>TxDOT Dallas: accident on US 75 southbound at Renner Rd in Richardson. 3 all lanes blocked - This is a test message.</td>
<td>Dallas</td>
<td>04/22/2013 08:50:13 AM</td>
<td>TxDOT Dallas</td>
<td></td>
</tr>
<tr>
<td>Incident</td>
<td>US 75 Southbound</td>
<td>TxDOT Dallas: accident on US 75 southbound at Renner Rd in Richardson. 3 all lanes blocked - This is a test message.</td>
<td>Dallas</td>
<td>04/22/2013 08:31:14 AM</td>
<td>TxDOT Dallas</td>
<td></td>
</tr>
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<td>Incident</td>
<td>US 75 Southbound</td>
<td>TxDOT Dallas: accident on US 75 southbound at Renner Rd in Richardson. 3 all lanes blocked - This is a test message.</td>
<td>Dallas</td>
<td>04/22/2013 07:51:33 AM</td>
<td>TxDOT Dallas</td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>IH 20 Westbound</td>
<td>TxDOT Dallas: construction on IH 20 Westbound between FM 148 and FM 1641 from 20:00:00 until 05:00:00. Right lane closed nightly, except for Fri and Sat.</td>
<td>Kaufman</td>
<td>04/22/2013 05:58:50 AM</td>
<td>TxDOT Dallas</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>IH 20 Eastbound</td>
<td>TxDOT Dallas: construction on IH 20 Eastbound between FM 1641 and FM 148 from 20:00:00 until 05:00:00. Right lane closed nightly, except for Fri and Sat.</td>
<td>Kaufman</td>
<td>04/22/2013 05:58:50 AM</td>
<td>TxDOT Dallas</td>
<td></td>
</tr>
</tbody>
</table>
ICM Coordinator decides to proceed
J 75 S 266
Major Incident
between Renner
Exit and Campbell-
Galatyn Exit

LEGEND
- Diversion Route
- Incident Segment
- Dynamic Message Sign
  - TxDOT
  - DART
  - NTTA
  - Dallas
  - LBJ Express
- Park-n-Ride Rail Station

Not To Scale

Approved: 1/11/13
Revised:
Richardson
- Greenville/Plano Road: activate signal timing signal plan #34 and monitor every 15 min.

<table>
<thead>
<tr>
<th>Native Signal ID</th>
<th>Name</th>
<th>SmartNet Signal ID</th>
<th>DIRECT Signal ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>142</td>
<td>Plano @ Renner</td>
<td>7020017</td>
<td>4300</td>
</tr>
</tbody>
</table>

- CCTV: monitor traffic conditions on US 75 Frontage Rds. and on Greenville every 15 min.

Plano
- Frontage Road: activate signal timing signal plan #32 and monitor every 15 min.

<table>
<thead>
<tr>
<th>Native Signal ID</th>
<th>Name</th>
<th>SmartNet Signal ID</th>
<th>DIRECT Signal ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>4324</td>
<td>CENTRAL @ NORMAN WHITSITT</td>
<td>1010147250</td>
<td>4408</td>
</tr>
<tr>
<td>4318</td>
<td>CENTRAL @ PLANO</td>
<td>1010147190</td>
<td>4418</td>
</tr>
<tr>
<td>4331</td>
<td>CENTRAL @ PARK</td>
<td>1010147320</td>
<td>17</td>
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</tbody>
</table>

- Greenville/K Avenue: activate signal timing signal plan #34 and monitor every 15 min.

<table>
<thead>
<tr>
<th>Native Signal ID</th>
<th>Name</th>
<th>SmartNet Signal ID</th>
<th>DIRECT Signal ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>4695</td>
<td>PARK @ STATE HWY 5</td>
<td>1010151710</td>
<td>18</td>
</tr>
<tr>
<td>4332</td>
<td>18TH @ STATE HWY 5</td>
<td>1010147330</td>
<td>78</td>
</tr>
<tr>
<td>4330</td>
<td>15TH @ STATE HWY 5</td>
<td>1010147310</td>
<td>N/A</td>
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<tr>
<td>4329</td>
<td>14TH @ STATE HWY 5</td>
<td>1010147300</td>
<td>4280</td>
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<tr>
<td>4322</td>
<td>PLANO @ STATE HWY 5</td>
<td>1010147230</td>
<td>4282</td>
</tr>
<tr>
<td>4321</td>
<td>PLANO RD @ PGBT WB FR</td>
<td>1010147220</td>
<td>4286</td>
</tr>
<tr>
<td>4697</td>
<td>FM 2514 @ STATE HWY 5</td>
<td>1010151730</td>
<td>5708</td>
</tr>
</tbody>
</table>
Each agency votes on readiness.
### Results of Voting

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>User Name</th>
<th>Readiness</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/20/2013 10:39:37 AM</td>
<td>kmiller(Richardson)</td>
<td>Accepted</td>
<td>I guess we are okay with this</td>
</tr>
<tr>
<td>02/20/2013 10:40:01 AM</td>
<td>TxDOTUser(TxDOT Dallas)</td>
<td>Accepted</td>
<td>Plan accepted.</td>
</tr>
<tr>
<td>02/20/2013 10:54:38 AM</td>
<td>fbouatouira(DART)</td>
<td>Implement</td>
<td></td>
</tr>
<tr>
<td>02/20/2013 10:55:40 AM</td>
<td>PlanUser(Plano)</td>
<td>Implement</td>
<td></td>
</tr>
<tr>
<td>02/20/2013 10:56:51 AM</td>
<td>NTTAUser(NTTA)</td>
<td>Implement</td>
<td></td>
</tr>
</tbody>
</table>

### DSS History

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Action Type</th>
<th>Action Details</th>
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</thead>
<tbody>
<tr>
<td>02/20/2013 10:32:46 AM</td>
<td>DSS NEW</td>
<td>DSS Plan Created</td>
</tr>
<tr>
<td>02/20/2013 10:36:59 AM</td>
<td>DSS User</td>
<td>Recommended plan J7S5266 accepted by fbouatouira</td>
</tr>
<tr>
<td>02/20/2013 10:39:37 AM</td>
<td>DSS User</td>
<td>Accepted plan J7S5266 accepted by kmiller</td>
</tr>
<tr>
<td>02/20/2013 10:48:01 AM</td>
<td>DSS User</td>
<td>Accepted plan J7S5266 accepted by TxDOTUser</td>
</tr>
<tr>
<td>02/20/2013 10:54:38 AM</td>
<td>DSS User</td>
<td>Accepted plan J7S5266 accepted by NTTAUser</td>
</tr>
<tr>
<td>02/20/2013 10:55:40 AM</td>
<td>DSS User</td>
<td>DSS Plan actions updated by PlanUser(Plano)</td>
</tr>
</tbody>
</table>

Results of Voting and comments
Based on results, ICM Coordinator decides to implement.
**DSS Response**

<table>
<thead>
<tr>
<th>Action</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement Message_ID 3 for US 75_SB Park DMS</td>
<td>Completed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rejected</td>
</tr>
</tbody>
</table>

**DSS Response Summary**

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>User Name</th>
<th>Readiness</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/21/2013 06:26:44 PM</td>
<td>DARTUser(DART)</td>
<td>Accepted</td>
<td>DART Organization accepts plan</td>
</tr>
<tr>
<td>04/21/2013 06:27:42 PM</td>
<td>NTTAUser(NTTA)</td>
<td>Accepted</td>
<td>NTTA Accepts plan</td>
</tr>
<tr>
<td>04/21/2013 06:29:12 PM</td>
<td>RichardsonUser(Richardson)</td>
<td>Rejected</td>
<td>City of Richardson rejects plan</td>
</tr>
<tr>
<td>04/21/2013 06:29:54 PM</td>
<td>PlanoUser(Plano)</td>
<td>Accepted</td>
<td>City of Plano accepts plan</td>
</tr>
</tbody>
</table>

**DSS History**

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<tr>
<th>Date and Time</th>
<th>Action Type</th>
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</tr>
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<tbody>
<tr>
<td>04/21/2013 06:18:36 PM</td>
<td>DSS NEW</td>
<td>DSS Plan Created</td>
</tr>
<tr>
<td>04/21/2013 06:24:03 PM</td>
<td>DSS User</td>
<td>DSS plan J75S266 accepted by DARTAdmin</td>
</tr>
<tr>
<td>04/21/2013 06:26:44 PM</td>
<td>DSS User</td>
<td>DSS plan J75S266 accepted by DARTUser</td>
</tr>
</tbody>
</table>
Signals Optimized for Frontage Road Flow

Greenville Ave. Flow is priority
Recommend Transit Usage on DMS

Headways Reduced, If needed

Availability of Parking Monitored
Incident has cleared
Traffic back to normal
# Plan Decision Dialog (ICM User)

**DSS Name:** J75S266  
**Last Update:** 2013-04-21 18:36:58.3

**URL:**  
[http://icmresponseplans1.dyndns.org/icm/responseplans/J75S266.pdf](http://icmresponseplans1.dyndns.org/icm/responseplans/J75S266.pdf)

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<td>DSS User</td>
<td>DSS plan J75S266 rejected by RichardsonUser</td>
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No. of Lanes: 

Lane Description: 

Status: 

Total Lanes: 

Other Information: 

Description: 

1 1/2 mile delay

TDOT Dallas: accident on US 75 southbound between Renner Rd (in Richardson) and Campbell Rd (in Richardson) 1 to 2 lanes blocked 1 1/2 mile delay

Contact Information

Time and Schedule Information

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<th>Final Duration</th>
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<td>5:23 PM</td>
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Actions

Count: 12

First: 04/21/2013 05:23:15 PM

Last: 04/21/2013 06:55:53 PM

Event Action List:

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<td>04/21/2013 06:48:23 PM</td>
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<td>DSS Plan J755266 actions updated by TxDOTUser(TxDOT Dallas)</td>
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<td>DSS CLOSE</td>
<td>DSS plan J755266 Terminated by SmartNET</td>
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</tbody>
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For More Information

Dr. Kevin T Miller, P.E.
Deputy Project Manager
Schneider Electric

(313) 354 –2126
kevin.miller@telvent.com