FLOWER MOUND ATMS – BROADBAND BACKHAUL TO MANAGED NETWORK ON A BUDGET

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Matt Hotelling, P.E., PTOE
Traffic Engineer
Town of Flower Mound

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)

Number of Vehicles	Number of Households	Percentage
No Vehicles	**227**	1.01
1 Vehicle	4,564	20.36
2 Vehicles	11,519	51.39
3 Vehicles	4,641	20.70
4 Vehicles	1,133	5.05
5+ Vehicles	**332**	1.48
Average	2.14	–

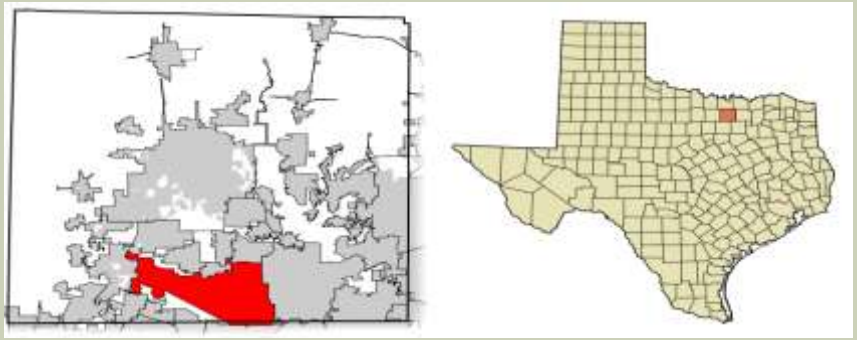


Photo Source: Wikipedia

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

ATMS GRANT

- 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

BACKHAUL CONTINUED

- 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

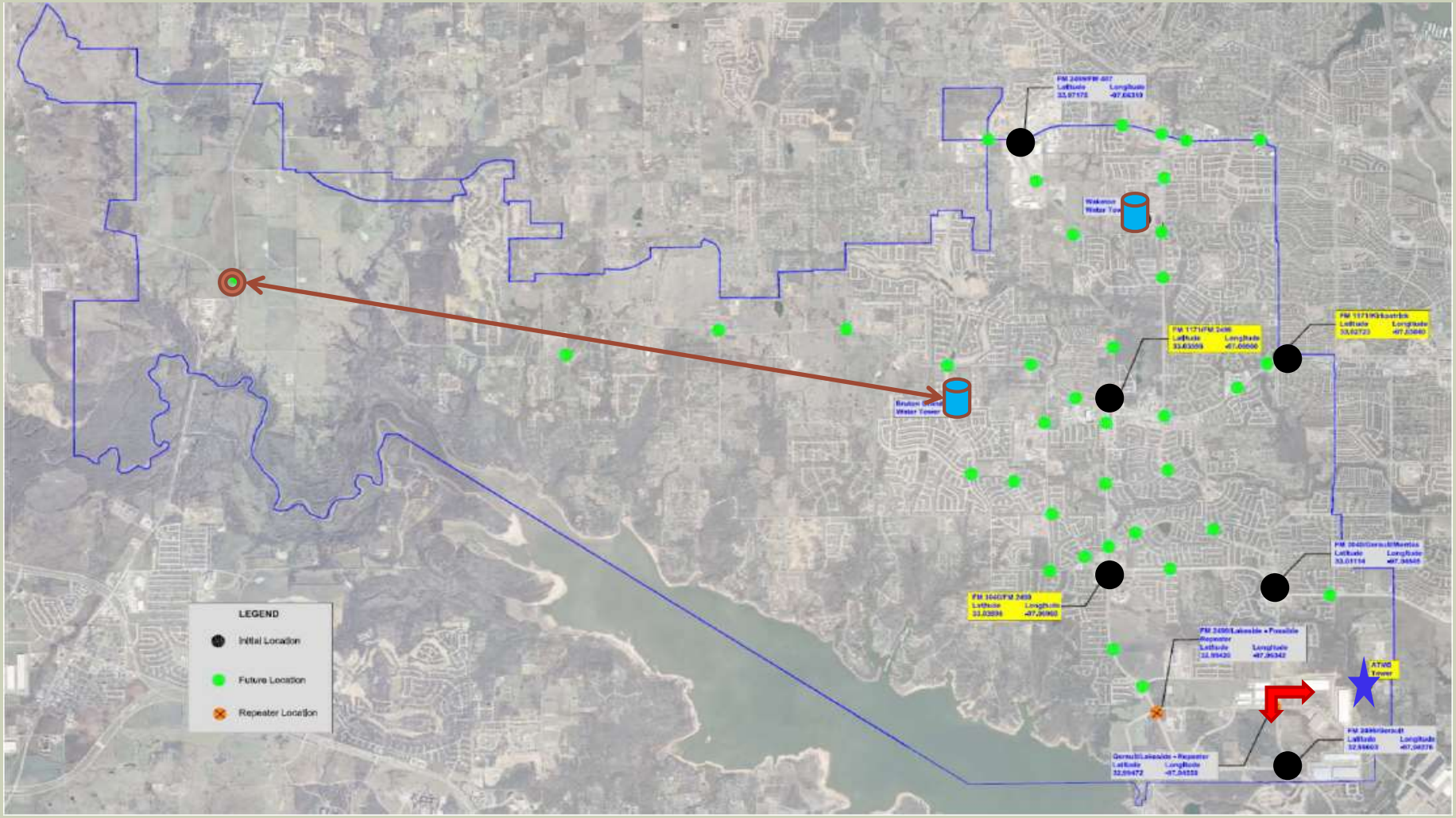
5.8GHZ RADIO LOCATIONS

- 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

BACKHAUL BID

- 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



VIDEO INTERFACE

- 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

AUTOSCOPE TERRA FIX

- Problem solved (Thanks *internet*)
- html script to embed 4 Quick Time Videos in one webpage.
- Can provide that information if one is interested

Folder structure

- Intersection Name (Folder, user choice)
  - QuadView.htm (File, name user choice)
  - Shortcut to Camera1 (points to Frame1.htm)
  - Shortcut to Camera 2 (points to Frame2.htm)
  - Shortcut to Camera 3 (points to Frame3.htm)
  - Shortcut to Camera 4 (points to Frame4.htm)
  - Frame (Folder, required name)
    - Frame1.htm (File, required name)
    - Frame2.htm (File, required name)
    - Frame3.htm (File, required name)
    - Frame4.htm (File, required name)

Quadview.htm

```
<html>

<frameset border="0" frameborder="0" framespacing="0" cols="1*,1*">
<frameset border="0" frameborder="0" framespacing="0" rows="1*,1*">
 <frame name=Frame1 src="Frame/Frame1.htm" style='mso-linked-frame:auto'>
 <frame name=Frame2 src="Frame/Frame2.htm" style='mso-linked-frame:auto'>
</frameset>
<frameset rows="1*,1*">
 <frame name=Frame3 src="Frame/Frame3.htm" style='mso-linked-frame:auto'>
 <frame name=Frame4 src="Frame/Frame4.htm" style='mso-linked-frame:auto'>
</frameset>
<noframes>
 <body lang=EN-US>
 <div class=Section1>
 <p class=MsoNormal>This page uses frames, but your browser doesn't support
them.</p>
 </div>
 </body>
</noframes>
</frameset>

</html>
```

FrameX.htm

```
<BODY bgcolor="#000000"> <div align="center">
<OBJECT
CLASSID="clsid:02BF25D5-8C17-4B23-BC80-D3488ABDDC6B"
WIDTH  = "576"
HEIGHT  = "384"
CODEBASE="http://www.apple.com/qtactivex/qtplugin.cab">
<PARAM NAME="src" VALUE="/dummy.mov" >
<PARAM NAME="QTSRC" VALUE="rtsp://172.29.214.106/video" >
<PARAM NAME="CONTROLLER" VALUE="False" >
<PARAM NAME="AUTOPLAY" VALUE="True" >
<PARAM NAME="SCALE" VALUE="Aspect" >
<PARAM NAME="EnableJavaSript" VALUE="True" >
<PARAM NAME="TARGET" VALUE="myself" >
<PARAM NAME="LOOP" VALUE="False" >
</OBJECT>
</BODY>
```

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

MANAGED NETWORK

- 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

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- Jackie Jamison, Twincrest Technologies

Matthew J. Hotelling, P.E., PTOE
Traffic Engineer
Town of Flower Mound
Matthew.hotelling@flower-mound.com

Don't Drive Distracted by talking on the phone or texting.

See this site for more information:

http://www.distraction.gov