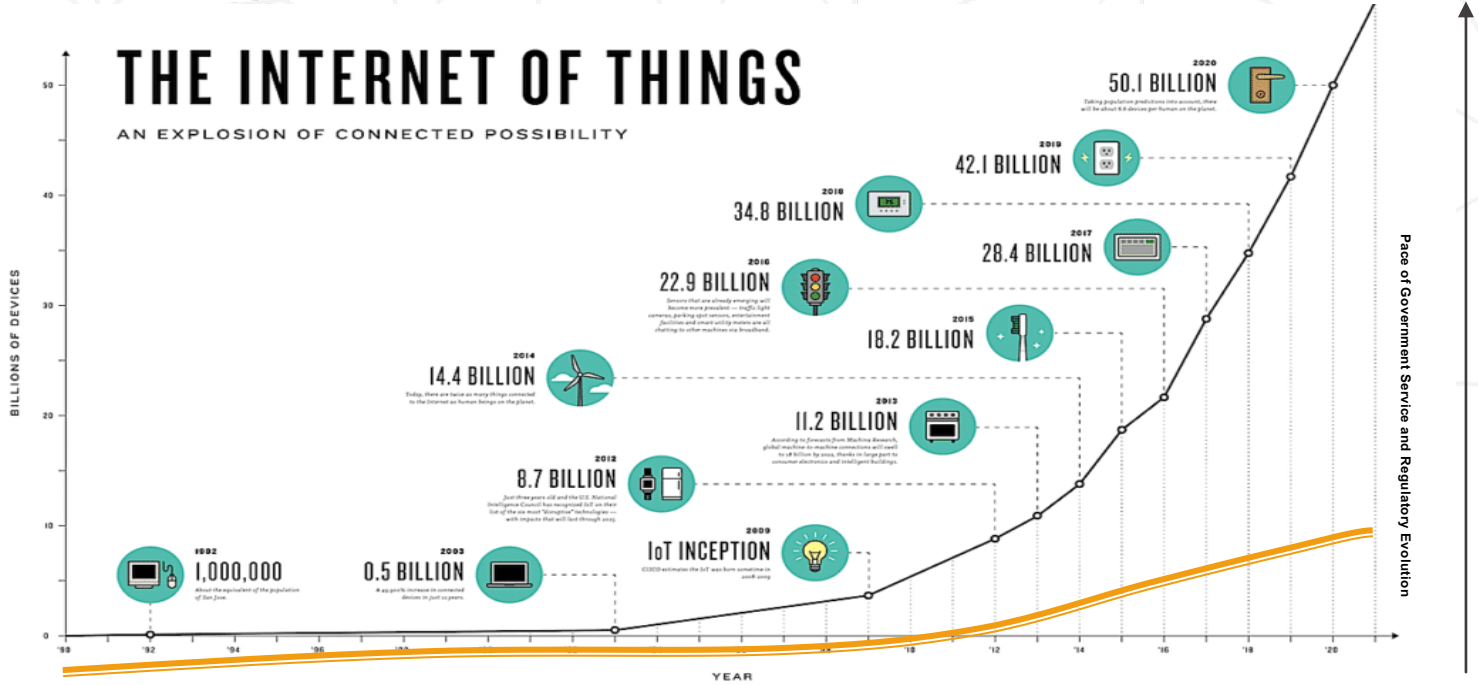
HRGreen.

Building Communities. Improving Lives.

Credit: Ameritrade Financial 2020

Does it feel like the world is accelerating? It is, exponentially...



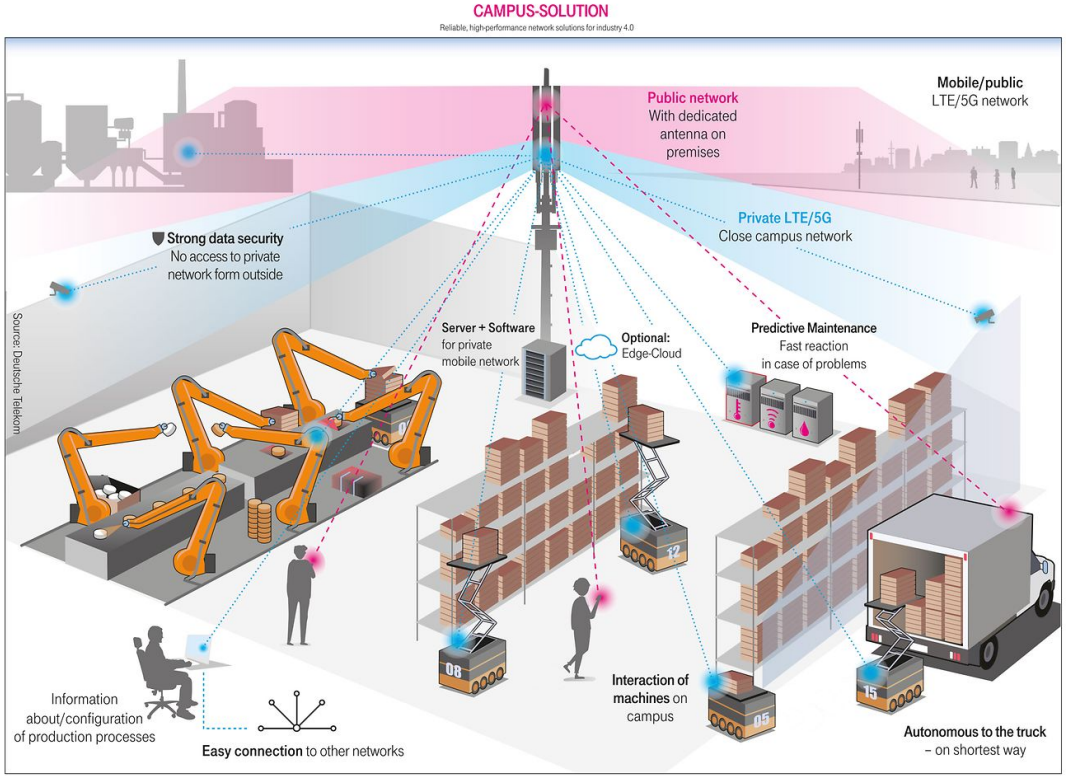
Source: National Cable & Telecommunications Association (NCTA), with speaker modifications

- Steam Power
- Electricity
- Computers
- The 4th: ***Confluence*** of:
  - **Artificial intelligence**
  - **Internet of Things (IOT)**
  - **Nanotechnology**
  - **Quantum computing**
  - **3D printing**
  - **5G data transmission**
  - **Technologies that will fundamentally change our world**
- Smart Cities!

4th Industrial Revolution

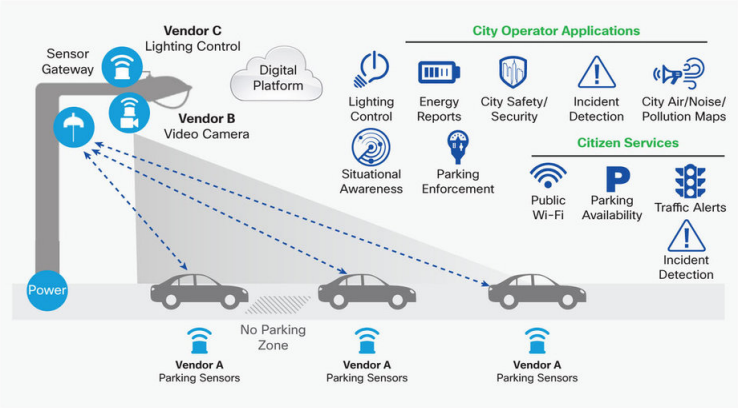
Smart Factories with computing “on the edge”

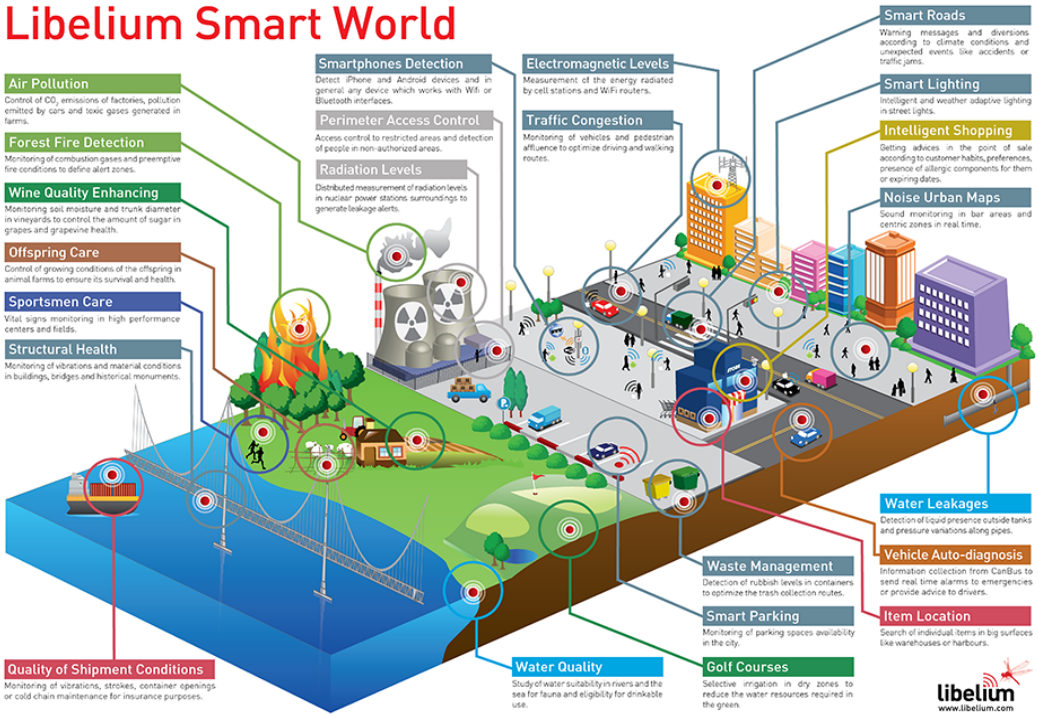
- Connected Devices make independent decisions
- Sensors monitor and proactively identify needs on the shop floor
- “Real Time” changes
- Remote management




Post-Pandemic: 4 Things
Autonomous Cars = Extra capacity / widening (?)
Stimulus Programs: Infrastructure spending (?)
Telecommuting = Demand reduction (?)
Telecommunications: MORE critical for infrastructure
!!!
Transit
ybe)
g
e)
Telecommuting
10-20% (maybe)
Driverless capacity
300 (yes) 300%

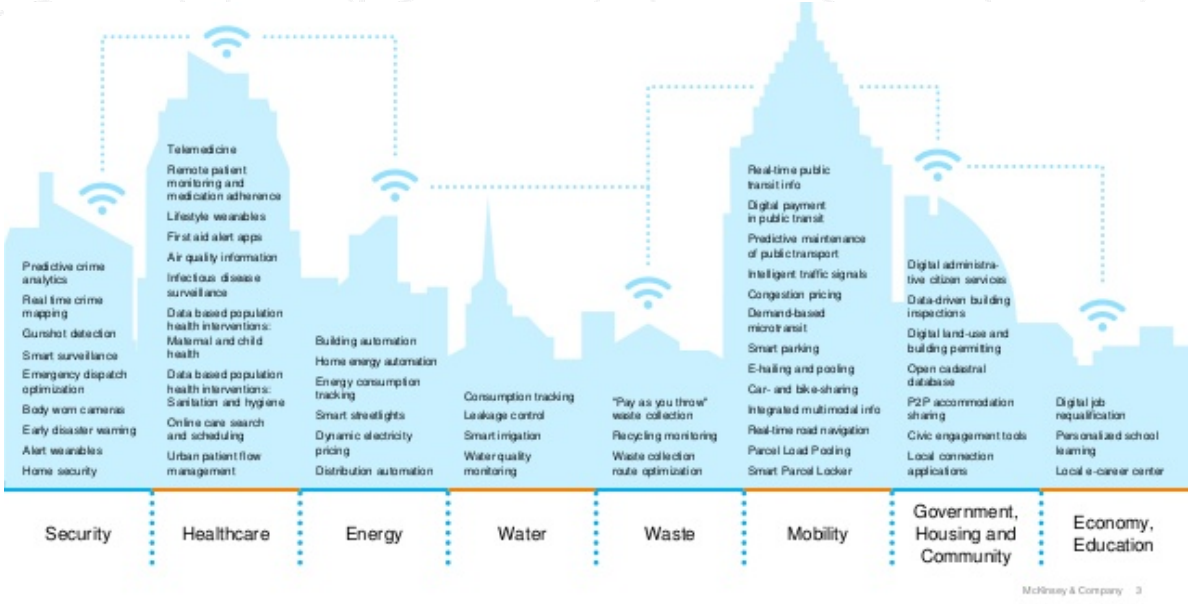
- Urbanization / Suburbanization
- Uberization - sharing economy
- Permanent work from home
- Distance: Education / Tele-Health
- Consumer demand changing





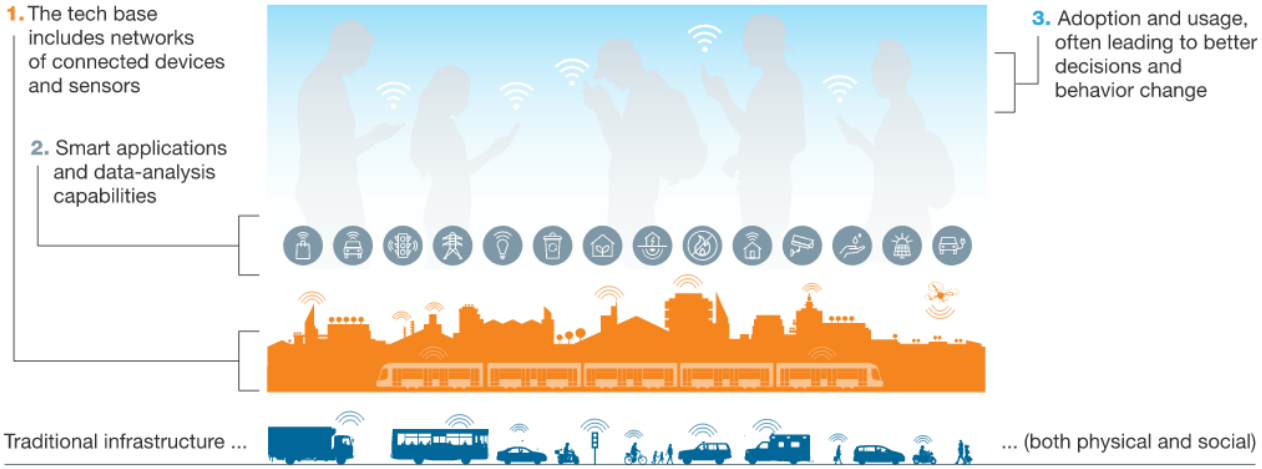
Making Smart Cities Simple | Smart Is Not Simple Today

- Pilot projects still prevalent
- Projects are often driven by a single department/goal
- Most common applications are emerging



- Connecting and converging technology & infrastructure
- Making infrastructure SMART to move citizens to ACTION

3 layers of "smartness" will elevate life in cities of the future



McKinsey&Company | **Source:** McKinsey Global Institute analysis

- What will constituents demand?

What Not to Do?

- Avoid it… It is coming/resistance is futile
- Too Expensive to solve yourself (partnerships)
- Isolated Solutions (ITS fiber is never just ITS fiber)

Interconnecting everything:

- Streetlights, Utilities, Energy
- Traffic Signals, Parking, Roads
- Transit, People, Logistic Systems
- Sensors: Fire, Wearables, Cameras, Drones
- Technology is the enabler
- Communications are the common thread

BECOMING SMART
EXAMPLES FROM OUR WORLD

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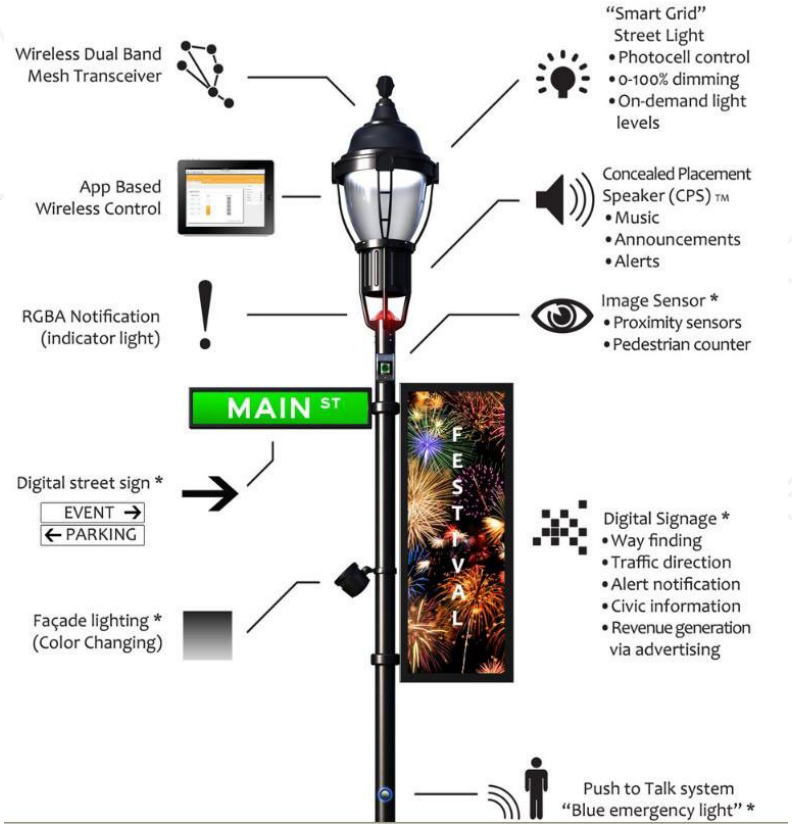
Value through Streetlights

- First streetlight municipalization in Colorado
- SIGNIFICANT annual budget reduction… AND…
- Identified platform for future smart city initiatives

- Streetlights are an intersection of traditional infrastructure and technologies
- Requires a holistic approach
- Nothing happens in a vacuum… if the path has been determined



** Graphic by IntelliStreets, Inc.*

- **Millions** in costs avoidance / savings
- More important: ***asset value***
- Even more savings: LED (10-20 yr ROI's)
- Lighting at the next level
- "**Smart**" streetlights: sensors, counters
- 5G cellular enabled **small cells**
- **Revenue source** ($250 - $6,000)
- **Conduit:** May be most valuable

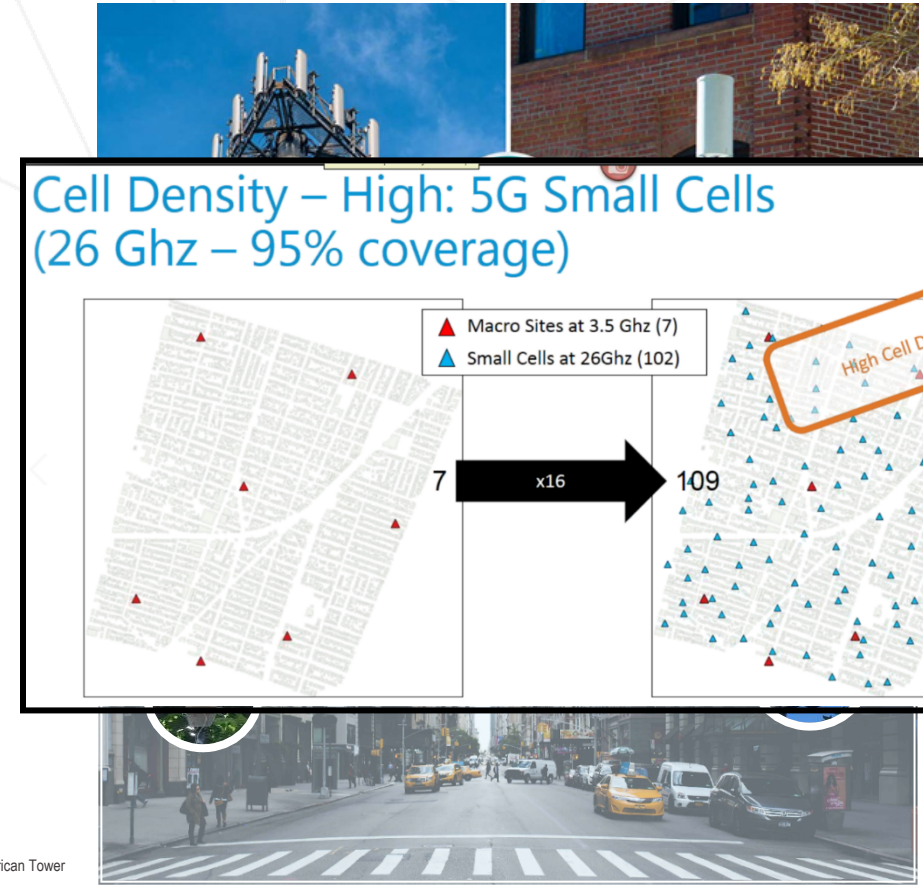
Making Smart Cities Simple | **Street Light Municipalization**

Playing 5G Defense

- Needed policies to effectively manage private sector deployments
- Dedicated focus on health concerns & compliance
- Ongoing plan review

…and next, offense

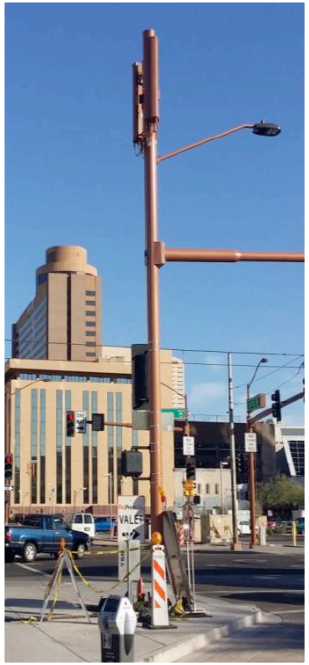
- 3 Miles vs 300 Feet
- A tidal wave of attachments – your poles and streetlights
- Densified fiber optics to serve wireless applications



Graphic Courtesy – American Tower

Street Light Pole

Stand-Alone Pole



Traffic Signal Pole

Existing – Dual Use

Source: “Verizon Small Cell Program”, 2017 CML Conference Presentation

Underground Communication Vault

Concealed Equipment Enclosure

The New York Times

The 5G Health Hazard That Isn't

How one scientist and his inaccurate chart led to unwarranted fears of wireless technology.

Golden Cosmos

5G Is Coming: How Worried Should We Be about the Health Risks?

So far, at least, there's little evidence of danger

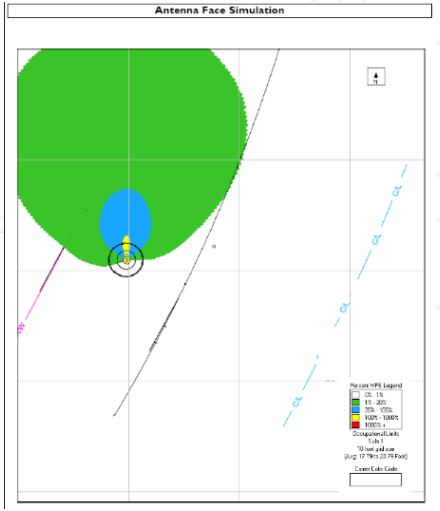
By Kenneth R. Foster on September 16, 2019

> 5G is an emerging technology that hasn't really been defined yet.
>
> Michael Wyde, toxicologist

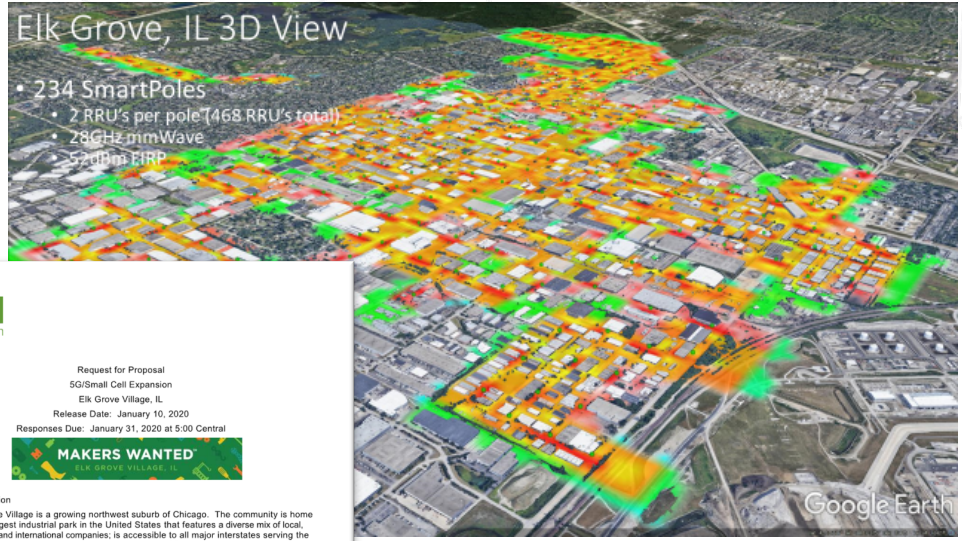
Activists fear radiation from 5G wireless service could be dangerous to public health. And they want more research done before carriers deploy the technology.

NurPhoto

Making Smart Cities Simple | **Health Concerns: Science is undecided… The fear is real.**



Making Smart Cities Simple | Context Sensitive Compliance



NW View from O'Hare Airport

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Request for Proposal
5G/Small Cell Expansion
Elk Grove Village, IL
Release Date: January 10, 2020
Responses Due: January 31, 2020 at 5:00 Central

MAKERS WANTED
ELK GROVE VILLAGE, IL

I. Introduction

Elk Grove Village is a growing northwest suburb of Chicago. The community is home to the largest industrial park in the United States that features a diverse mix of local, national, and international companies; is accessible to all major interstates serving the metropolitan area; and is immediately adjacent to O'Hare International Airport. These location advantages are complimented by the Village's ideal suburban setting affording a high quality of life for its businesses and their employees.

The Village is a proactive and business-friendly community that values its citizens and corporate residents and works diligently to support the growth of their businesses. The Village consistently invests in the modernization and infrastructure improvements to its business districts.

The Village is a commercial hub for Chicago and boasts:

- Over 3,800 businesses and more than 400 manufacturers in the Business Park
- Proximity to O'Hare International Airport and the City of Chicago
- Convenient access to Interstates 90, 290, 294, 355, & 390 Expressway
- Extensive freight rail service throughout the Business Park
- A highly educated and notably creative workforce
- Recent expansion via the creation of the Elk Grove Technology Park, which contains more than 1.2 million square feet of high-image, state-of-the-art space

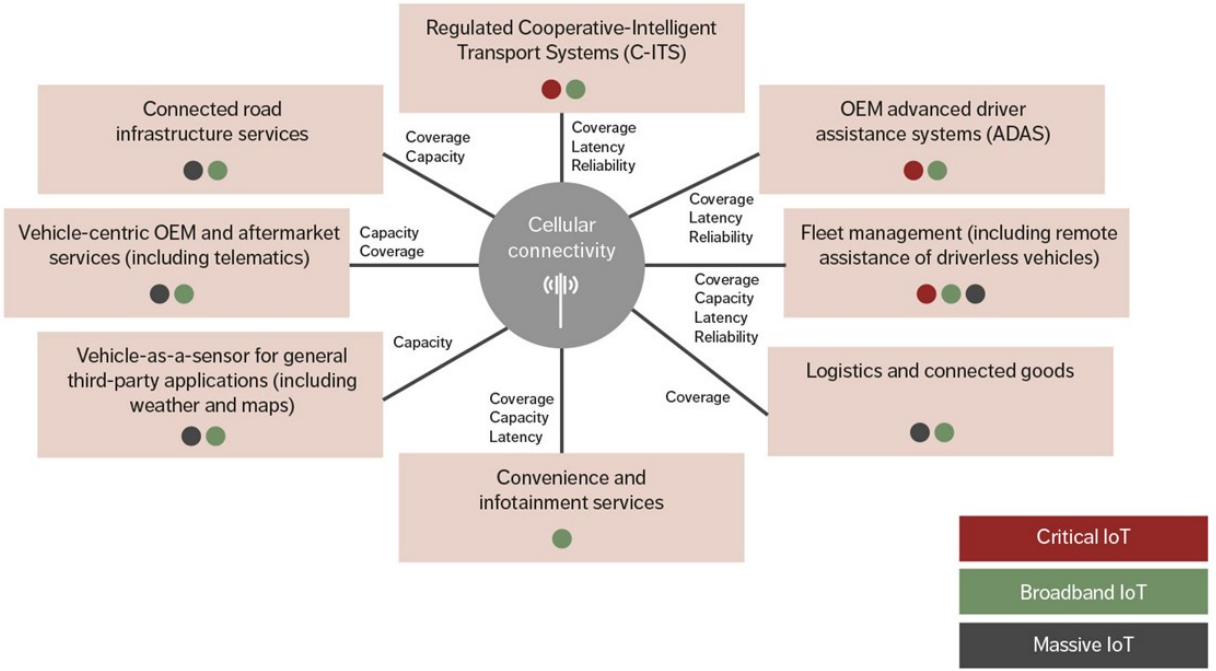
In 2019, the Village began the process of evaluating the future of this important, Midwest asset. It was determined by Village leadership that the creation of advanced communication technology through 5G and Small Cell technologies will be crucial to creating a technology-friendly, future-proofed community.

Going on 5G Offense

- Creating the smartest business park in North America
- Leveraging National Partner(s)
- Enabling future industrial automation technologies

Autonomous Vehicles

- V2V and V2I Technology
- Real Time Telemetry Data
- Fleet Management



Future Proofed Communities

- 5,000-acre master planned community east of Denver
- Wanted technology “hooks” to attract residents and developers

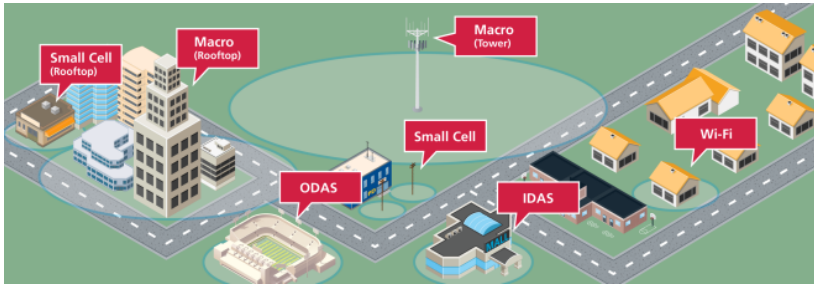
- Converged fiber-optic network
- Scalable Macro Tower Network
- 5G Enabled Smart Poles
- Carrier Grade WiFi
- Commercial ODAS/IDAS

NETWORK DESIGN

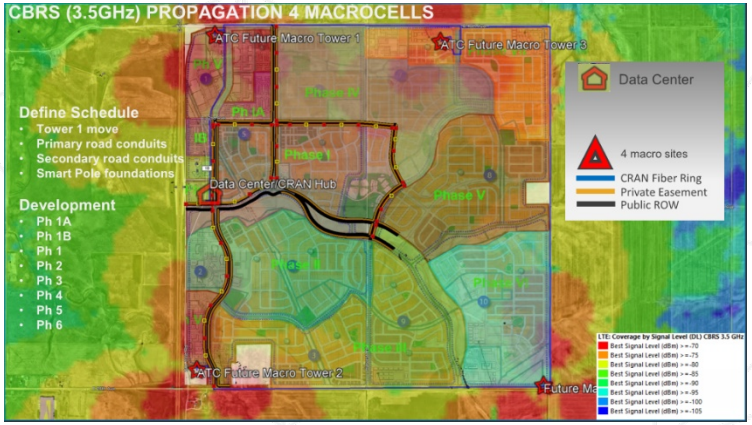
Use Cases

MOBILITY	FIXED WIRELESS	CONNEC-TIVITY	IN-BUILDING & VENUE	ALL

▪ 4G macro tower coverage
▪ 4G capacity in high traffic areas
▪ Design for licensed and un-licensed spectrum
▪ Prepare for 5G mmWave overlay network
▪ Prepare for multi tenant 4G and 5G deployments
	▪ Cost effective alternative to FTTH
	▪ Each node covers ~25 single homes
	▪ mmWave "Fiber over Radio"
	▪ Ability to add 5G Mobility functionality
		▪ FTTH (dark fiber)
		▪ Licensed spectrum
		  ▪ 4G/5G
		▪ Un-licensed 4G/5G
		  ▪ Carrier Grade Wi-Fi 6.0
		  ▪ CBRS
		  ▪ Private LTE
			▪ Enhanced services
			  ▪ Retail
			  ▪ Offices
			  ▪ Light Industry
			▪ Enhanced end user experience added to Public Schools
			▪ Private LTE/CBRS
			▪ Carrier Grade WiFi
				▪ Shared BBU Hotel, C-RAN
				▪ Shared MEC, Mobile Edge Computing
				▪ Shared edge data center (e.g.Netflix)
				▪ Dark fiber Hub
				▪ Carrier Fronthaul
				▪ Carrier Backhaul



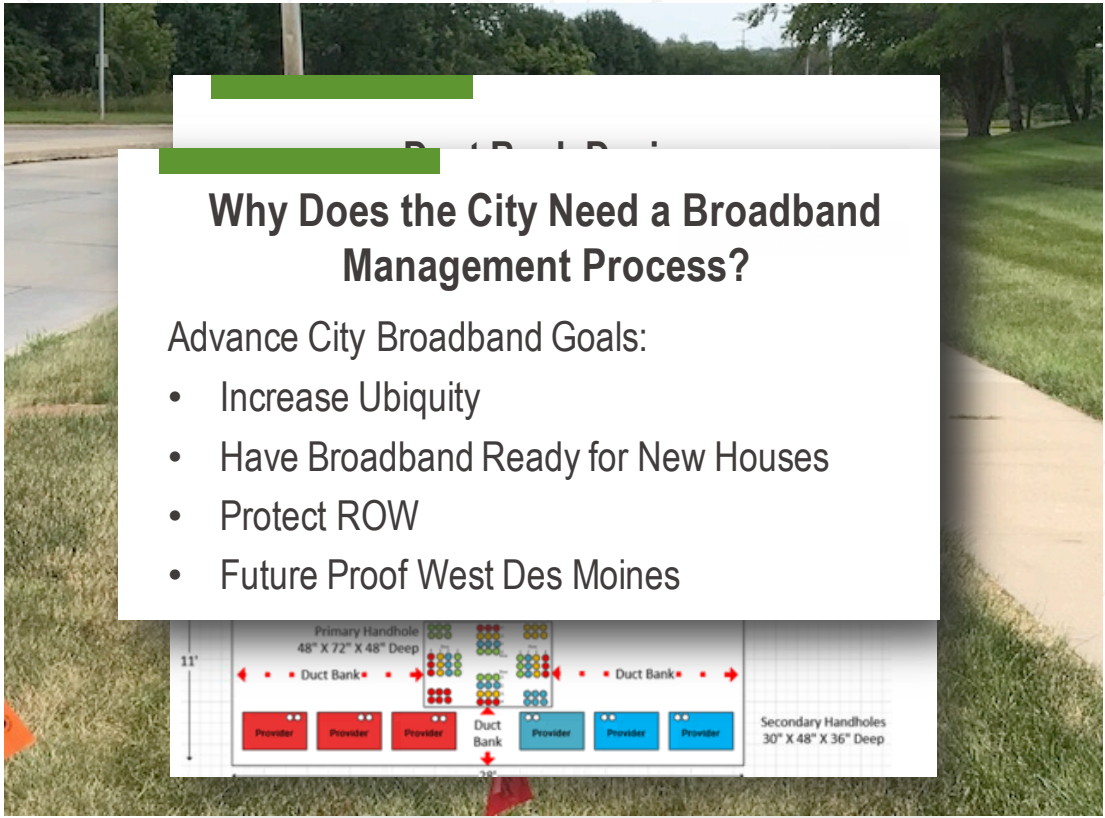
- Developer: Land and conduit infrastructure
- Partner: Carrier data center, fiber, smart poles & ongoing operations management
- Cable/Telcom firms lease capacity
- Revenue Sharing
- Smart City Pilot Zone



Managing Right of Way

- Fiber optics mean ever dwindling right of way
- Creative approach to solving a key municipal problem

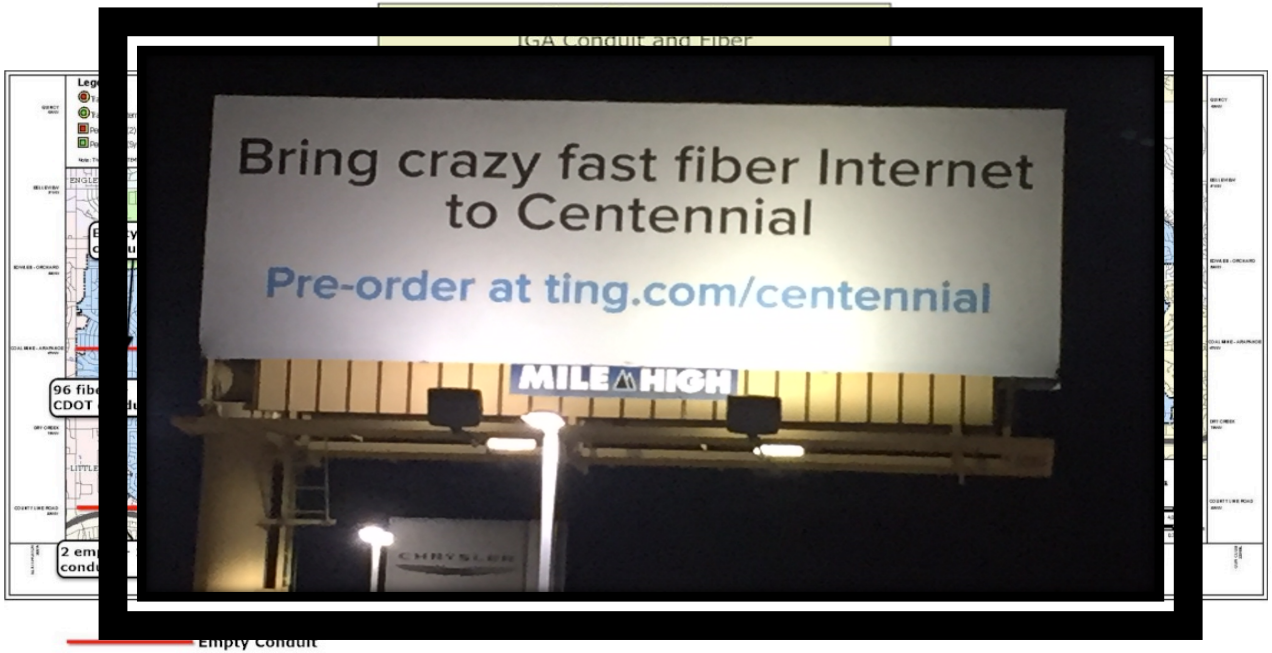
- Solves shared problems
- Creates shared infrastructure to protect right of way
- Future and built infrastructure
- Facilitate provider engagement
- Operationalizing the system



- Desire to upgrade city infrastructure
- Acquiring streetlights
- Implementing signal controls (ITS)
- Needs a plan for convergence

- Fiber optic connectivity
- Streetlights as a platform for 5G Services
- Signals to drive mobility upgrades
- Upgrade IT network
- Evaluating broadband upgrades for business & residents

- 3 Miles to 60+ Miles
- Conduit Cost = $600,000
- Value = $10-$20MM



Utility + Fiber = Another New Revenue Source!

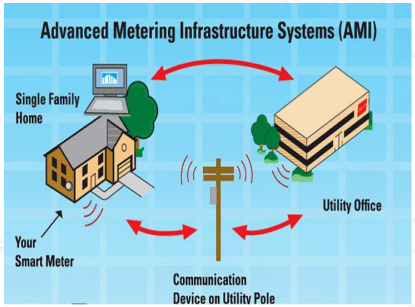
The data network that meter companies will most often recommend is a single-function RF system.

BUT – it is not the only option and may **not** be the best for:

- Longer term investments
- Smart City initiatives

STUDY:

- What role should **fiber** play?



AMR  **vs** **AMI** 

ACHIEVING SMART GOALS
A PRACTICAL GUIDE

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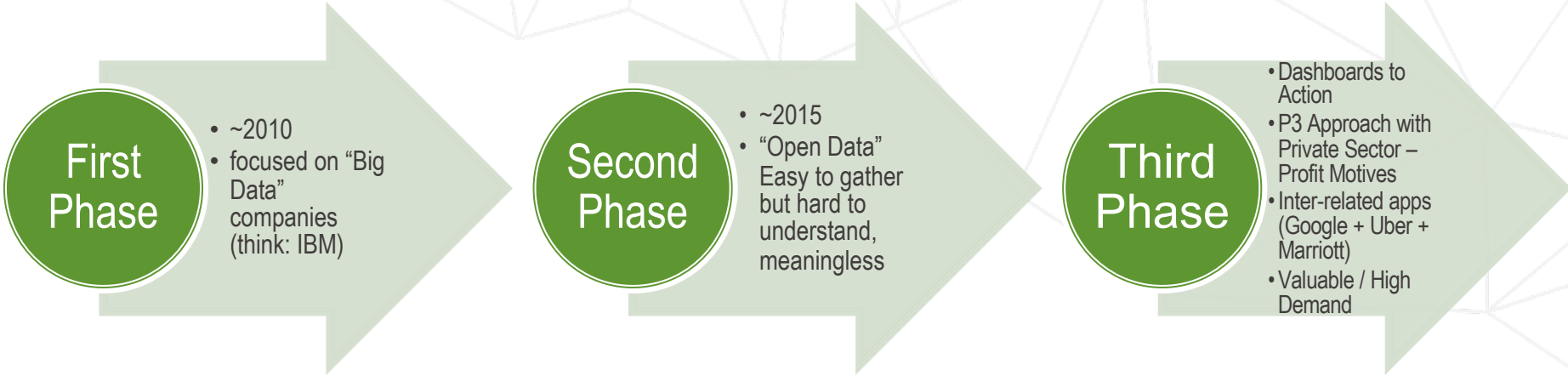
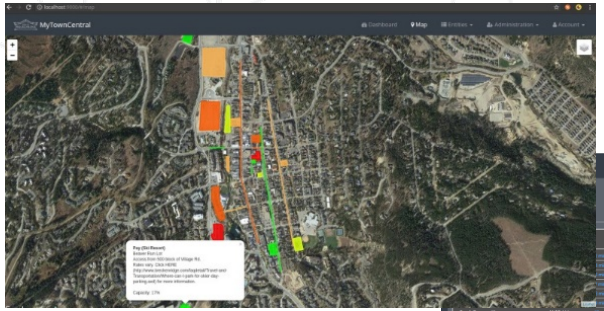
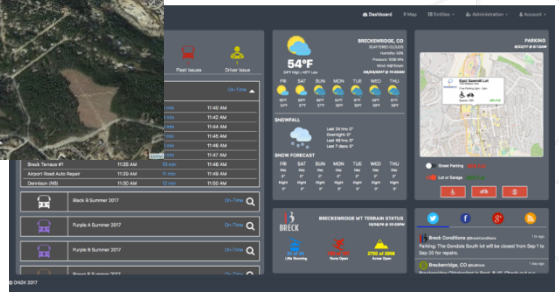

First Phase
• ~2010
• focused on “Big Data” companies (think: IBM)
Second Phase
• ~2015
• “Open Data” Easy to gather but hard to understand, meaningless
Third Phase
• Dashboards to Action
• P3 Approach with Private Sector – Profit Motives
• Inter-related apps (Google + Uber + Marriott)
• Valuable / High Demand

- Smart City is IoT-Based… Localized Data is Smarter!

✓ Smoke detection, indicating a **fire**
✓ **Flood** / **tsunami** warning
✓ **Mud / debris flows** (Rain event: “all reds”)
✓ Abnormal vehicle congestion (events)
✓ Stolen vehicle on a corridor
✓ Signal / **utility malfunction** (water leaks)
✓ Obstruction on the road (tree falls)
✓ Events/parking/congestion/unusually large crowds
✓ Gunshots/crime prevention/video
✓ Signals reduced accidents

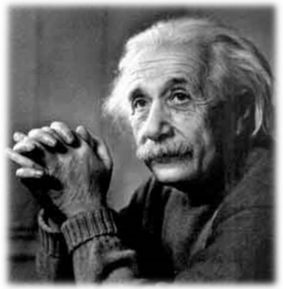




- Citizens are oblivious to general notices
- They want information on kids, schools and immediate impacts

SENSORS → “Fog” → **DASHBOARDS** → Cloud → **ACTION**

- **Identify** fiber-related **assets:**
  - Conduits, agreements, splice points, vaults,
  - Streetlights & poles
  - Identify underutilized capacity
- **Upgrade** public policy **items**
  - Develop fiber friendly policies
  - Update management systems
- Create **strategic plan/vision**



"If I had an hour to solve a problem, I'd spend **55 minutes thinking about the problem** and **5 minutes thinking about solutions."**
- Albert Einstein

- Deploy fiber and sensors to create technology core
- Identify internal champion / leadership team
- Identify community partners and seek mutual benefit

- **Facilitate private sector competition** and consumer choice
- **Make** some **public** assets available to **private** sector
- **Encourage** internet-based **economic development, job creation**, new business start-ups and entrepreneurs
- **Encourage the private sector to invest**
- **Facilitate** access in public places
- **Monetize** access to connectivity assets

- Be a big city with resources (!!!)
- Align to community goals and Vision
- Assess needs across department boundaries
- Create Master Plan and Strategy to avoid application thinking
- CARES Act and Other Funding available

CONTACT INFORMATION

Ed Barrett
HR Green
ebarrett@hrgreen.com

Dave Zelenok
HR Green
dzelenok@hrgreen.com

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QUESTIONS

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