

A wide-angle photograph of the Boston skyline at dusk. The city's lights are reflected in the calm water in the foreground. The sky is a mix of blue and purple. The text 'NEDAS' is superimposed in large white letters across the center of the image.

NEDAS

B O S T O N

JULY 17, 2019

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SAVE THE DATE



September 5, 2019



November 21, 2019

NEDAS NEWSLETTER

NEDAS Bi-Weekly Newsletter

Welcome to this week's edition of the NEDAS Newsletter. Highlights are new NEDAS sponsors, industry news, the recorded April 30 Webinar and all things NEDAS Boston Symposium.

If you haven't already, don't forget to reserve your hotel room for the Boston Symposium at the Marriott AC Boston Downtown with our amazing group rate of \$249 per night please [click here](#). The discounted rate is only available until Monday, June 17, 2019.



How to Develop a CBRS Business Case Webinar

NEDAS Sponsor Sponsorlight



Sponsor Spotlight

EdgePresence is an owner and operator of edge points of presence (PoP) providing space, power, bandwidth, or interconnection on a leased basis either in multi-tenant or in single tenant build-to-suit. We are happy to discuss your needs and work with you to determine the best solution. Possible options range from client build-to-suit configurations, managed services, and single or multi-tenant leases in our infrastructure.

[To find out more click here»](#)

This Week's Featured Advisory Council Member



NEDAS Advisory Council Profile Series: Connie Laguardia

NEDAS introduces Connie Laguardia in its Advisory Council Profile Series.

[NEDAS Advisory Council Profile Series Here»](#)

[Request A Meeting With Our Advisory Council](#)

NEDAS VIDEOS



Q & A with NEDAS and ZenFi
Networks



NEDAS NYC 2018 Interviews



NEDAS WEBINARS

- Average 150 registered attendees
- Moderated program
- Polling capabilities to increase engagement
- Full report to follow
- Ongoing promotions
- Ongoing viewer information share with sponsors quarterly



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NEDAS SAVE THE DATE



September 5, 2019



November 21, 2019



KEYNOTE



NEDAS



DEREK PETERSON, PhD

Chief Technology Officer,
Boingo Wireless

**PREPARING FOR 5G:
HOW CAN TECHNOLOGY
AND REAL ESTATE
SUPPORT 5G AND OTHER
NEXT GENERATION
SERVICES?**



JIM MCCULLOCH
VERTICAL SYSTEMS

JIM MCCULLOCH

SVP - Real Estate
Vertical Bridge



BERGE AYVAZIAN
WIRELESS 20/20

BERGE AYVAZIAN

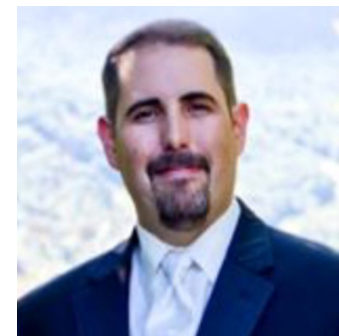
Senior Consultant
Wireless 20/20



GABE COLE
JLL

GABE COLE

Managing Director
Data Center
Solutions, JLL



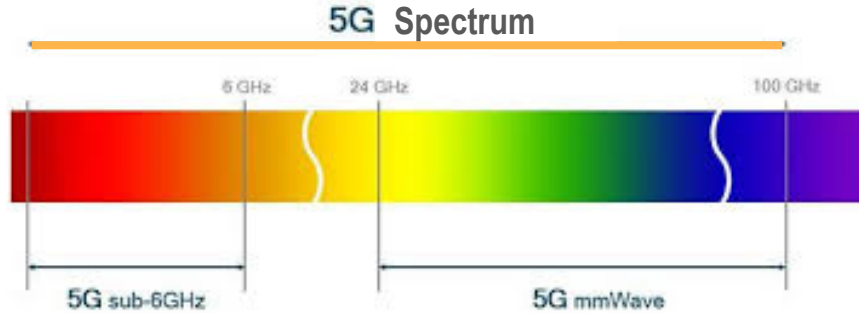
KEVIN RUSS

Vice President - 5G
& Small Cells, KMB
Design Group



Preparing for the Commercial Launch of Mobile 5G

How can Real Estate Technology Support 5G?



5G will be the designated choice for outdoor wireless networks



Wi-Fi 6 will be the access choice for indoor networks



Commercial Real Estate





How can Real Estate Technology Support 5G and Other Next Generation Services?

Today's business users rely on Commercial Real Estate Technology to access high speed wireless networking capabilities and edge-cloud servers inside buildings.

The commercial Launch of Mobile 5G is just starting in selected US markets and higher 3.5 GHz to 6 GHz and millimeter wave 5G spectrum are especially susceptible to being blocked or reflected by walls, windows and other common building materials

Vendors are deploying fiber and power to new radio and antenna networks to bring 5G to users inside commercial buildings.

Preparing for the Commercial Launch of Mobile 5G



Verizon 5G networks using mmWave spectrum are live in 8 US cities: Atlanta, Cleveland, Dallas, Las Vegas, Los Angeles, NYC, Denver and Providence.

Verizon to launch 18 more cities later in 2019 including Atlanta, Boston, Charlotte, Cincinnati, Cleveland, Columbus, Dallas, Des Moines, Detroit, Houston, Little Rock, Indianapolis, Kansas City, Memphis, Phoenix, San Diego, Salt Lake City and Washington, DC



AT&T 5G+ mmWave only networks limited to business users in select high-traffic areas of Atlanta, Austin, Charlotte, Dallas, Houston, Orlando, Indianapolis, Jacksonville, Raleigh, Los Angeles, Louisville, Nashville, Waco, Oklahoma City, New Orleans, San Antonio, San Diego, San Francisco and San Jose. Nationwide 5G using sub-6 GHz spectrum in early 2020



T-Mobile 5G mobile service using mmWave spectrum was launched in parts of 6 cities Atlanta, Cleveland, Dallas, Las Vegas, Los Angeles and NYC



Sprint 5G networks launched using 2.5 GHz spectrum in parts of Los Angeles, NYC, Atlanta, Chicago, Dallas, Houston, Kansas City, Phoenix and Washington, DC covering 575 sq. miles and about 1.6 million POPs

WOMEN IN TECH: DIVERSITY AND ADVERSITY CHALLENGING THE NORMS



CARRIE CHARLES

Chief Executive Officer
Broadstaff, LLC



AUBREY BLOSSER

Sr. Program Manager
Azure Networking, Microsoft



NEDAS

MAUREEN HOPKINS

Division Counsel
Tilson Technology
Management, Inc



CONNIE LAGUARDIA

Principal
+10 dB



LAURIE CARUSO

Chief Executive Officer
Safe Fi Technologies



**INTELLIGENT
INFRASTRUCTURE:
FROM SITING FOR SMALL
CELL DEPLOYMENTS, TO
ANTENNA SIGNALS AND
FIBER CONNECTIVITY -
HOW TO ENSURE A
NETWORK IS DESIGNED
AND BUILT FOR SUCCESS**



DAVID BRONSTON

Special Counsel
Phillips Lytle LLP



ERNST MANN

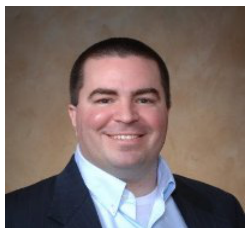
VP Engineering
Mann RF Solutions



JOSH DOTSON

Telecommunications
Division Manager
GPRS

NEDAS



BEN EDMOND

CEO & Founder
Connected2Fiber



CHRIS HORNE, PE

eMuWave PLLC





SUBSURFACE
SCANNING
SOLUTIONS

DESIGNING A SUCCESSFUL NETWORK





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FIELD CHALLENGES

Challenges in the field - Information

On average design locates are taking upwards of 45 days if getting completed at all.
Private companies can locate on demand, at the direction of the customer.





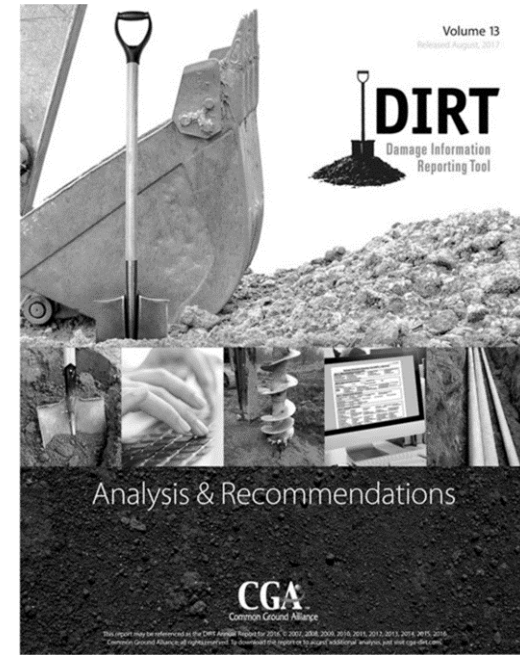
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LINE STRIKE + DAMAGES

On average, a utility line is damaged every six minutes in the United States

Common Ground Alliance (CGA) "over the past 20 years utility hits have resulted in \$1.7 billion in property damage"

1,906 injuries, and 421 deaths - 379,000 damages reported in the US - 20% increase in utility damages on a National level from 2015 -2016



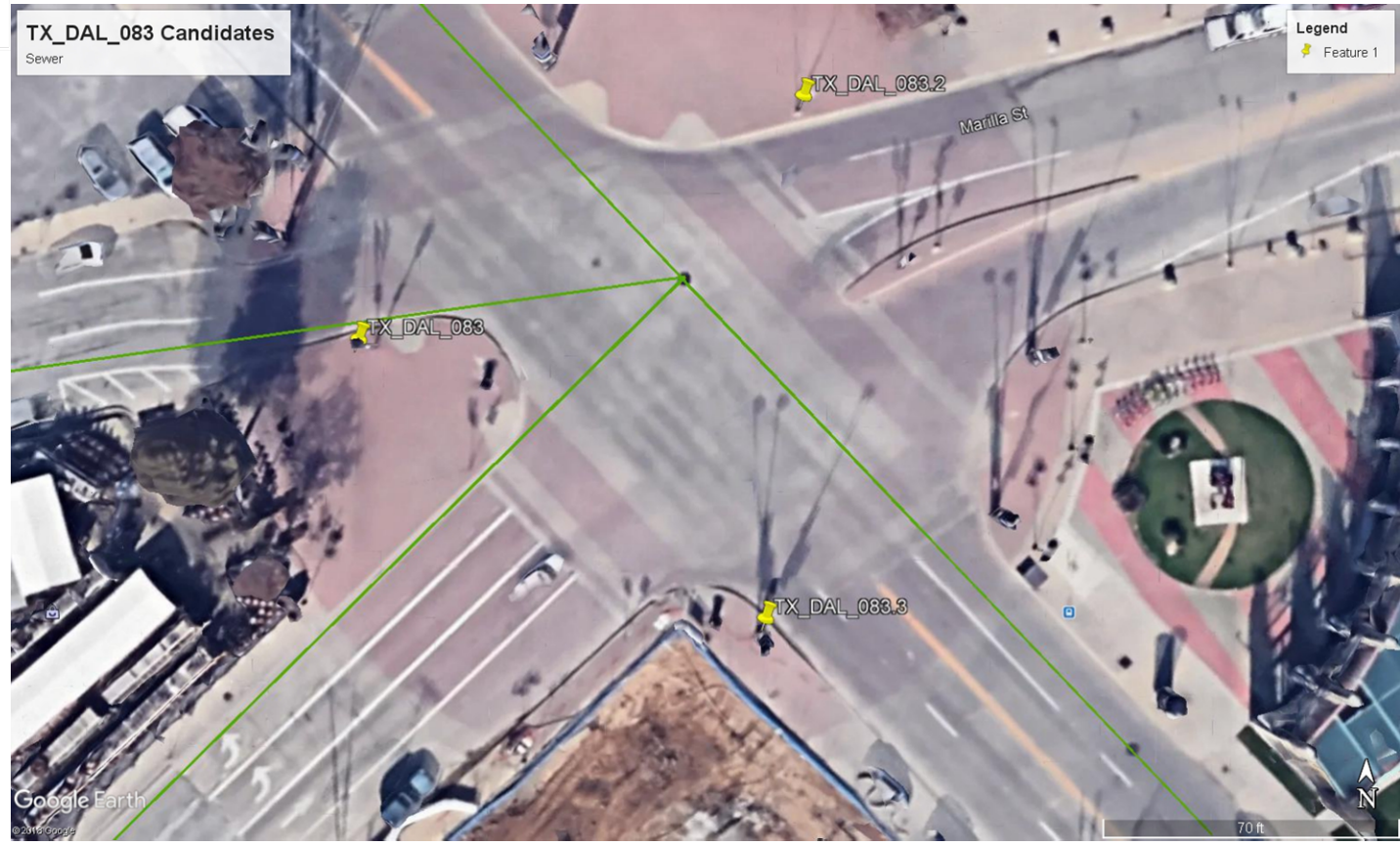


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GPRS REPORTING SERVICES



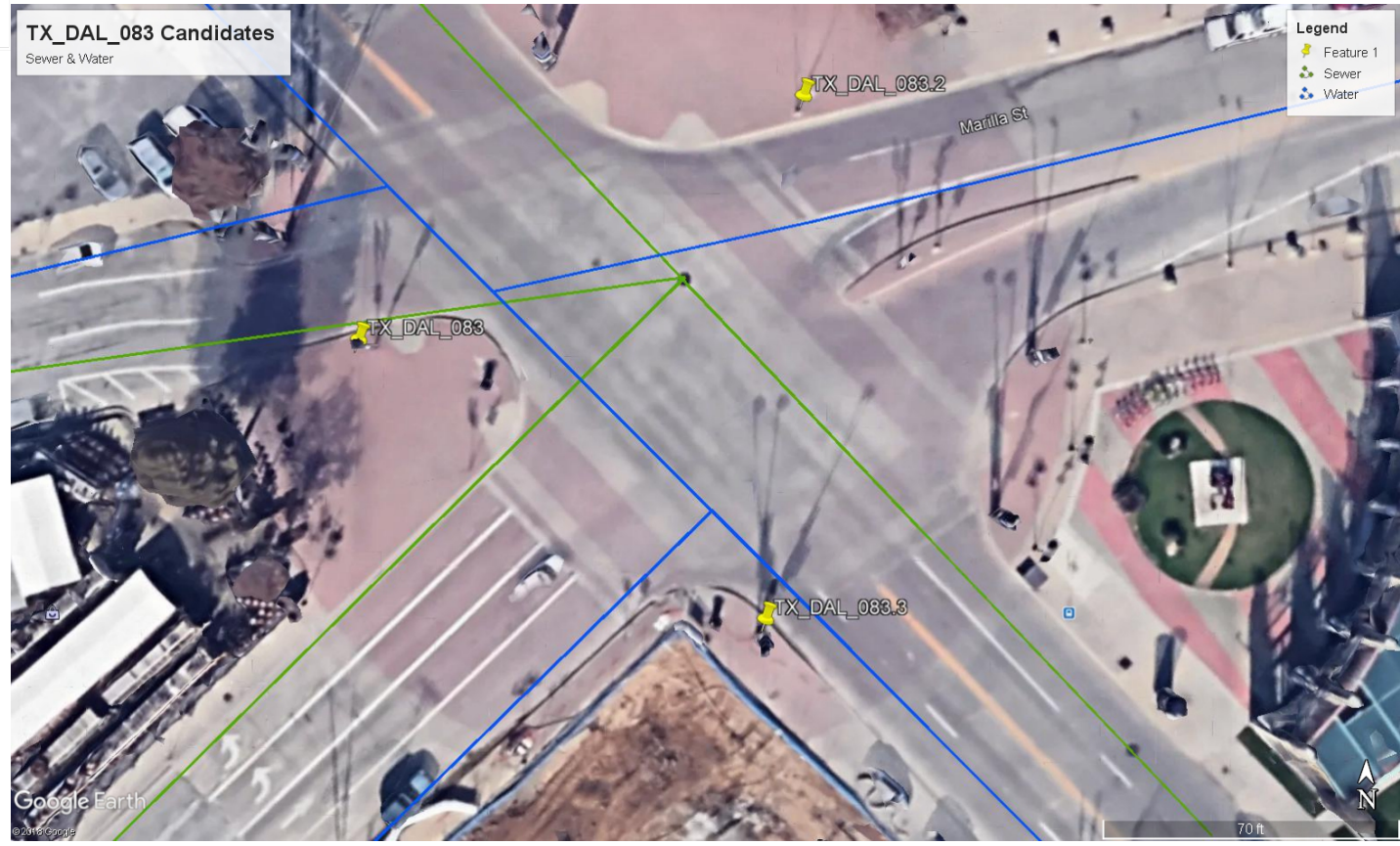
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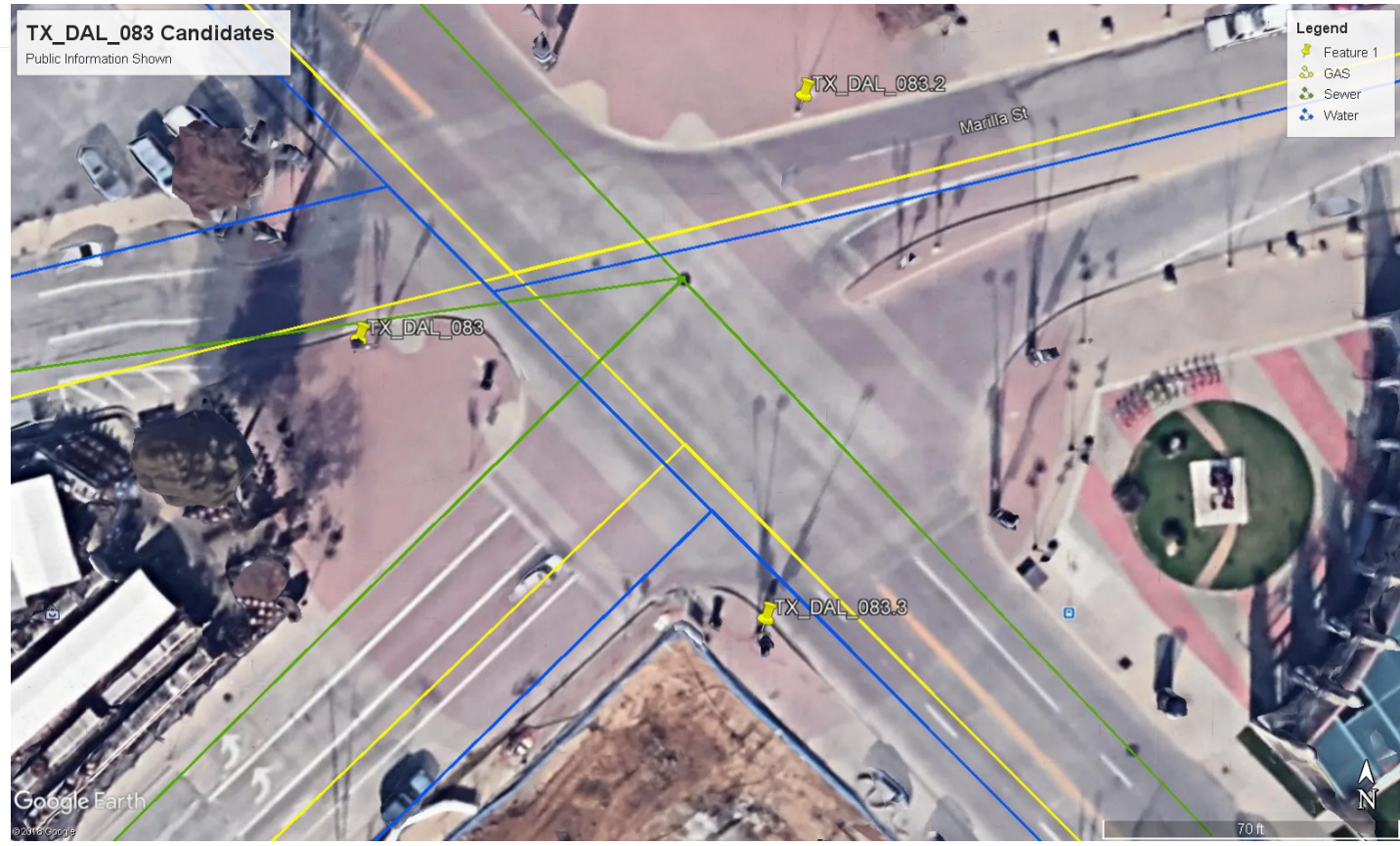
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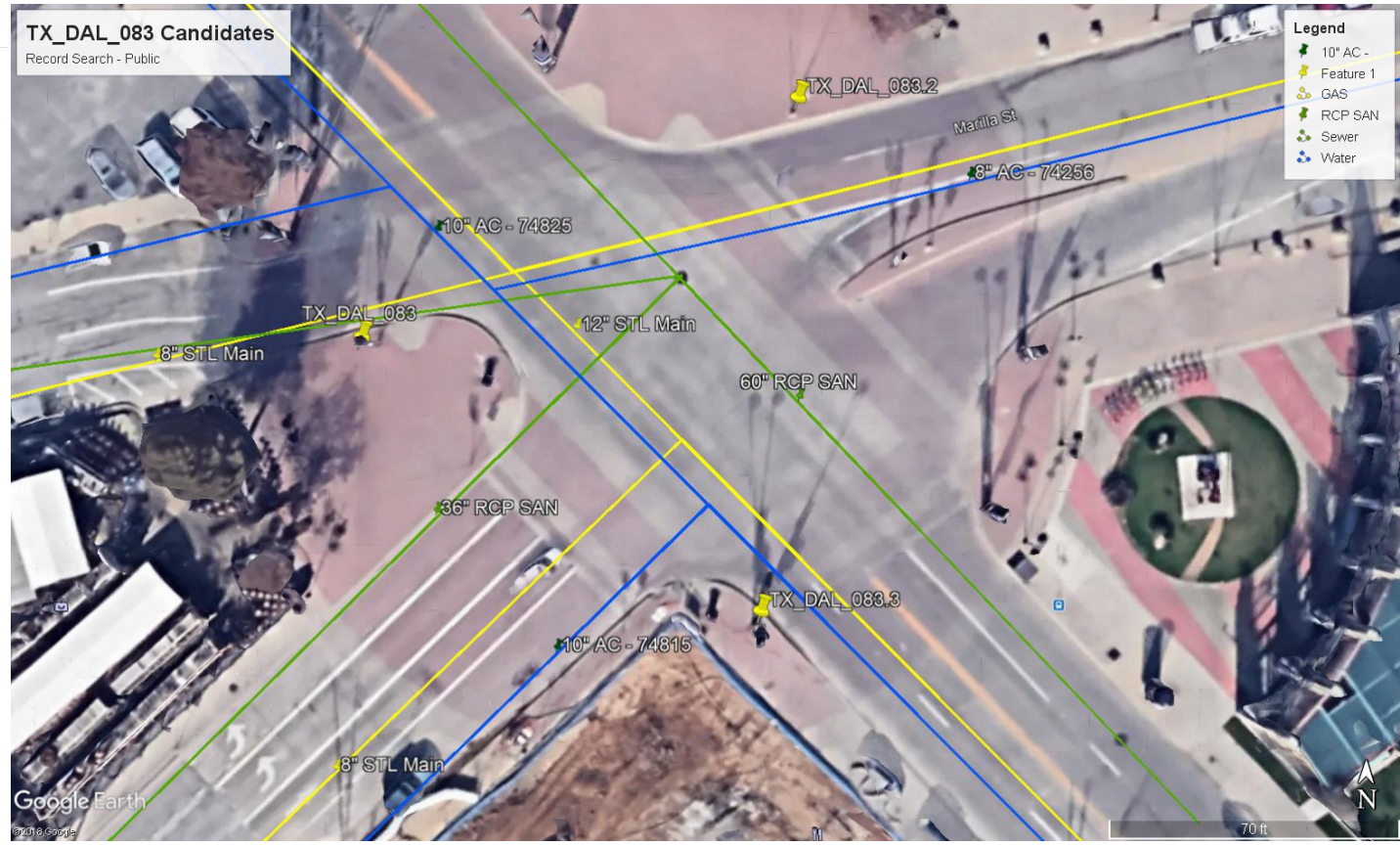
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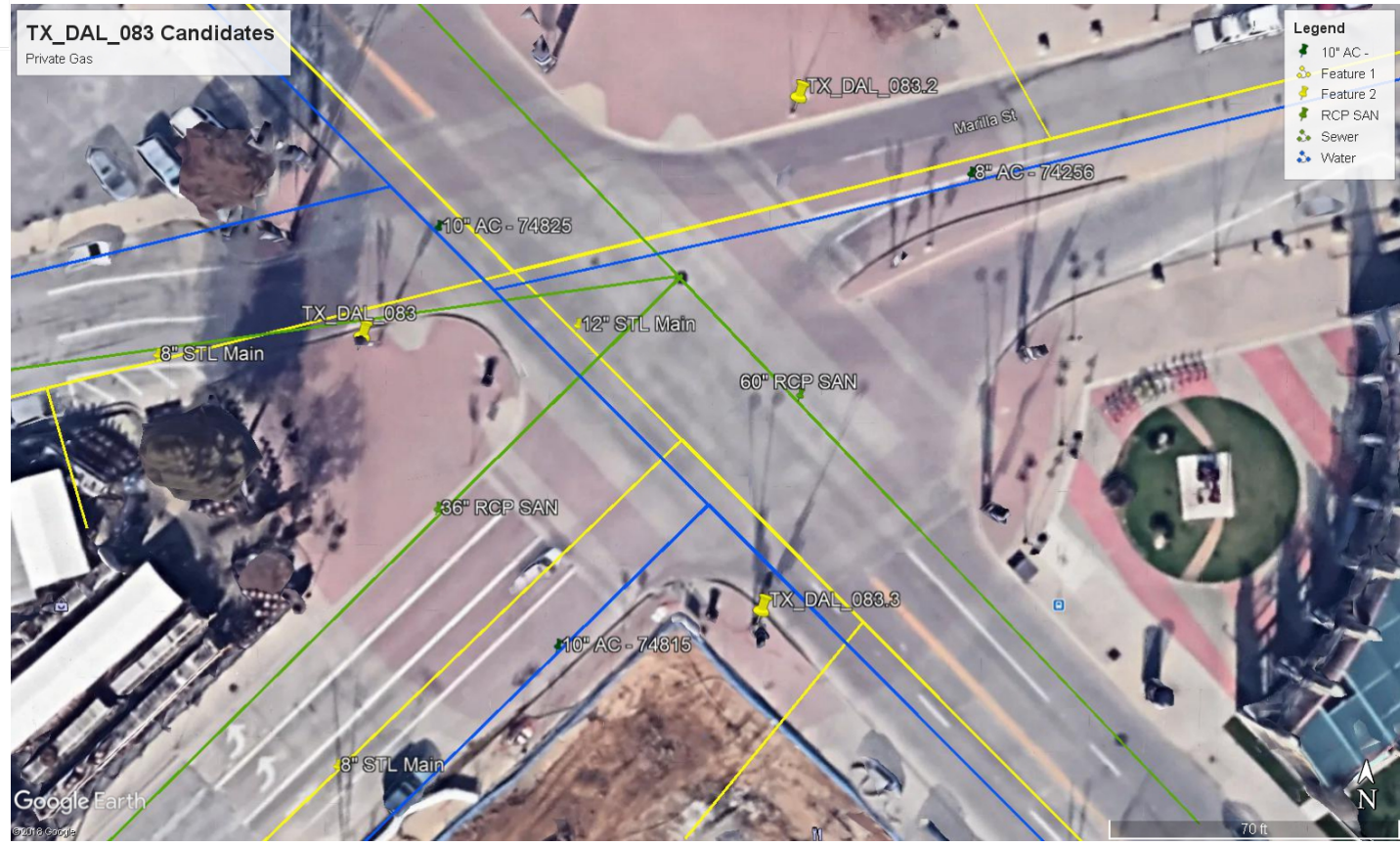
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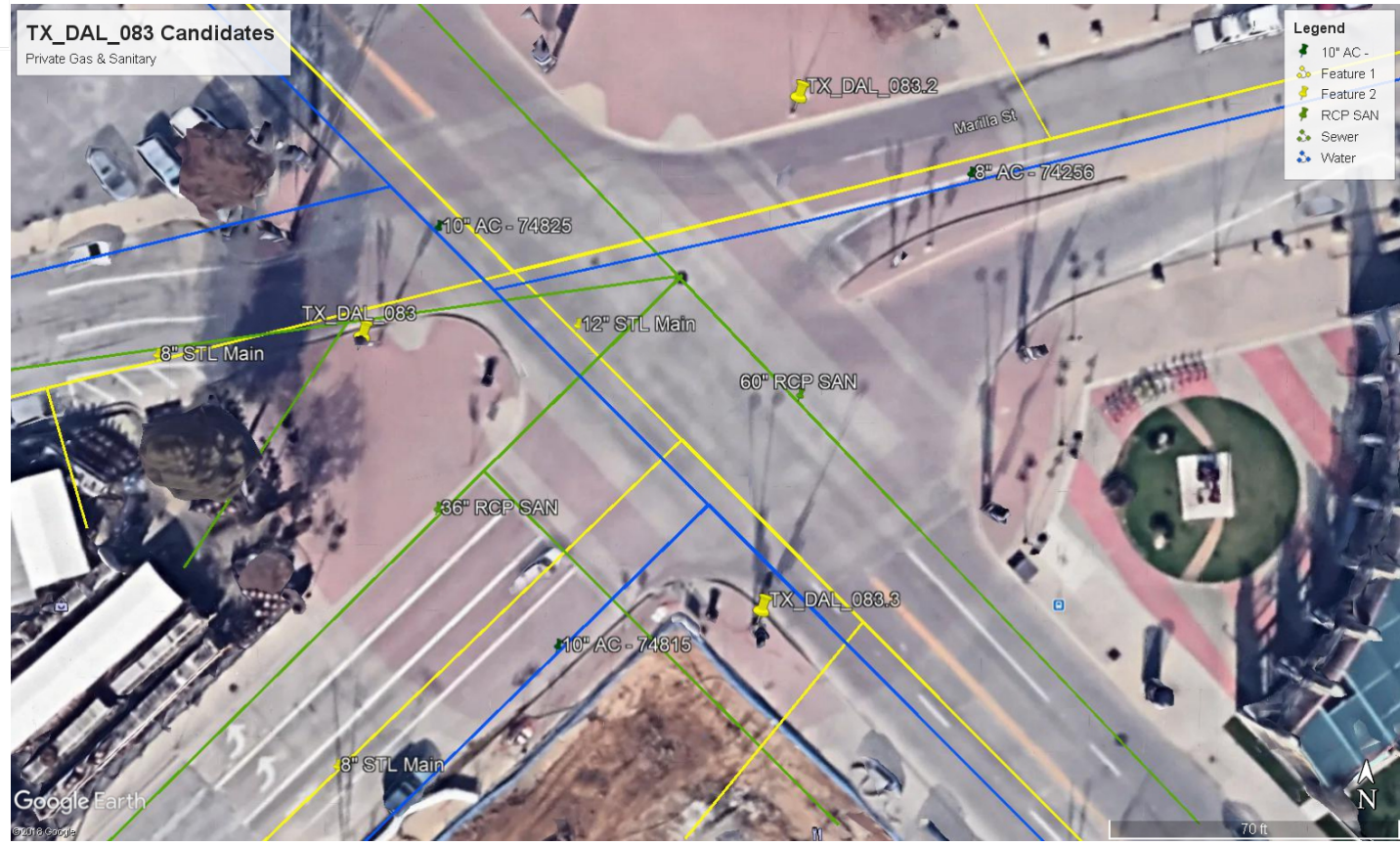
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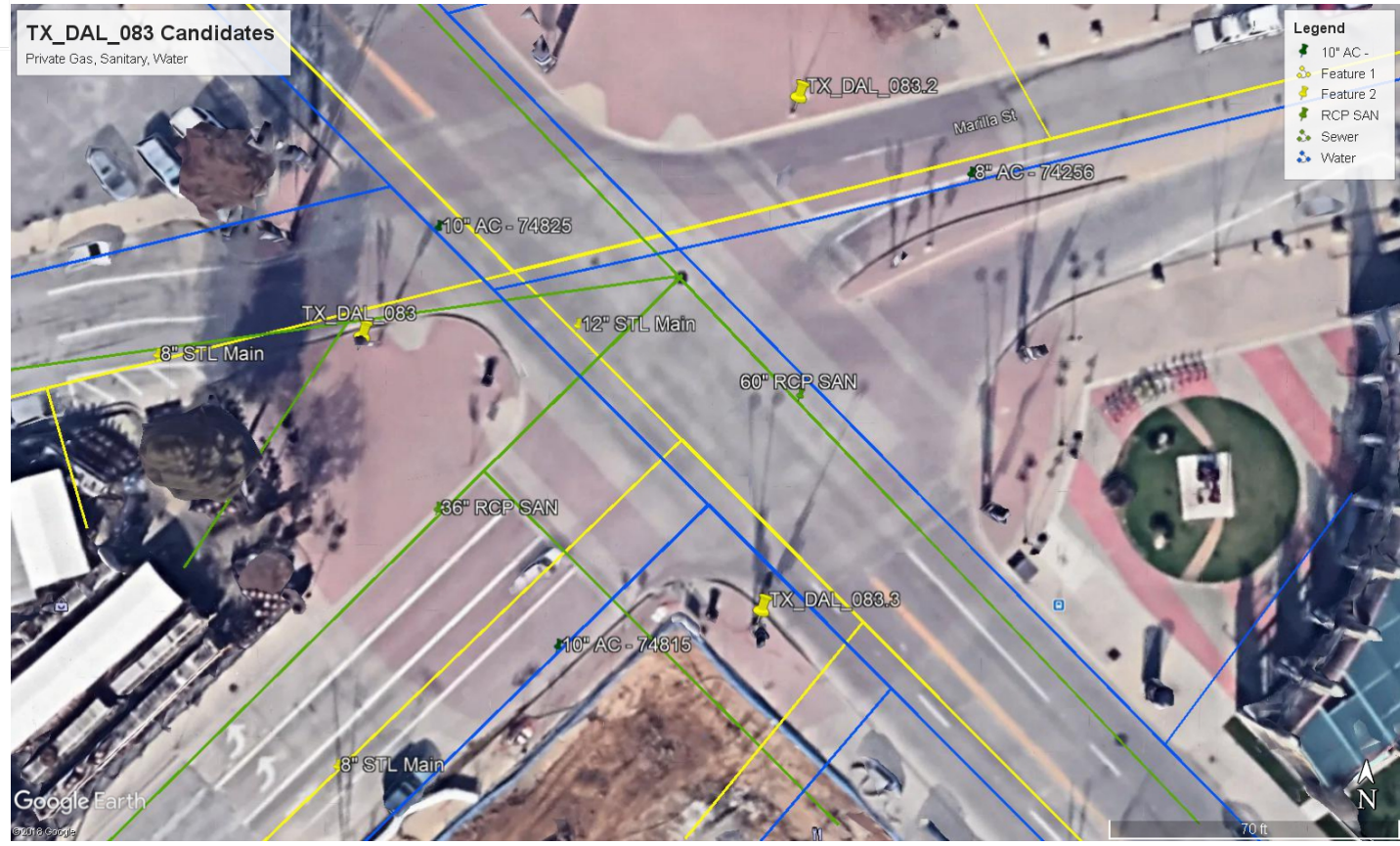
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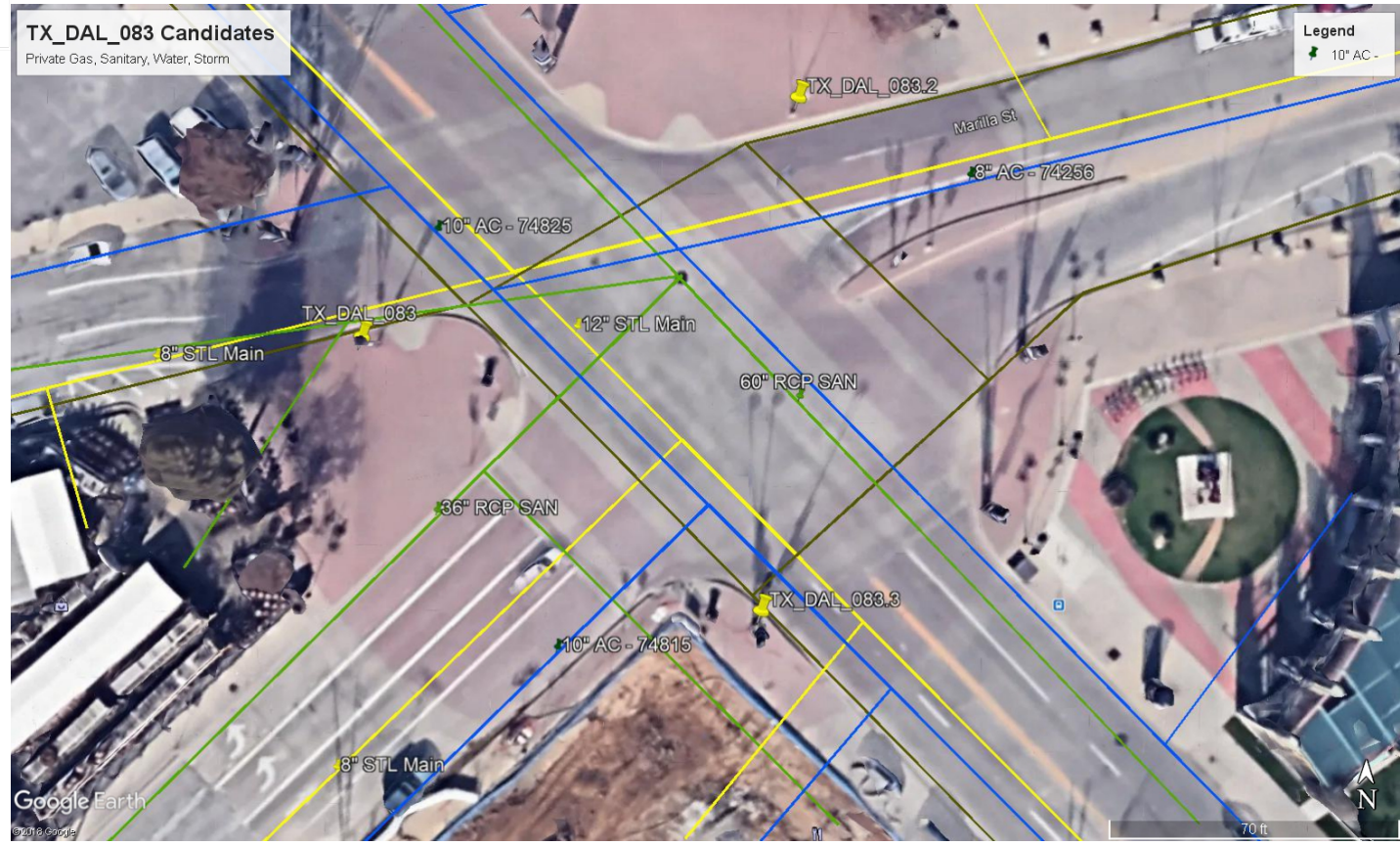


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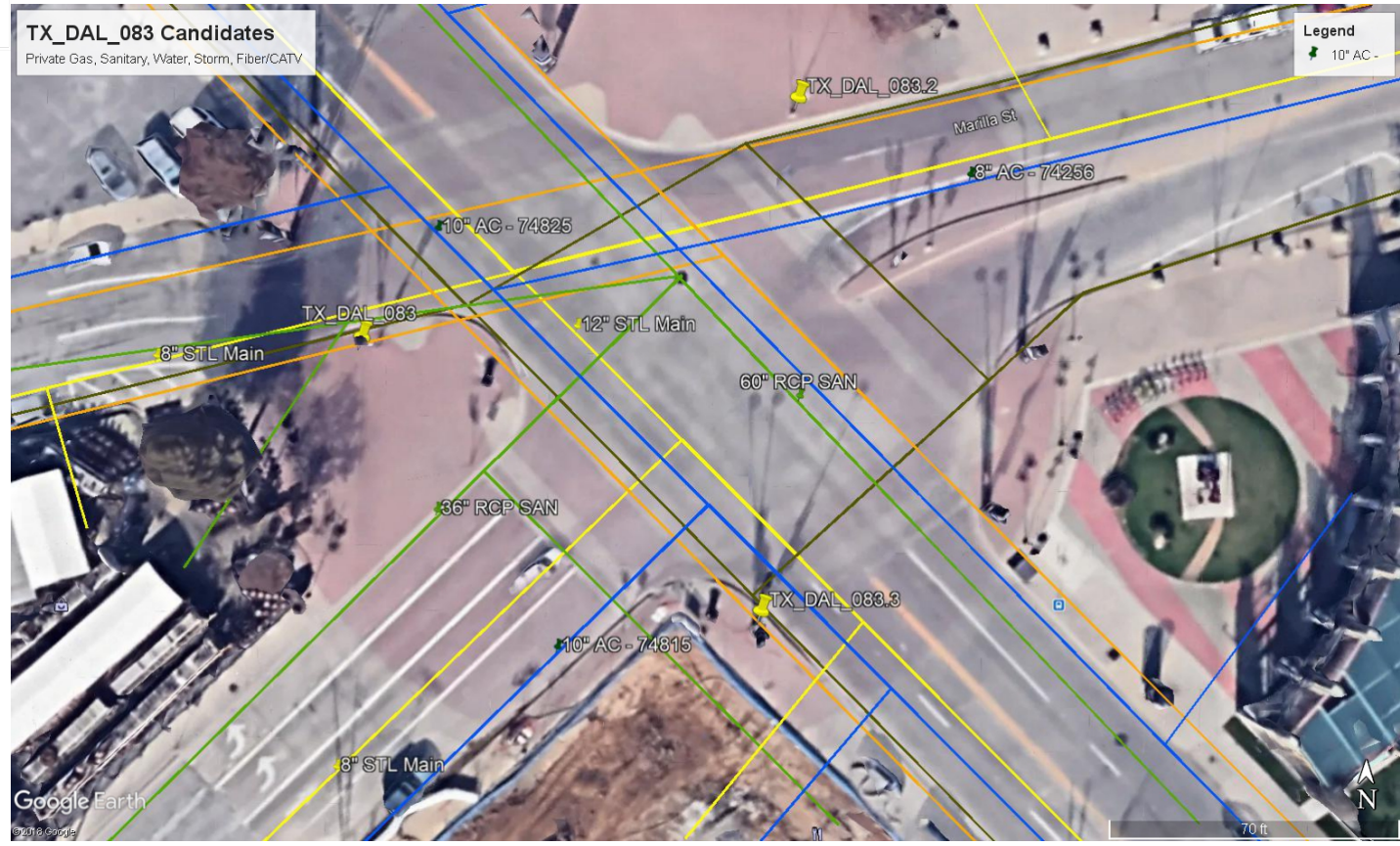
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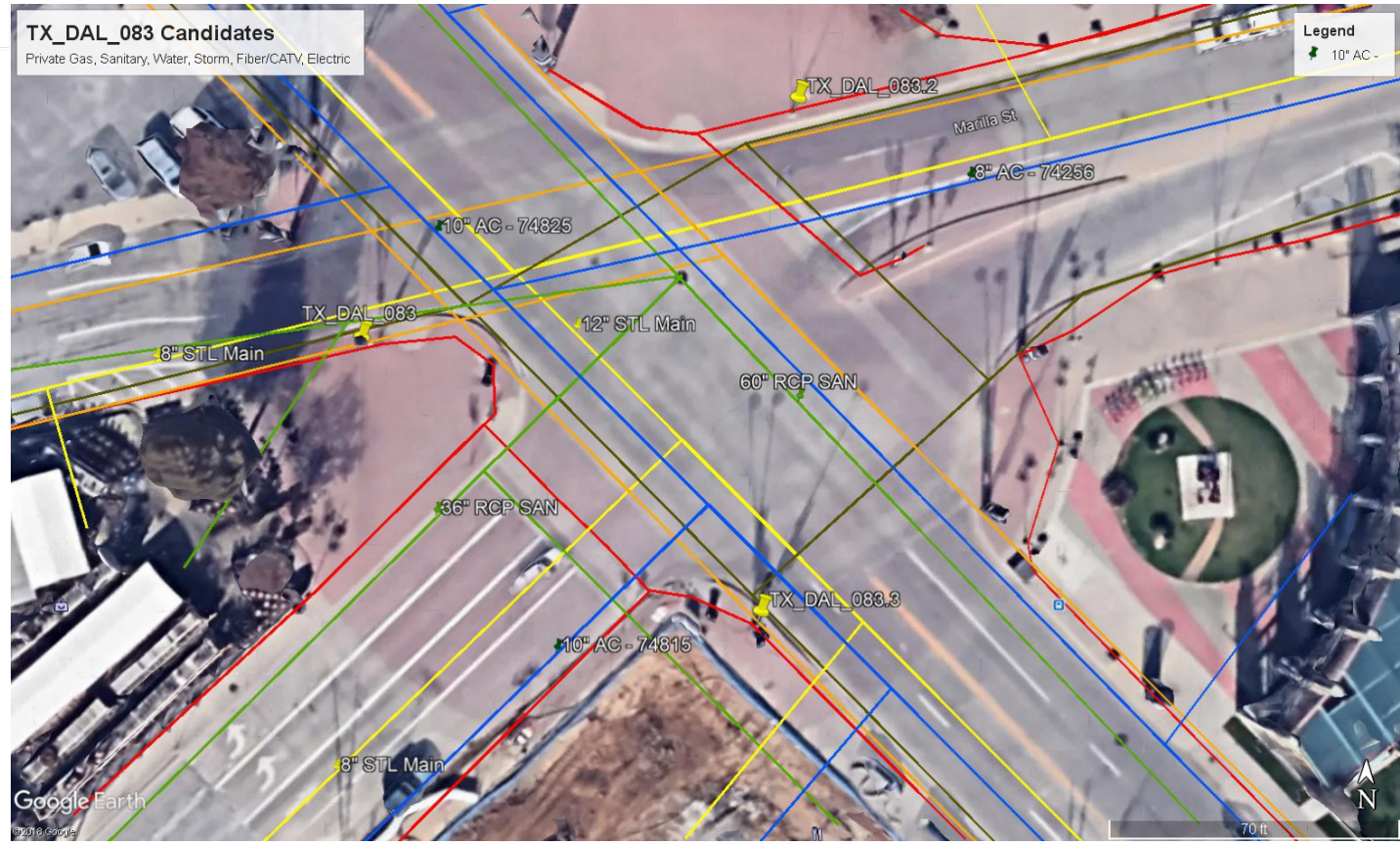
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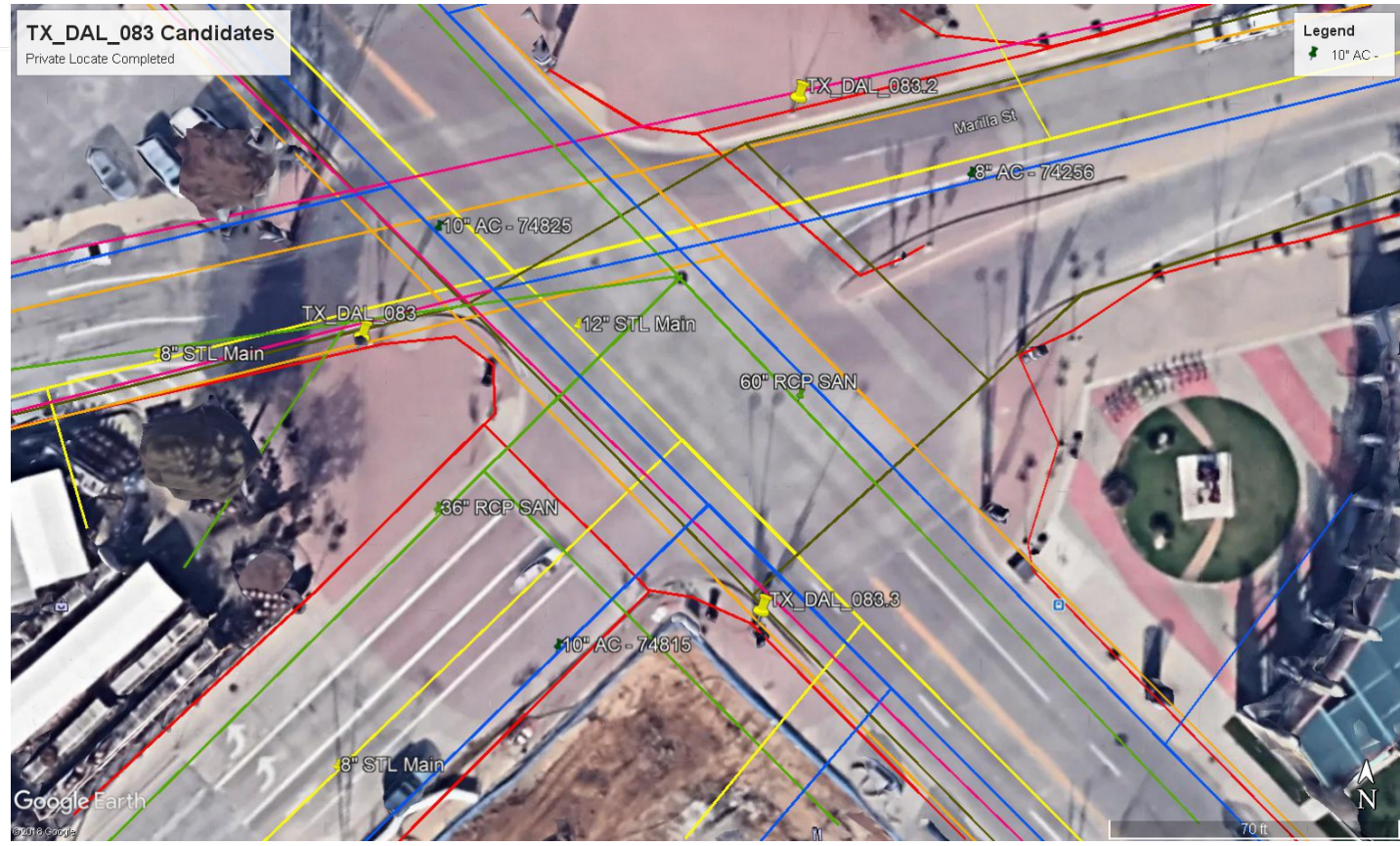


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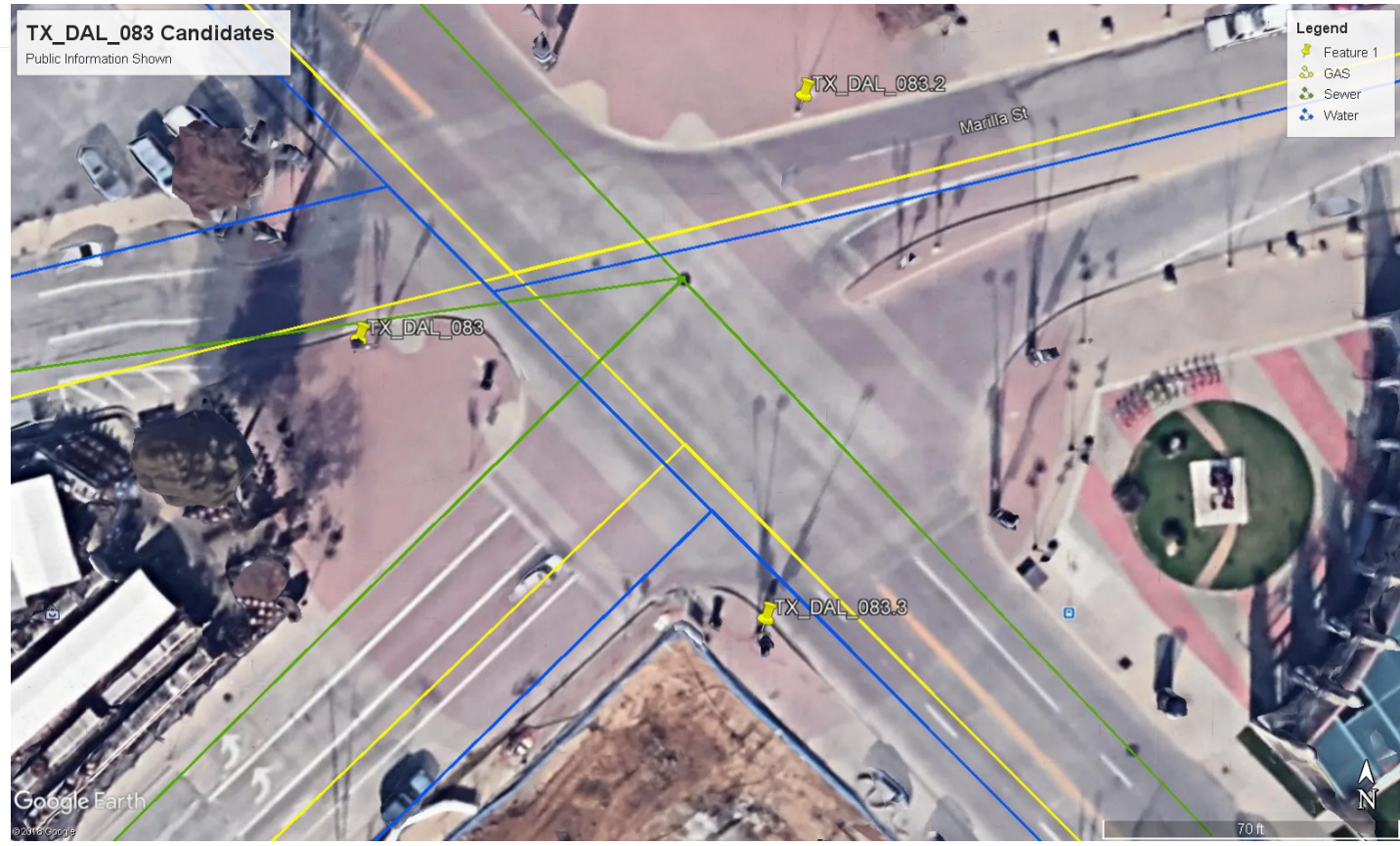
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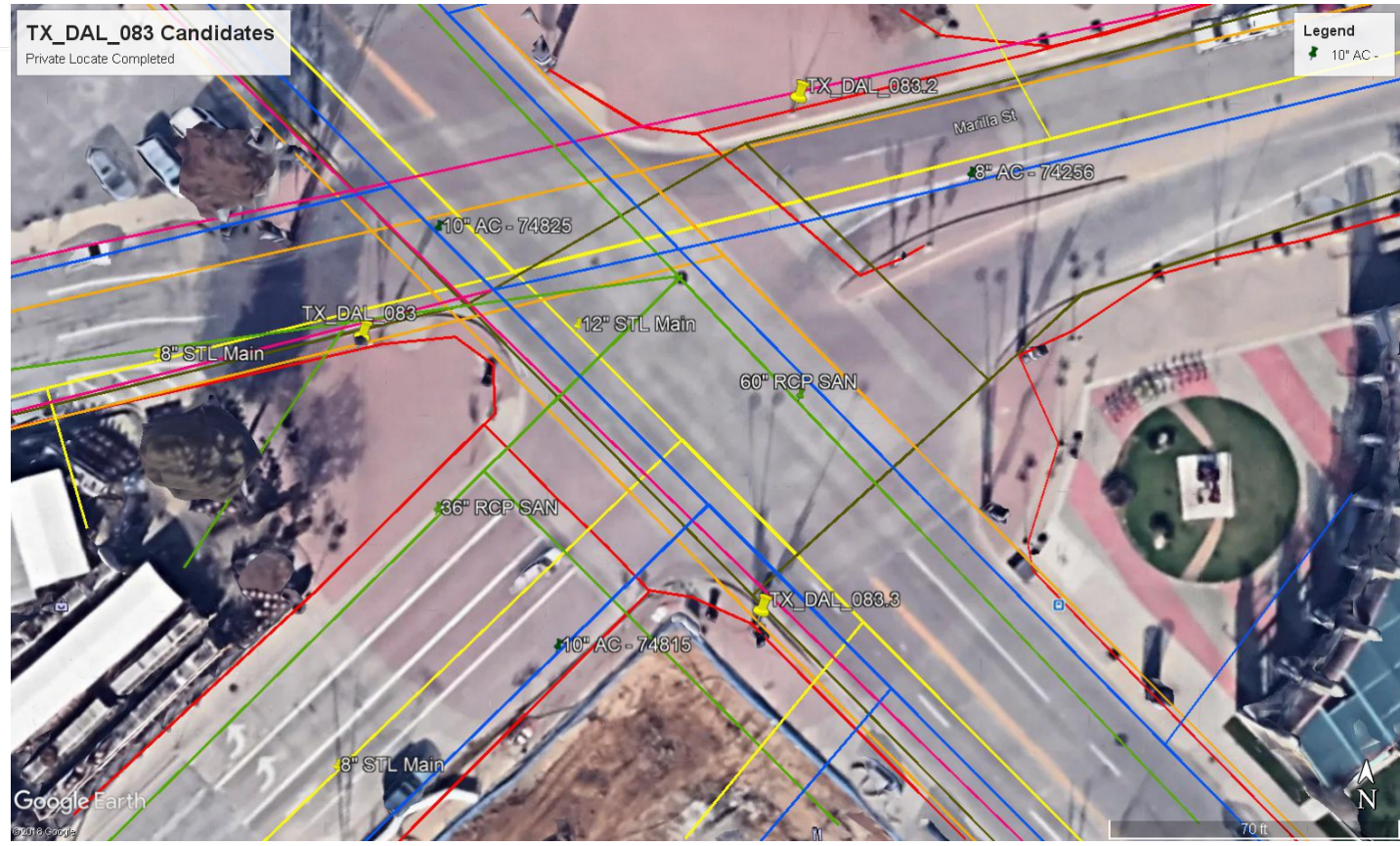


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GPRS REPORTING SERVICES





APPLYING METHODS STATISTICS

- **GPRS completed 50,000+ projects in 2018**
- **GPRS maintains a high level of subsurface investigation accuracy at a less than 1% error rate**
- **64% of the top 100 Environmental Contractors (according to ENR)**
- **84% of the top 50 General Contractors (according to ENR)**
- **Historically when a customer reaches the \$10,000 mark the following year revenues are 120% of the previous year.**

Compromised DAS RF Infrastructure and its Effect on Network Performance

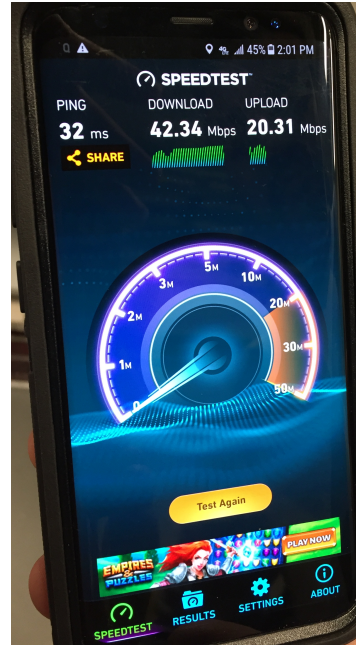
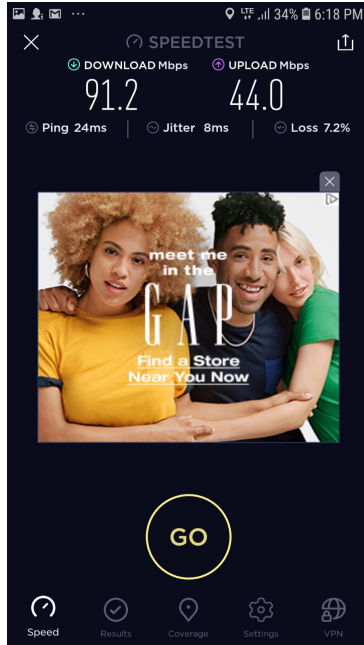


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B O S T O N

JULY 17, 2019

RF INFRASTRUCTURE ISSUES ARE A MAJOR CAUSE OF UNDER-PERFORMING DAS



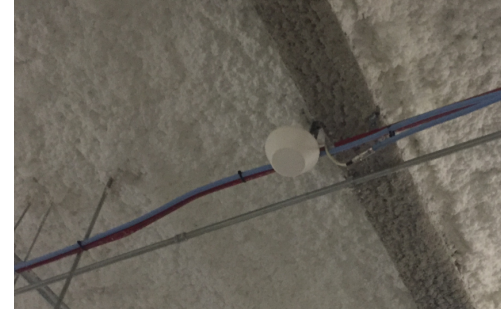
DAS COMPONENTS



External Antenna



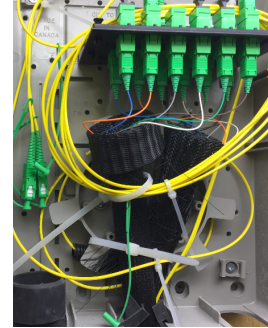
Amplifier/Fiber Remotes



Internal Antennas



RF Infrastructure



Fiber Infrastructure

PASSIVE INTERMODULATION (PIM)

NEDAS

- PIM is a mode of interference that reduces uplink (phone back to network) performance
- Noticeable by dropped calls and slow data speeds
- Effects can come and go as a function of channel usage (more usage/users develops higher power levels-more PIM)



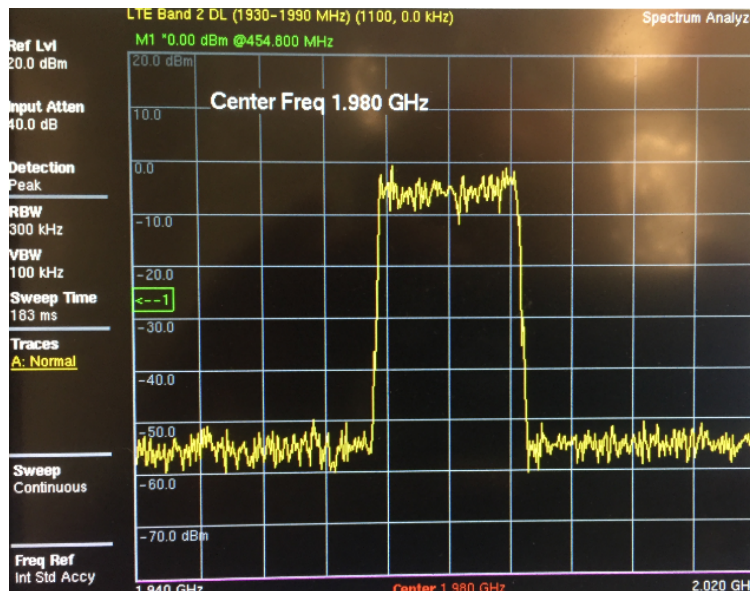
PASSIVE INTERMODULATION (PIM)

NEDAS

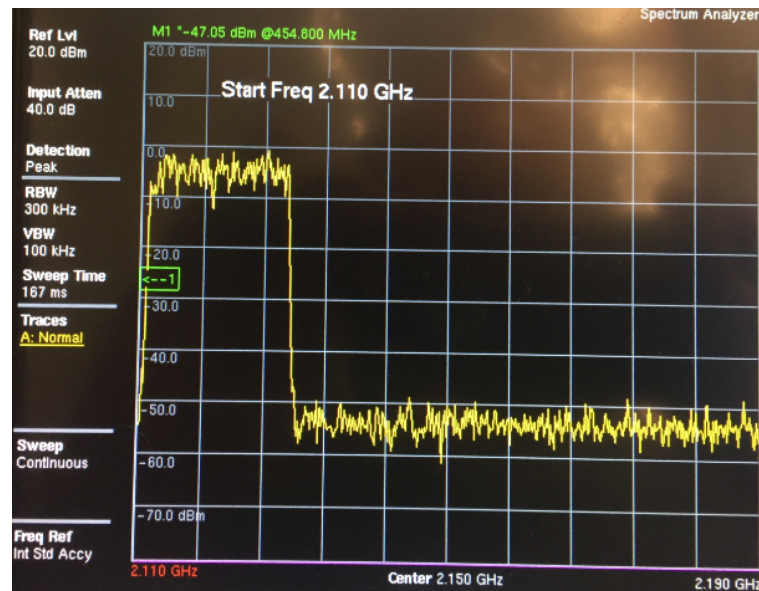
- Caused by network downlink (network to phone) channels that “mix” in passive system components producing new spurious RF signals
- “Mixing” process produces new interfering signals in the RF spectrum used by phones to get back to the network
- More prevalent in high power (> 5 watt remote units) DAS systems



PIM SOURCE

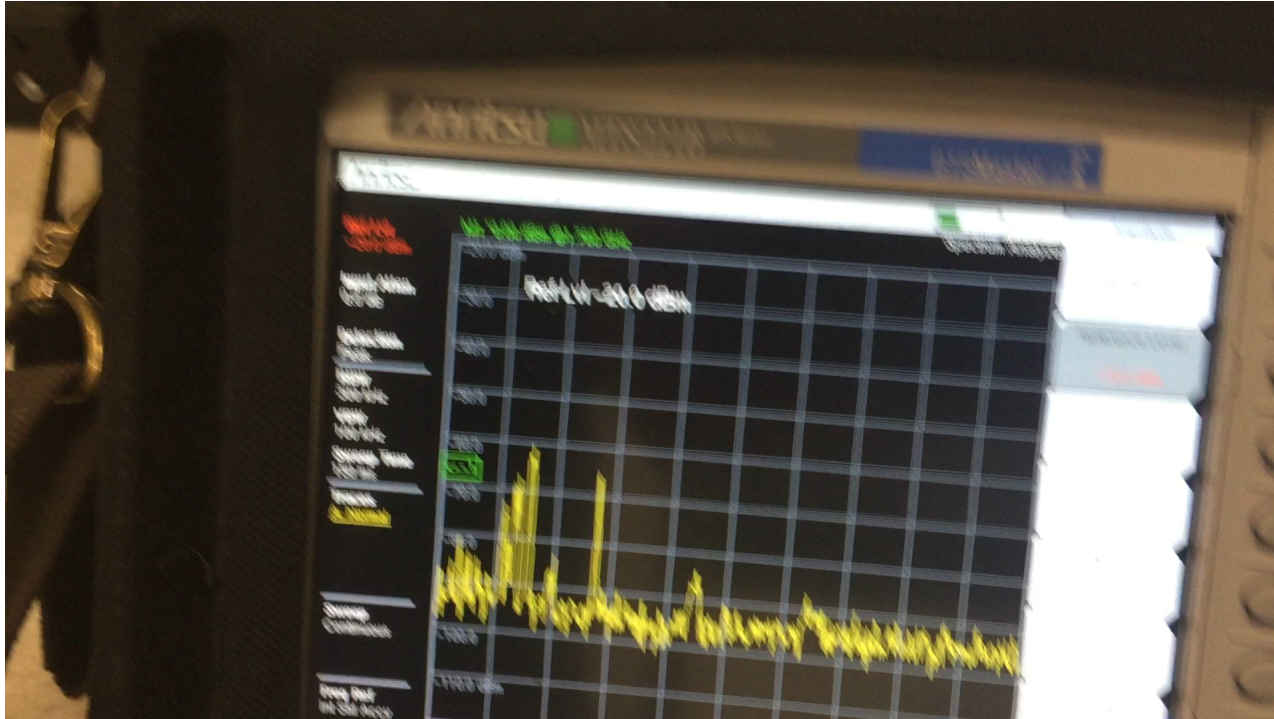


20 MHz Tx (downlink) Channel
BW / PCS Band



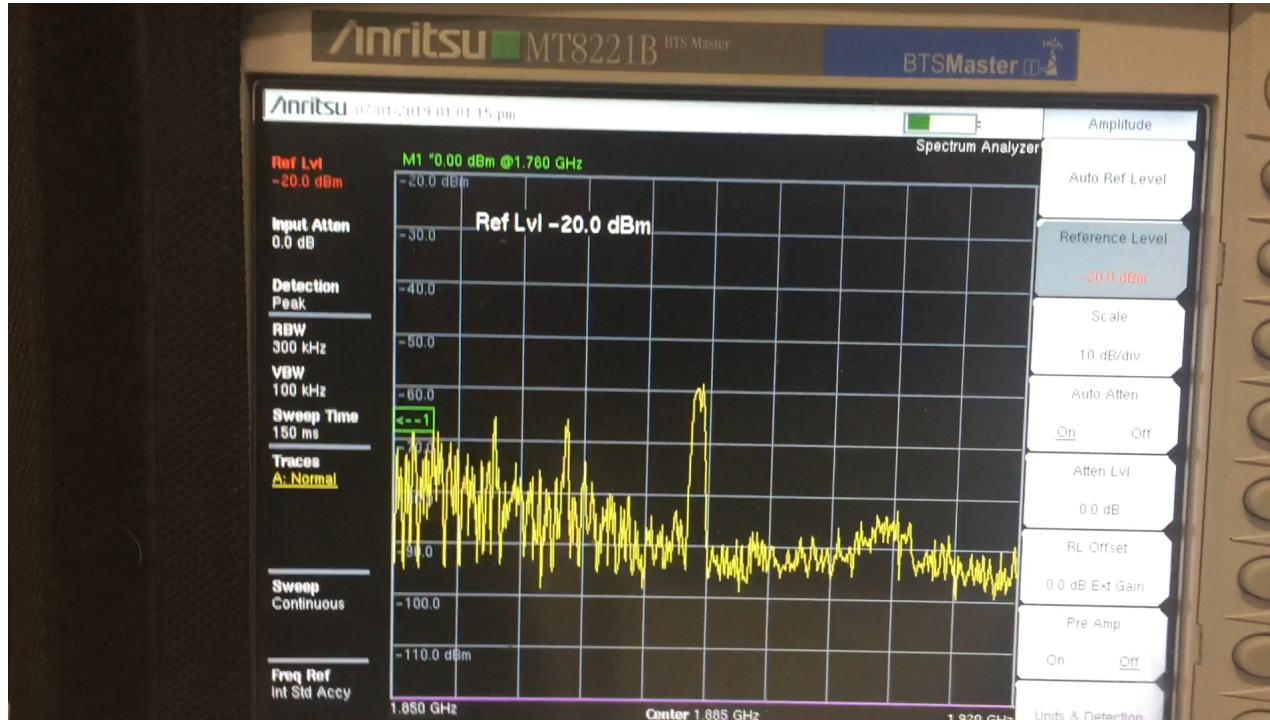
20 MHz Tx (downlink) Channel
BW / AWS Band

PIM-FREE SPECTRUM



Interference-free Uplink Spectrum

PIM INTERFERENCE (UPLINK)



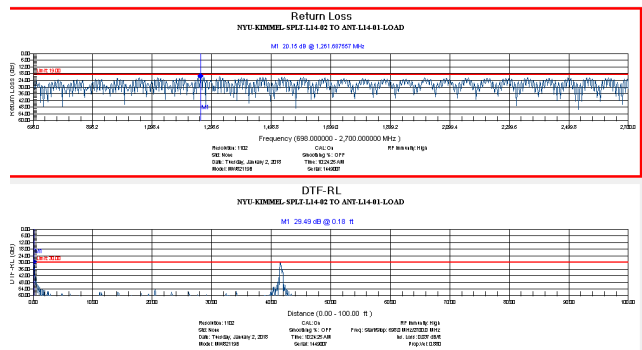
Real-Time Interference

TYPICAL CAUSE OF PIM



Construction Grit / Metal Filings / Loose Connectors

PRIMARY TEST TOOLS TO DIAGNOSE “COMPROMISED CABLES” AND PIM



Cable Segment Sweeps



PIM Levels



Distance-to-PIM Estimates

PIM TAKEAWAYS

NEDAS

- PIM is present in all systems - keeping the PIM levels below key thresholds is critical to minimizing its effect on performance
- One faulty connection – in a system that contains many hundreds of connections - can reduce network perform for all users associated with the system



PIM TAKEAWAYS CTD.

NEDAS

- More likely to have issues with broadband channels (i.e. LTE) currently used in most systems
- Best addressed at the commencement of the infrastructure planning and installation by “creating an “operating room environment” culture right from



TOWER FAMILY FOUNDATION



NEDAS



VICTOR DROUIN

Tower Family Foundation



Providing Support by Standing Together



MISSION STATEMENT

*The Tower Family Foundation has been established to help provide **financial assistance and scholarships** to family members of a severely injured, permanently disabled, or deceased tower worker injured or killed in an accident stemming from working at heights on communication structures or other on the job related activities that tower workers are involved in on a daily basis.*

GIVING

Since its inception in September of 2014, the Tower Family Foundation has awarded **\$701,000 in financial assistance and scholarships to eligible tower workers and their families.**

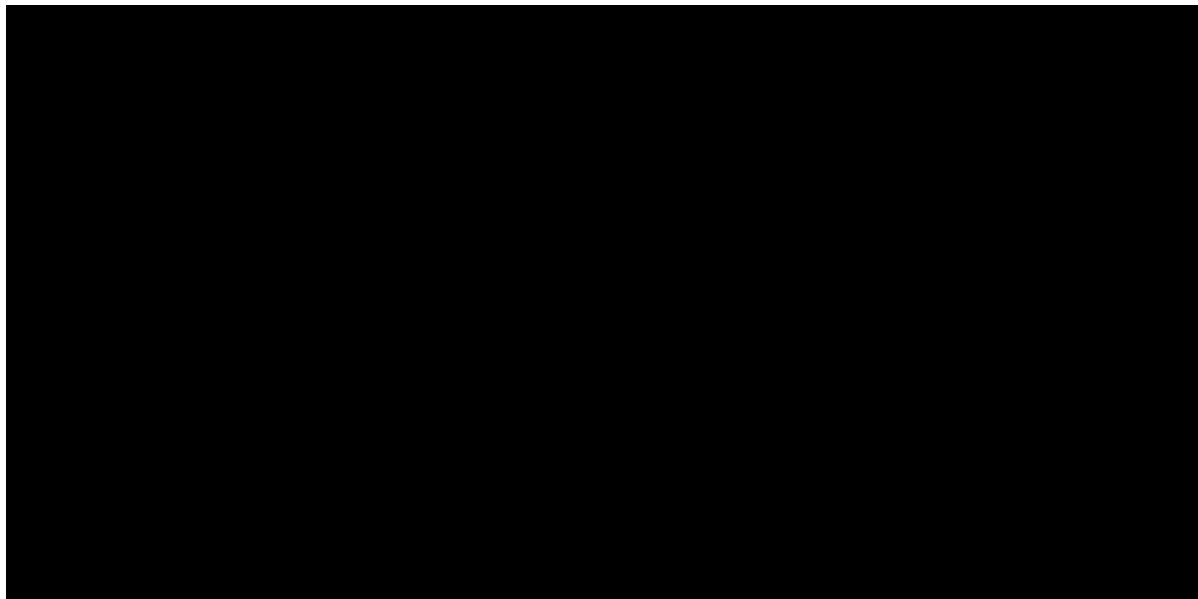


STEWARDSHIP

In 2017, VRS P.C., an independent certified public accounting firm, calculated that **over 97 cents of every dollar donated to the Tower Family Foundation goes directly to eligible benefactors.**



TESTIMONIAL



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SAVE THE DATE!

**Tower Family Foundation
GOLF EVENT**

Powered by NATE Wireless Industry Network

Thursday, February 20, 2020

Lonnie Poole Golf Course

Raleigh, North Carolina

More information coming in July at natehome.com.



THANK YOU!



WORKFORCE DEVELOPMENT CHALLENGES OF TELECOM



NEDAS



GINA RAE

Senior Program Manager
Timberline Communications, Inc.

WORKFORCE DEVELOPMENT CHALLENGES IN TELECOM



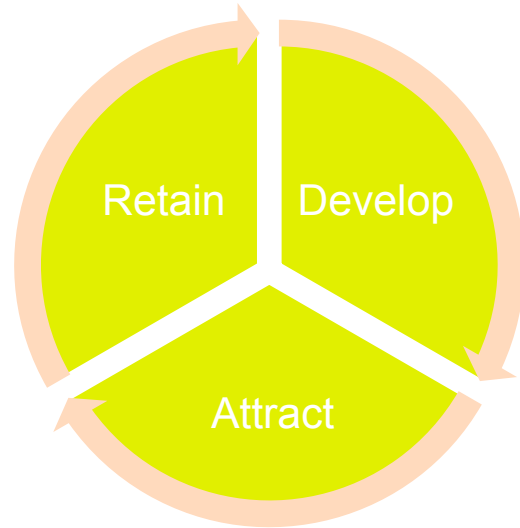
21ST CENTURY TELECOM



- Massive network overhauls and 5G launches impact workforce development
- Consumer convenience and expectations drive industry
- Content/Media demands change industry landscape impacting workforce

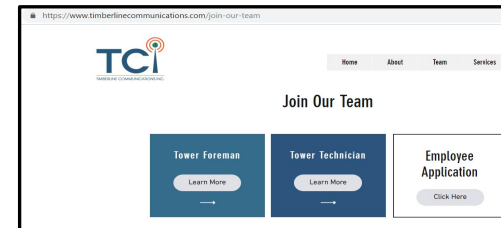
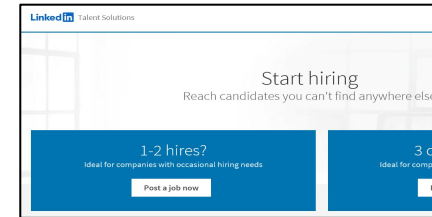
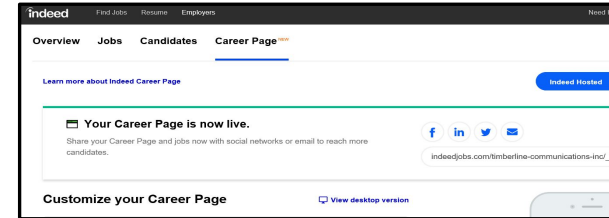
INDUSTRY CHANGES IMPACT WORKFORCE

- Job titles and pay used to be fairly standardized
- Specific skillsets were associated with given job titles
- Expectations were easier to set and gauge for career orientation and goal accomplishment
- Career longevity was more easily achieved



INDUSTRY CHANGES IMPACT WORKFORCE

- Job titles, skillsets and pay no longer as standardized
- Attracting talent:
 - Necessary to use multiple job posting databases, recruiting companies, social media platforms
- Skills gap amongst most applicants
- Contract positions impact retention
 - More remote workers



PROMINENT DIVERSITY CHALLENGES

- Aging Workforce
 - Primary concern for Field Operations/ Trades
 - Younger candidates have less interest in trades positions
 - Difficult to in-fill
- Gender Diversity
 - Less women
 - Perform the trades positions
 - Hold senior positions



INDUSTRY AND JOB PUBLIC AWARENESS



- Lack of awareness of industry and jobs within it
 - Infrastructure exists without much question
- Lack of interest in the trades types of work within the industry
 - Younger candidates prefer digital ways of working; remote work and flexible, easily established career paths

DEGREES AND CERTIFICATIONS

- General degrees can be applied to myriad telecom jobs
 - Electrical Engineer
 - Mathematics
 - Business Management
- Too few schools offer specialized degrees and certificates for specific jobs such as:
 - RF Engineer
 - Tower Technician
 - Project Manager



Overview



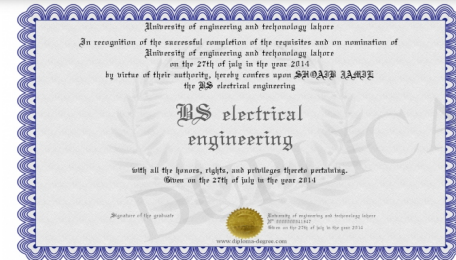
PMP Certified

You are a PMP in good standing

PMP Number: 1964887

PMP Credential holder since: 03 Oct 2016

PMP Credential valid through: 02 Oct 2019



SOLUTIONS TO ENHANCE WORKFORCE DEVELOPMENT

- Prepare for more industry changes
- Standardize job titles, tasks and pay
- Educate public about the vast range of employment opportunities; emphasize trades
- Attract younger candidates
- Generate excitement for the industry itself
- Increase retention rates by generating clear career paths, flexible schedules and work locations
- Work with state/federal organizations to increase funding for specialized training programs
- Sponsor women's participation in the industry

THANK YOU!



WHERE IS THE EDGE?



NEDAS



MARTY HANNIGAN

Founder & CEO DeepEdge



Where is the edge?

Martin Hannigan
Founder, Chairman and CEO

NEDAS 2019 in Boston
July 17, 2019

Deep Edge: What and who?

- **Deep Edge**

- A private equity backed startup
- In stealth mode
- Operating nationally from Boston, USA
- Founded in 2018

- **Martin**

- Thirty year Internet networking industry veteran
- Akamai, Microsoft, Amazon and Level(3)
- Former Chair of IXPs including France-IX
- Interconnection, Network and RE Expert

Primer: latency and bandwidth

- **Bandwidth:** how many bits at once a connection can send or receive
- **Latency:** the speed of transmitting and receiving data from point one point to another e.g. 1 ms or 100 ms
- **Combined:** a measure of performance
- **Size matters:** small network connections limit performance
- **Distance matters:** long paths increase transmission time
- Distance and sizing impact cost and performance
- Thus, the beginning of an edge

High latency

An illustration of high latency of a social media platform

Start: 2019-07-09 T 09:22:09-0500 Massachusetts, USA

HOST: deep-edge	Loss%	Snt	Avg	Best	Wrst	StDev
7. -- bbr01nwtwct-bue-4.nwtw.ct	11.0%	100	26.4	14.1	79.0	11.2
8. -- bbr01blvlil-tge-0-0-0-11.	7.0%	100	34.7	21.1	321.2	32.3
9. -- prr01ashbva-bue-6.ashb.va	8.0%	100	29.9	18.2	247.2	26.2
10. -- ae18.pr03.iad3.tfbnw.net	9.0%	100	30.8	21.4	71.0	9.5
11. -- po103.psw02.iad3.tfbnw.ne	9.0%	100	33.4	18.9	245.1	29.2
12. -- 112.240.38.155	7.0%	100	31.2	20.8	220.3	23.8
13. -- I-am-not-close-iad	9.0%	100	28.9	20.3	168.3	17.2

Low latency

An illustration of low latency of a social media platform

Start: 2019-07-09 T 09:35:22-0500 Massachusetts, USA

HOST: deep-edge	Loss%	Snt	Avg	Best	Wrst	StDev
6. be-334-ar01.needham.ma.boston.co	0.0%	15	13.0	11.8	15.2	0.9
7. be-1003-pe02.onesummer.ma.ibone.	0.0%	14	13.1	11.5	16.5	1.3
8. 66.208.232.230	0.0%	14	12.7	11.2	15.0	0.9
9. 111.101.129.6	0.0%	14	11.6	9.2	18.8	2.6

Basic edge – benefits matter

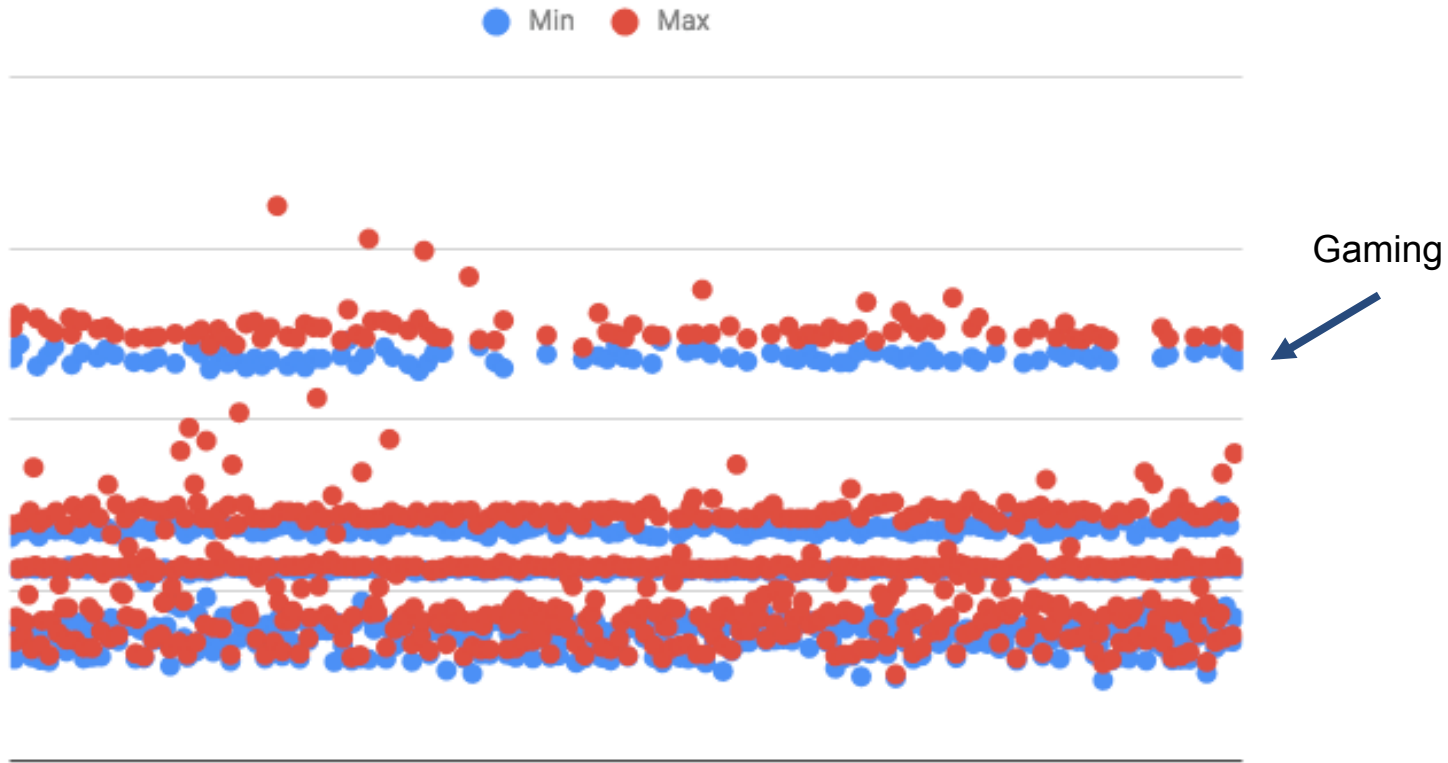
Cost benefits

- Some applications tolerate latency well
- They're designed to work in a variety of conditions
- Applications can be performance aware

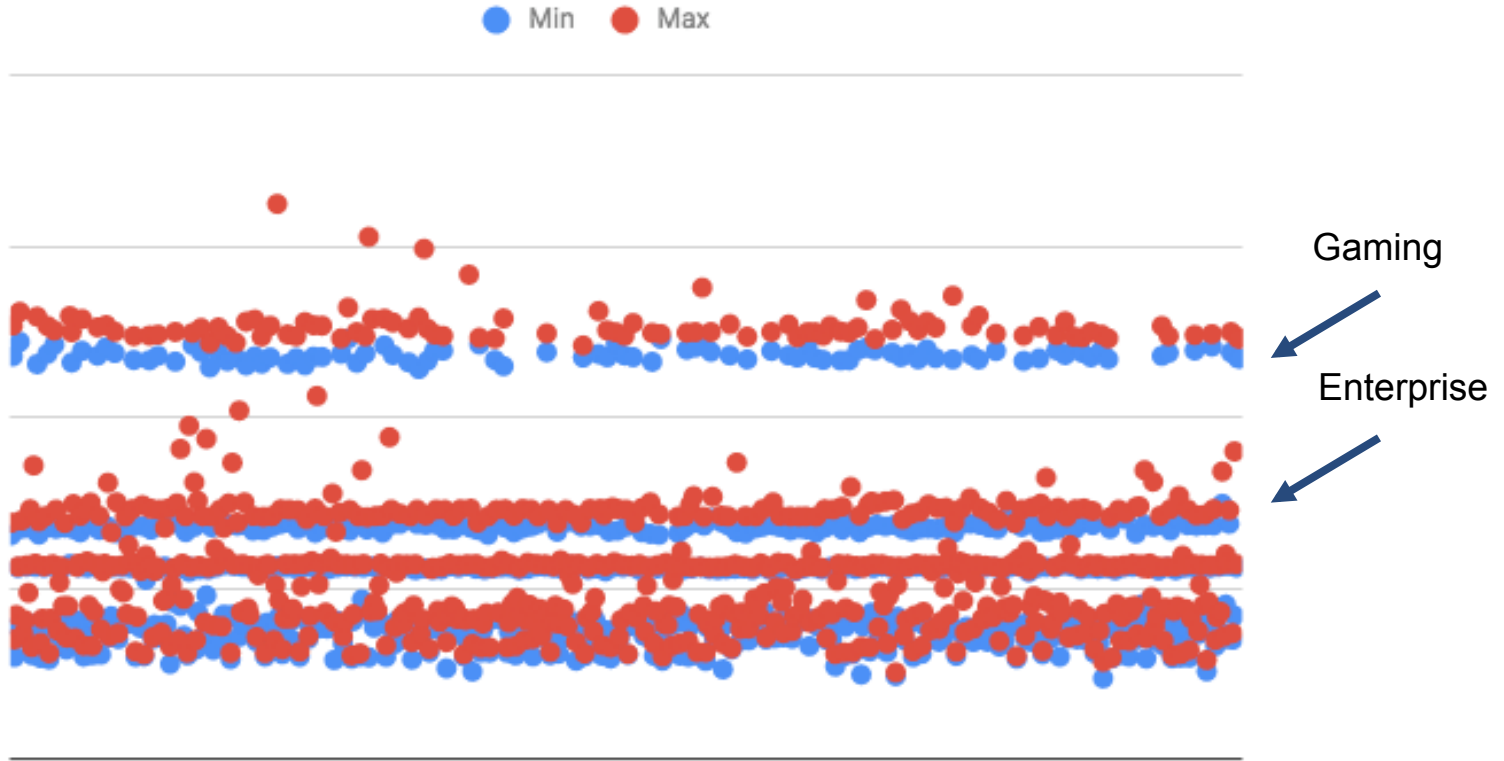
Performance benefits

- Faster transmission of data
- Purchasing of goods and services
- Applications that demand speed competitively

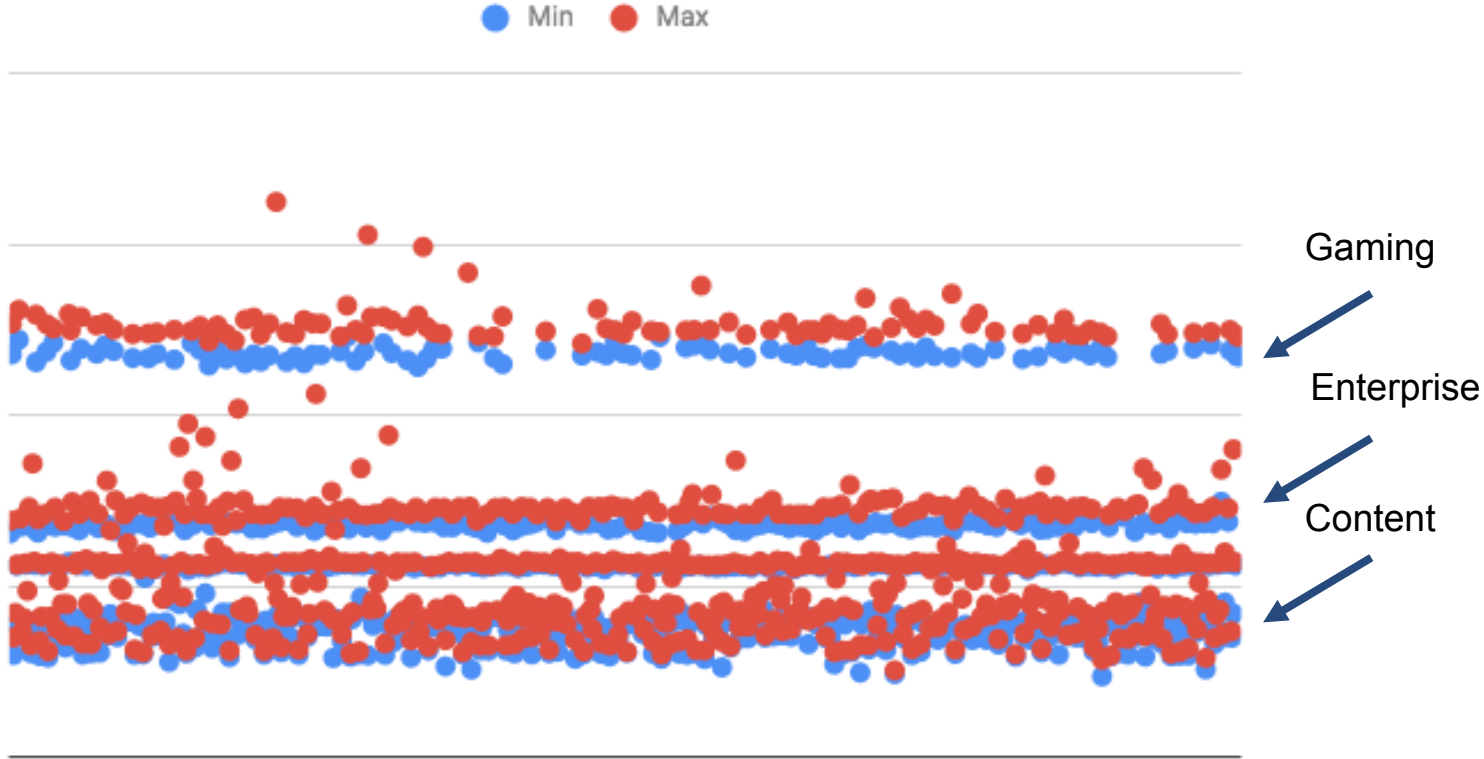
The edge



Or the edges?



Multiple edges?



Summary

- What is the edge?
 - Different for every application
 - It is not a differentiator by itself
 - Users define cost and performance benefits “edge”
- *It is everywhere, but it is different for everyone*

Questions and Thanks!

Martin Hannigan

marty@deepedgetech.com

+16178216079

GOING WIDE WITH IoT



NEDAS



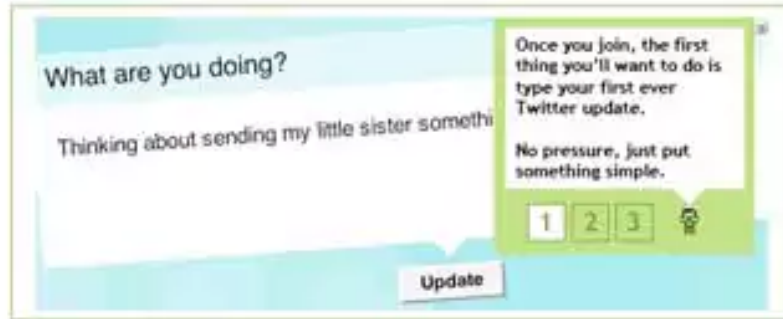
HANS SCHARLER

Principal IoT Engineer
MathWorks

In 2006...

[Twitter.com](https://twitter.com)

A global community of friends and strangers answering one simple question: **What are you doing?**



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[Fapinkap fabienne](#)



My toaster is on Twitter.
@mytoaster



mytoaster
@mytoaster

Toasting

7:06 PM · May 7, 2019 · [ThingTweet](#)

3 Retweets **10** Likes

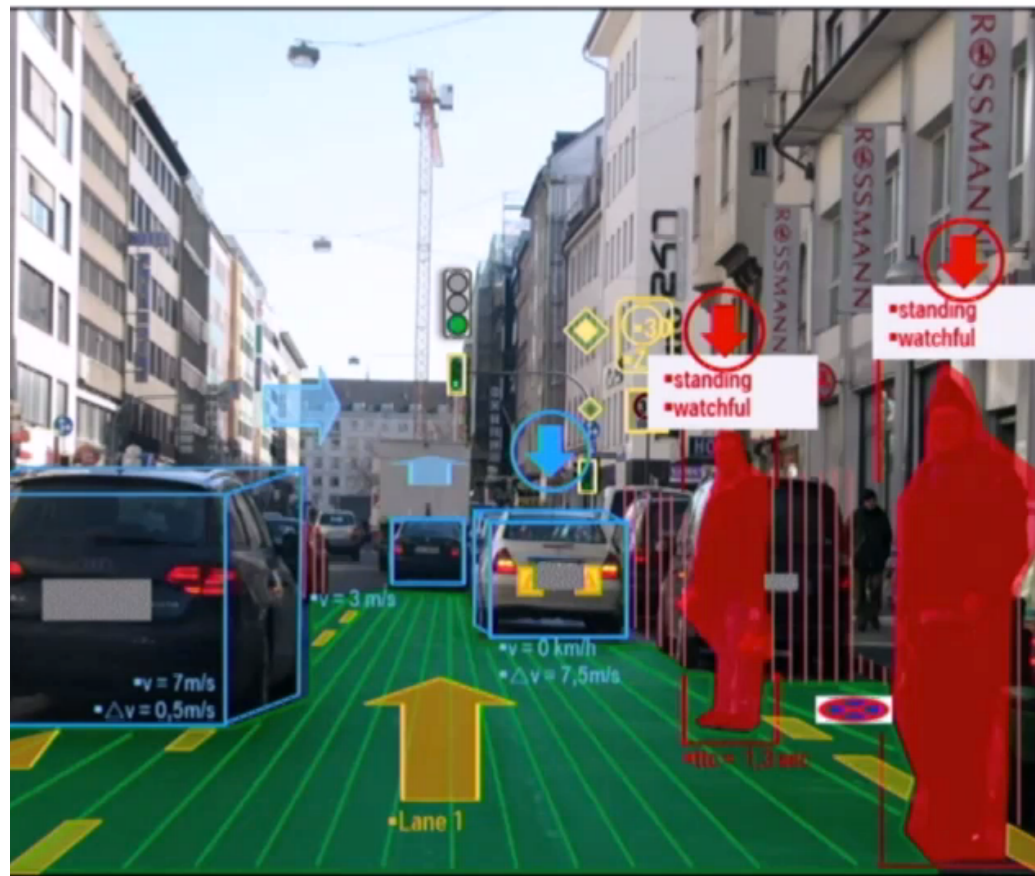


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@mytoaster

Done Toasting

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1 Retweet **13** Likes



Source: MathWorks® Automated Driving Toolbox

Topics

NEDAS

- Projects
- Trends
- Opportunities
- Challenges



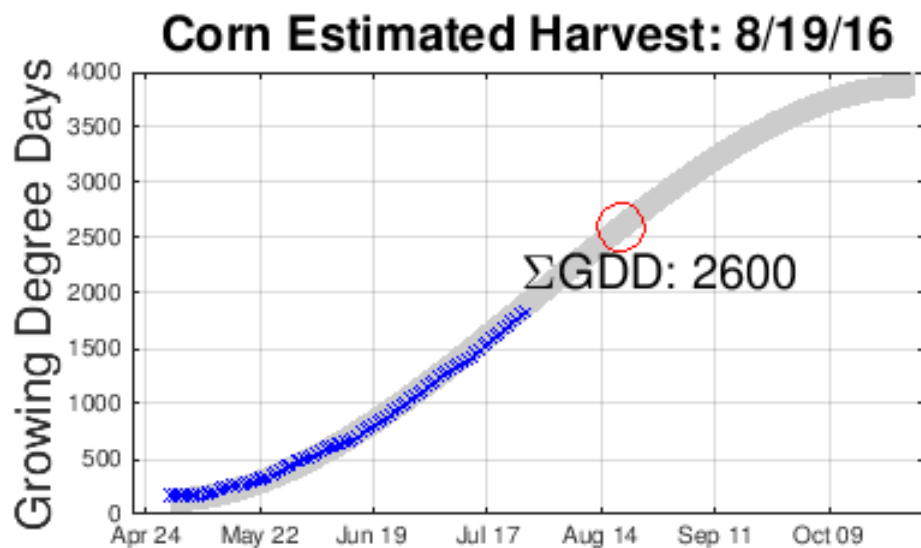


When should
I pick up the
trash?

When it's full.

Where should
I deliver
propane?

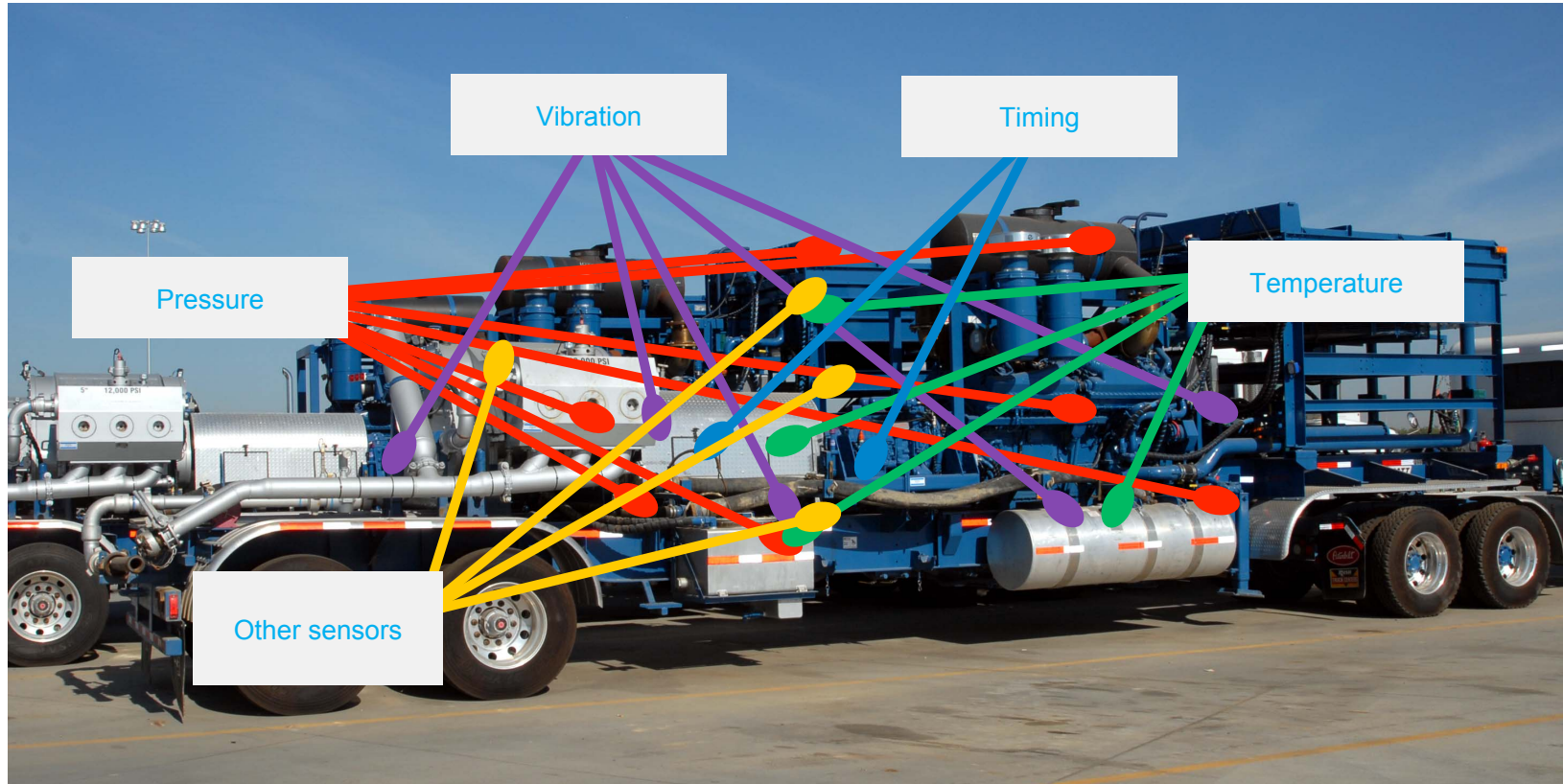




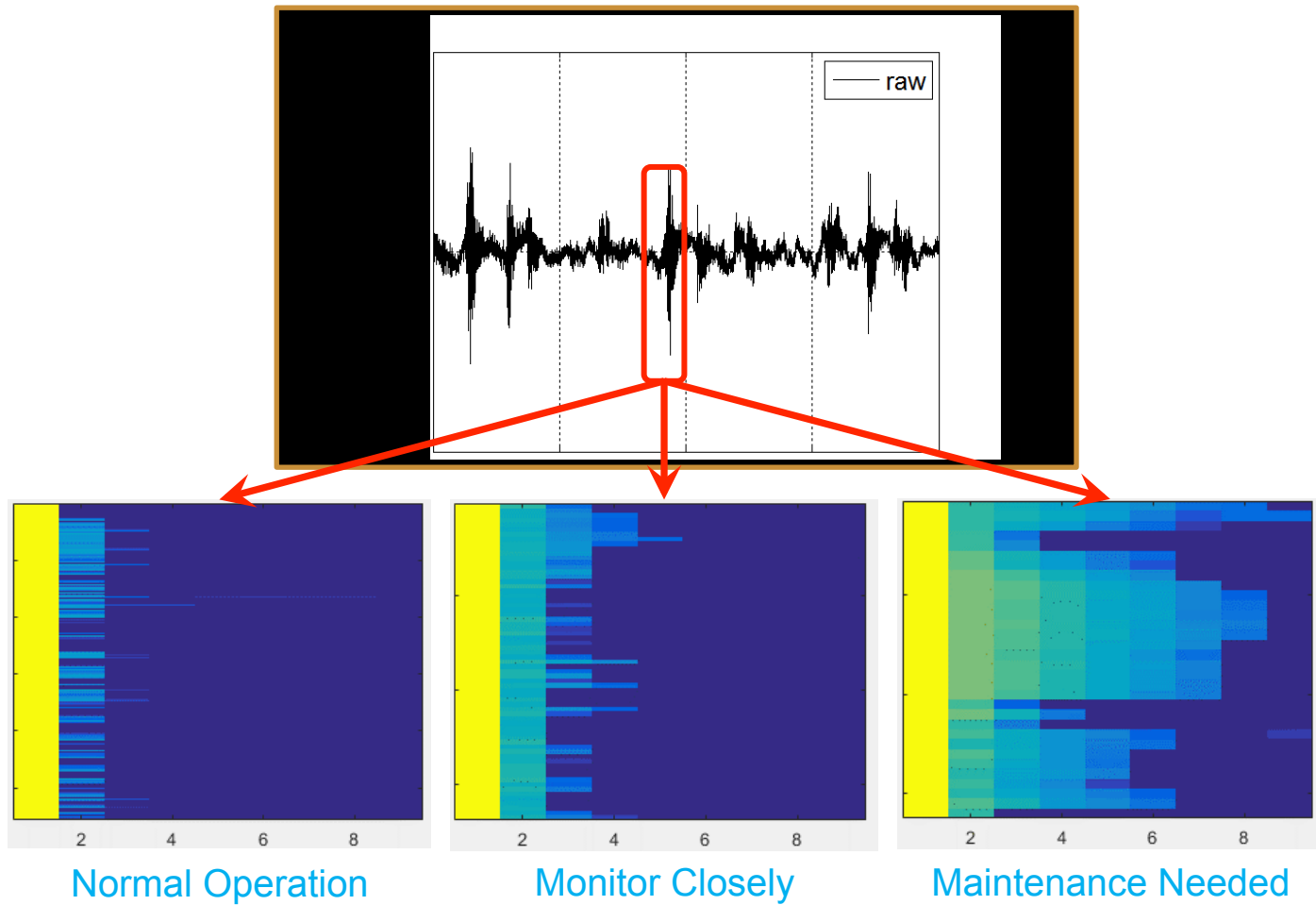
Predictive Maintenance

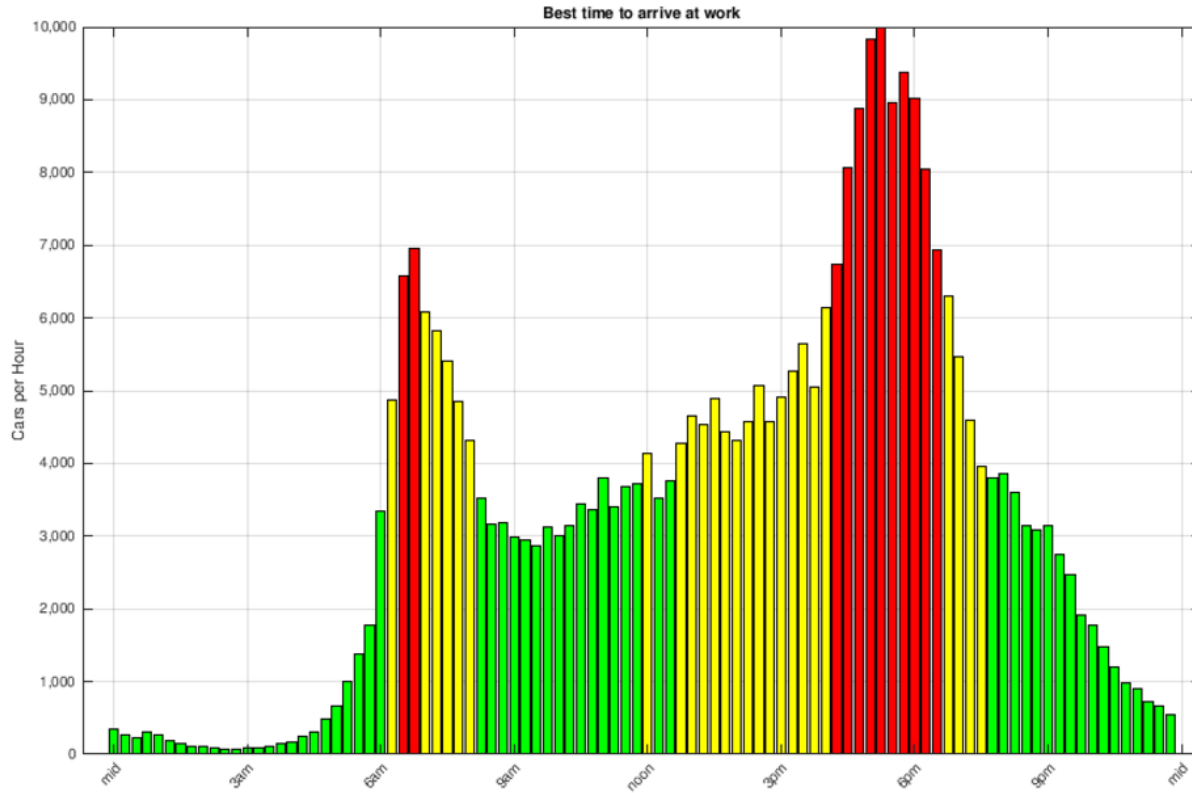


Predictive Maintenance

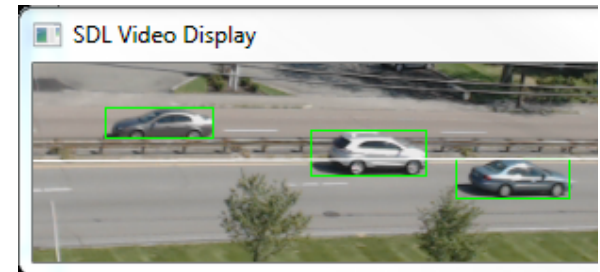


Source: MathWorks® Predictive Maintenance User Story





When
should I go
to work?



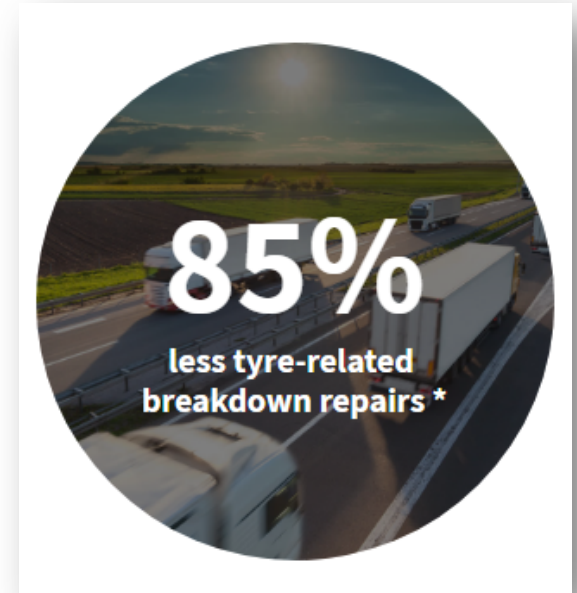
Tires-as-a-Service



GOODYEAR
PROACTIVE SOLUTIONS

Goodyear **TPMS**
Keep your vehicles on the road.

**Connected fleets:
drive smart and save!**



IoT Project Phases

Connecting Things + Data Collection

- Connectivity
- Storage
- Retention

Analyze Data

- Model development
- Optimization
- Historical analysis
- In operation
- Predictions

Take Action

- Alerts
- Control
- Integration

Long-term Maintenance

- Connection reliability
- Evolution of standards
- Cost

Smart City

Smart Agriculture

Optimization

Fleet Analytics

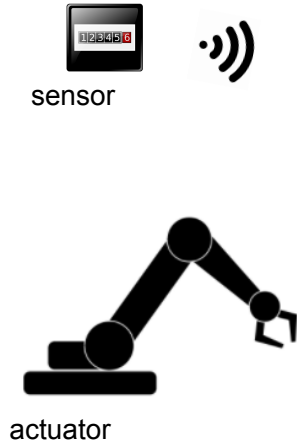
Predictive Maintenance

LoRa®



Source: *Semtech® LoRa®*

5G



URLLC: Ultra-Reliable and Low Latency Communications



mMTC: massive Machine Type Communications

Cover more edge nodes

Combined solutions

Offer _____ as-a-Service

Create new insights

Connectivity

Testing

Coverage

Application development

Offsetting ongoing costs



5G Development with MATLAB



Predictive Maintenance with MATLAB

*Avoid costly equipment failures by using
sensor data analytics*

Resources

 ThingSpeak™

Understand Your Things

The open IoT platform with MATLAB analytics.

Get Started For Free

CARRIERS AND CRE's: A SYMBIOTIC RELATIONSHIP THAT NEEDS CLARITY



FEDOR SMITH

President and Managing
Partner, Atlantic ACM



ANDY PENLEY

Vice President, Wireless
Solutions ZenFi Networks



CHRIS PARRA

Vice President Z5G
Zayo Group



STEVEN STRICKLAND

Executive Director of Real
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Global Mass Transit



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NEDAS ENTER TO WIN!



The Fitbit Iconic
Smartwatch with GPS



\$50, \$75 & \$125 Prizes



NEDAS SAVE THE DATE



September 5, 2019



November 21, 2019





THANK YOU

