Uma Marques
Virginia Smart

David Clow
DC Metro Police

Jon Minshew
Dell Technologies

Malik Ishak
Signify

A Network of Living Laboratories

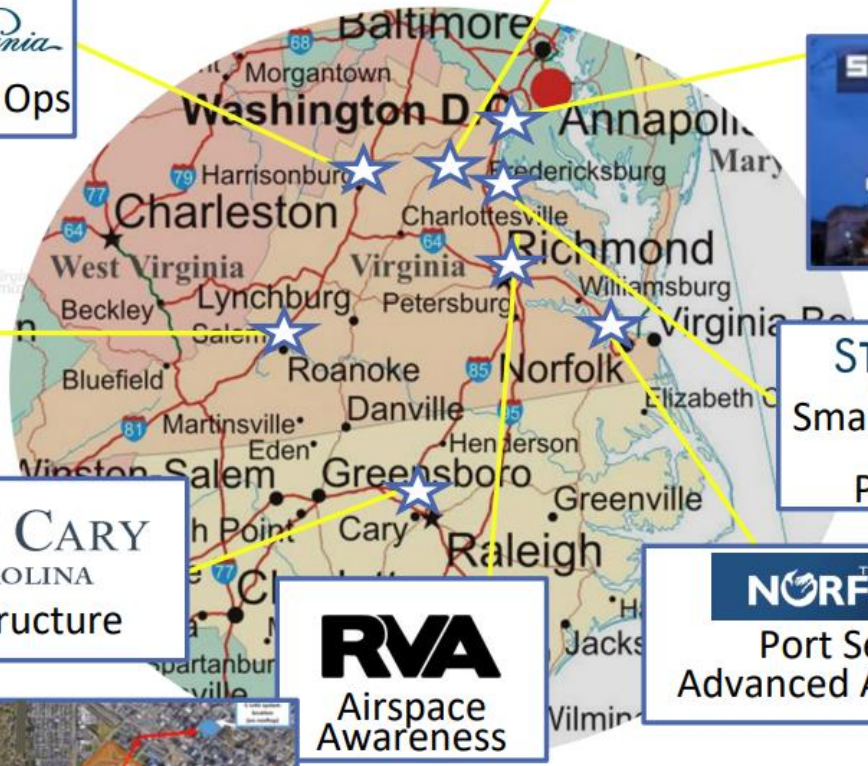
Many made possible by DHS Support

Winchester Virginia
Municipal Drone Ops

Garrisonville
Smart Bases
Workforce Development
AR/VR/Immersive Tech

WASHINGTON DC
In-Building Sensors

ROANOKE
Integrated
Water
Management



STAFFORD *Virginia*
Smart Communities
Secure IoT
Public Safety

TOWN of CARY
NORTH CAROLINA
Civic Infrastructure

RVA
Airspace
Awareness

THE CITY OF NORFOLK
Port Security
Advanced Air Mobility

VIPC | VIRGINIA INNOVATION PARTNERSHIP CORPORATION
Connecting Innovators with Opportunity

A Proven Process *Entrepreneurial Support*

RIoT Accelerator Program (RAP)

- 12-week intensive program (September 28th - December 15th) | Apply by July 29th
- Located both virtually and in person @ Virginia Smart Community Testbed | Stafford, VA
- Access to 100+ Mentors & Corporate Partners with expertise across industries
- Creative startup environment to develop fresh ideas
- Validate business viability of a new product offering
- Develop new technical capabilities and test MVPs

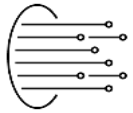
Validation	*Startup Foundations & Customer Discovery*	**Product & Business Development**	*Prototyping & Go To Market Strategy*	**Growth**	*Storytelling & Scaling Strategy*
Week 1: Orientation - Business Best Practices, Key Performance Indicators Week 2: Startup Foundations & Customer Discovery Week 3: Startup Legal & Financial Management		Week 4: MVP Strategy & Design Review Week 5: Go to Market Strategy Week 6: Data Engineering Week 7: Sales & Branding Week 8: Pitch Prep, Stakeholder Engagement		Week 9: Growth Strategy - Team Building Week 10: Growth Strategy - Funding Week 11: Pitch Practice, Mock Board Meetings Week 12: Pitch Night	

Questions? Email Jennifer: jennifer@riot.org

Digital Infrastructure

Scalable/Interconnected

Fiber	IoT	Cell-Macro, Small & DAS	Wi Fi	Private LTE & 5G	Smart Poles	Devices



NB-IoT

LoRa®

LTE

Lighting +

Cameras

Kiosks

Computers/Tablets

Sensors

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
- ≤ 0.3 mi. / 450 m Range

Lighting

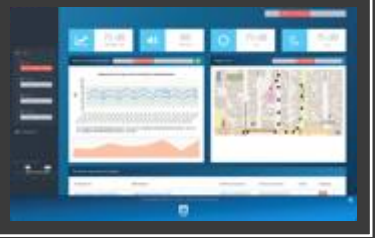
Energy efficiency connected luminaires

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

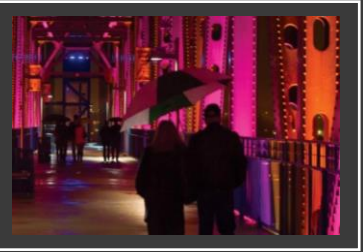
The 24-Hour City
Improving environments around the clock

7:00am –12:00pm
Morning Commute

2:00pm –5:00pm
Workday Continues

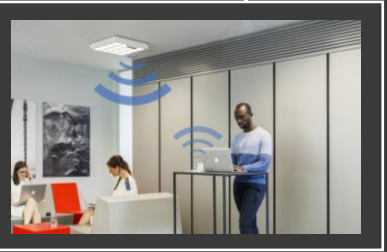


7:00pm –10:00pm
Events and Entertainment



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

IoT Data Infrastructure Supports Many Types of Devices

Air Quality/ Wildfire

Weather Stations

Drone Video/Data

Smart Lighting/ WiFi

Flood

Information Kiosks

Robotic Devices

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Firstnet


FIRSTNET
Built with AT&T


WARNING:
DO NOT POWER RADIO UNLESS ANTENNAS ATTACHED AND ELEVATED
CONTACT NUMBERS
RESCUE 42 877 288 9611
FIRSTNET CARE 800 574 7000
CRADLEPOINT 855 228 6304
EXPEDITION COMMUNICATIONS 877 343 4089
COMPONENT
SERIAL
MAC
CRADLEPOINT MM213700000661 00:30:44:63:D6:69
SAT MODEM 793718130067 00:A0:BC:83:02:C5
SAT TERMINAL 1928A20470
CHASSIS H10013
AT&T FAN
SBO SERIAL # EB213990123
SBO CELL ID FZS05126
FIRSTNET Built with AT&T
Manufactured by Rescue 42
ViaSat Auto Acquire Modem
iNetVu
cradlepoint

Samsung Mobility Lab-Devices, 5G, Public/Private

Smart buildings & campus: Capabilities

Are the lights left on when not in use? Is the air conditioning optimized when the room is empty?

Building automation solution provides integration to multiple systems like building controls, security, utilities, maintenance and energy monitoring systems.

Fault monitoring

Heterogeneous building systems integration

Energy consumption analytics

Bi-directional control

Condition-based predictive maintenance

Campus safety & security

Rule-based equipment control

Work order management integration

Edge device security

Digital twin

Smart buildings & campus: Challenges

Disparate building automation and energy systems; islands of information

No established baseline to compare asset performance and identify energy losses

Traditionally geared towards retro commissioning

Lack of diagnostic/predictive capabilities

No single view of building portfolio: Scattered information cause people to miss patterns

Solutions need to be more secure and IT-friendly

Smart buildings & campus: Key outcomes

Buildings tell you when there's going to be a problem

You plan maintenance instead of responding to emergencies

Improved tenant well-being

Productivity measures Increase

Reduces your energy consumption

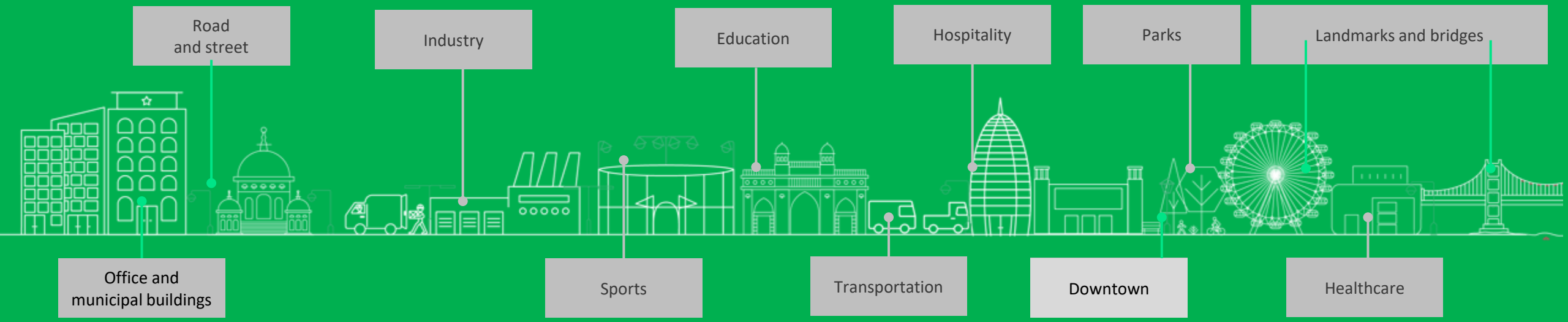
Space utilization is optimise using real-time data

Your buildings evolve as your occupants change

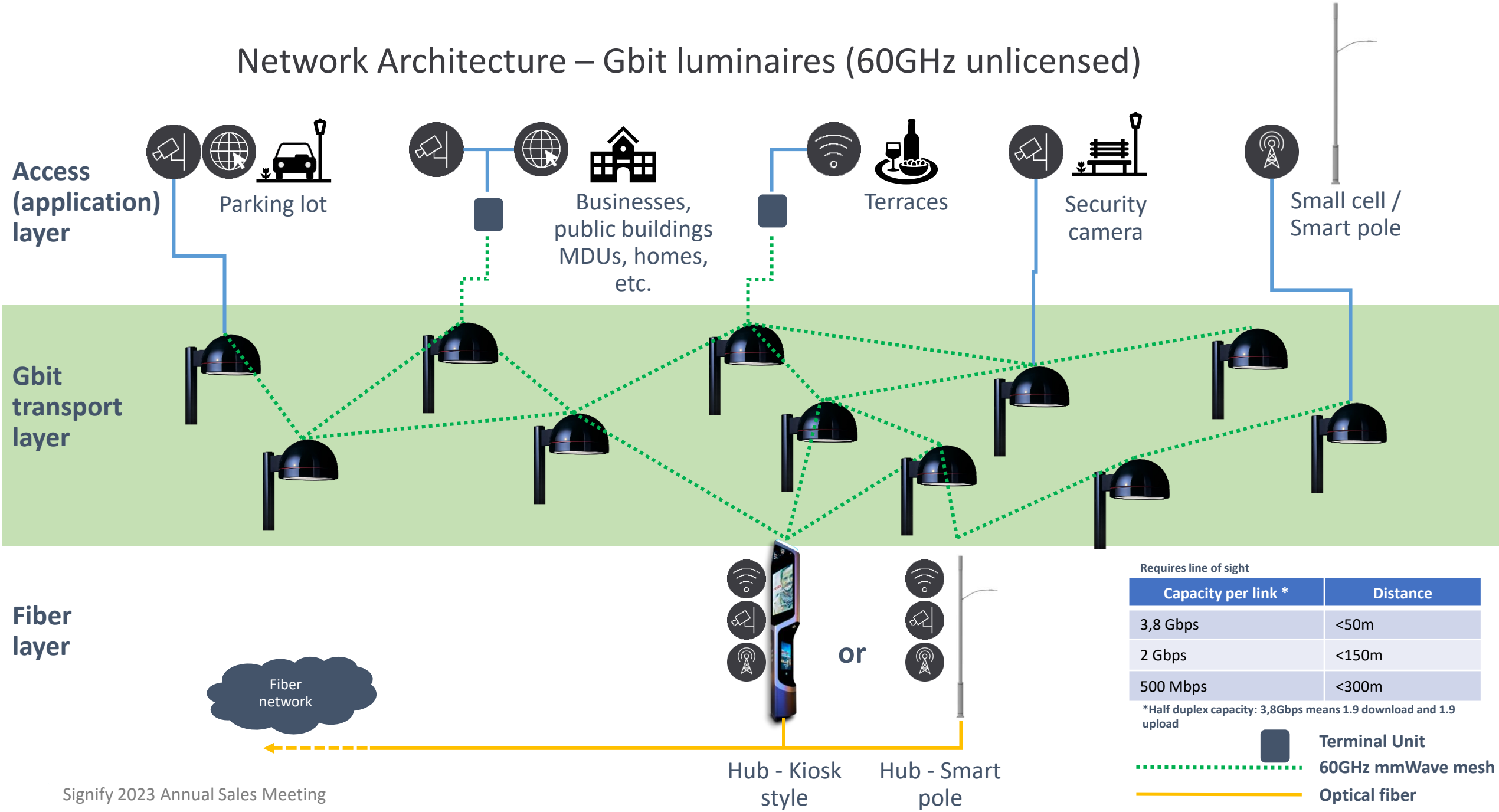
Occupant user experience is enhanced

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



Network Architecture – Gbit luminaires (60GHz unlicensed)



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

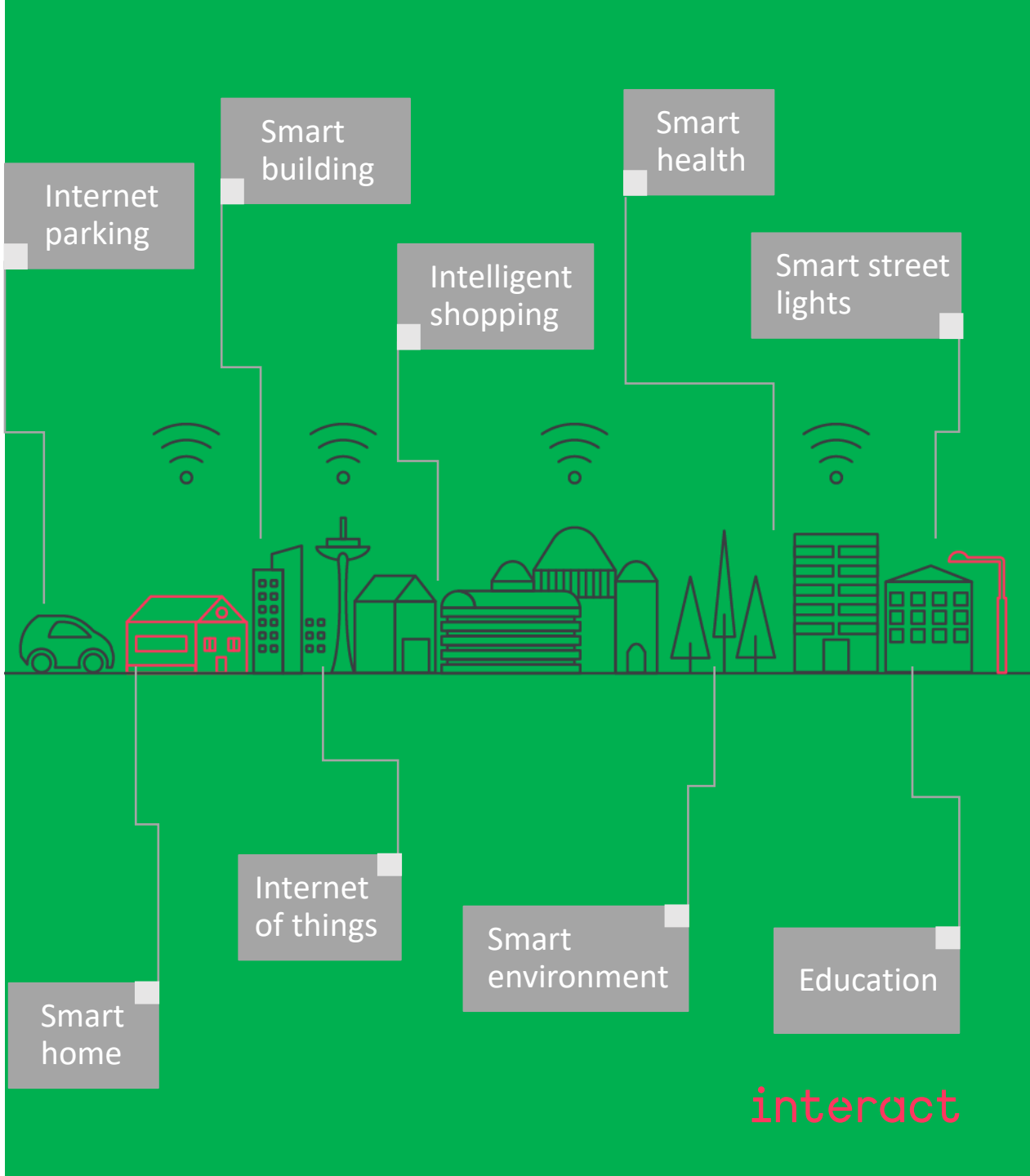
Terminal Unit
60GHz mmWave mesh
Optical fiber
Ethernet cable

Connected system benefits

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

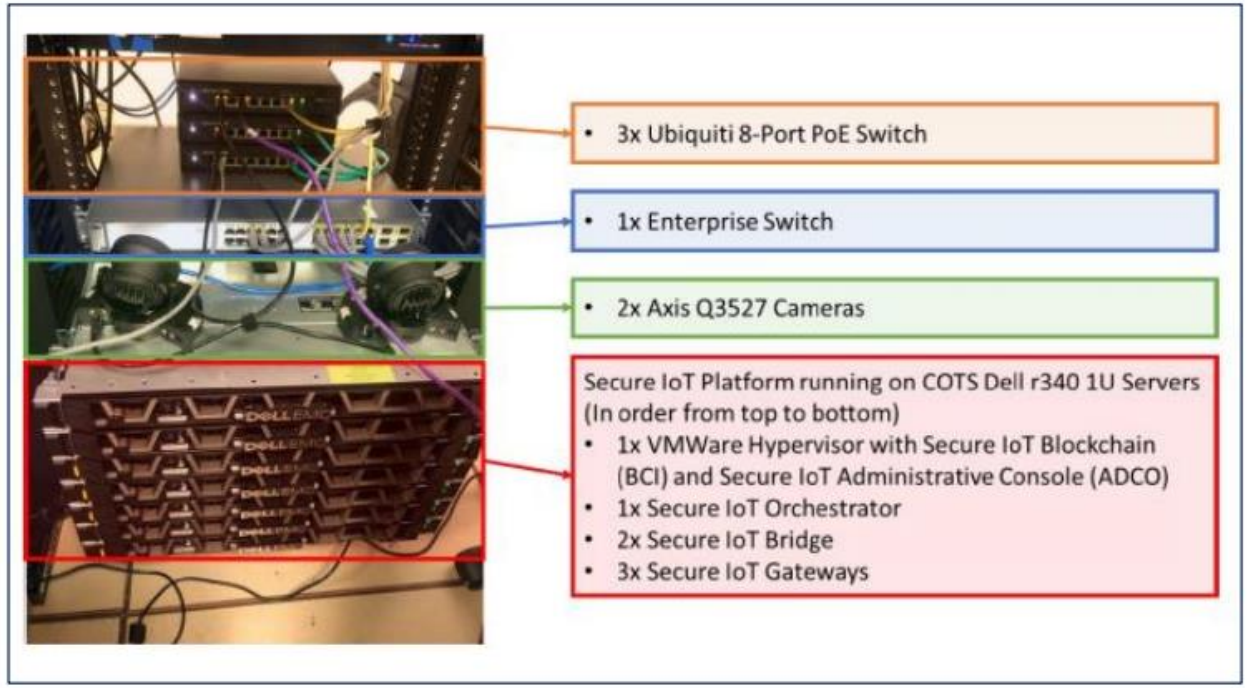
- Optmized energy usage;
- Connected citizens;
- Healthier City
- Safer City;
- More interactive city etc.

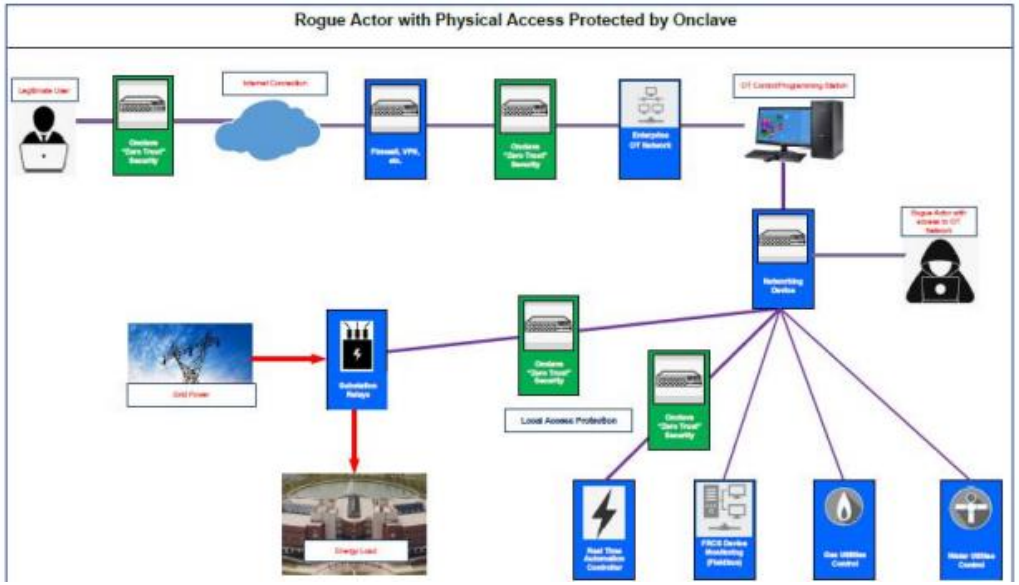
Arriving to those objectives in a city demands a team effort of an expert chain of several verticals according to the service the city will wish to improve.



IoT Critical Infrastructure Security

- "Zero Trust Security"
- Makes groups of IoT devices invisible to hackers
- Widespread adoption growing across many applications
- Critical infrastructure demo at Ft. Belvoir for power infrastructure





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Connecting Innovators with Opportunity

Jamaal Smith
Kajeet

Andrew Clegg
Google

Eric Toenjes
Graybar

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

SELECTED CUSTOMERS

EDUCATION

FIELD SERVICES

HEALTHCARE

TRANSPORTATION

MONITORING

TELCO & CABLE

PARTNERS

Alliance Membership – 165 Strong & Growing

4RF Limited
Accelleran
ADRF Technologies
Agri-Valley Communications, Inc
Airspan Networks
Airtower Networks
Allen Vanguard Wireless, LLC
Alpha Wireless
Amdocs Management Limited
American Tower Corporation
Amit Wireless Inc.
ANS Advanced Network Services, LLC
Anterix
Asiatelco Technologies, Inc
Askey Computer Corp.
Aspire Technology Partners
AT&T
ATDI
Athonet
Baicells Technologies Co., Ltd.
Ballast
Barich, Inc
Bearcom
BEC Technologies, Inc
Betacom
Black Box
Blinq Networks
BlueArcus Technologies
Boingo Wireless, Inc.
BTI Wireless
Cable Television Laboratories Inc
Cambium Networks
Capgemini America, Inc
Casa Systems
CellAntenna Corporation
Celona, Inc
Centerline Communications
Charter Communications
Ciena
Cirrus Core Networks, Inc
Cisco Systems
Codium Networks
Comba Telecom, Inc
Comcast Corporation
Commscope
Communication Technology Services, LLC
COMSovereign Holding Corp
Connected Devices, Inc
Connectivity Wireless Solutions
Contour Networks
Corning Optical Communications
Cox Communications
Cradlepoint
Crown Castle
CTIA
CTL
DEKRA Testing and Certification, S.A.U.
Dell Technologies
Dense Air Limited, LLC
Digi International
Digital Global Systems
Dish Network
Druid Software
EDX Wireless
Element Materials Technology Washington DC LLC
Encore Networks
Ericsson, Inc.
EUCAST Co., Inc
ExteNet Systems, Inc.
Facebook
Federated Wireless
Fibocom Wireless USA, Inc
Fibrolan
FreedomFi, Inc
Frequencz
Frontier Communications
Fujitsu Network Communications
Gadgetspace, LLC
GE MDS
Gemtek Technology Co., Ltd
GenXComm, Inc.
Geoverse
Giesecke+Devrient
Global Technology Associates, LLC (GTA)
Goodman Telecom
Google, LLC
Graybar
HALO DAS, LLC
HCL Technologies
Hewlett Packard Enterprises
Highway9 Networks, Inc
Huber + Suhner
Ibwave
Imagine Wireless
Impact Broadband Corporation
Inseego Corp
Insta Advance Oy
Intel Corporation
IOT4NET, Inc
JACS Solutions
JMA Wireless
JPU
Juniper Networks
Kajeet
Keysight Technologies, Inc
KLA Laboratories, Inc
Kleos UK Ltd
Kore Wireless
LandMark Dividend, LLC
Mavenir Systems, Inc
Midcontinent Communications
Miller Electric Company
Mobilitie, LLC
Monogoto, Ltd
Motorola Solutions
Multi-Tech Systems, Inc
Munisite Networks
Nesten, Inc
NextGen Global Resources, LLC
Nokia
NRTC
Nsight
OneLayer
Palo Alto Networks
Panasonic
Parsec Technologies, Inc
Pavlov Media, Inc
Pierson Wireless
Pyramid Network Services, LLC
QuadGen Wireless
Qualcomm
Quanta Cloud Technology
Quantum Wireless
Qucell
Qulsar
Radio Frequency Systems
Radisys Corporation
Radtonics, Inc
Rakuten USA, Inc
RANlytics
Ranplan Wireless, LLC
Redline Communications
RF Connect
Samsung Electronics America Inc.
SBA Communications
Securus Technologies
Seowonintech Co., Ltd
Sequans Communications
Sercomm USA, Inc
SGS North America, Inc
Shared Access
SNS Telecom & IT
Socionext America, Inc
Solid
Sony Group Corporation
Sporton International, Inc
Star Solutions International, Inc
Sterlite Technologies Limited
Super Micro Computer, Inc
SureSite Consulting Group, LLC
Syniverse Technologies, LLC
Tango Networks
Teal Communications
Tecore Government Services, LLC
Telecommunication Technology Labs, CAICT
Telit
Telka, LLC
Telrad Networks
Telsasoft
Terranet Communications, LLC
Tessco Technologies, Inc
Texas A & M University
The New York Library
The Quilt
T-Mobile USA
Transit Wireless
Trextel, LLC
TruConnect
U.S. Cellular
University of New Mexico
Valid8.com, Inc
Vedanta Telecom, LLC
Vergibility, LLC
Verizon Communications
Vertical Bridge Holdings LLC
View, Inc
VMware Inc
Wesco
Wilson Electronics
Winncom Technologies
Wispa (Wireless Internet Service Providers Association)
XCOM Labs, Inc
ZenFi Networks
Zyxel Communications Corporation

CBRS Momentum - Where Are We Today?

Over 300K

CBSD's
deployed in the US

- Healthcare
- Manufacturing
- WISPs
- Airports
- Oil & Gas
- Warehouses
- Hospitality
- Education
- In-building
- Public Safety
- Agriculture
- Utilities
- Military
- Large Venues
- Rural Access

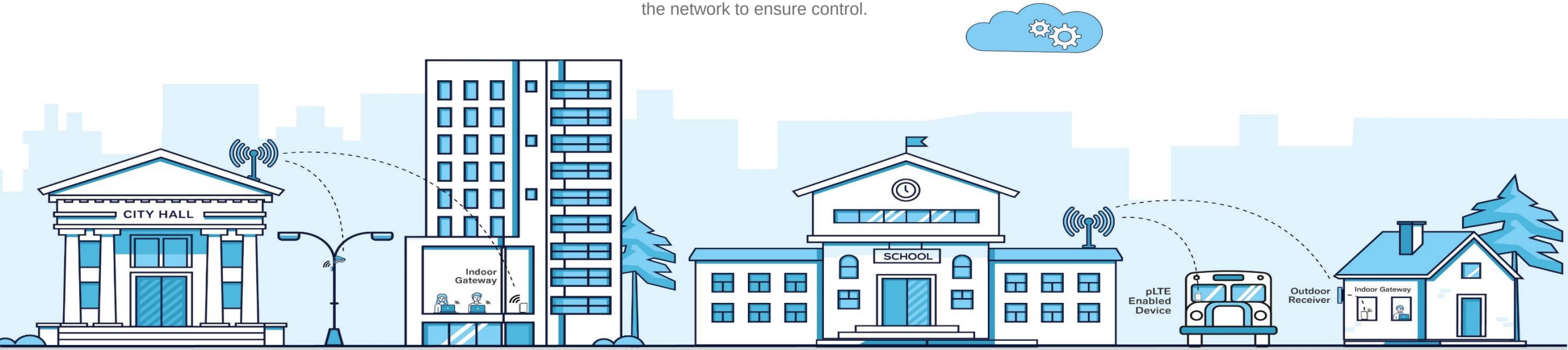
Over 900

Different operators leveraging freely available CBRS spectrum (GAA)

Bridge the Digital Divide & Extend the Smart City Foundation

Build a private LTE/5G wireless network broadcast from city and school facilities

Secure Network
Monitors the wireless network, all connected gateways and private LTE enabled devices. Data stays local to the network to ensure control.



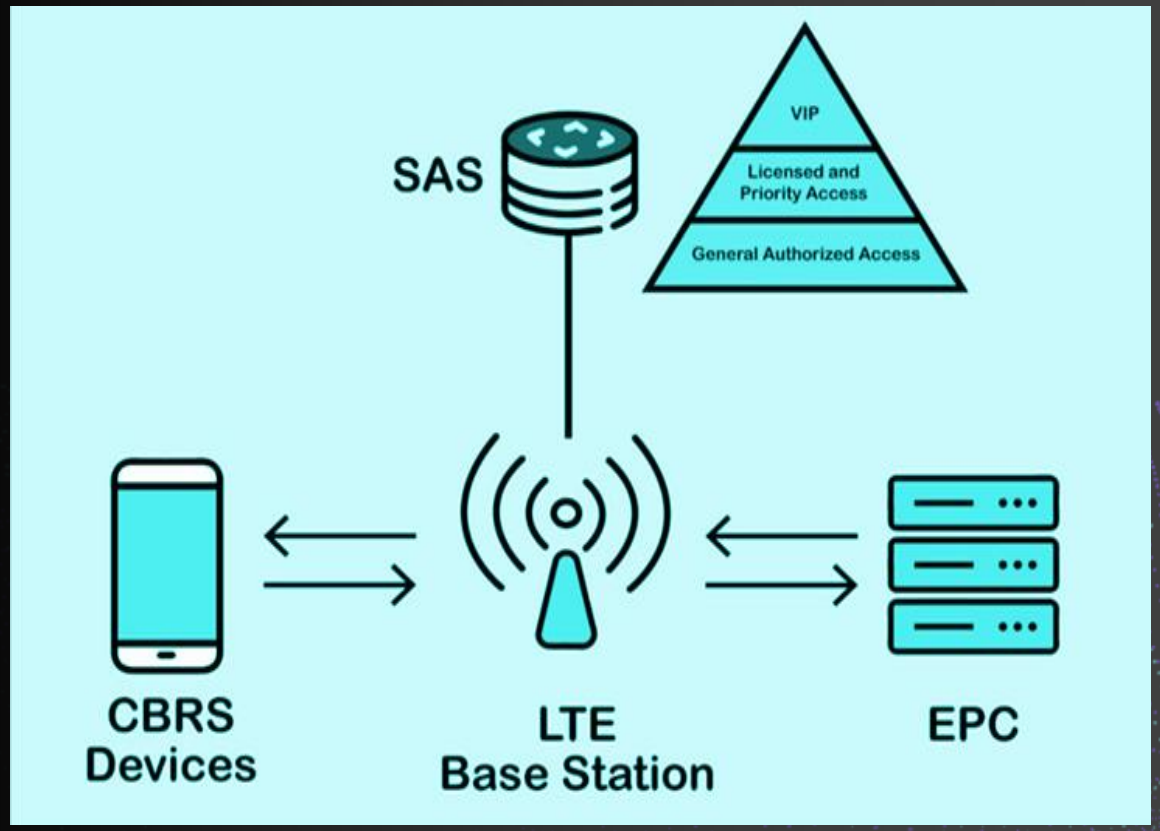
GraybaR

Training and certification

Most CBRS devices need to be installed by a Certified Professional Installer (CPI), and Google is making it simple to becom
online training on Coursera at your own pace. After passing the online certification exam, you will automatically receive you
registered in the WinnForum CPI database, and can start installing devices.

	CPI certification package	CBRS professiona training
Price	$599	$399
Online training	✓	✓
Online certification exam	✓	
Digital certificate (credentials)	✓	
Registration with WinnForum	✓	

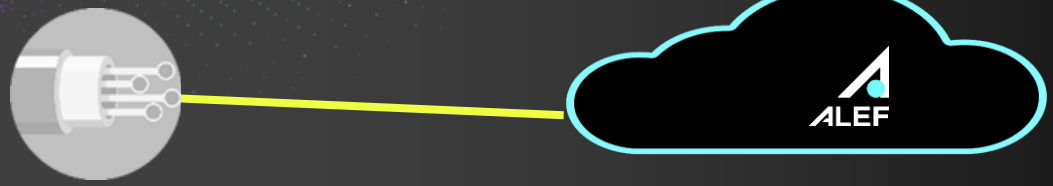
What is CBRS & How to Leverage for a Private Network?



- 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

Typical Private Network Topology

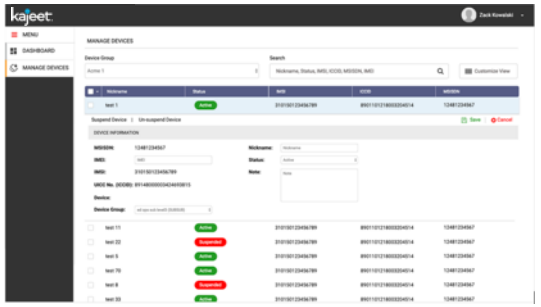
City or School Fiber Network & Service Layer

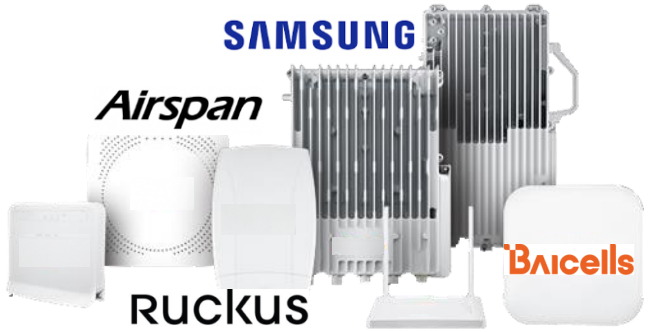


ALEF

Smart Private 5G™ Platform

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





Private 5G **CLOUD**

SIM, Device, Subscriber & Network Management

Private 5G **EDGE-CORE**

5G Cloud Core & Edge Core

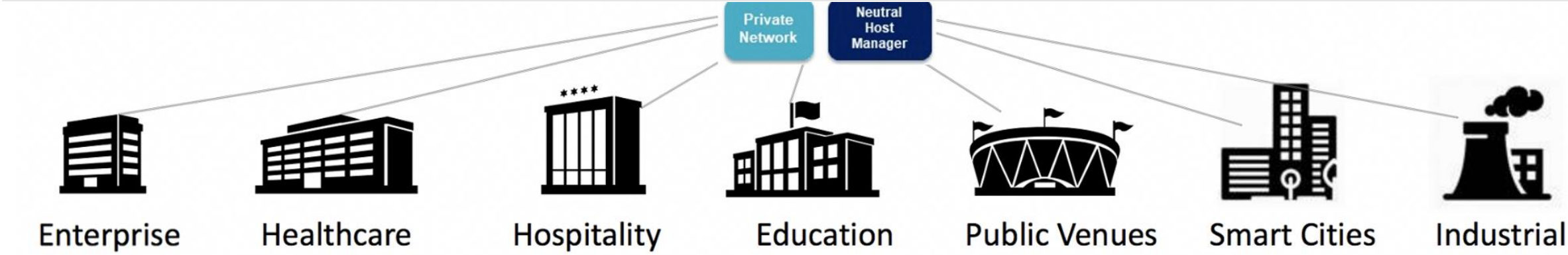
Multivendor **RADIOS**

Private Radio Access Network

Private 5G **SIMs**

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**

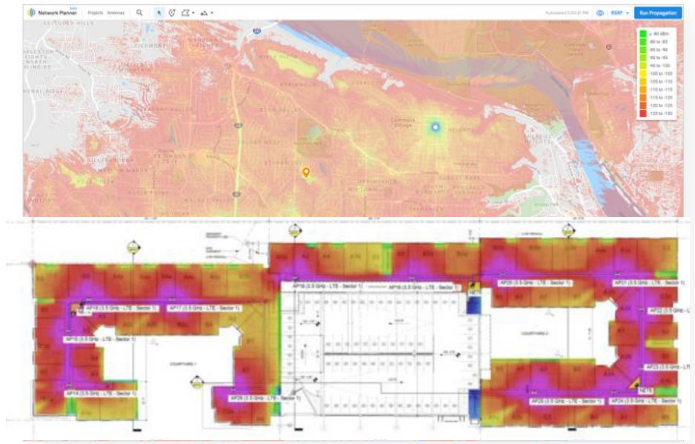


Turnkey Smart Private 5G™ Managed Services

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.



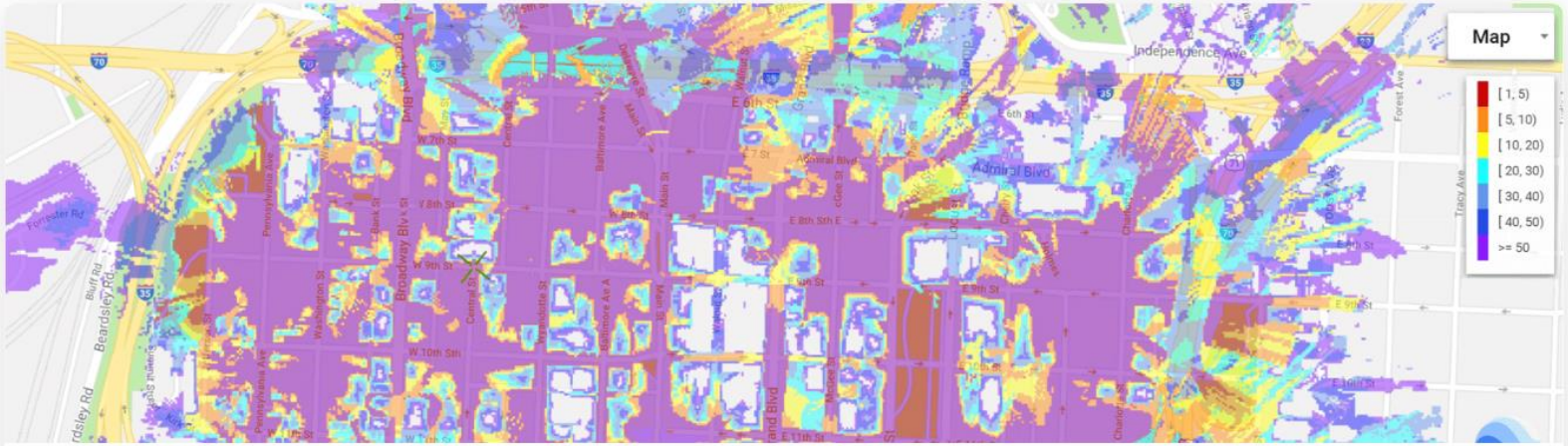
Private 5G Installation

- 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

Google technology for the CBRS ecosystem



New Services for CBRS

To ensure long-term success for CBRS network operators, Google is bringing to market a suite of cloud-based products and services.

Spectrum Access System (SAS)

Controls fundamental access to CBRS.

Learn more

Network Planner

Accurate, fast, easy-to-use planning over a web browser.

Learn more

Training and certification

Making it simple to become a Certified Professional Installer.

Learn more

CBRS versus Wi-Fi

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

OnGo Awards
April 2023

Award Winners

Excellence in an Enterprise OnGo Private Network Deployment:

- **Baicells Technologies (with Alef Edge, Cellocity, Druid, LittleBird, Winncom)**: Delivering Highly Desirable Tenant Amenities to the MDU Vertical

OnGo in State, Local, and Education (SLED):

- **Federated Wireless (with AWS):** Powering the 5G Innovation Campus of the Future at Cal Poly

Excellence in OnGo Technology Innovation:

- **JMA (with Boingo, Cisco, Dell, DISH, Google, Hughes, Intel):** Flight Line of the Future with OnGo and ORAN at Naval Air Station Whidbey Island

OnGo Neutral Host Architecture/Solution:

- **CTS (with Airspan, Druid):** Neutral Host trial with a leading healthcare provider showcases using OnGo Network to provide cost-effective coverage to the middleprise

Excellence in a WISP OnGo Deployment:

- **Ericsson (with Ohio TT, Winncom)**: Ohio TT Expanding Broadband to Rural Communities

Judges' Choice Award:

- **BearCom (with Airspan, Athonet, & BEC):** PLTE for Rent to Musical Festivals

Longmont, CO, USA

City of Longmont, Colorado

- Longmont is a growing community of 100K people ~ 10 miles Northeast of Boulder
- Began as a student broadband project to provide connectivity to 4,000 low-income student locations.
- The City of Longmont and their ISP (Nextlight) saw the possibilities of Private LTE and leveraging it for public security cameras.
- Network is currently at 37 base stations and will continue to expand.
- City planning to extend CBRS coverage across entire city in 2023

Closing the Digital Divide in Shreveport, LA with CBRS

Problem

- 40% of City residents lacked access to Wi-Fi at home
- Limited budget (American Rescue Funds)
- Tight timeline for deployment

Solution

- City contracted Spread Networks, who selected Pollen
- Pollen designed a RAN using CBRS radios on city buildings
- Spread Networks deployed the radios with Pollen support

Universal Digital Access

- Residents check out a CPE (Wi-Fi Hotspot) from the library
- City provides internet backhaul using existing network
- Pollen monitors and operates the Cellular network
- Spread Networks is working with city officials to expand into other underserved areas and improve coverage

Available from Graybar via Omnia Contract
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

ALEF

OMNIA PARTNERS | Public Sector

GraybaR

OMNIA PARTNERS

POWER. ACCESS. TRUST.

OMNIA PARTNERS PUBLIC SECTOR COOPERATIVE PROGRAM

GraybaR

OMNIA PARTNERS | Public Sector

- Competed Contract satisfies Public Solicitation Process
- 23 years and 20,000 cities / agencies
- Kansas City – Lead public agency
- No Cost / Non-Binding
- Products & Services eligible
- Best in Class Vendors
- National Volume
- Best Overall Value

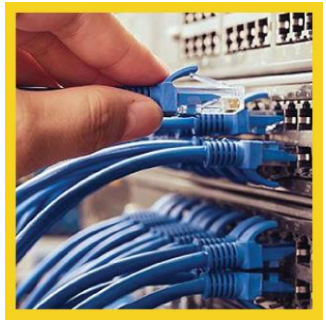
Key Benefits:

- **No RFP or Solicitation required**
- **Flexibility to choose suppliers and installation partners**
- **Shorten timeframes from concept to completion**
- **Great pricing resulting from competed contract**

GraybaR

TYPES OF PRODUCTS

Electrical



DataComm

Lighting & Controls

Power Distribution

Industrial Control & Automation

Conduit, Raceway & Cable Support

Wire, Cable & Wiring Devices

Power Protection & Maintenance Supply

GraybaR