FLOWER MOUND ATMS – BROADBAND BACKHAUL TO MANAGED NETWORK ON A BUDGET
WHERE IS THE TOWN OF FLOWER MOUND?

- Suburb of Dallas/Fort Worth
- 3 miles north of DFW Airport
- Approx. area 46 square miles
- Population – 69,062 (Yes. Still referred to as a Town)
- More than 30 mi. of multi-purpose trails, 680 acres of parkland, 11 mi. of equestrian trails and 26 mi. of unpaved hike and bike trails
  - Two National Recreation Trails (Northshore and Knob Hill)

<table>
<thead>
<tr>
<th>Number of Vehicles</th>
<th>Number of Households</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Vehicles</td>
<td>227</td>
<td>1.01</td>
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<tr>
<td>1 Vehicle</td>
<td>4,564</td>
<td>20.36</td>
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<tr>
<td>2 Vehicles</td>
<td>11,519</td>
<td>51.39</td>
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<tr>
<td>3 Vehicles</td>
<td>4,641</td>
<td>20.70</td>
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<td>4 Vehicles</td>
<td>1,133</td>
<td>5.05</td>
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<tr>
<td>5+ Vehicles</td>
<td>332</td>
<td>1.48</td>
</tr>
<tr>
<td>Average</td>
<td>2.14</td>
<td>–</td>
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INTRODUCTION

- ATMS Grant
- Backhaul Construction
  - 5.8, 4.9 or 2.4 GHz Discussion
- Video Interface
- System Expansion
  - More “EnGenius” expansion
- Flat vs Managed Network
- Where is TOFM ATMS Today
Prior to ATMS Grant, Town had 32 traffic signals
- Various cabinet and controller manufacturers
- No Communication to any

Original ATMS Grant - 2004
- $556K ($892K with amendments)
  - 14 Controllers Cabinets and controllers
  - 39 Freewave 900 MHz radios
  - Naztec Streetwise
  - Convert 15 locations from Incandescent to LED
  - Convert 23 locations from loops to VIVDS
  - ~$106K left for a broadband backhaul system
BROADBAND BACKHAUL

- Designed in-house
- Robust to bring video back from VIVDS & PTZ
- Consultation with Information Technology (IT)
- Separate systems as much as possible
Decided on 5.8 GHz
- Higher Throughput
Consulted with 2 vendors to determine specification
Request from IT to have some 2.4 GHz hotspots
- Who was going to be near a traffic signal to use it?
Public Safety on 4.9 GHz
Collaboration between Traffic Operations and Engineering

Selected based on the following criteria:

- Major/Major Arterial Intersections
- Locations where concerns from citizenry was high
- Location where a repeater was needed
- At least one location per tower
- Completion of a corridor
July 2009
$74K (~$32.7K remaining)
Project included: 7 intersections (1 repeater location), 2 water towers (backhaul plus 4 sector antennas each), and 1 PTZ

Water Tower locations
- Originally
  - 1 dedicated backhaul radio
  - 1 radio serving 4 sector antennas
- Change Order ($11.1K) increased the number of radios at the water towers to:
  - 1 dedicated backhaul radio
  - 4 radios serving 4 sector antennas
LOCATIONS FOR BACKHAUL WORK
At the cabinet – Axis 241Q video server
At the office – Standard internet browser
Each intersection was IP addressable
Any Town staff could pull up a camera
Autoscope Terra
  - Viewed through QuickTime
  - Only one approach at a time.
  - Cumbersome
Problem solved (Thanks internet)
html script to embed 4 Quick Time Videos in one webpage.
Can provide that information if one is interested
EXPANSION

- A portion of the remaining $20.6K spent on additional 5.8GHz radios (New total 12 intersections)
- One expansion location was US 377 and FM 1171
  - ~6.5 miles from nearest water tower
  - Lowered frame rate to 15 frames per sec
  - Not obstructed by large buildings
- New Water Tower built
  - Included the backhaul traffic equipment in design
  - Within 2.8 miles of US 377 /FM 1171
MORE “ENGENIUS” WAY TO EXPAND

- 2.4 GHz EnGenius Extender Radio
- Video Quality degraded
- Fraction of the cost of 5.8 GHz
- Number of intersections returning video increased to 31
MANAGING IP ADDRESSES

- Early Stage
  - Few intersections
  - Used Favorites in *Internet Explorer*

- Expansion Stage
  - Many intersections
  - Difficult to keep track of all IP addresses
  - Needed a simple way
TOFM IP ADDRESS SOLUTION

- Microsoft Publisher
  - Simple web page design
  - Provide Hyperlink to each IP address
  - Keeps corridors organized
  - Saves as a Html file
  - Can still use the QuickTime fix
FLAT VS MANAGED NETWORK

- Originally a “Flat” Network
  - Easy to design and install
  - Everything can transmit and receive to every device
  - Less Security
  - Difficult to troubleshoot if there is an issue
    - A security camera on the Town network had a malfunction that slowed down the network
    - Single intersection radio with a bad receiver but an awesome transmitter that caused a problem
Decision was made to place a Network Router at point of entry of the ATMS into the Town’s network

- Malfunctioning piece of ATMS equipment would no longer affect Town equipment and vice versa
- Does not help find the malfunctioning radio
ULTIMATE MANAGED NETWORK

- Used a *MicroTik 750GL* router
  - Robust and a much lower price than a *Cisco* router
  - Not a friendly user interface
  - Recommended by *Cactus Computer Inc.*
- *MicroTik* Router in every cabinet
  - 255 individual IP addresses for each router
- Reduces “Cross talk” amongst devices for better quality throughput
- Used a new subnet for traffic system
  - Requires a special route statement
  - Better security
WHERE IS TOFM ATMS TODAY?

- 21 PTZ cameras
  - Partnership with Police for Incident Management
- 55 intersections with video backhaul
- 3 water towers for backhaul
- 1 communications tower at service center
- 1 repeater tower at Community Activity Center
- Using 900 MHz radios to connect to school zone flashers
- Use of 5.8 GHz MicroTik Radio to replace 2.4 GHz Radio
  - 300Gb
  - More robust than 2.4 GHz
  - About the same cost
Melanie Young, P.E., Dallas District Transportation Operations Engineer

Kent Collins, P.E., Former Assistant Town Manager, TOFM

David Stallings, Traffic Operations Manager, TOFM

Jake Smith, Cactus Computer Inc.

Jackie Jamison, Twincrest Technologies
Don’t Drive Distracted by talking on the phone or texting.

See this site for more information:

http://www.distraction.gov

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