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**The first Edge API Platform** that offers edge as a service to empower cities to create, customize, and control their own private LTE/5G network, inside their firewall using programmable APIs.

# About Senet

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**Senet provides cloud-based managed network services for highly scalable LoRaWAN® IoT solution deployments**



**Operator Experience** Senet operates the largest carrier grade LoRaWAN network in United States



**Senet's LVN™** Senet's patented LPWAN Virtual Network (LVN) connects Network Operator, Application Provider, and RAN Provider networks under a cooperative model, delivering pervasive and unified connectivity



**Global Network Available** Extended Coverage partners like Helium and Eutelsat provide access to Senet services worldwide



**Public and Private deployment models** Deployment models in support of your individual business needs



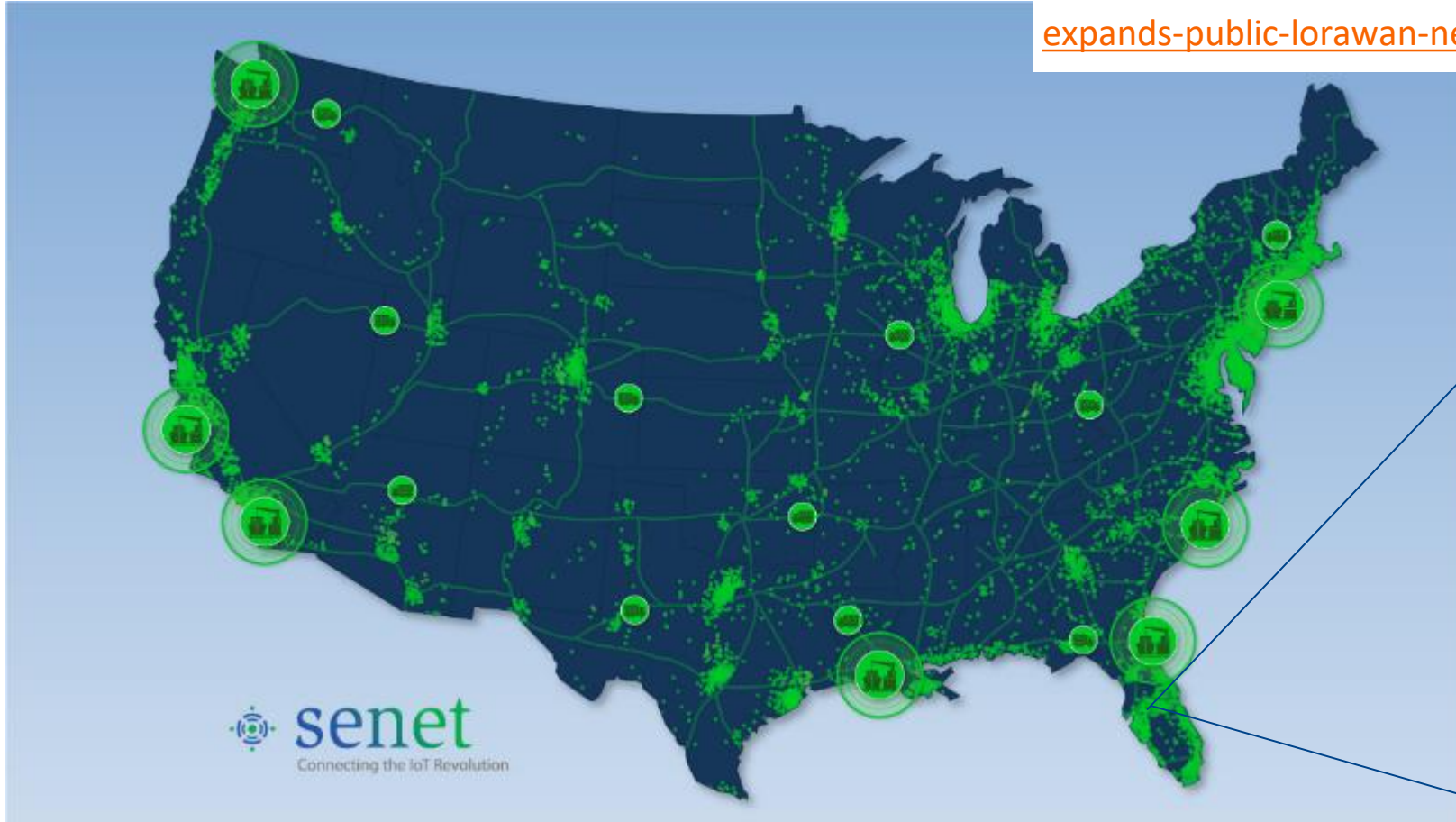
**Senet provides world class support** Our support organization invests in your success

## Connecting the IoT Revolution



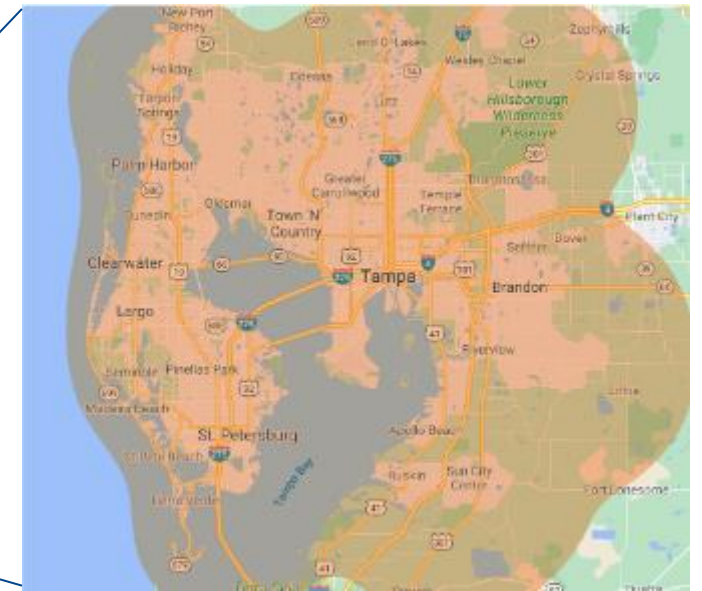
# Senet Network Coverage <https://www.senetco.com/us-coverage/>

The largest public carrier-grade LoRaWAN network in the US



Tampa Expansion <https://www.senetco.com/about/news/senet-expands-public-lorawan-network-across-tampa-bay-metro-region/>

The largest and densest metropolitan deployment of public carrier-grade LoRaWAN connectivity in North America



# kajeet. AT A GLANCE

- A Leading Public & Private Wireless Managed Service Provider
- Two Decades of Experience
- Leading US provider of off-campus wireless internet for students
- Over 3,000 Customers
- Service 7 Large High Growth Verticals
- 5.5M+ Lines Connected
- Award Winning Software Platforms
- 40 Foundational U.S. Wireless Patents
- 150+ employees
- MSP for Charter & Comcast
- 40+ Private Wireless Deployments

## MARKETS SERVED



EDUCATION



ENTERPRISE  
FIELD SERVICE



HEALTHCARE



MONITORING



TELECOM  
& CABLE



TRANSPORTATION



PRIVATE  
NETWORKS

## SELECTED CUSTOMERS

EDUCATION



FIELD SERVICES



HEALTHCARE



TRANSPORTATION



MONITORING



TELCO & CABLE



## PARTNERS



# Product Portfolio Overview



## Smart poles

Everything needed for small cell tower and IoT

- Small cells (RRU for 4G LTE / 5G)
- Neutral host
- IoT applications



## Pole attachments

Economic solution for retrofitting existing poles

- Full size radome: 5G mmWave, CBRS/LAA + universal antenna
- Compact radome: CBRS/LAA + universal antenna



## Hub

Fiber hub with smart services for highly visible locations

- Neutral host for Telco and IoT devices
- Digital screens for advertising
- In kiosk or pole form factor



## Gb Luminaire

Wireless mesh for last mile coverage

- Utilizing ubiquitous lighting grid
- Up to 16Gbps aggregated capacity
- $\leq 0.3$  ml. / 450 m Range



## Lighting

Energy efficiency connected luminaires

- Energy efficient Existing sensor based connected luminaires
- Offer narrow band IoT services through Interact



# The 24-Hour City

## Improving environments around the clock

**7:00am  
–12:00pm**  
Morning Commute



**2:00pm  
–5:00pm**  
Workday Continues



**7:00pm  
–10:00pm**  
Events and Entertainment



**12:00  
–7:00am**  
Nighttime & Public safety



**12:00pm  
–2:00pm**  
Office Workday



**5:00pm  
–7:00pm**  
Evening Commute



**10:00pm  
–12:00pm**  
Weekend



**24/7**  
Digital Equity



# Our portfolio in 2021 – Luminaires with Gbit technology

## Road & Street



C7002 –  
Philips LumiStreet



C7012 –  
Hadco PureForm

## Urban



C7007 –  
Lumec Ancestra AT50



C7009 –  
Lumec Domus DMS60



C7005 –  
Lumec Renaissance RN20



C7012 –  
Hadco PureForm



C7008 –  
Lumec Ancestra AT10



C7006 –  
Lumec Domus DMS50



C7004 –  
Pendant Modular



C7003 –  
Bond St ETO

## Site & Area



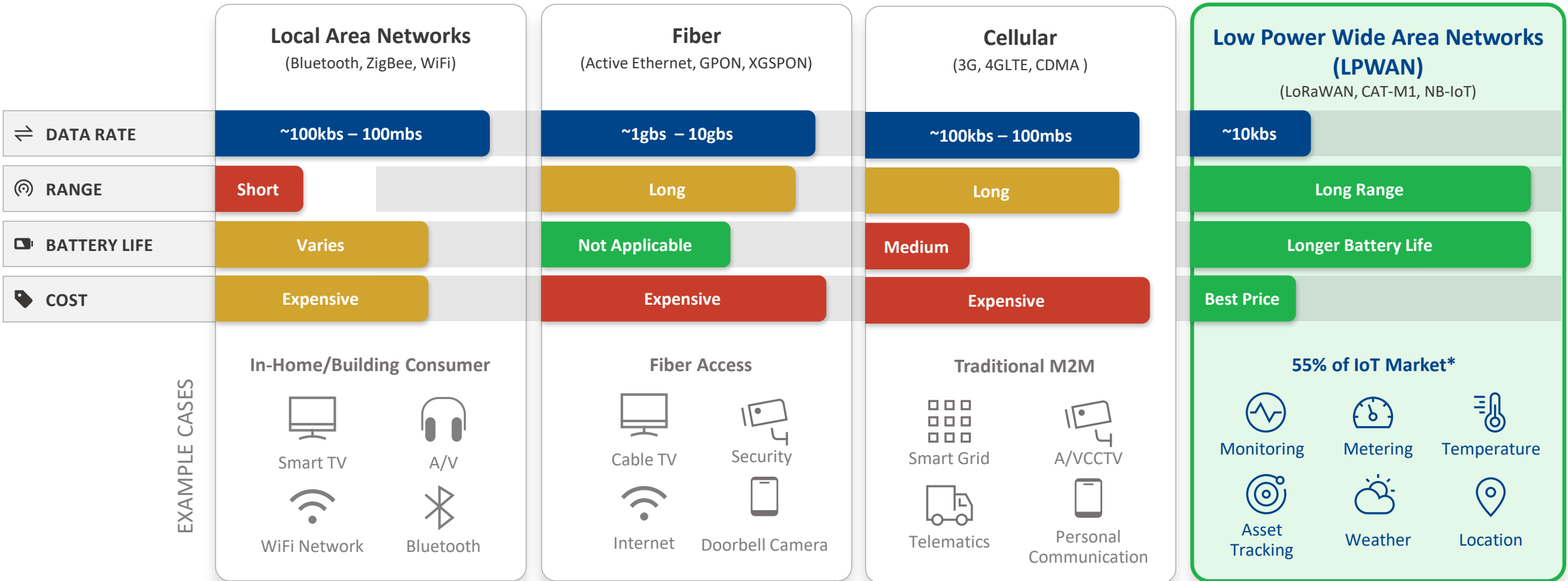
C7011 –  
Gardco Form 10



C7012 –  
Hadco PureForm



# Technology Landscape



# What is LoRaWAN<sup>®</sup>?

**LoRaWAN is the Open Global Standard for Carrier-Grade Low Power Wide Area Network Connectivity**



## The Technology

utilized in a network supporting the LoRaWAN protocol is designed to connect low-cost, battery-operated sensors over long distances



## The LoRaWAN Protocol

offers unique and unequalled benefits with security, bi-directional communication, mobility, and location services

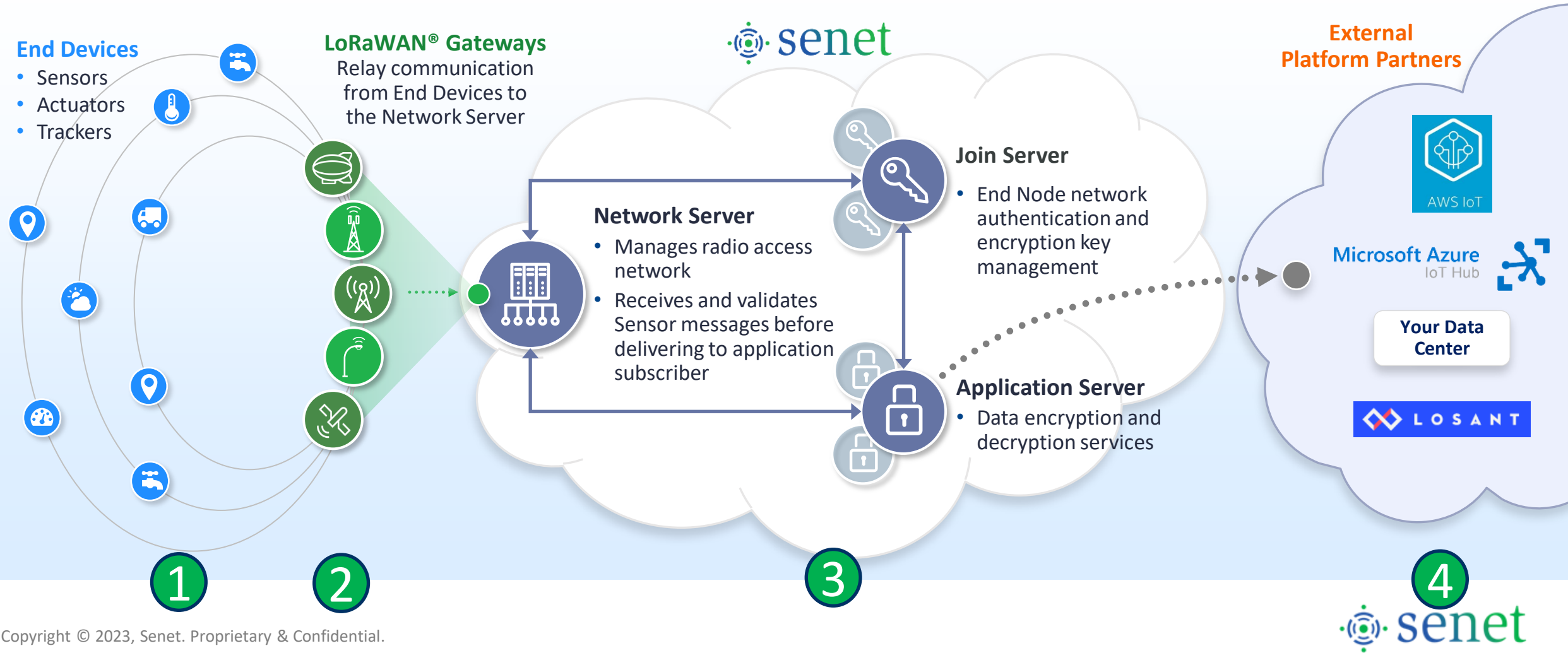


## The LoRa Alliance<sup>®</sup>

an open, non-profit association promoting the LoRaWAN protocol has grown to include more than 500 members since its inception in March of 2015

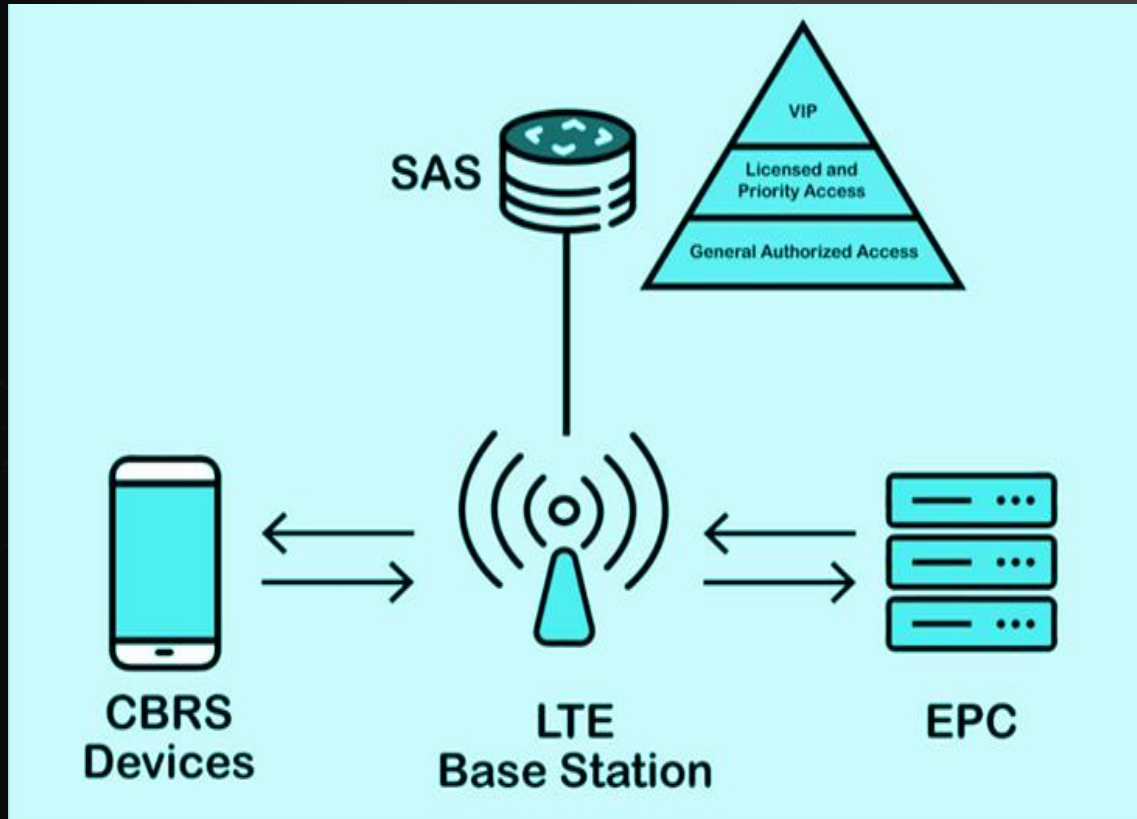
# Key Elements of the Senet Network

Senet provides network transport, security, data streaming/ warehousing, and end device management





# What is CBRS & How to Leverage for a Private Network?



- Allows Enterprise to use cellular technology (LTE or 5G) to enable a private network instead of connecting to AT&T/VZW/TMO
- Provides connectivity for enterprise applications using 150 MHz of spectrum in the 3.5GHz range
- SAS coordinates all frequencies to be used to ensure QoS
- SIM/eSIM at device level required for network access
- EPC can have local break out to LAN and provide devices with private IP addresses

# CBRS versus Wi-Fi

	CBRS	Wi-Fi
<b>Devices</b>	Handles many	System performance unpredictable as devices added
<b>Inference</b>	Greatly reduces	Prone to interference from signals in most unlicensed bands
<b>Authentication &amp; Encryption</b>	End-to-end SIM based	Requires proprietary / conflicting coordination
<b>Security</b>	Channel monitoring and coordination of spectrum	Poorer security vs LTE/5G
<b>Handover</b>	Controlled between devices managed by standards	Proprietary best effort for roaming
<b>Latency</b>	Consistently Lower	Unpredictable
<b>Radio</b>	Works well in complex environments with many wireless clients/devices	Works well in simple environments with a moderate number of devices

# Typical Private Network Topology



City or School Fiber Network & Service Layer

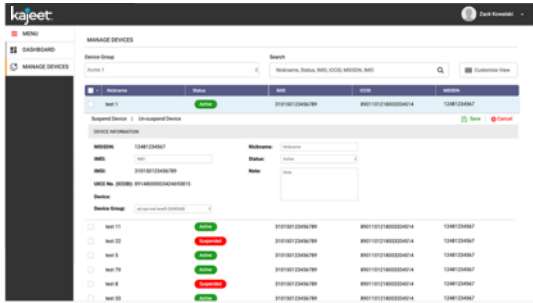






# Smart Private 5G™ Platform

Smart, Simple & Secure Cloud-Based Platform To Manage Private 5G & LTE Networks



## Private 5G CLOUD

## Private 5G EDGE-CORE

## Multivendor RADIOS

## Private 5G SIMs

SIM, Device, Subscriber & Network Management



5G Cloud Core & Edge Core



Private Radio Access Network



Private Wireless SIM & eSIM



Network Design & Installation

SIM & Device Management & Logistics

Network Slicing & Management

Open APIs Application & Developer Platform

Neutral Host & Carrier Connectivity

Private 5G/LTE as a Service



Enterprise



Healthcare



Hospitality



Education



Public Venues



Smart Cities



Industrial

Planning

Site Selection

Acquisition

Deployment

Integration

Operations

Maintenance

## Private 5G Design

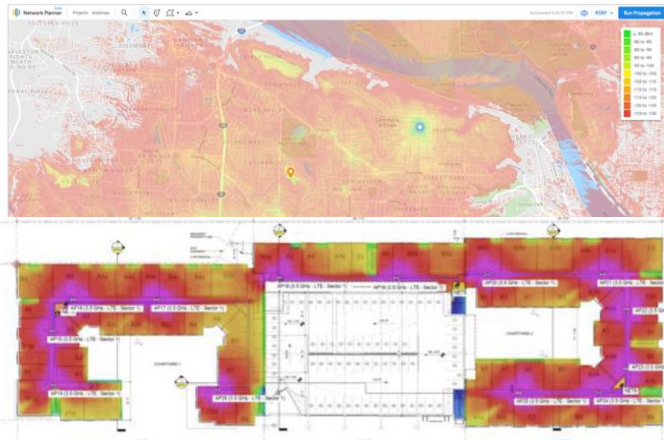
- Kajeet Private Network Design
- Is the initial step in determining customer requirements.
- Gather customer requirements, number of locations, user devices, coverage and throughput.
- Determine Spectrum requirements, CBRS, PAL or GAA, EBS, or other.
- Create propagation map and review with customer
- Provide Budgetary Pricing for network and firm pricing for Site Survey.

## Private 5G Installation

- Kajeet Private Network Implementation
- References the Smart 5G Design to determine the RAN elements required for the Private Network.
- Acquisition of equipment and services
- Core and Site turnup of services
- Integration with Kajeet’s network core and Sentinel™ application
- End-2-End network integration
- System/coverage and acceptance testing

## Private 5G-as-a-Service

- Kajeet Private 5GaaS is a complete Managed Service for your Private Network Infrastructure and end user equipment.
- 7x24x365 Network Operations Center to monitor all Private Network elements.
- Customer Support Tiers that range from standard business hours to 7x24x365 support for your end users and their devices
- Access to Sentinel™ application for device management and reporting
- On-Site network support Tiers



Non-Penetrating Mount — Rooftop

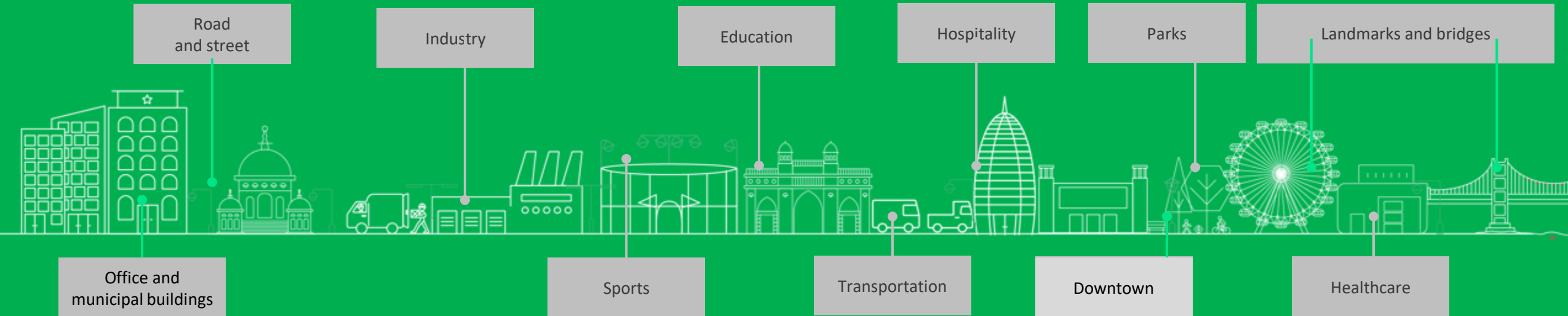


Tower



# Lighting infrastructure reaches every part of your city

It all contributes to the goals of government leaders and cities with solutions that go beyond illumination



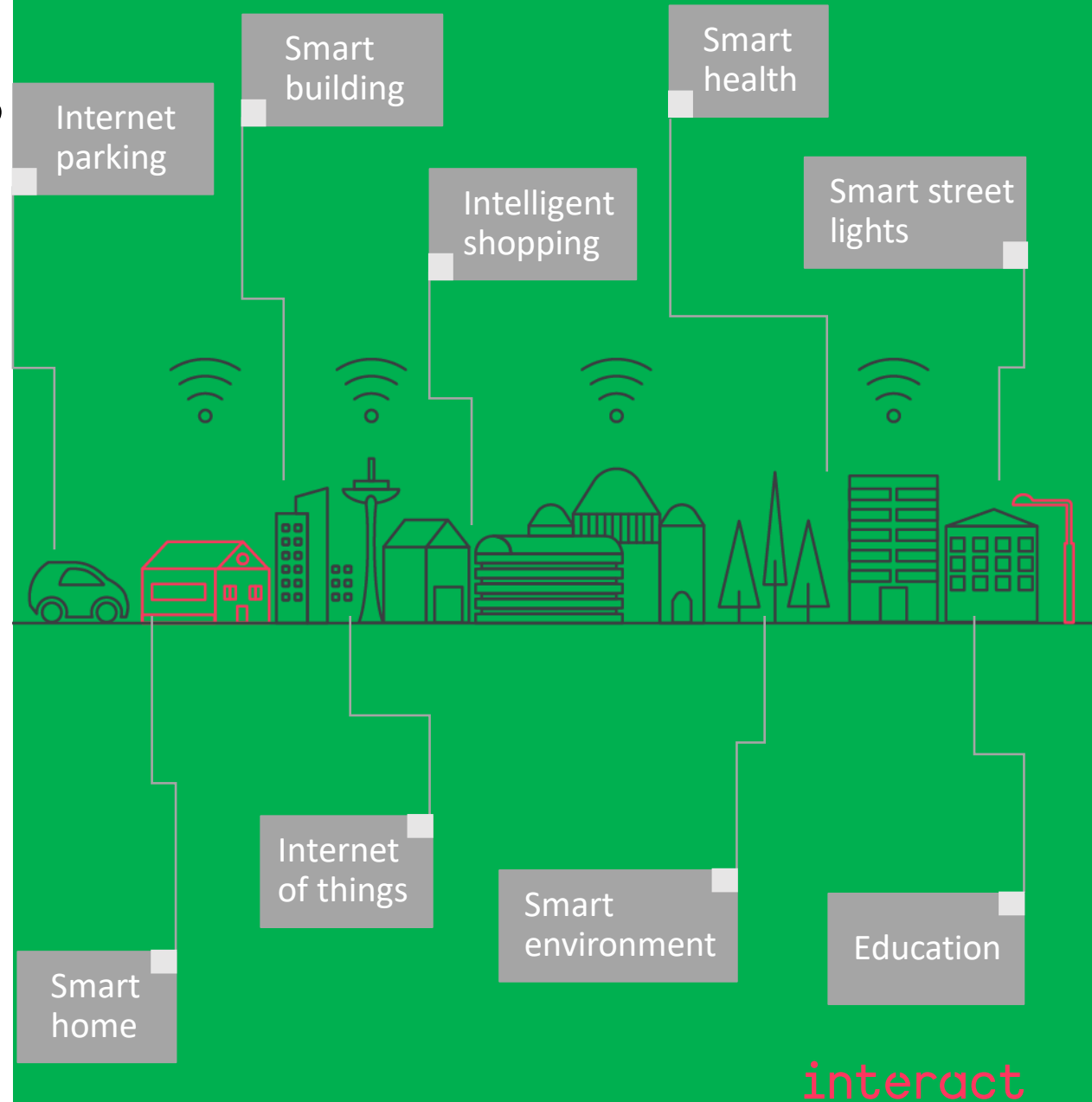


# Connected system benefits

The systems on a smart city can help in many points, for example:

- Optimized energy usage;
- Connected citizens;
- Healthier City
- Safer City;
- More interactive city etc.

Arriving to those objectives in a city demands a team effort of an expert chain of several verticals according to the service the city will wish to improve.

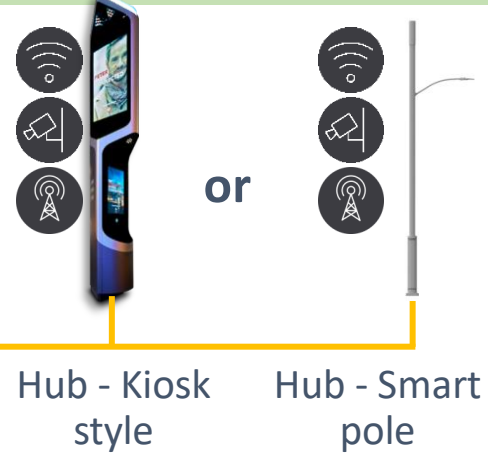
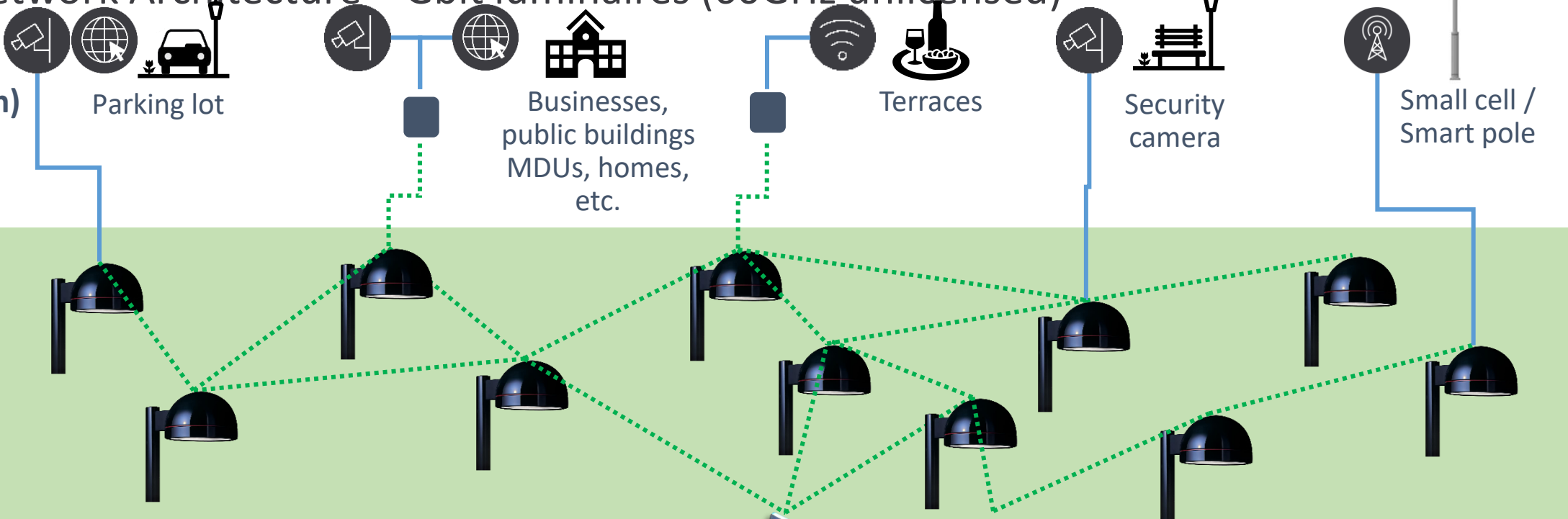


# Network Architecture – Gbit luminaires (60GHz unlicensed)

Access (application) layer

Gbit transport layer





Fiber layer



Requires line of sight

Capacity per link *	Distance
3,8 Gbps	<50m
2 Gbps	<150m
500 Mbps	<300m

\*Half duplex capacity: 3,8Gbps means 1.9 download and 1.9 upload

-  Terminal Unit
-  60GHz mmWave mesh
-  Optical fiber
-  Ethernet cable

# Smart Cities: Example LoRaWAN<sup>®</sup> Solutions

## Infrastructure Monitoring

- Water System Monitoring 
- Gas Systems Monitoring/Safety 
- Electric Infrastructure Monitoring 
- Manhole Monitoring 
- Tank Monitoring 

## Environmental Monitoring

- Air Quality Monitoring 
- Water Quality Monitoring 
- Flood Level Monitoring 
- Roadway Condition Monitoring 
- Greenspace Monitoring/Irrigation 

## Municipal Service Delivery






- Smart Lighting 
- Parking Management 
- Waste Management 
- Pest Management 
- Asset Tracking 










# Smart Buildings: Example LoRaWAN<sup>®</sup> Solutions

## Infrastructure Monitoring

Water Metering	
Water Leak Detection	
Gas Metering	
Gas Leak Detection	
Gas Shutoff	

HVAC Monitoring	
Connected Faucets and Flush Valves	
Parking Monitoring/Management	
Waste Monitoring/Management	
Pest Management	

## Environmental Monitoring

Air quality, air flow, temp, moisture, CO2	
Room Occupancy Monitoring	
Cold Storage/ Food Safety	
Asset Tracking	
Healthy Workplace Covid Air Quality	

# Available from Graybar via Omnia Contract (Coming soon to GSA) Private Cellular Network Connectivity

## Rapid Deployment, Single Site & Concept Testing Scenarios

- Large pelican case
  - Cellular Base Station with Antenna (CBRS/EBS)
  - SAS & Radio Cloud control
  - Switching and Routing Hardware
  - Cellular, Satellite or Wired backhaul to Alef core
- Kitted pre-provisioned with the following and Alef (e)SIMs.:
  - CBRS Mobile Point of Sale Devices
  - CBRS Tablet
  - CBRS Router for creating Wi-Fi Hotspot's
  - Up to 25 SIMS/ESIMs
  - Additional Devices Ala Carte including outdoor CBRS Camera with A.I. Functionality

