



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

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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	-

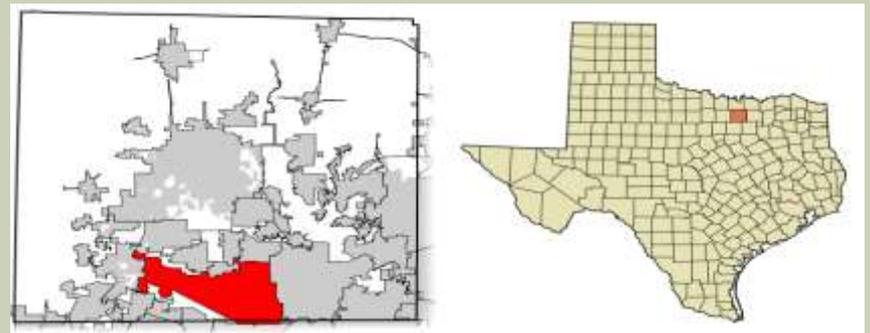


Photo Source: Wikipedia

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

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**">
<framecset 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-D3448ABDDC6B"
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="EnableJavaScript" 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



The screenshot shows a web browser window with the address bar displaying 'Z:\VIVDS\LinkToVIVDSPTZ.htm'. The page content includes a navigation menu with links for 'VIVDS/PTZ Page', 'PTZ', 'UPS Page', and 'Technical Manual'. Below the menu is a section titled 'PROJECT LIST—PTZ AND VIVDS'. The text under this section reads: 'Here is a list of PTZ and VIVDS locations throughout the Town of Flower Mound. Hyperlink locations will take you to the respective traffic signal.' There are three sub-sections: 'PTZ CAMERAS', 'VIVDS (VIVDS) ON FM 1171', and 'VIVDS (VIVDS) ON FM 2499'. Each sub-section contains a list of hyperlinks to specific camera locations.

PTZ CAMERAS
These links will take you to the PTZ cameras.

FM 1171@Kirkpatrick	FM 1171@Tour 18	FM 2499@FM 3040
FM 1171@Luther	FM 1171@High Rd	FM 2499@Gerritt
FM 1171@Morris	FM 1373@US 377	FM 3040@Garden Ridge
FM 1171@Churchill	FM 2499@FM 497	Old Settlers/Peters Colony
FM 1171@Glemick	FM 2499@Waketon	Old Settlers/Sagebrush
FM 1171@Bridlewood	FM 2499@West Windsor	
FM 1171@Shubb	FM 2499@FM 1171	
FM 1171@EMSD	FM 2499@Foothill	

VIVDS (VIVDS) ON FM 1171
These links will take you to VIVDS video

FM 1171 at Kirkpatrick	FM 1171 at Timber Creek
FM 1171 at Luther	FM 1171 at Morris
FM 1171 at Fornas	FM 1171 at FM 2499
FM 1171 at Churchill (240Q)	FM 1171 at Old Settlers
FM 1171 at Glemick	FM 1171 at Bridlewood/Eaton Grand
FM 1171 at Flower Mound Link	FM 1171 at Shubb
FM 1171 at High Road	FM 1171 at Tour 18 (Radar)
FM 1171 at US 377	

VIVDS (VIVDS) ON FM 2499
These links will take you to VIVDS video

FM 2499 at Gerritt	FM 2499 at Silvers
FM 2499 at Lakeside	FM 2499 at Spinks/Fountain Park (240Q)
FM 2499 at Aberdeen	FM 2499 at FM 3040
FM 2499 at Fossil Vista (240Q)	FM 2499 at Emerald (240Q)
FM 2499 at Sagebrush	FM 2499 at Churchill (240Q)

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

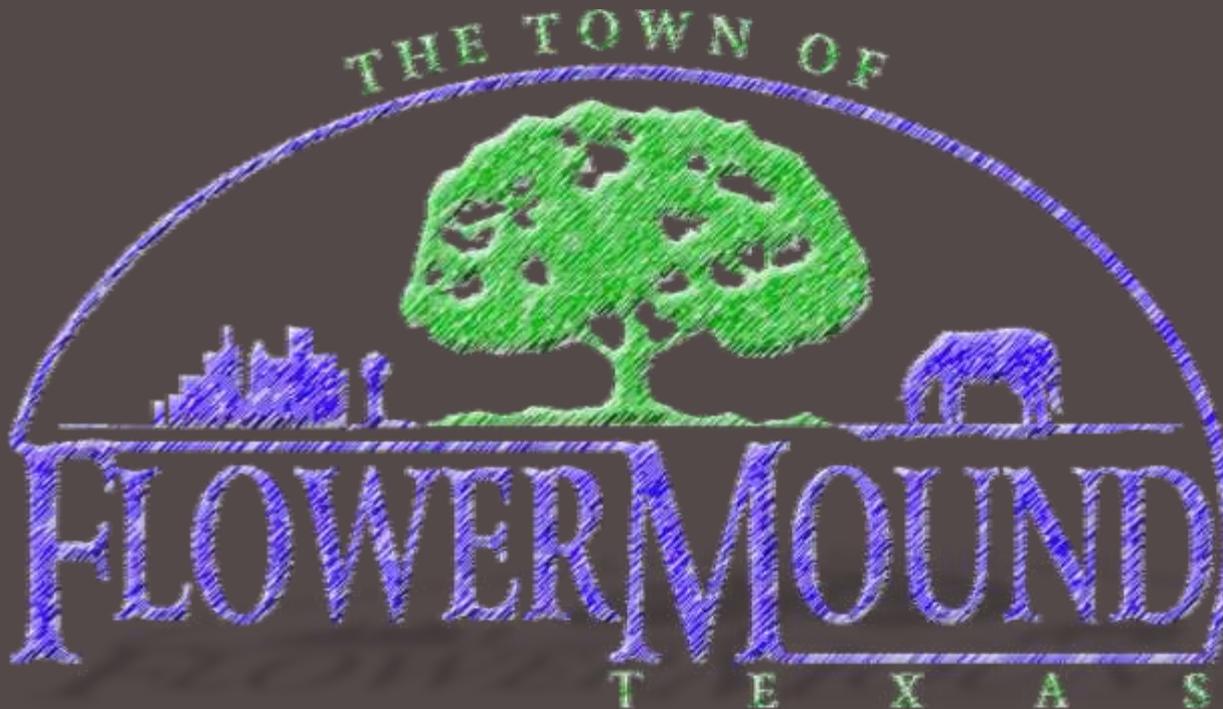
WHERE IS TOFM ATMS TODAY?

- 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**



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

See this site for more
information:

<http://www.distraction.gov>

