"Getting to Smart" Las Vegas

June 12th Connected Corridor Tour
June 13th Connected Cities Event
Del Friscos 3925 Paradise Road

5G, WiFi, IoT, DSRC, Small Cells, DAS, CBRS

Presenting Sponsor: GraybaR

"Getting to Smart" is a quick dose of knowledge to help you navigate in our increasingly mobile, always-on, information intensive, and SMART Society

Las Vegas understands the role of Connectivity in "Getting to Smart". On the afternoon of the 12th we will tour the Connected Corridor and understand **how Las Vegas is enabling interoperability** between smart infrastructure supporting transportation, public safety, energy, facilities and public works.

On the 13th, we will explore how Smart Infrastructure provides a platform for advancements in autonomous and connected vehicles, video surveillance and analytics.

Join Industry Thought Leaders and explore Business Models, Technology Architectures and First Hand Use Cases that are driving Innovation and Disruptive Solutions.

HITACHI Inspire the Next

JMA WIRELESS

CONNECTED CITIES TOUR 2019

extenet SYSTEMS

CityPole

5th Gen MEDIA

T-Mobile BUILD YOUR OWN COVERAGE

SAFER BUILDINGS COALITION

Granite

Gabe's

LANDMARK FLEXGRID

"Getting to Smart" Connected Cities Tour

Connectivity and Bandwidth are the oil of the Gig Economy.

Network Technologies such as: 4G/5G, IoT, Fiber, Small Cell and Wi Fi are Transforming How Society Operates.

These sessions bring together thought leaders from Government, Enterprise, Academia and the Tech Community to look at the Business Models, Technology Architectures and action plans that City and Community ecosystems are using to build Dense Broadband Infrastructure.

Be part of the Solution

Dense NETWORKS

The Social Think Tank™

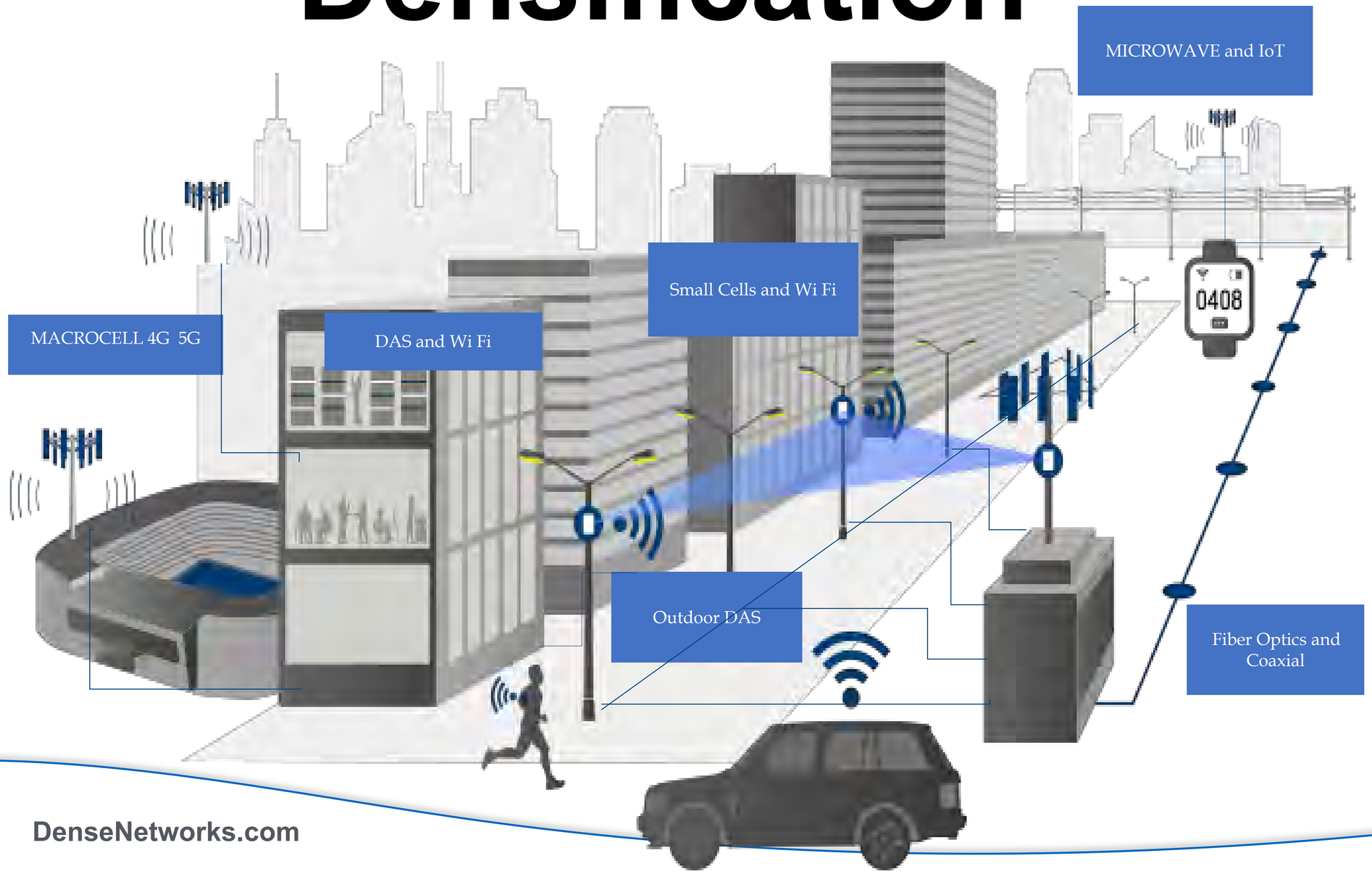
2019 Event Schedule

June 13	Las Vegas
August 22	Chicago
September 10	Seattle
September 18	St. Louis
October 23	Los Angeles
October 29	San Diego
November 14	New York
December 5	Columbus


CONNECTED CITIES
TOUR 2019
www.ConnectedCitiesTour.com

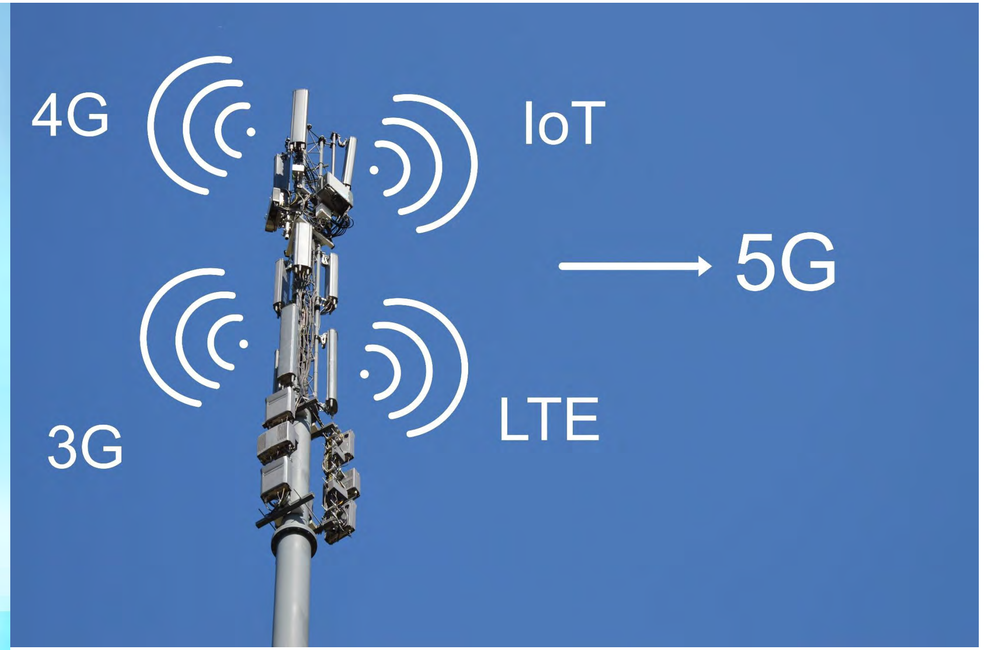

Connected City
Smart City

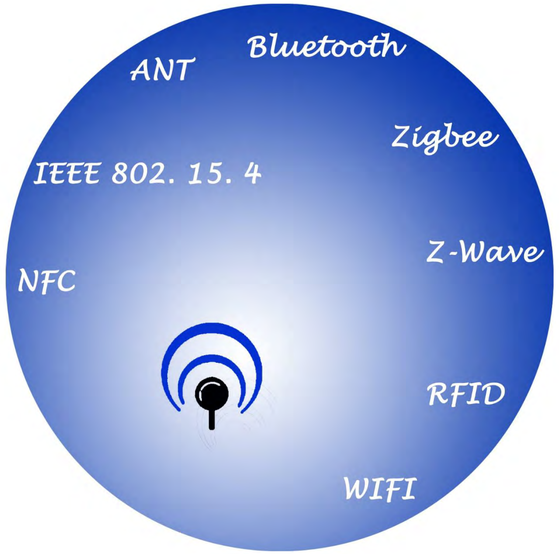
Densification



How Many Networks?

Capacity, Coverage, Compliance

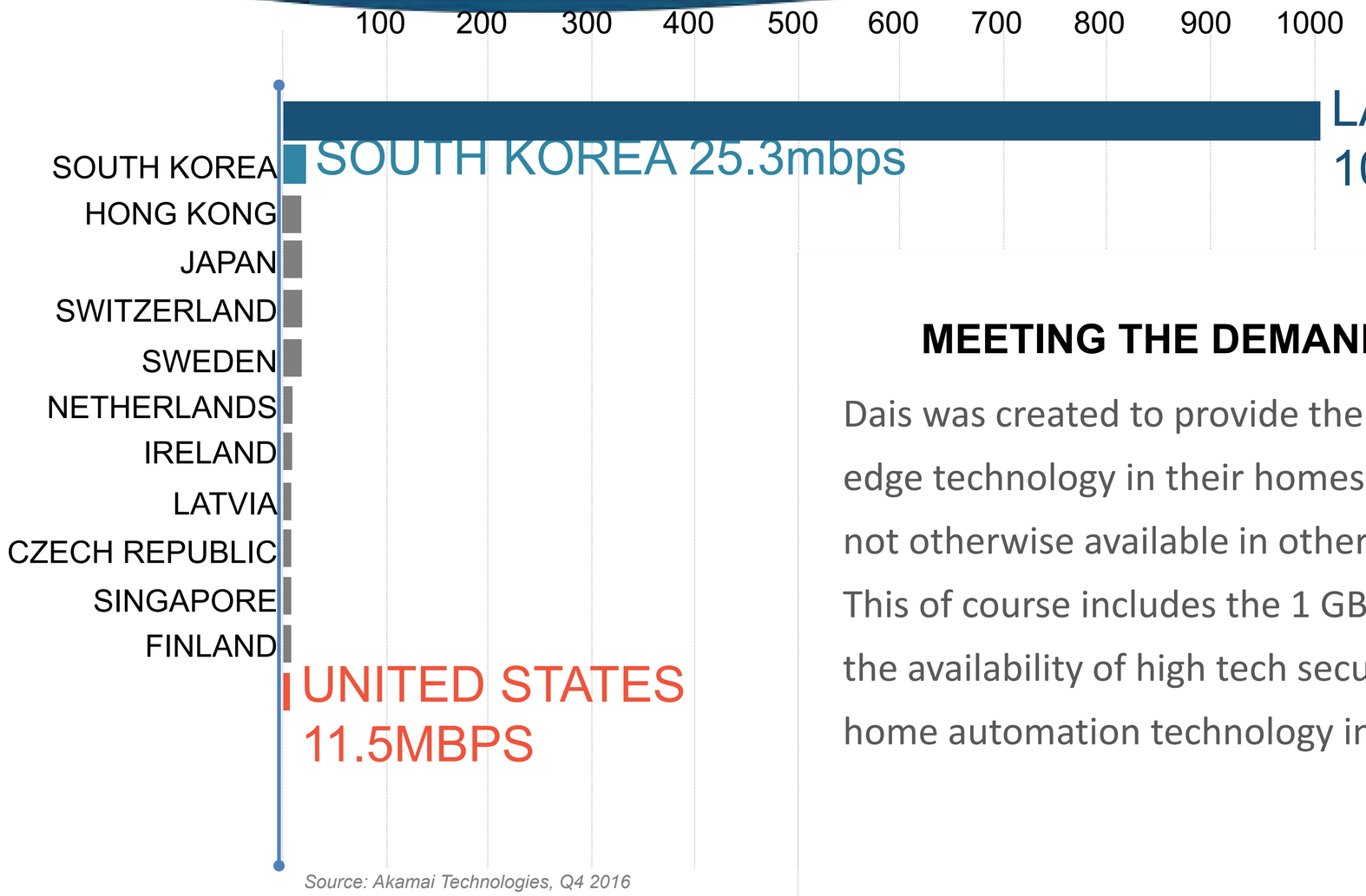




A Tidal Wave of Antennas

Significant opportunity exists to evolve to a *shared* infrastructure model in urban centers

TECHNOLOGICAL INFRASTRUCTURE



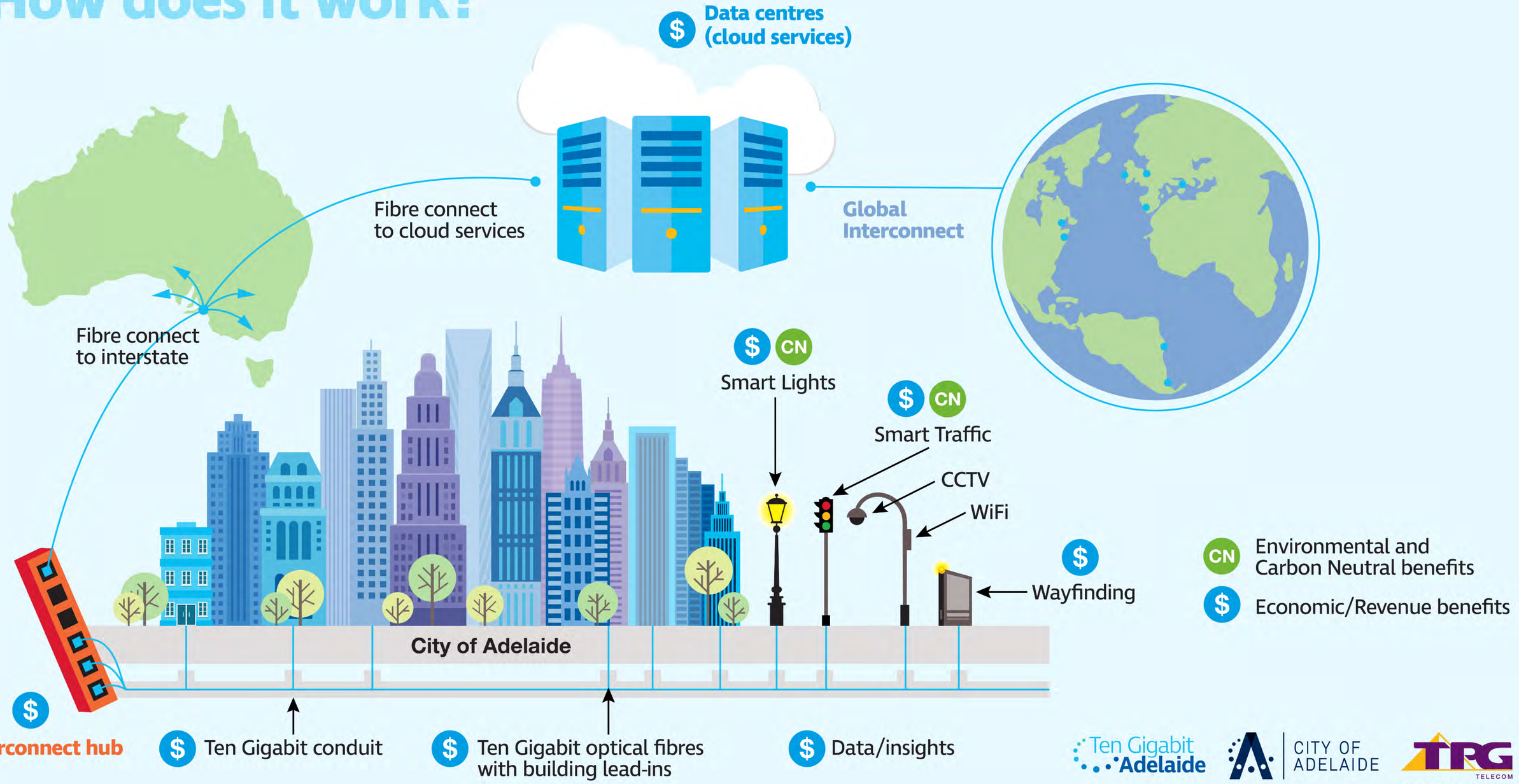
Source: Akamai Technologies, Q4 2016

MEETING THE DEMANDS OF THE FUTURE - TODAY

Dais was created to provide the residents of Lake Nona with cutting-edge technology in their homes -- something special and exciting, and not otherwise available in other premier Orlando neighborhoods. This of course includes the 1 GBPS internet connection It also includes the availability of high tech security, home theater, networking and home automation technology in the homes built in Lake Nona. “

dais

How does it work?



Ten Gigabit Adelaide

CITY OF ADELAIDE

TPG TELECOM
OFFICIAL NETWORK PROVIDER

SAN FRANCISCO
DEPARTMENT OF
TECHNOLOGY

Fiber for San Francisco
Internet for All

Date RFQ Issued:	January 31, 2018
Pre-Submittal Conference:	February 12, 2018 (10:00 a.m. PST) View livestream: http://sfgovtv.org/youtube_live
Deadline for Respondent Team Written Questions or Requests for Clarification:	March 2, 2018
Respondent Team Submittals Due:	March 26, 2018
Issue Notice of Shortlist of Respondent Teams Selected for Oral Interviews:	April 9, 2018
Oral Interview with Selected Respondent Teams:	Week of April 16, 2018
Issue Notice of Qualified Bidders:	April 30, 2018

*Dates are subject to change.

The Big Picture

Smart Collaboration > Improved Efficiency > Faster Response > Better Service

Public Safety

Waste

Energy

Transportation

Public Health

Water

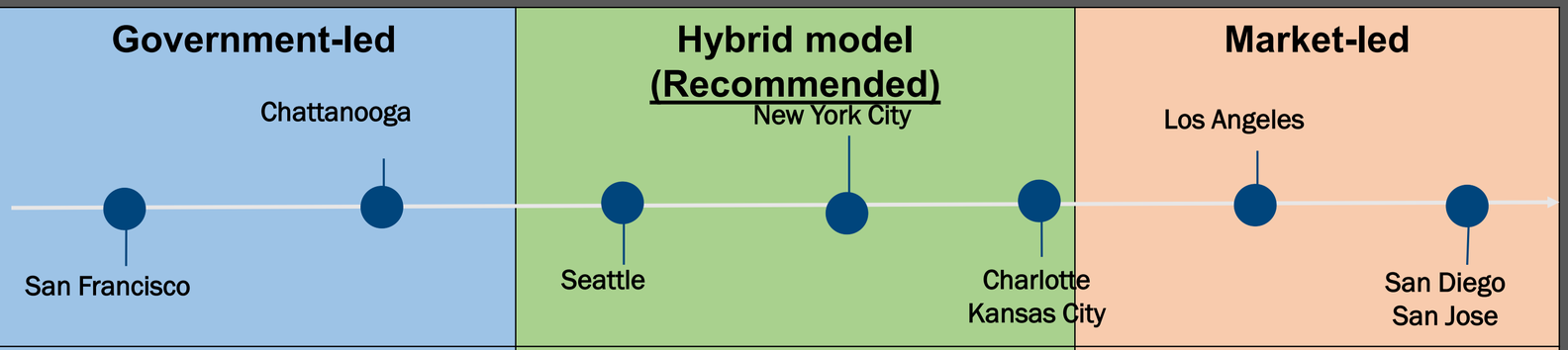
Connectivity

Community

Commerce

Broadband Strategy

Hybrid Approach – 80% results for 20% effort



	Government-led	Hybrid model (Recommended)	Market-led
Summary	Cities building full fiber networks is expensive, complex, and risky Too Risky	Cities that welcome private investment with appropriate guidance are most successful Just Right	Cities with laissez faire broadband stagnate as cable-telecom duopolies Too Ineffective
Key Takeaways	• Seattle, Palo Alto and others have determined that city-led full fiber build-outs are not practical, after detailed assessments • Chattanooga's unique buildout included control by the utility and federal funds	• Seattle leveraged streamlined policies to drive competition and massive fiber buildout • NYC used franchise agreements to drive fiber build-out	• Broadband speed and price cluster to the bottom of the peer set • No substantial competition in any market-led city
Potential costs	**Very high.** City-owned fiber-to-the-premise would cost $800M+.	**Moderate.** Working with carriers could cost $50-250M based on build types.	**Very low or none.** City relies on private sector investment.
Results	Peers show **90%+ fiber build-out.**	Peers show **55-70% fiber build-out.**	Peers show **0-5% fiber build-out.**

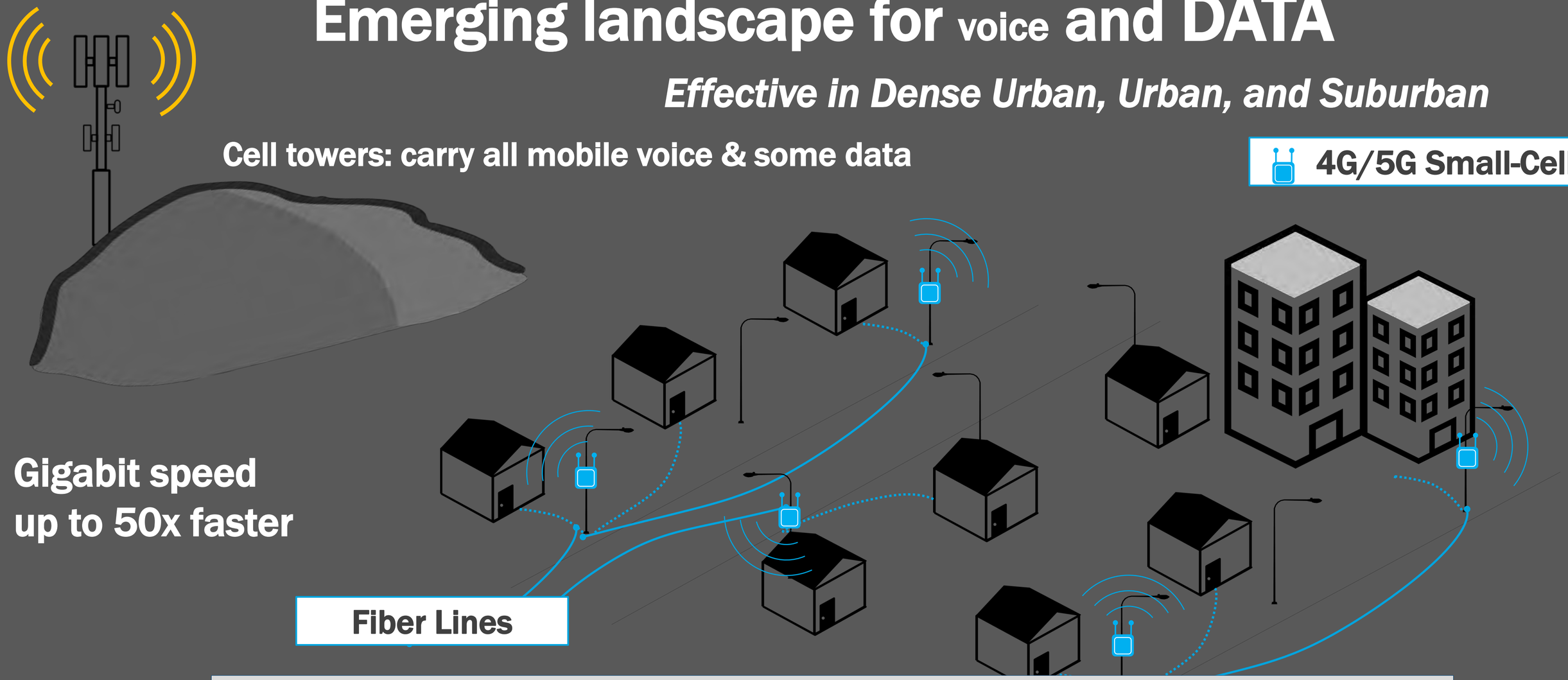
Broadband Strategy

Emerging landscape for voice and DATA

Effective in Dense Urban, Urban, and Suburban

Cell towers: carry all mobile voice & some data

4G/5G Small-Cells



Gigabit speed
up to 50x faster

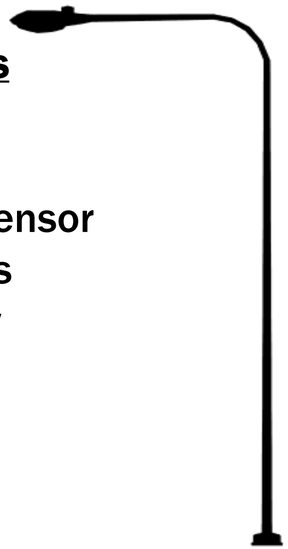
Fiber Lines

Light pole is most valuable asset for broadband

Broadband Strategy

STREETLIGHT

Light/Safety

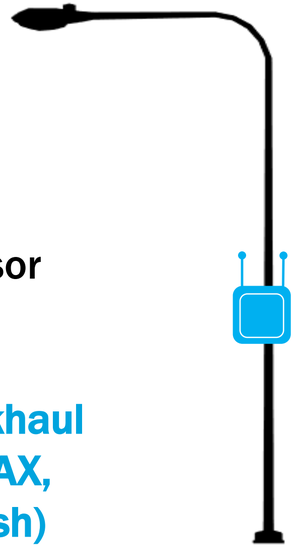


Properties

- Height
- Power
- Light Sensor
- Lumens
- Density

SMALL CELLs

Broadband Digital Infrastructure

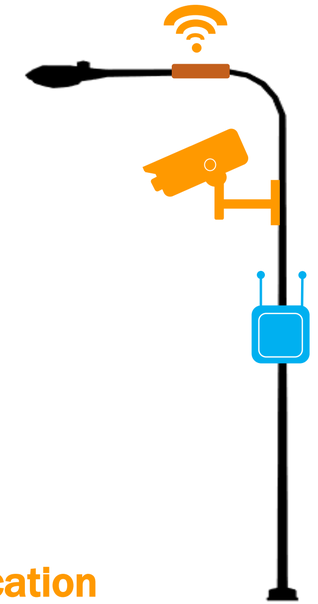


Properties

- Height
- Power
- Light Sensor
- Lumens
- Density
- Data Backhaul (Fiber, COAX, Radio mesh)

INTERNET OF THINGS

Smart Cities



Properties

- Height
- Power
- Light Sensor
- Lumens
- Density
- Data Backhaul
- Sensors
- Cameras
- 2-way Communication
- Banner Advertising

Maturity:	**Mature**	**Emerging**	**Extremely Immature**
Possible Action:	**Proceed w/ LED Light Replacement Only**	**Re-examine in Broadband Strategy**	**Seek to Understand with Knight IoT Grant**

Light Pole as Smart Venue Information Hub

Smart Lighting

Expandability to Additional Sensors/ Smart Apps

Wi-Fi Connectivity

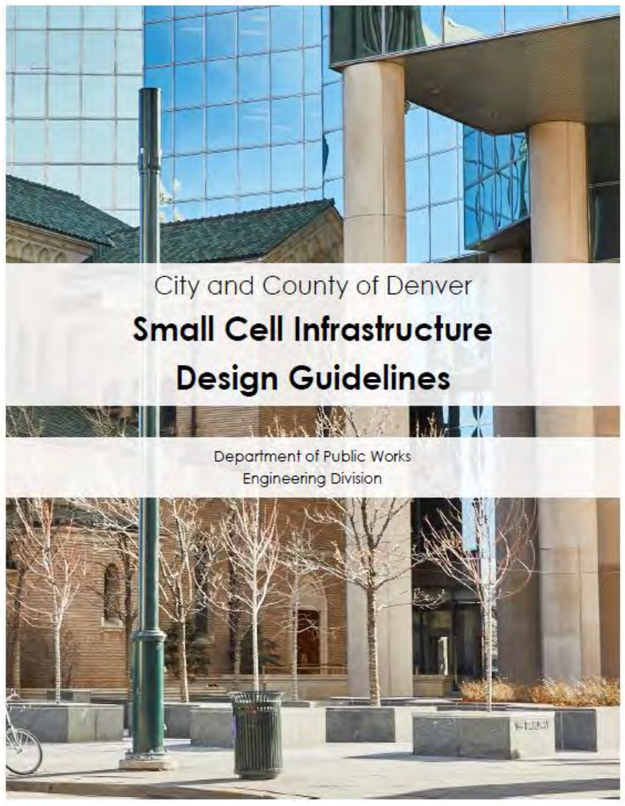
Smart Parking

Smart Traffic

Video Surveillance

verizon

Public Works has created Design Guidelines and a custom Permit process to address:



- Public-facing review process including Districts, City Departments, Neighborhood Orgs
- Policy for co-location first
- Notification of adjacent property owner
- Restricting new pole density through min 250’ spacing
- Restricting placement (along parks, historic & residential frontages)
- Restricting placement in front of residential & valuable sight lines
- Requiring camouflage and concealment
- Limiting height and equipment size
- Opportunity to coordinate fiber conduit

DENVER THE MILE HIGH CITY

The City and County of Denver
Public Works Department
Jon Reynolds, Engineering Supervisor

JACOBS

Jacobs Engineering Group
Mike Butters, Project Manger

CLANTON & ASSOCIATES
LIGHTING DESIGN AND ENGINEERING

Clanton & Associates:
Nancy Clanton, CEO
Dane Sanders, Principal
Annie Kuczkowski, Engineer II - Lighting

Aero *Wireless Group*

Aero Wireless Group:
Jim Lockwood, CEO
Mike Hoganson, Chief Operating Officer

CITY GOALS

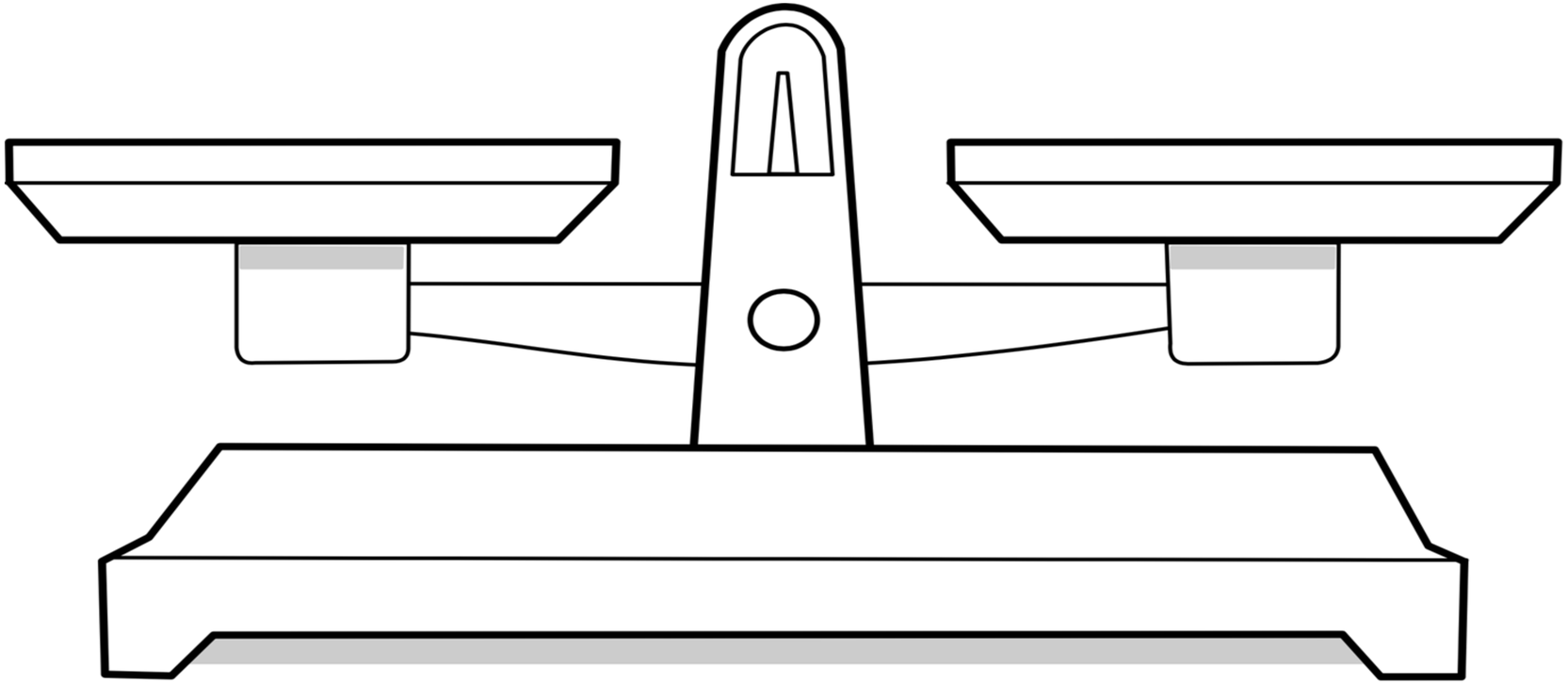
- *Minimize aesthetic impacts*
- *Encourage competition in wireless market*
- *Community awareness / comfort*
- *Fair compensation for use of public asset*

INDUSTRY GOALS

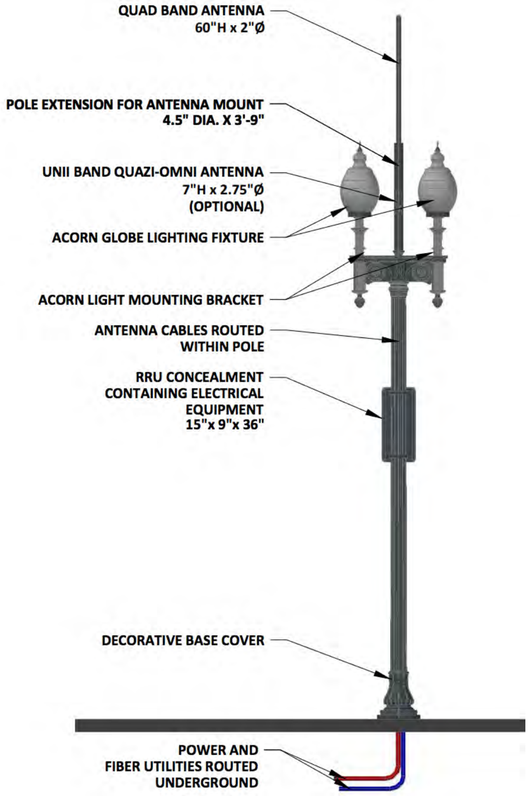
- *Fast and predictable approvals*
- *Large volume of installations*
- *Manageable community process*
- *Appropriate pricing models for carriers and neutral hosts*

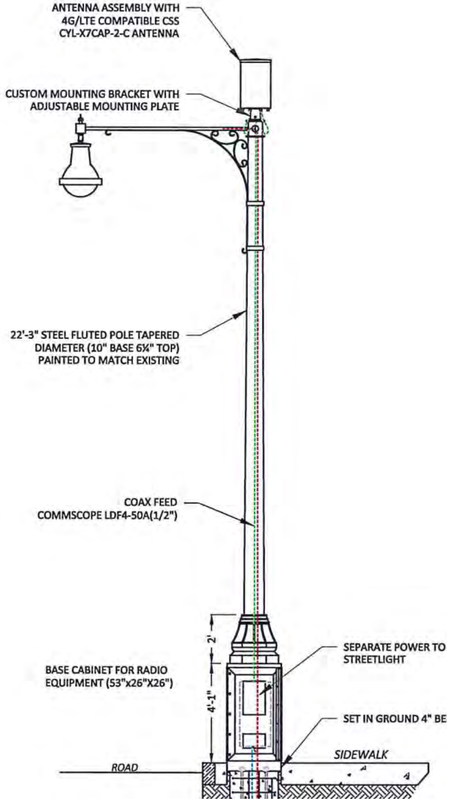
SHARED GOALS

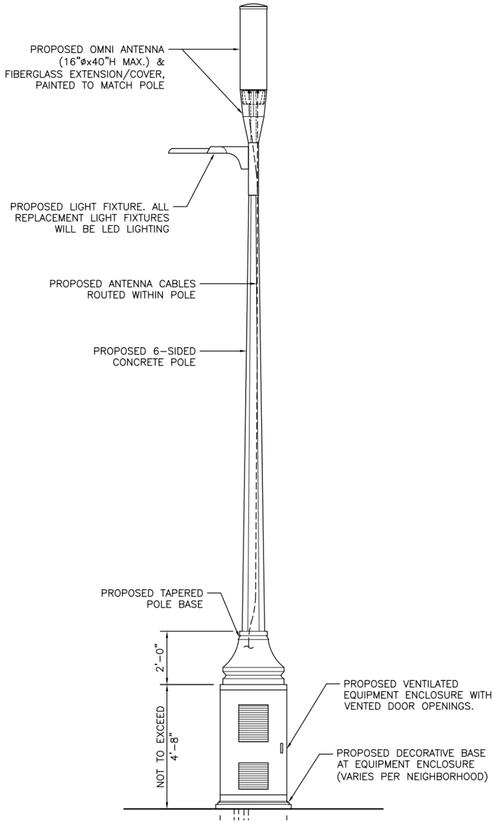
- *Great wireless service in every neighborhood*
- *Avoid community concerns with deployment*

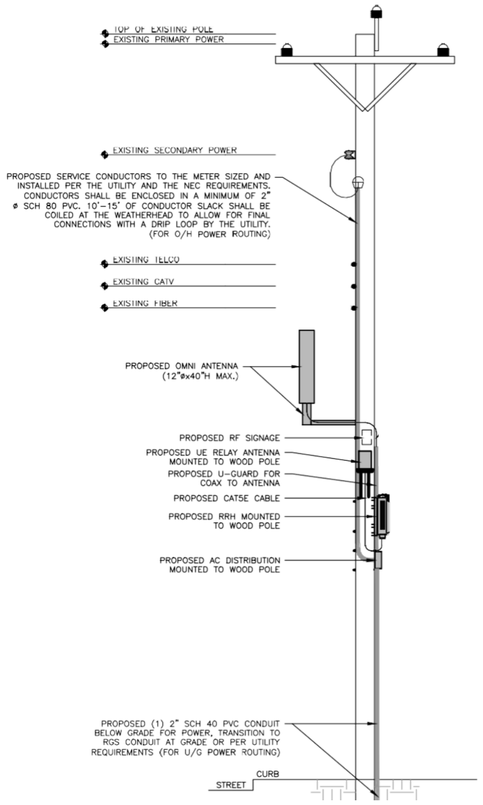


COOPERATIVE DESIGN PROCESS





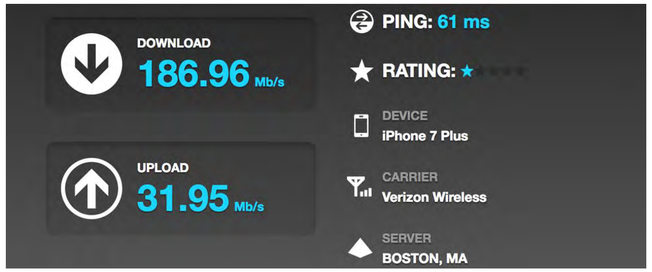




- *City and Licensees develop designs for replacement lights together*
- *Heavy focus on aesthetics, concealment, and historic character*
- *Once approved, design can be used by any licensee*

RESULTS (OCTOBER 2017)

- *>800 approved or installed, 314 in process*
- ***90% approved within 10 business days, 100% within 28 business days***
- *Improved wireless service*



- *Funding for digital equity programs and hotspot lending*
- *Positive relationship between City and licensees*

Smart Street lighting

- **GOAL:** 100% LED streetlight by 2020

- OUC working to retrofit 25,000+ streetlights to LED
  - 18,000 currently retrofitted

- Exploring test of new “Smart Streetlights” in Downtown
  - LED technology
  - Video surveillance
  - Environmental monitoring
  - Traffic analytics
  - Wi-fi / DAS systems
  - Gun shot detection

A Smart Miami is:

- *Connected*
- *Equitable*
- *Resilient*
- *Sustainable*
- *Transparent*
- *Self-Aware*

L A K E N O N A

"HOW TO BUILD A GREAT AMERICAN CITY."

– FORTUNE

LAKE NONA®

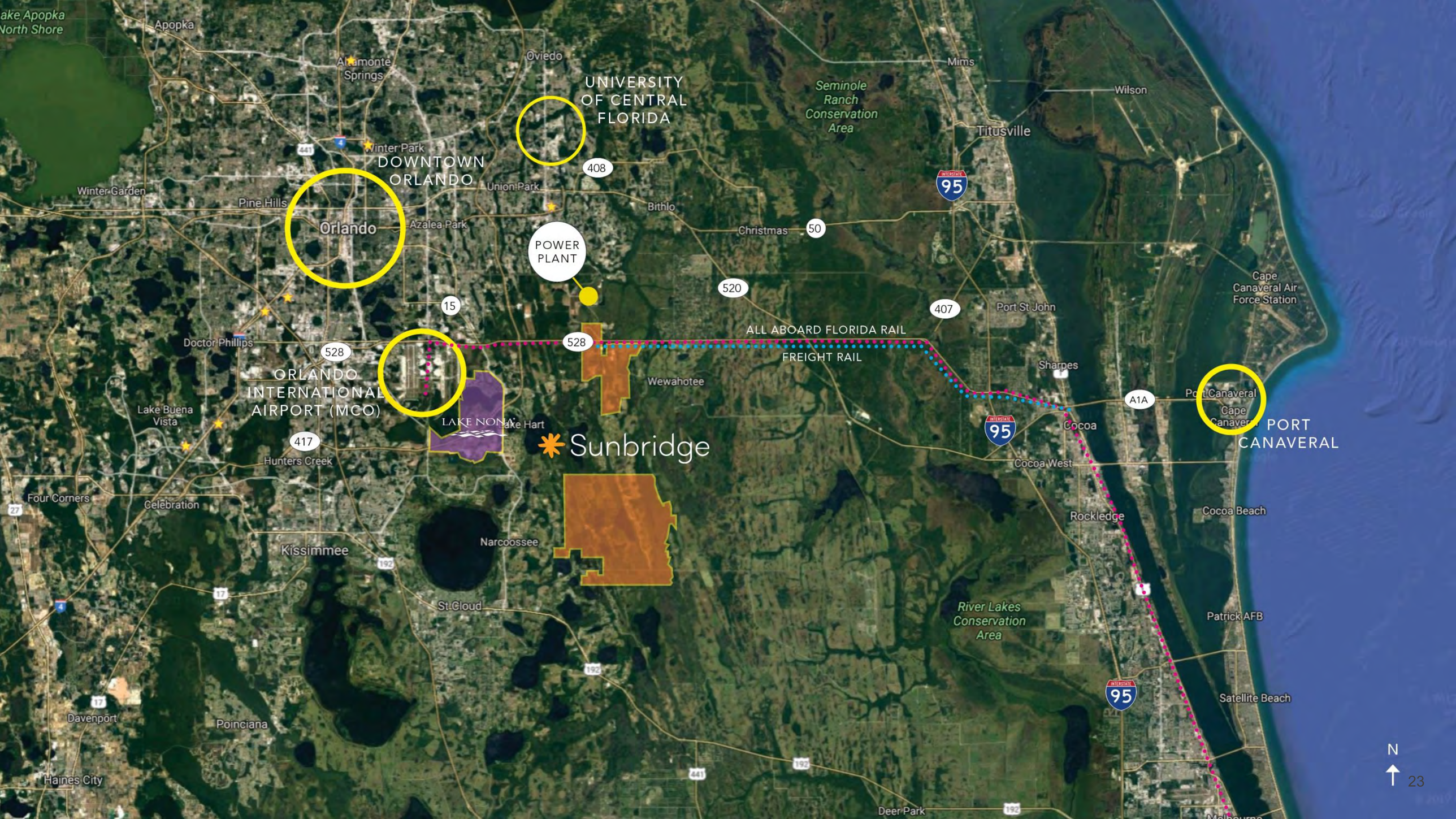
Spring 2018

LAKE NONA IS A SMART CITY

usignite

- **Clustering businesses to create moments of intersection** that spark breakthrough ideas
- **US. Home of Veteran's Affairs SimLearn Center**, their national simulation training center
- **Partnered with White House** for U.S. Ignite project to focus on possibilities of gigabit network
- Network of towers providing robust cellular coverage & operates a campus wide **Distributed Antenna System (Das)**
- **First** Gigabit city in Florida & 1st Cisco designated Smart + Connected City
- **Robust fiber network** across 17-square-mile community
- Designing **healthy homes** that enhance wellbeing
- **Partnering with GE** to build homes with a 20% reduction in energy emissions and water consumption
- **<u>Lake Nona's definition of SMART extends far beyond our robust technology infrastructure...</u>**

TAVISTOCK
DEVELOPMENT COMPANY


Apopka
Oviedo
Mims
UNIVERSITY OF CENTRAL FLORIDA
Seminole Ranch Conservation Area
Wilson
Titusville
Winter Park
DOWNTOWN ORLANDO
408
Winter Garden
Pine Hills
Union Park
Bithlo
Orlando
Azalea Park
Christmas
50
POWER PLANT
520
15
407
Port St John
Cape Canaveral Air Force Station
ALL ABOARD FLORIDA RAIL
FREIGHT RAIL
Doctor Phillips
528
Wewahotee
Sharpes
ORLANDO INTERNATIONAL AIRPORT (MCO)
A1A
Lake Buena Vista
LAKE NONA
Lake Hart
Cocoa
PORT CANAVERAL
Sunbridge
417
Hunters Creek
Cocoa West
Four Corners
Celebration
Rockledge
Cocoa Beach
Kissimmee
Narcoossee
St Cloud
River Lakes Conservation Area
Patrick AFB
Davenport
Poinciana
Satellite Beach
Haines City
Deer Park
N

City of Orlando
Proper population

277,173

Total visitors to
Orlando in 2016

68,000,000+

Travelers passed through
Orlando International
Airport in 2016

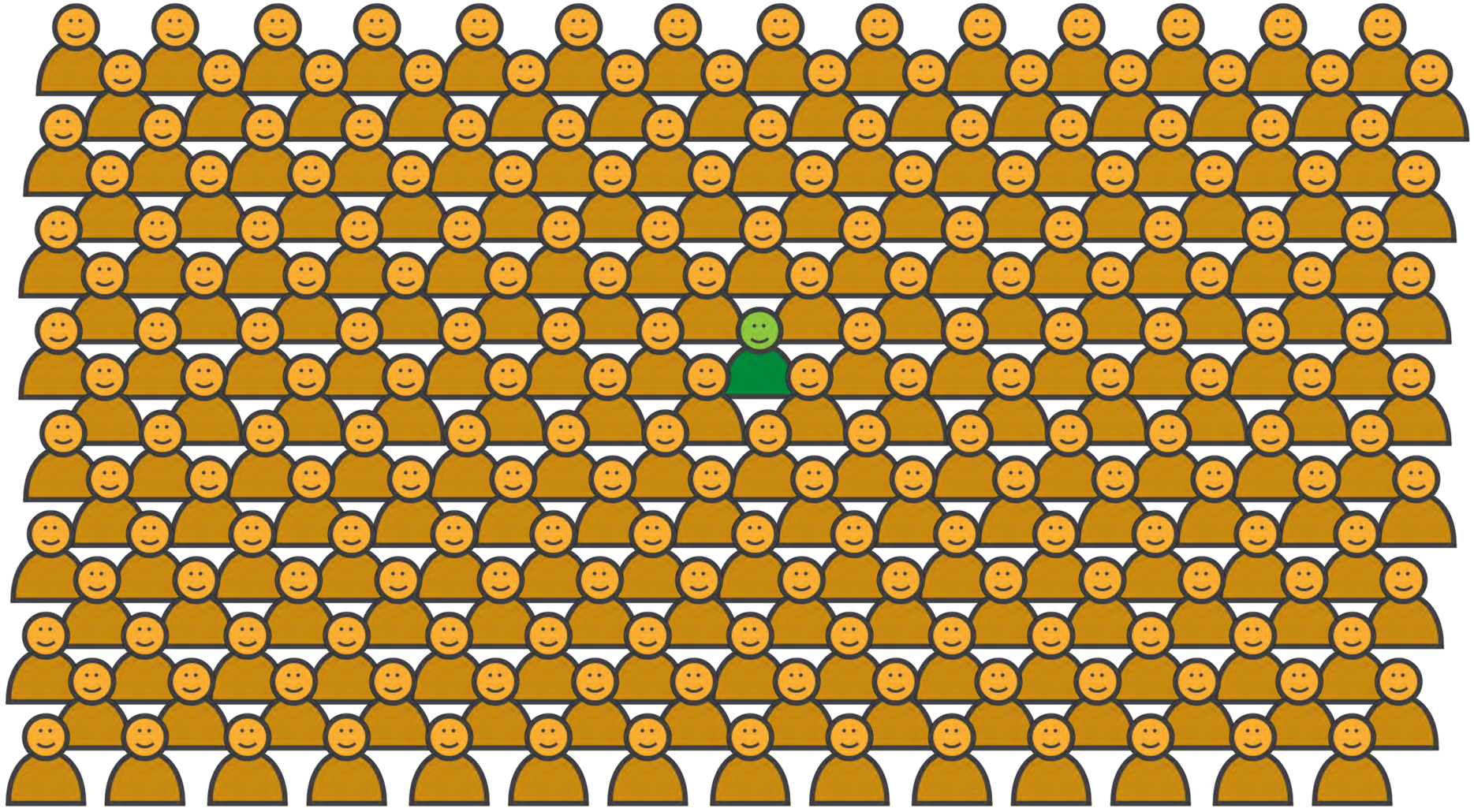
43,120,808

2017 Smart Cities Council Readiness Challenge WINNER!

- 1 of 5 cities nation-wide
  - Orlando, Miami, Austin, Philadelphia, Indianapolis
- Develop comprehensive ‘smart cities’ roadmap and framework

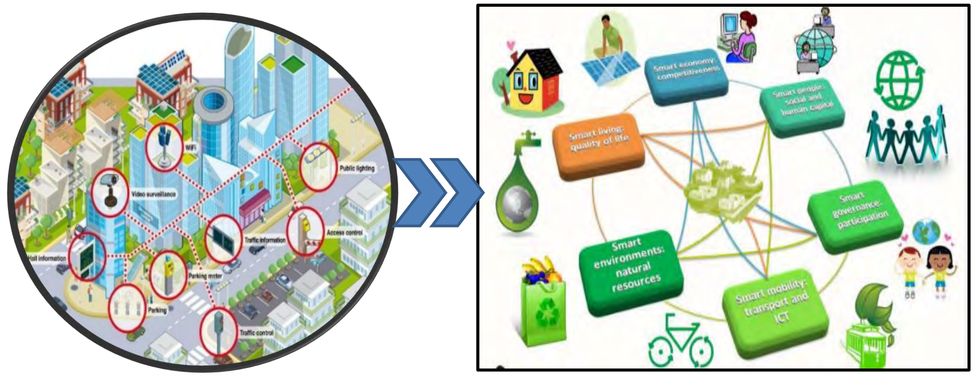
Population Vs Visitors

1 Resident to 245 Tourists



What is a “Smart & Sustainable City” to Orlando?

A city that uses information and communications technology (ICT) to enhance its livability, workability, sustainability and resilience.



Uses technology to make critical infrastructure and services more intelligent, interconnected, and efficient.

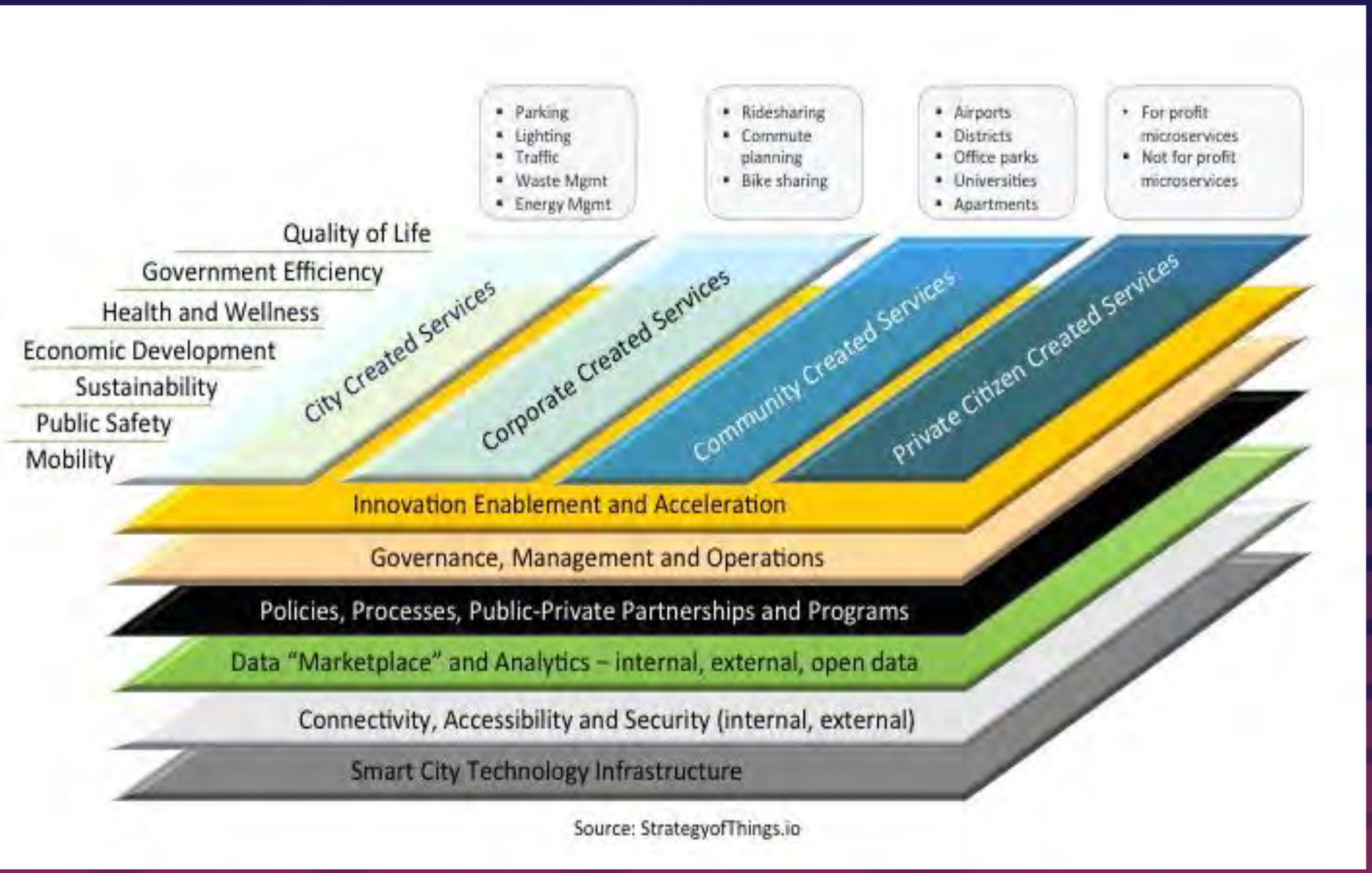
Into the Vision

The Smart City Book of Knowledge

City of Miami

Department of Innovation and Technology

2018

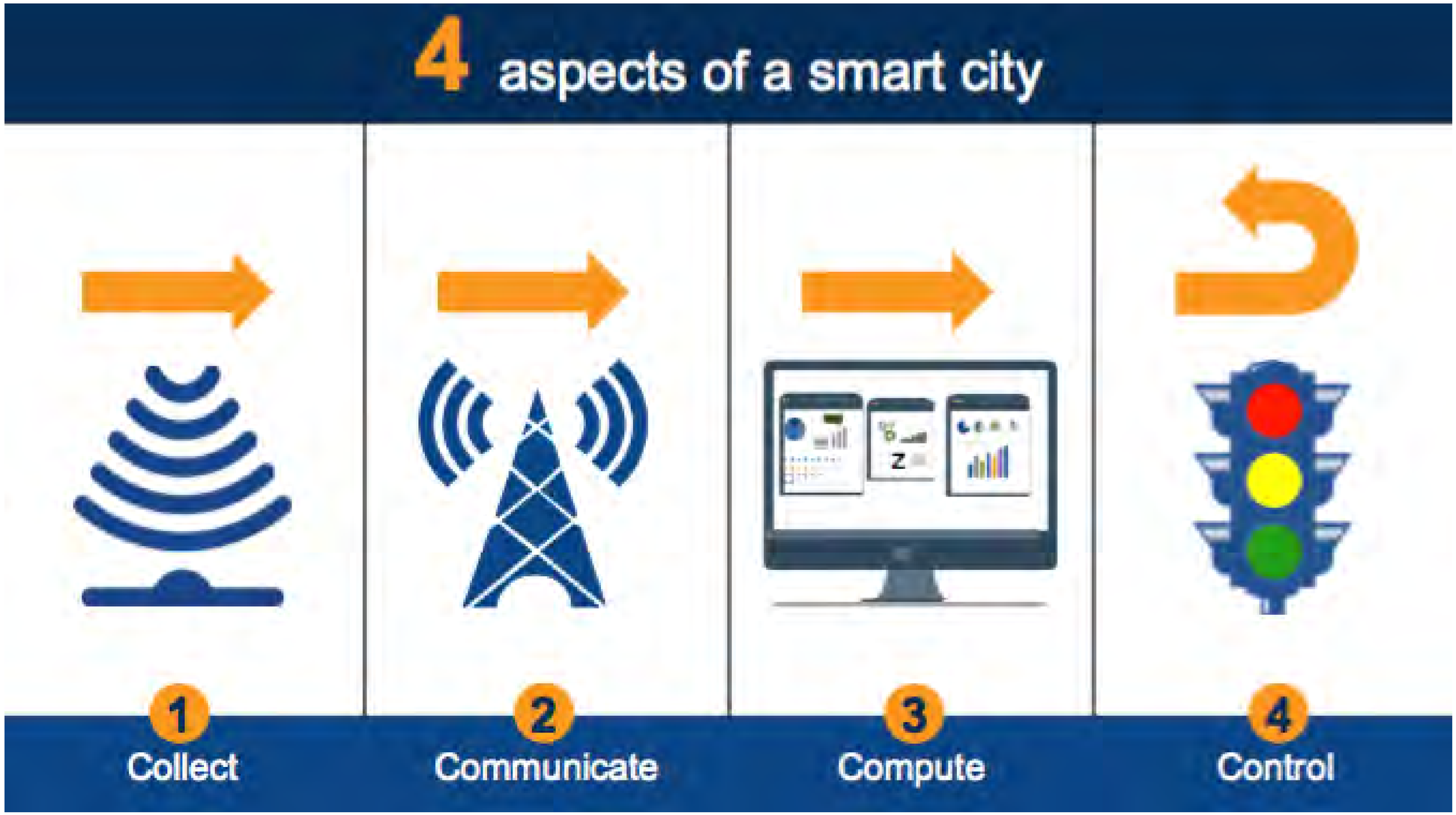

Parking
Lighting
Traffic
Waste Mgmt
Energy Mgmt
Ridesharing
Commute planning
Bike sharing
Airports
Districts
Office parks
Universities
Apartments
For profit microservices
Not for profit microservices
Quality of Life
Government Efficiency
Health and Wellness
Economic Development
Sustainability
Public Safety
Mobility
City Created Services
Corporate Created Services
Community Created Services
Private Citizen Created Services
Innovation Enablement and Acceleration
Governance, Management and Operations
Policies, Processes, Public-Private Partnerships and Programs
Data "Marketplace" and Analytics – internal, external, open data
Connectivity, Accessibility and Security (internal, external)
Smart City Technology Infrastructure
Source: StrategyofThings.io

Why is it important now?

- There are business and support opportunities for utilities in the Infrastructure layer
- Support for 5G
  - Requires significant bandwidth and therefore upgrades
  - The Utility needs to get ahead of the new wave of pole attachment requests
- Greenfield Developments
  - The utility is in a good position to first know about new developments and second to expand their definition of infrastructure
  - Installation costs are order of magnitude less before development occurs vs retrofitting
  - Many large developers are considering Smart City as a differentiator to their business model and how they attract customers/businesses
  - These developers will find solutions and self perform if the utility is unwilling or unable to assist
- Established Developments
  - The Utility has significant assets that can be leveraged for infrastructure deployment
  - Major cities are looking for cost effective ways to deploy Smart City concepts

Internet of Things (IoT)

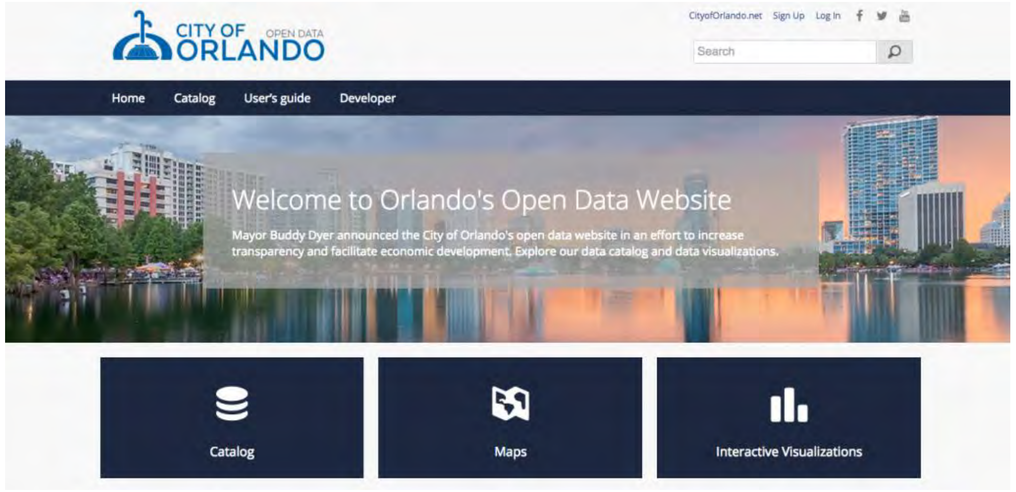
IoT is sensors…	Sending data to…	For the purpose of…
Audio monitoring	Traffic control	Keeping people with asthma out of dangerously polluted parts of the cities.
Garbage fill level	Mobile apps	
Traffic monitoring	The police	Alerting the police to a shooting.
Air quality	The fire department	Mapping pedestrian traffic around a city.
Gunshot detection	EMS	Relieving traffic congestion.
Foot traffic monitoring	Community organizations	Watering flowers.
Facial recognition	City Governments	Altering the police to crimes in progress.
Soil moisture levels	University researchers	
Flood sensors	Citizen Scientists	Sending the fire department and rescue vehicles to a crash.
Cameras	Digital Kiosks	Predicting flood locations.

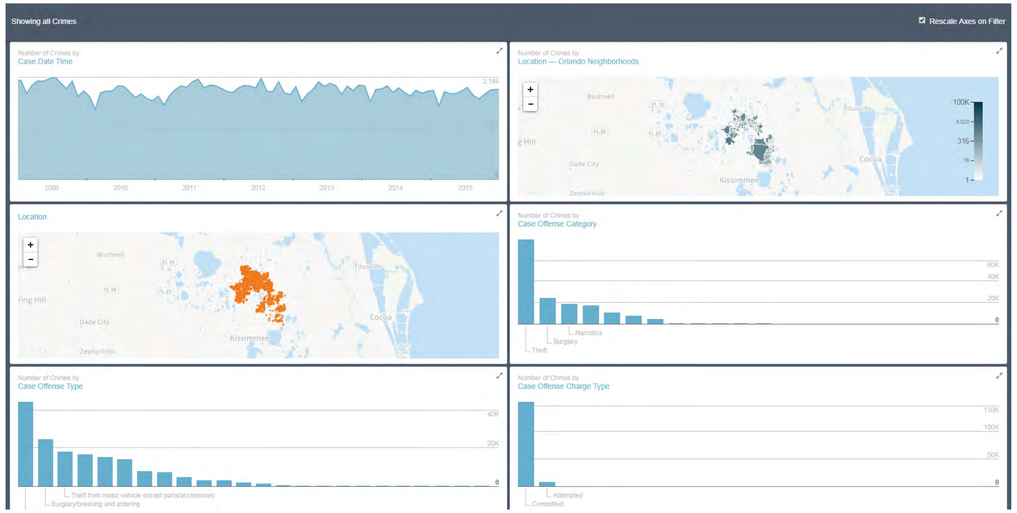

4 aspects of a smart city
1
Collect
2
Communicate
3
Compute
4
Control

Orlando
Open Data Initiative & Digital City Hall

- **Launched Orlando.gov** (alpha) to interface with residents via 'Digital City Hall

- **Open Date Initiative helps to**:
  - Increase transparency and facilitate economic development
  - Analyze crime data in Orlando Neighborhoods
  - Access GIS Maps and Interactive Visualizations
  - Provide access to energy and water use information in buildings (BEWES)





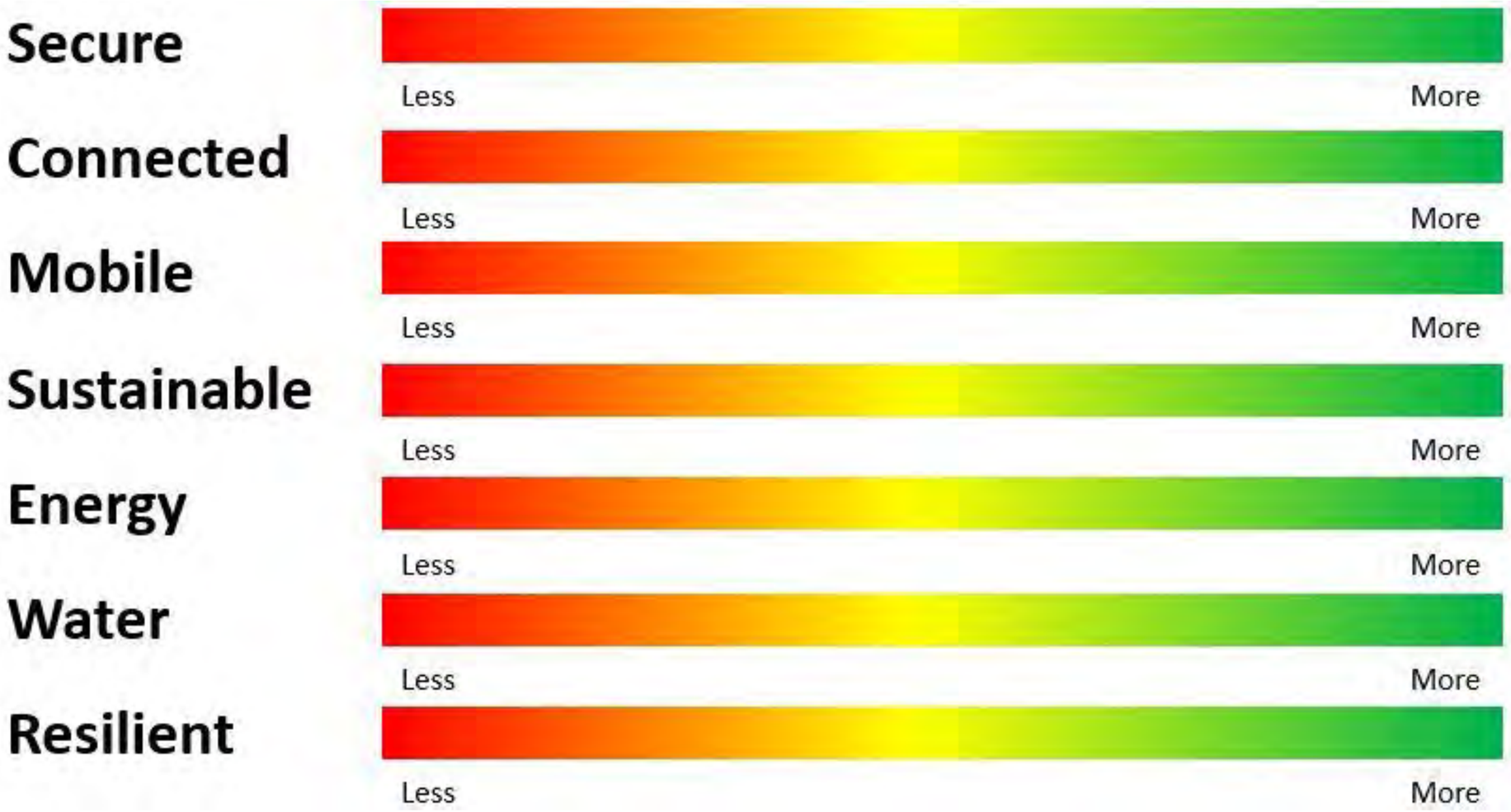
City as Platform:
Master Control of the System of Systems

City as Platform:
Master Control of the System of Systems

Opportunity and Risk

- Monetization of Data vs Privacy
- Can the City be the defender of data privacy?
- Blockchain and Identity Management
- Privacy, Security and Data Ownership

OUC Approach



Smart Community Ideas: Secure

	Apartments	Master Planned Residential	Office & Retail	Industrial	Hospitality/ Community
Smart Streetlights	●	●	●	●	●
Incident Detection	●	○	●	◑	●
Real-time Surveillance	◑	◑	●	●	●
Crowd Monitoring	○	○	◑	◑	●
Wearables	◑	◑	○	○	◑
Real-time Recognition	○	○	◑	◑	●

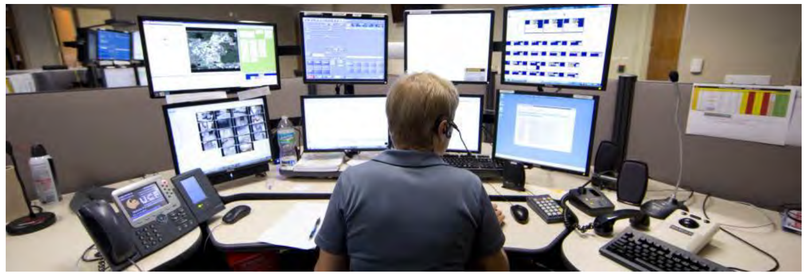
Less

More

OUC The Reliable One

Public Safety
Strategic Objectives

- Lowering crime rates and making residents and visitors feel safer
- Correlating data gathered to create intelligence and smart decision making
- Enable predictive analytics and high-definition video surveillance
- Establish public data management system
- Real-time situational awareness to improve response time



Smart Public Safety

- OPD Body cameras and audio recorders
- 178 IRIS cameras throughout the City to improve public safety
- Emergency signal priority for Traffic lights
- Computer Aided Dispatch (CAD) to improve response time

Current Initiatives

- Keeping on top of smart city trends
- Looking for grants (ie – Hitachi)
- Evaluating potential partners for PPP
- Participatory Budgeting Project
- Underline Park

Smart Community Ideas: Connected

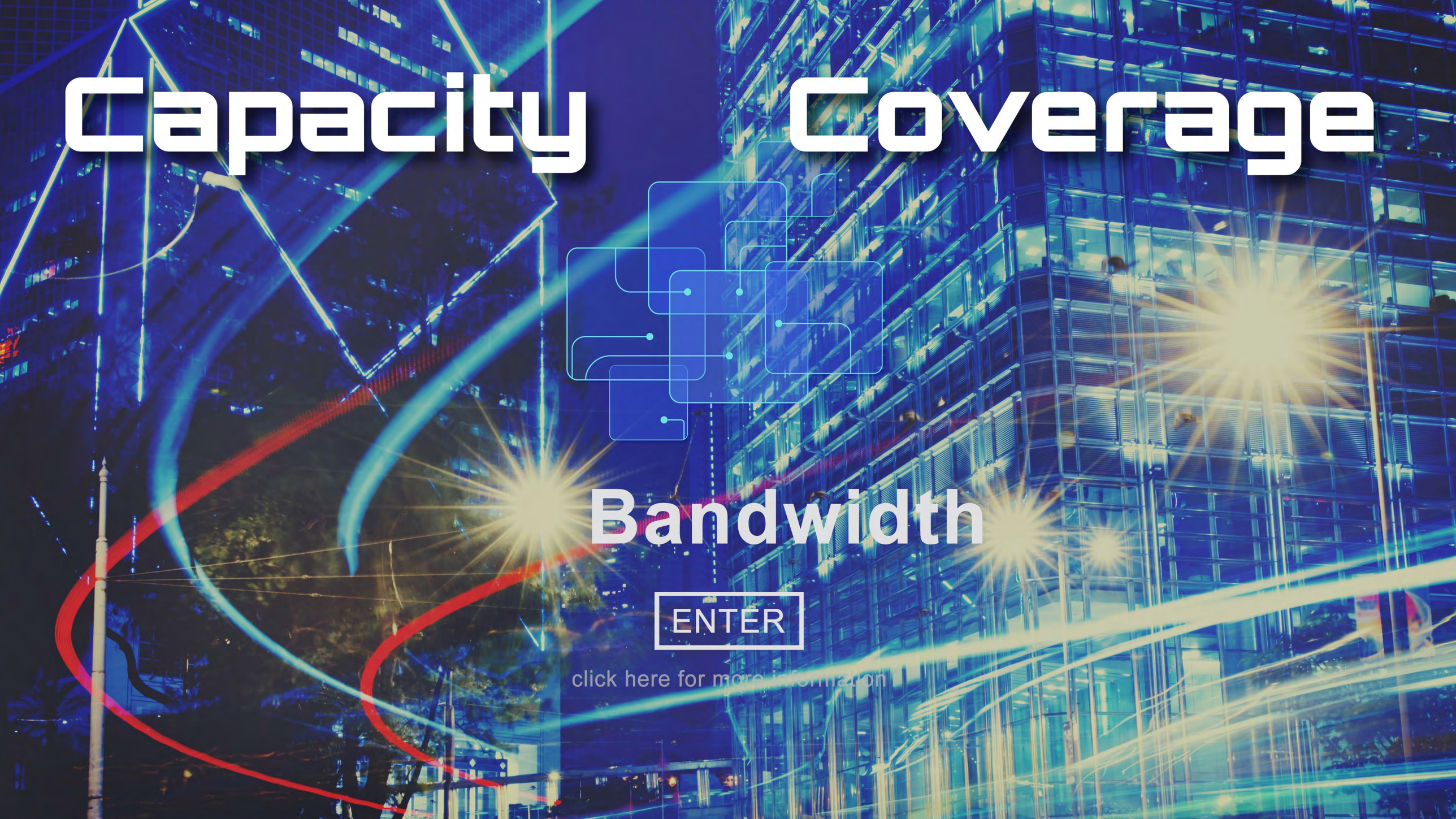
	Apartments	Master Planned Residential	Office & Retail	Industrial	Hospitality/ Community
Smart Controls	●	●	●	●	●
Interactive Kiosks	◐	○	◐	○	●
Waste Collection	●	●	●	●	●
Real-time Community Info App	●	●	●	○	●

Less

More

A WELLNESS HOME BUILT ON INNOVATION AND TECHNOLOGY

MeetWHIT.com


Capacity
Coverage
Bandwidth
ENTER
click here for more information


HOSPITAL
5G

Smart Community Ideas: Mobile

	Apartments	Master Planned Residential	Office & Retail	Industrial	Hospitality/ Community
Bike Hubs	●	●	●	◑	●
EV Charging Infrastructure	●	●	●	◑	●
Car Sharing Programs	●	●	●	●	●
Autonomous + Electric Shuttles	●	●	●	●	●
Traffic Analytics	◑	◑	●	●	●

Less

More

OUC The Reliable One

Mobility

- **Miami ranks #5 in the US and #10 in the world in time spent in traffic per year.**
- **64 hours – time spent in congestion per driver in Miami per year**
- **$2000 per year - Cost per Miami driver (lost productivity, fuel and maintenance)**
- **Miami is the 14th most dangerous city for pedestrians in the United States**

Transportation affects income inequality. People can't get to where the jobs are.

So what can we do?

- Must get people out of low occupancy vehicles
- Multimodal is the future
- Mobility as a Service (MaaS) must be a seamless experience
- Full AV is still a while away
- Congestion pricing/reduce parking

Adaptive and Connected

Upgrades to the traffic signal systems to fully adaptive signal controllers

Transit Signal Priority

Bringing Transit to the front line in traffic management techniques

SMART TECH

Communication Network

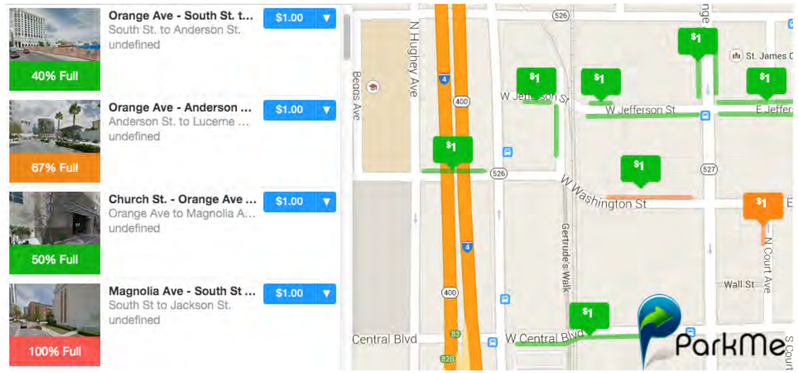
Taking adantage of streetlights to create a communitcation network for Smart Cities Solutions

Mobility Management

Using technology to manage demand in ***Time***, ***Space*** and ***Mode***

Transportation
Strategic Objectives

- Pilot a Downtown electric and/or autonomous shuttle for the Lymmo
- Connect all parking garages with real-time information
- Sponsored remote parking with shuttle
- Implement real-time monitoring to understand unusual traffic modelling to prepare for events



Central Florida Automated Vehicle Partnership


Autonomous
P
Connected

Autonomous Vehicle Mobility Initiative (AVMI)

- **GOAL:** travel by autonomous vehicles makes up 10% of total urban, public transit travel by 2040.

- **Research and development** of autonomous transit vehicle technology using Lymmo lanes;
- **Design, building and testing** of autonomous transit vehicles infrastructure on exclusive and shared rights-of-way; and
- Development of **data and communication protocols** for all AVMI systems and infrastructure; and
- **Workforce development** strategies (retention, recruitment and training) to support AVMI;


4 Terabytes Per Vehicle

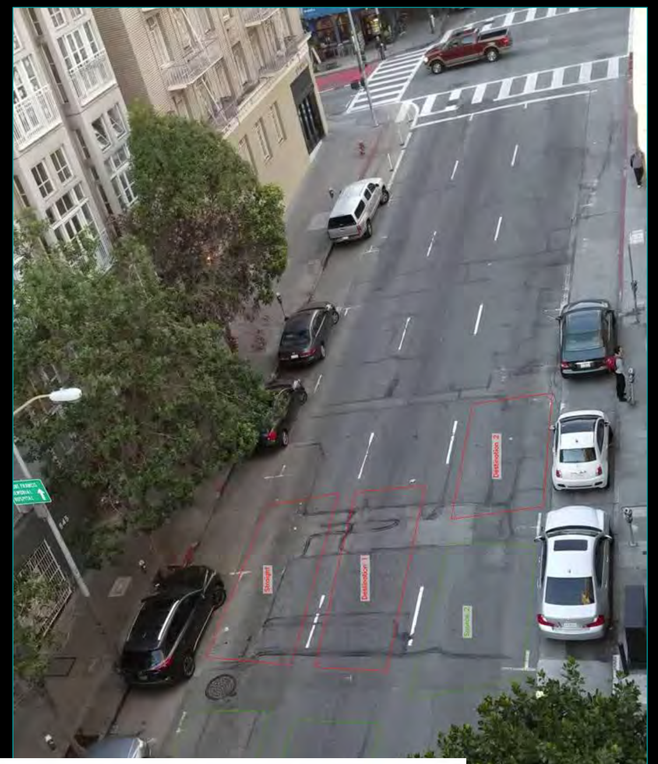
What is OUC doing

- OUC has set strategy and begun work on the roadmap
- We have lifted up three pilots
  - One for infrastructure that addresses Secure, Mobility, Connected
  - One for building efficiencies that addresses Sustainability
  - One for conservation that addresses Water
- We have work in progress to address Energy and Resilience

Video + AI = Rich Insights and Alerts
Operations, Business and Safety Intelligence

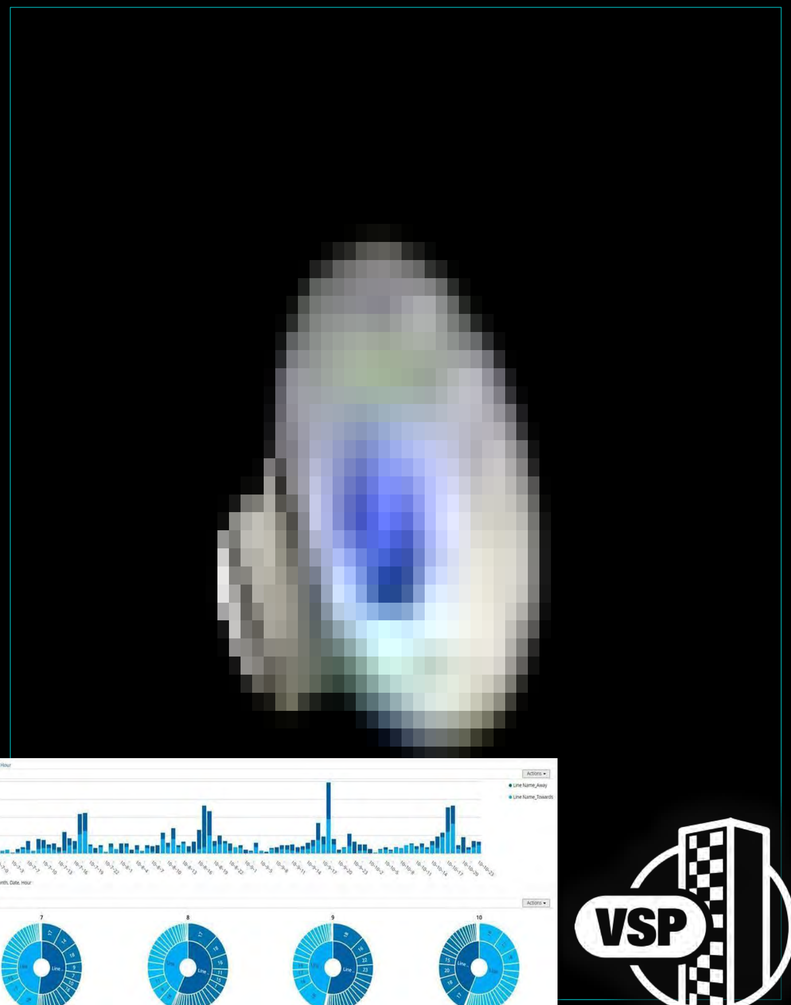
NEXT 2018

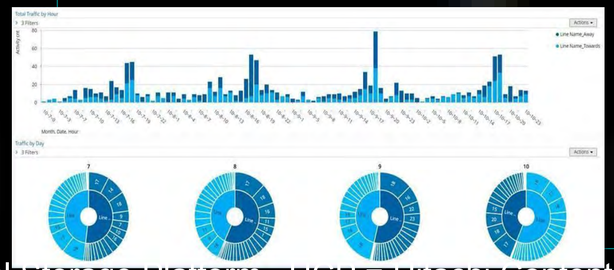
Traffic Analysis



VMP

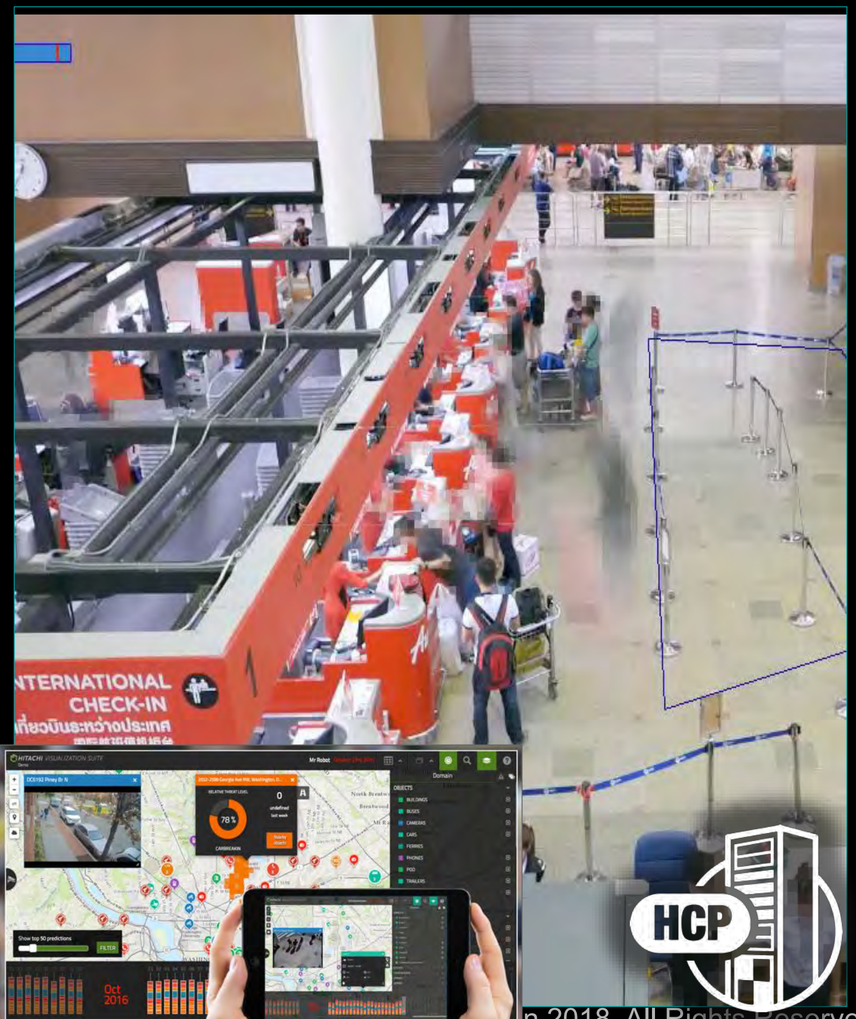
People Counting

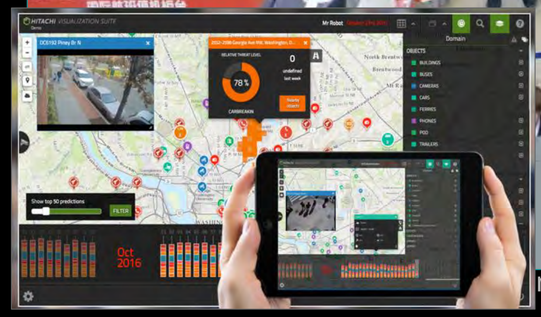




VSP

Operations and Privacy





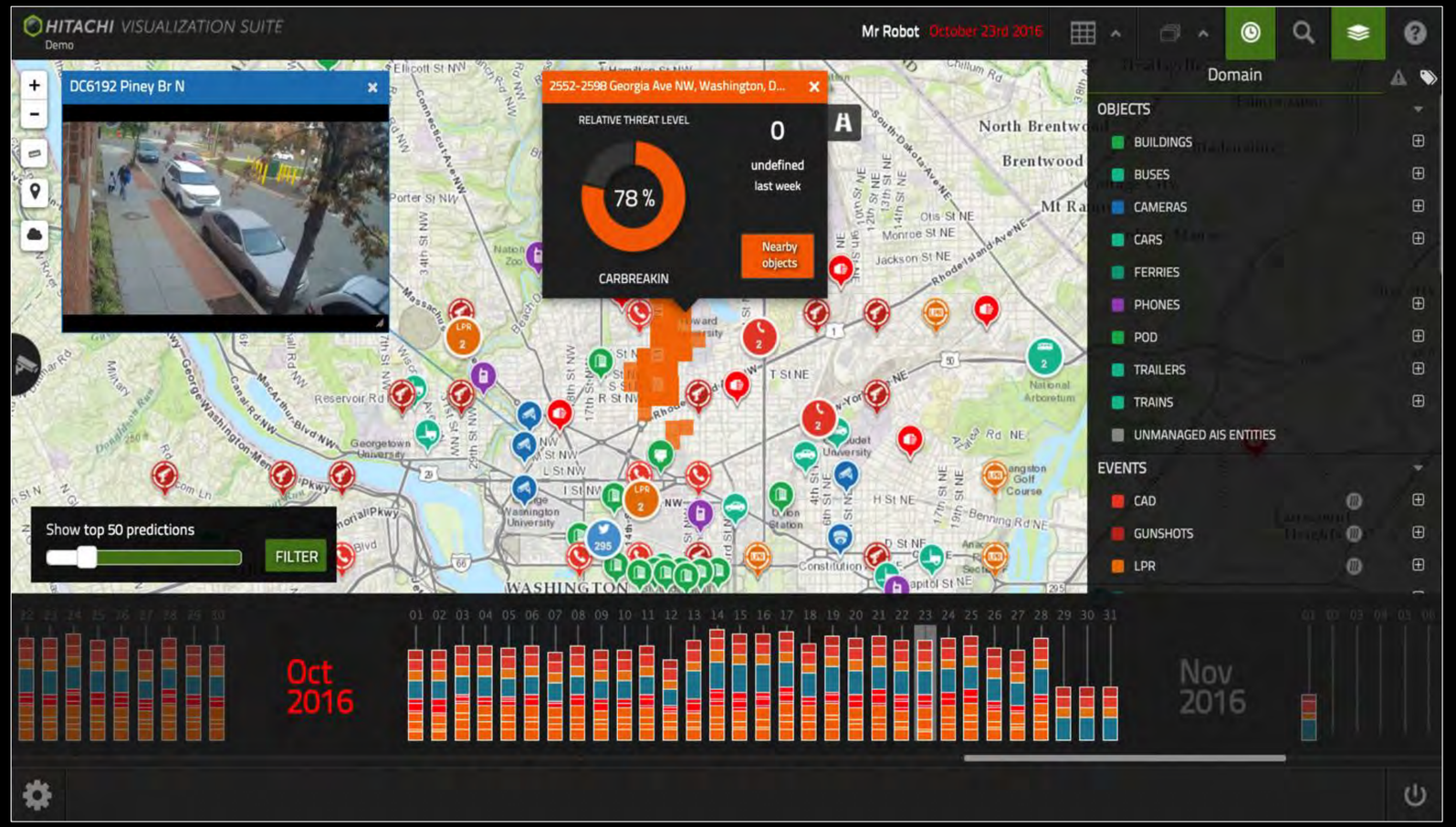
HCP

*VMP = Video Management Platform VSP = Virtual Storage Platform HCP = Hitachi Content Platform

Situational Awareness Through Hitachi Visualization Suite

NEXT 2018

- Real-time video and IoT data from facilities, vehicles, infrastructure, security, and shops
- Unlimited data layers on a single pane of glass
- Distributed intelligence for all staff with browser-based desktop or mobile capability
- Workflow automation for setting alerts for customer needs or security incidents

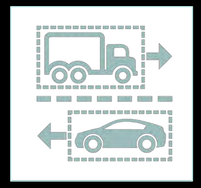


Hitachi Video Analytics Delivers Digital Insights

NEXT 2018

Operational & Business Intelligence

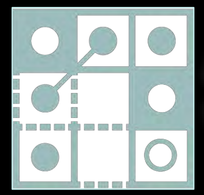
People Counter



Traffic Analyzer

Queue Detector

License Plate Recognizer



Activity Visualizer

Parking Space Analyzer

Direction Controller

Camera Health Monitor

Security

Intrusion Detector

Facial Recognition

Object Detector

Video Enhancer

Privacy

Privacy Protector

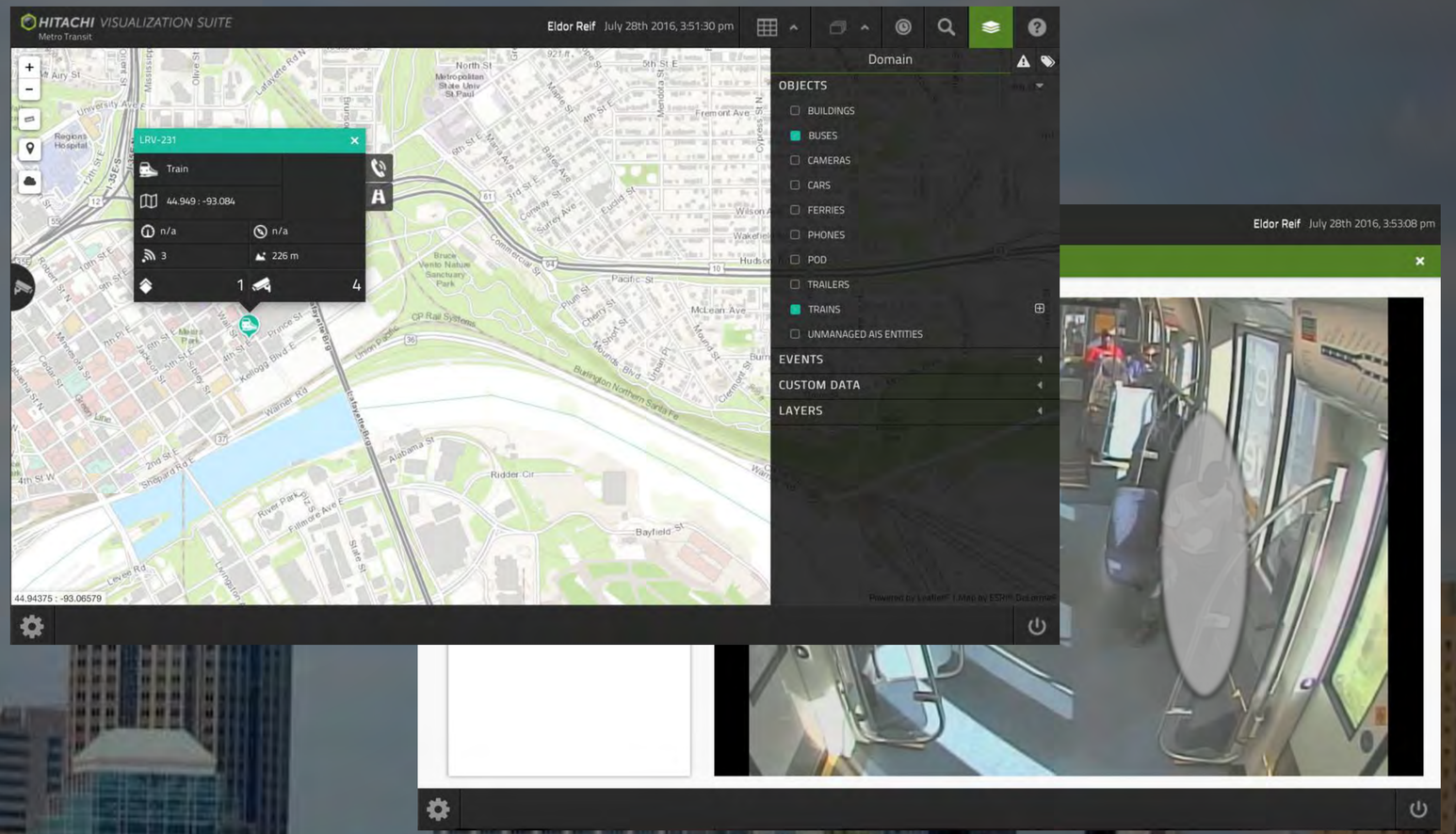
European Privacy Seal

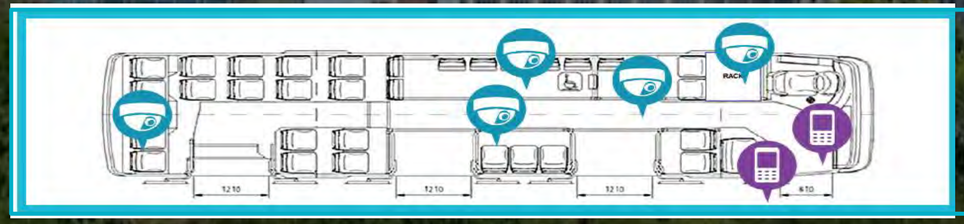
EP-P-F9LDTM / Valid till 2017-10

Police • Hospitals • Campuses • City Agencies • Retail • Financial Services • Transportation • Utilities

Smart Transportation Use Case

- Ensure public safety with real time and recorded video
- Integrate Disparate Fixed and Mobile Video Systems
- Provide situational awareness for first responders
- Track vehicle locations
- Count and track people and crowds
- Find objects left behind
- Integrate traffic data and video
- View IoT data for trains, stations, and infrastructure



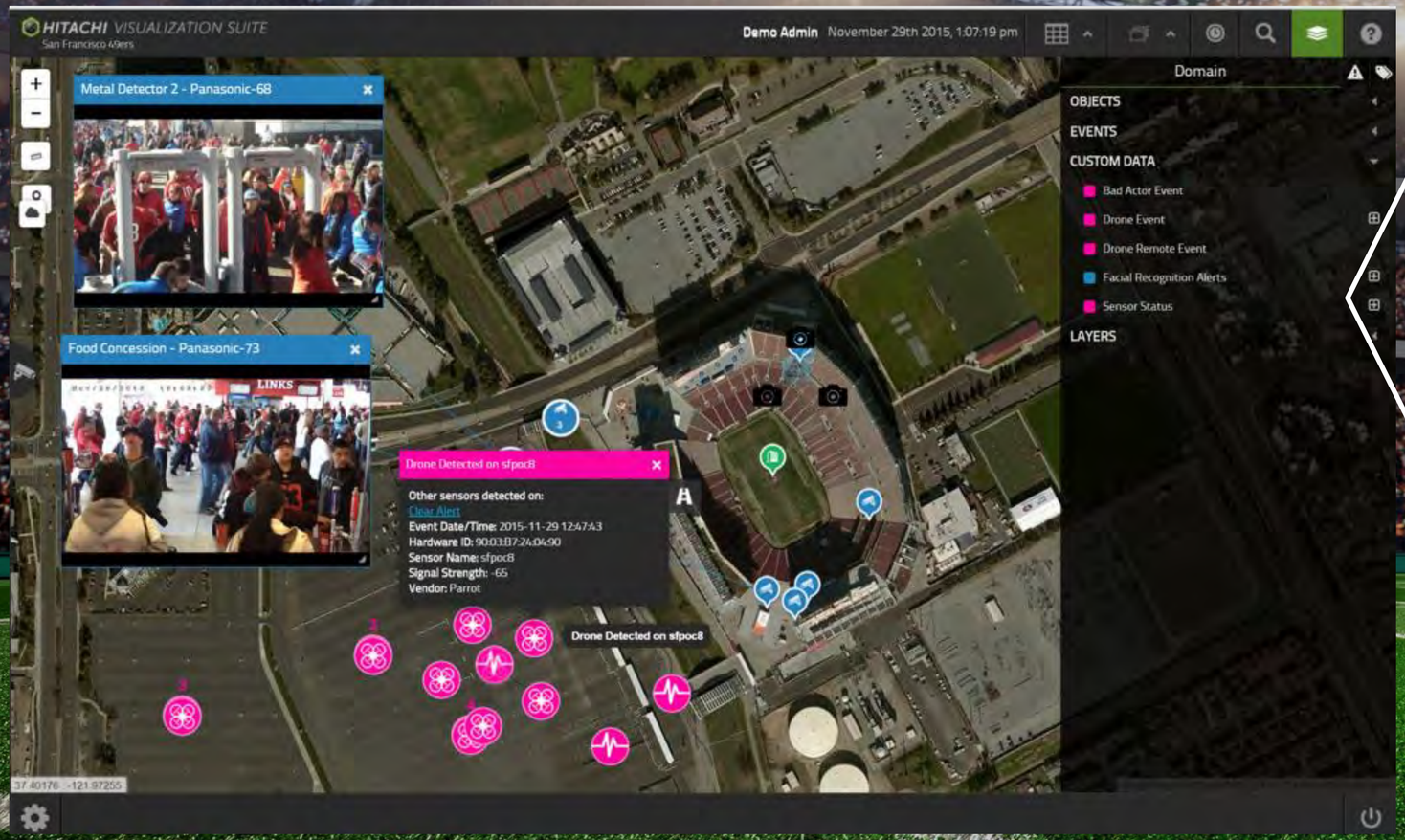


Vehicle schematics give real-time access to cameras and IoT data.

Smart and Safe Stadiums

NEXT 2018

Challenge: Emerging threats to stadiums and venues, need to improve operations and customer experience while ensuring safety.



TRANSFORMATION

- Drone detection, facial recognition and fan experience
- Millions of fans, visitors and city residents kept safe

Smart Campus: University

NEXT 2018

- 60,000 students, 4,000 staff smart campus
- **Goal**: Better student experience, increased efficiency and safety
- **Hitachi Smart City Platform** collects, integrates, and analyzes data

Curtin University

Outcomes:

- Campus and facility utilization analysis for operations
- Activity analysis to understand and enhance student experience
- Environmental health and sustainability on campus
- Public safety and prevent testing fraud

"The smart campus is all about looking at what we do at Curtin, and doing it better."

Paul Nicholls, Director, Strategic Projects (R&D), Curtin University


Connectedness

Cooperative Program Overview

GOVERNMENT PURCHASING, COOPERATIVES, & U.S. COMMUNITIES

- Government requires Three Bid or Solicitation Process
  - Best Value
  - Equal Access
- Cooperative purchasing saves money & time
  - Satisfy the competitive solicitation requirement of public agencies
  - Invest less time and money in the procurement process
  - Leveraging the aggregate volume government agencies nationwide
  - Speeds up the process
  - Maintain quality business partners and practices
- U.S. Communities - A national cooperative purchasing alliance for local governments including States, Cities, Counties, Special Districts, Schools, Colleges and Universities & Non-profits.

Website: www.uscommunities.org

GraybaR

ADVANTAGES OF COOPERATIVE PROCUREMENT

- Agency, Consultant, Contractor / Integrator, Manufacturer, Supplier
  - Offer Total Solutions
    - Specify, Finance, Integration, Product
    - Product & Project Management
  - Flexible & Legal Contract Vehicle
  - Saves Overall Costs

- No Bid
  - Saves Money on Procurement Process
  - Speeds up Project Timelines
  - Eliminates the Unknown

- Partnerships
  - Brings Together the Necessary Partners

GraybaR

U.S. COMMUNITIES
An OMNIA Partner

- Cooperative Contract Manager
- Lead Public Agency Managed Contracts
- Public Solicitation Process
- National Volume
- Nation's Largest Cooperative Program
- No Cost/ Non-Binding
- Best Overall Value
- Best in Class Vendors

GraybaR

ELIGIBLE AGENCIES

- Over 98,000 eligible agencies can participate
  - Registration & MICPA
  - Over 60,000 registered with US Communities
  - Over 17,000 using Graybar's contracts

- Eligible Agencies Include:
  - State Agencies, Counties, Cities, Towns and Villages
  - Specials Districts: Water, MUD's, Transportation, Airports
  - Public and Private Higher Education
    - Colleges, Universities, Technical Schools
  - K-12 School Districts, Charter Schools & Other
  - Non-Profits Churches, Education, Hospitals, YMCA & Other

GraybaR.

GRAYBAR'S ROLE WITH U.S. COMMUNITIES

- One Combined Contract # EV2370
  - Valid date February 1, 2018
    - 5 year initial term (with "three" two year extension options)
  - Electrical, Lighting, Utility
  - Data/Communications, Networking, Wireless, Service Provider, Security
  - Comprehensive Service Offering
  - Other Related Products & Services

- Graybar has a 21 year history with USC
- City of Kansas City, Lead Public Agency
- Large Breadth of Product - Consistent and competitive pricing
- Project & Volume Discounts Available
- No contracts to sign, no spend limits, non-binding & best overall value

GraybaR

SERVICES OVERVIEW

- Key areas for services are but not limited to:
  - Lighting & LED, Power & Energy, Technology, Networking & Wireless, Security, Repair
- Services performed by approved contractors and integrators
  - Agency Preferred Companies
  - Graybar suppliers, contractors, integrators
  - Manufacturers Approved Integrators
- Pricing is based on a Not to Exceed Cost Plus basis.
- Graybar acts as G.C.
- Sub-Contract and Service Owner Documents recommended

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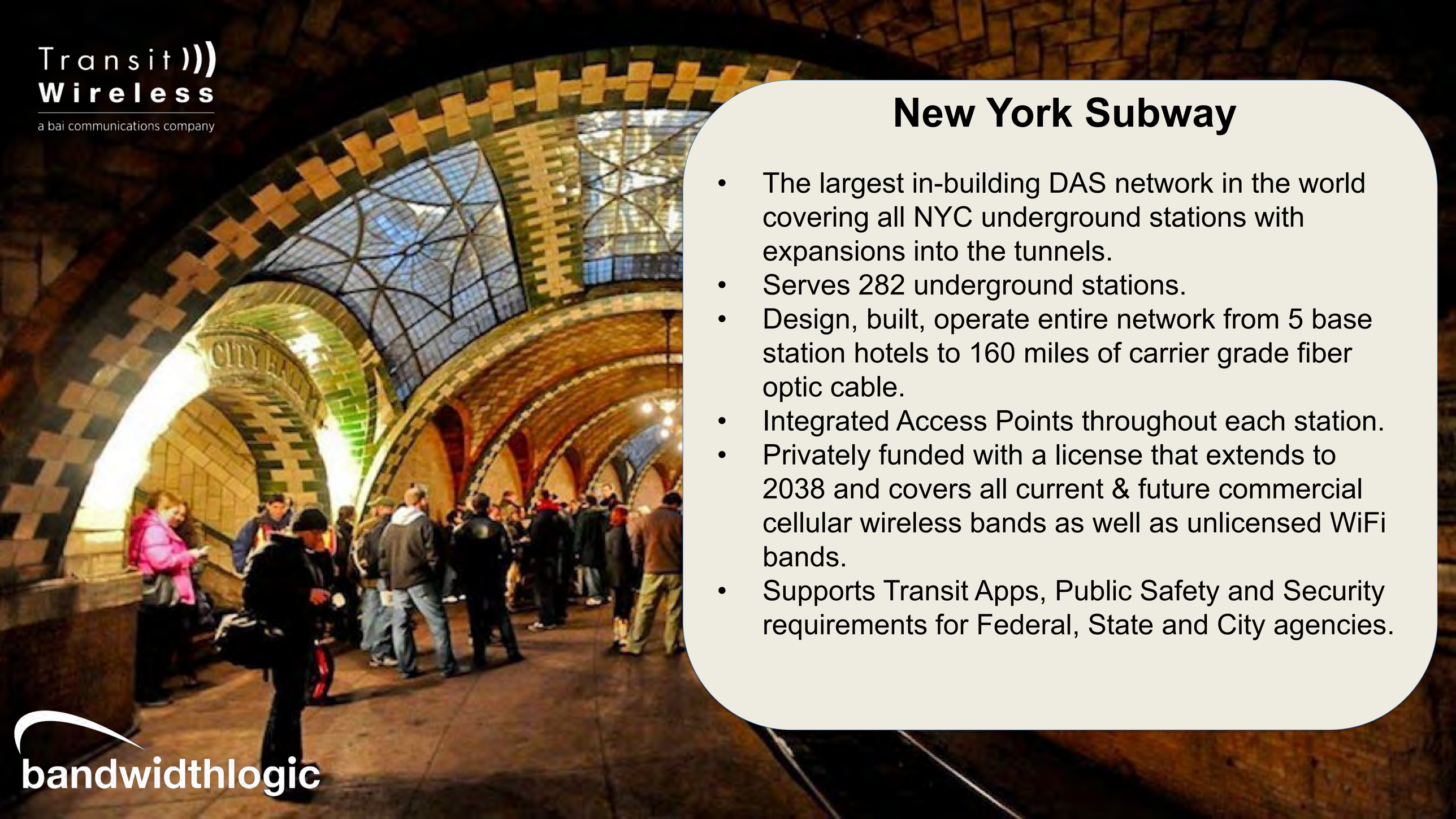

Transit Wireless
a bai communications company

New York Subway

- The largest in-building DAS network in the world covering all NYC underground stations with expansions into the tunnels.
- Serves 282 underground stations.
- Design, built, operate entire network from 5 base station hotels to 160 miles of carrier grade fiber optic cable.
- Integrated Access Points throughout each station.
- Privately funded with a license that extends to 2038 and covers all current & future commercial cellular wireless bands as well as unlicensed WiFi bands.
- Supports Transit Apps, Public Safety and Security requirements for Federal, State and City agencies.

bandwidthlogic