Intro to the Panel

John Dolmetsch – Founder and President of BIG/BIG Wireless

John Dolmetsch founded Business Information Group in 1992 and developed the companies Wireless Practice in 1998 under BIG Wireless. John has spent the last 15 plus years in the wireless industry as the Executive Architect on Smart Grid Networks, City Wide Municipal Networks, Cable Operator and Carrier Networks, Traffic Automation, Video Surveillance, Public Safety and many other aspects of telecommunication engineering. He has lead BIG to an industry leading role in the deployment of large scale communications networks with over 80 employees based in Central PA with staff spread out throughout the US. He helped develop the BICSII Wireless Certification Program, serves as a board member in other technology related companies and holds various industry certifications. He holds a Computer Science Degree from York Collage of Pennsylvania and has performed speaking engagement at technology events across the county.

Wade Sarver – Founder of Wade4Wireless.com

Wade Sarver is the creator of the Wade4wireless.com blog and podcast. Working in technology for over 30 years with over 25 years in wireless has helped create a firm understanding of end to end wireless systems deployment and business. Currently working on several smart city projects while support Nokia's sales for wireless LTE system to carriers and consulting companies and brands coming to market and building systems. Working as a consultant and tech advisor for several companies under Wade4Wireless.com and TechFecta he authored several books including:

- *The 5G Deployment Plan Handbook*
- *The LTE Deployment Book, Small Cells, CRAN, and DAS edition.*
- *Field Workers Tower Site Aid*
- *Tower Climbing: An Introduction*

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Intro to the Panel

Roger Hayes –Vice President of Operations / BIG Wireless

Roger Hayes has been in the ISP and Wireless industries for 20+ years. Roger began his career in the ISP industry with an independent ISP that was acquired by EarthLink. While at Earthlink, Roger held a number of positions including managing EarthLink's nationwide field staff, 3 data centers, before moving into EarthLink Muni-WiFi division, managing their deployments in Philadelphia, New Orleans, and Minneapolis. Roger has been with BIG Wireless for the last 10 years as their Vice-President of Operations. Roger is responsible for overseeing the operations of the company that includes its Sales, Engineering, and Network Operations Center. Additionally, Roger has managed numerous large projects for customers such as Comcast and Nokia. Roger holds a MBA from Lebanon Valley College.

Bob Hagarman – Director of Business Development / BIG Wireless

Bob Hagarman has been in the wireless and telecommunications industry for 27 years. Starting his career in 800MHz trunking and two-way systems in 1990. Bob has accomplished a vast array of industry knowledge from being a member of technical staff at Lucent Technologies, communications transport division, responsible for fiber optic multiplexing solutions. Product Manager at TESSCO founding their structured cabling and video surveillance program to the Director of Product Management at Hutton Communications responsible for the oversight of 120 manufactures they offer. Most recently, field engineer and Director of Business Development at BIG Wireless, responsible for providing point to point microwave, point to multipoint distribution, WiFi, Mesh and BDA/DAS networks and solutions for our new and existing customers.

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IoT to Smart City Planning

Consulting for Technical Deployments

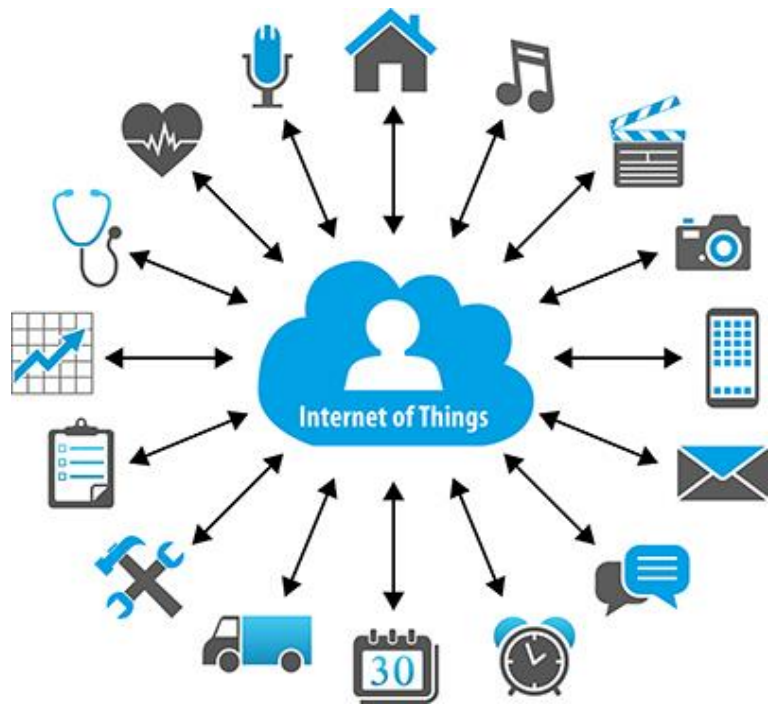TECHFECTA

Wireless

Wade4Wireless.com

BIGWIRELESS.NET

How BIG is the IoT Market?

63 devices connected every second.

Estimated **6.4 billion** devices connected to the internet in 2016.

5.5 Million new "things" will join each day

40 to 80 Billion connected objects by 2020.

There will be **10 connected objects** for every, man, woman and child on the planet.

People will not only consume data but become part of the fabric by the devices they carry.

Internet of Things

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IoT Benefits

IoT Overview

- IoT will connect things, machines talking to machines with little human interaction. There to serve specific functions, but requiring little bandwidth.
- IoT applications will connect "things" such as sensors, cars, meters, and more
- Connected car background:
  - Autonomous car connections include
    - 75MHz of spectrum dedication spectrum in 5.9GHz band.
    - Called DSRC, (Dedicated Short Range Communication).
  - Connected cars could connect using a Wi-Fi or MNO
    - Traffic conditions, emergency alerts, crash notification, etc.
- IoT offerings will includes
  - Parking meter payments, parking space tracking, garbage dumpster monitoring, meter reading, sensor tracking, and more.
- Building the infrastructure to support these offerings are critical to the growth of the city.
- Connecting a device to be monitored and controlled throughout the city.

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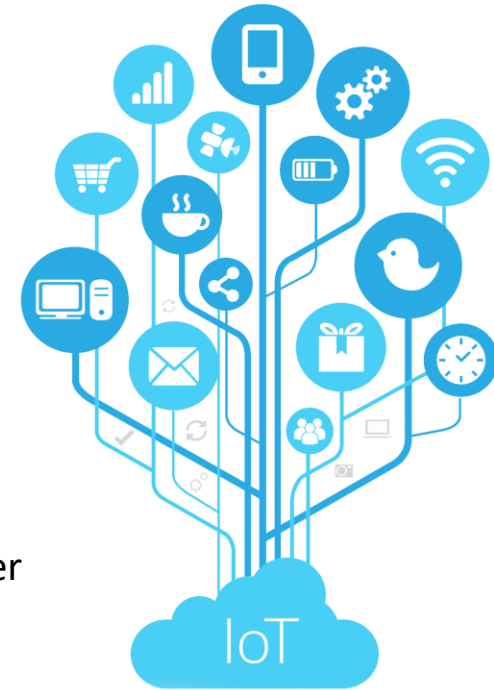
IoT Technologies

IoT Formats.

- LoRa – LoRaWAN, unlicensed spectrum 915MHz in US, low bandwidth, low power. Works well below noise levels.
- SIGFOX uses the 928MHz band, low power, low bandwidth, 3GPP.Deployed and in use.
- Wi-fi does have IoT functionality
- Wi-Fi HaLow – low power Wi-Fi in 900MHz band to improve battery life and dedicated to IoT applications.
- LTE-M – LTE format dedicated for IoT applications, uses in TDD and FDD formats, planning to be deployed by carriers.
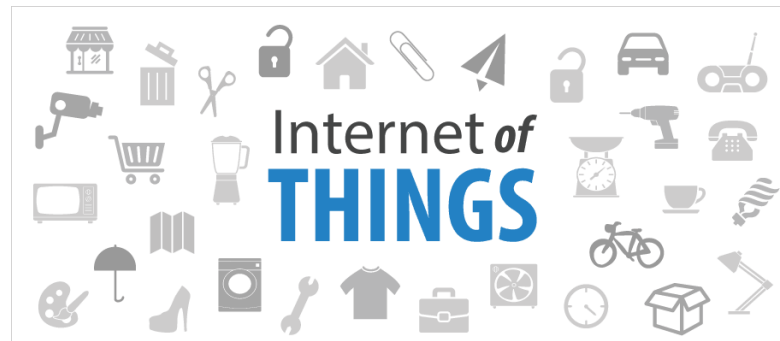
IoT for Smart City Planning

Let's review sustainability options for the Wireless Systems.
Initiate, Grow, Innovate!

What are you connecting to?
- Meters to businesses and home, (electric, gas, water).
- Parking meters.
- Parking garages and meters to monitor open parking spaces.
- Garbage dumpsters.
- Traffic lights
- Monitor traffic of cars and drones.
- Water main sensors, gas line sensors, flood sensors, etc.

Designing for integration, growth and expansion.
- Rolling out radios along busy walking areas and streets.
- Using existing poles billboards, signs, traffic lights to mount radios.
- Look at what your looking to connect:
    - Meters, lampposts in neighborhoods.
    - Traffic lights and vehicles, radios on posts at intersections.
    - Line up posts with garbage dumpsters.
    - Get close to the parking meters.
    - Use city owned parking garages when possible to connect.

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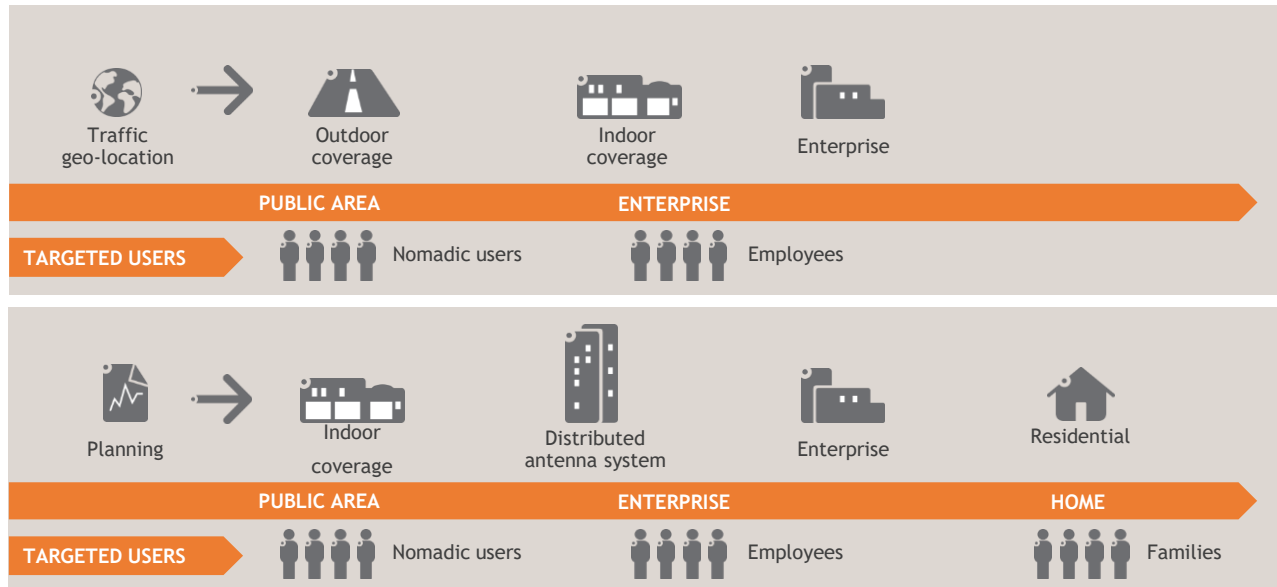# Smart City/IoT - Shared Infrastructure

Densification: get broadband to the people!

80%

of traffic typically contained in 15% of geographic area

COMMON OBJECTIVES:
- Architect for a long term plan.
- Deploy with the most effectiveness.
- Pick the most effective technologies for densification.
- Densify the coverage effectively.
- Pick the right mix of technology for use and growth.
- Enable the HetNet for maximum efficiency.

Traffic geo-location → Outdoor coverage | Indoor coverage | Enterprise

PUBLIC AREA   **ENTERPRISE**

TARGETED USERS   Nomadic users   Employees

Planning → Indoor coverage | Distributed antenna system | Enterprise | Residential

PUBLIC AREA   **ENTERPRISE**   **HOME**

TARGETED USERS   Nomadic users   Employees   Families

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The Need for Speed!

BANDWIDTH DEMAND GROWTH
Led by Video and Social Media Applications

Every **60 Seconds** the Internet carries

110,040 Calls
300 Hours Uploaded
51,000 Downloads
284,722 Snaps
1,736,111 Liked Photos

347,222 Tweets
34,150 Videos Viewed
1,041,666 Videos
4,166,667 Likes
77,160 Hours Streamed

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Wireless Options for Growth

Wireless options for growth and income.

- Wi-Fi is just one format, LTE-U is starting to take off and will be a great addition to the WiFi rollout.
- The CBRS, 3.5GHz, will offer a lightly licensed spectrum to provide secure and dedicated spectrum.
- Carriers are expanding and densifying their networks are looking for mounting assets that the city can provide. They need your help!
- IoT systems like NB-IoT is rolling out for meter reading. SigFox is rolling out in the USA.
- As 5G rolls out, networks will be expanding with new bands and new opportunities.
- Offer commercial companies to use city fiber before running their own.

Mounting assets across the city offer additional income on city assets:

- Lamp posts, street lights, and traffic lights
- Public buildings
- Wood poles
- Sidewalks and manholes, (underground)
- City towers
- City structures, public parks, park and ride areas, and other city owned properties
- Billboards

SMART CITY CHALLENGE

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Last Mile Options

Internet speed test ✕

68.5 Mbps download   **11.8** Mbps upload

Latency: 30 ms
Server: Washington, DC

Your Internet speed is very fast

Your Internet connection should be able to handle multiple devices streaming HD videos, video conferencing, and gaming at the same time.

LEARN MORE   TEST AGAIN

Feedback

The last mile connection is critical for FWA, (Fixed Wireless Access), to be a success.

For instance, AT&T and Verizon are both testing the last mile over wireless hoping that it becomes more cost effective than FTTS, (Fiber to the Structure). This is becoming a realistic model now that 5G and mmwave, (millimeter wave) radios are becoming cost effective and common.
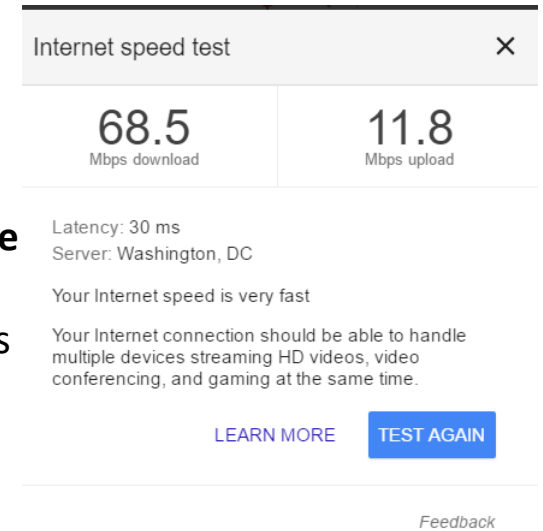
Business Case Models
- Connect businesses in remote locations without fiber access.
- Connect homes without broadband access.
- Connect tower and small cell sites in remote locations.
- Read smart meters in remote locations.
- Monitor IoT devices in remote locations.
- Connect public safety devices in remote areas along the highway.

"The last mile is a hurdle that's older than dark fiber."

MILE 1
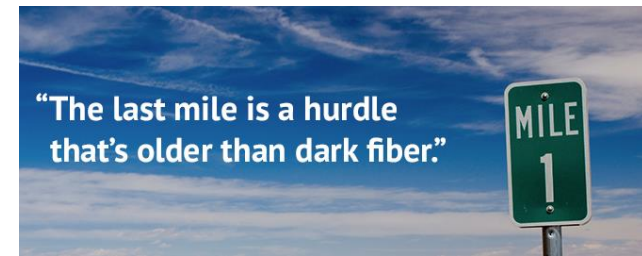
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Rolling out the network

Building the network:
- Design the proposed layout
  - Coverage area
  - Asset location
  - Underserved areas
  - Current fiber access
- Plan for fiber access and backhaul growth
- Allow for wireless backhaul where fiber in not available or too expensive to run.
- Make use of existing assets
- Replace assets with new poles that are aesthetically pleasing yet functional
- Replace lamp posts with energy efficient, pretty, and functional poles.

Broadband Backhaul
- City owned fiber can be used and leased
- Wireless backhaul options where fiber is not available
- Potential partners for last mile could be fiber companies, cable companies, or wireless ISPs.

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Let's DEPLOY!

Smart City System Management Rollout and Beyond!

Site Acquisition

Network Architecture Plan

Site Selection

Working with Partners

Installation

Asset Management

Commissioning & Integration

Smart City Platform

Backhaul Management

Design, deploy, manage, and grow!

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Thank You!
We appreciate your time.

AND