

Smart
Cities
Council

"GETTING TO SMART"



Federal Broadband Funding

When: June 8, 11 am Eastern



Andy Lipman
Senior Attorney, Morgan Lewis

Presenting Sponsor: www.densenetworks.com

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CBRS/Private Networks 101

When: June 23, 11 am Eastern



Eric Toenjes
National Market Manager, Wireless
Graybar



Steve Wimsatt
Sr. Director, Commscope

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Connected Cities Tour "Getting to Smart"

Presenting Sponsor: **GraybaR.**

2022

The Tour returns in 2022 with a focus on how Network Technology and the Cloud are enabling innovative new capabilities and services.

We will look at successful Use Cases, Technology Architectures, Business Models and Funding mechanisms for Cities, Schools, Building Owners, Utilities and Transportation.

For More Information Contact:
PeterMurray@DenseNetworks.com
267-237-5907

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Dennis Henderson

Ready Wireless



Noelani McGadden

Senet



Paul Fettucia

ANS, Advanced Network Services



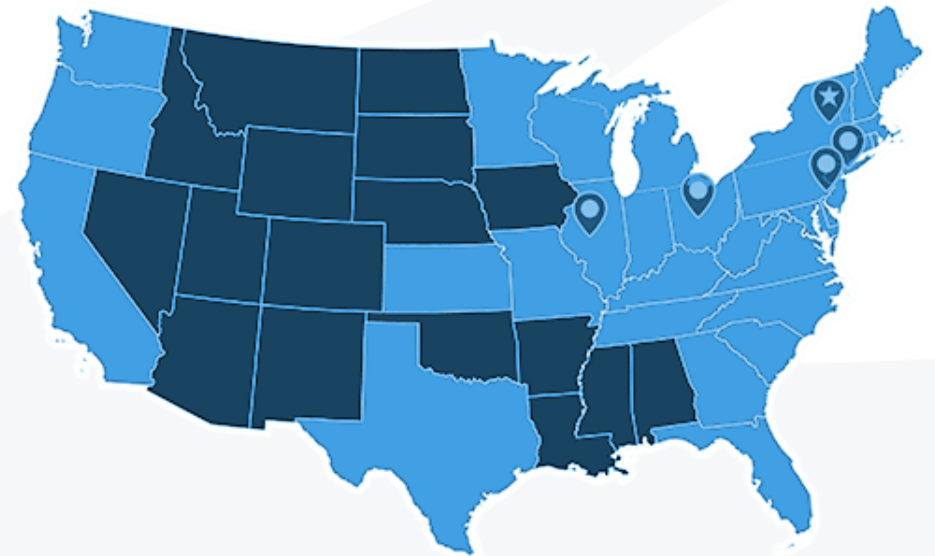
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ANS Advanced Network Services

Headquartered in **NY since 1991**

Regional operations centers –
Northeast, Midatlantic, Midwest

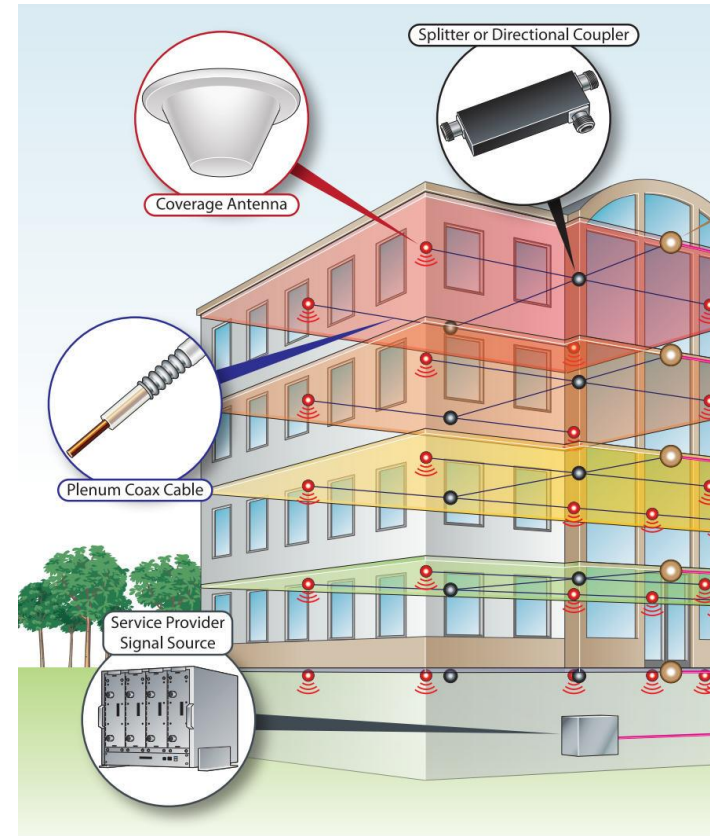
Suite of services include - In-Building Wireless, Tower Services, Network Infrastructure, DC Power Systems, AC Electrical, Monitoring & Maintenance and EV Charging Solutions



-  Headquarters
-  Warehouses and Offices
-  Service Areas

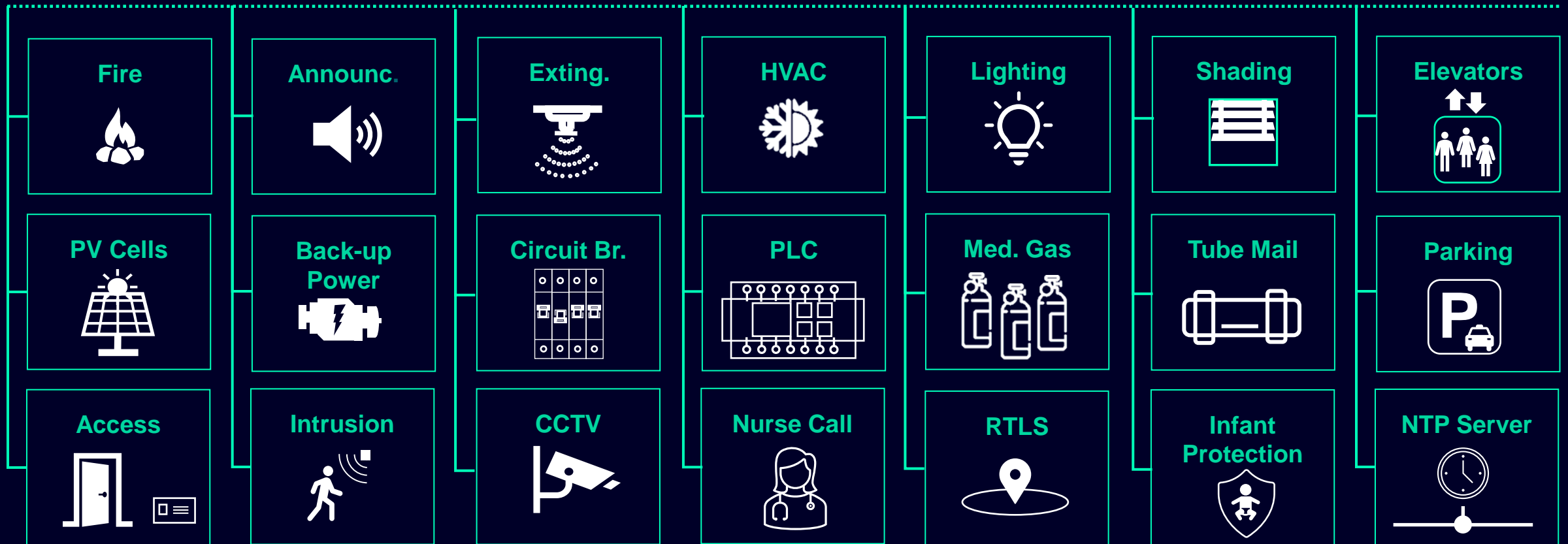
A Smart Building is a Connected Building

- Voice and data services for tenants via DAS and small cell networks
 - Convenience and business continuity
 - Ability to call 911 in case of emergency
- Emergency Responder Radio Communication System (ERRCS)
 - Ensures 2-way radio communications for first responders in case of emergency
 - Increasingly required by code
 - Responsible thing to do if not code required

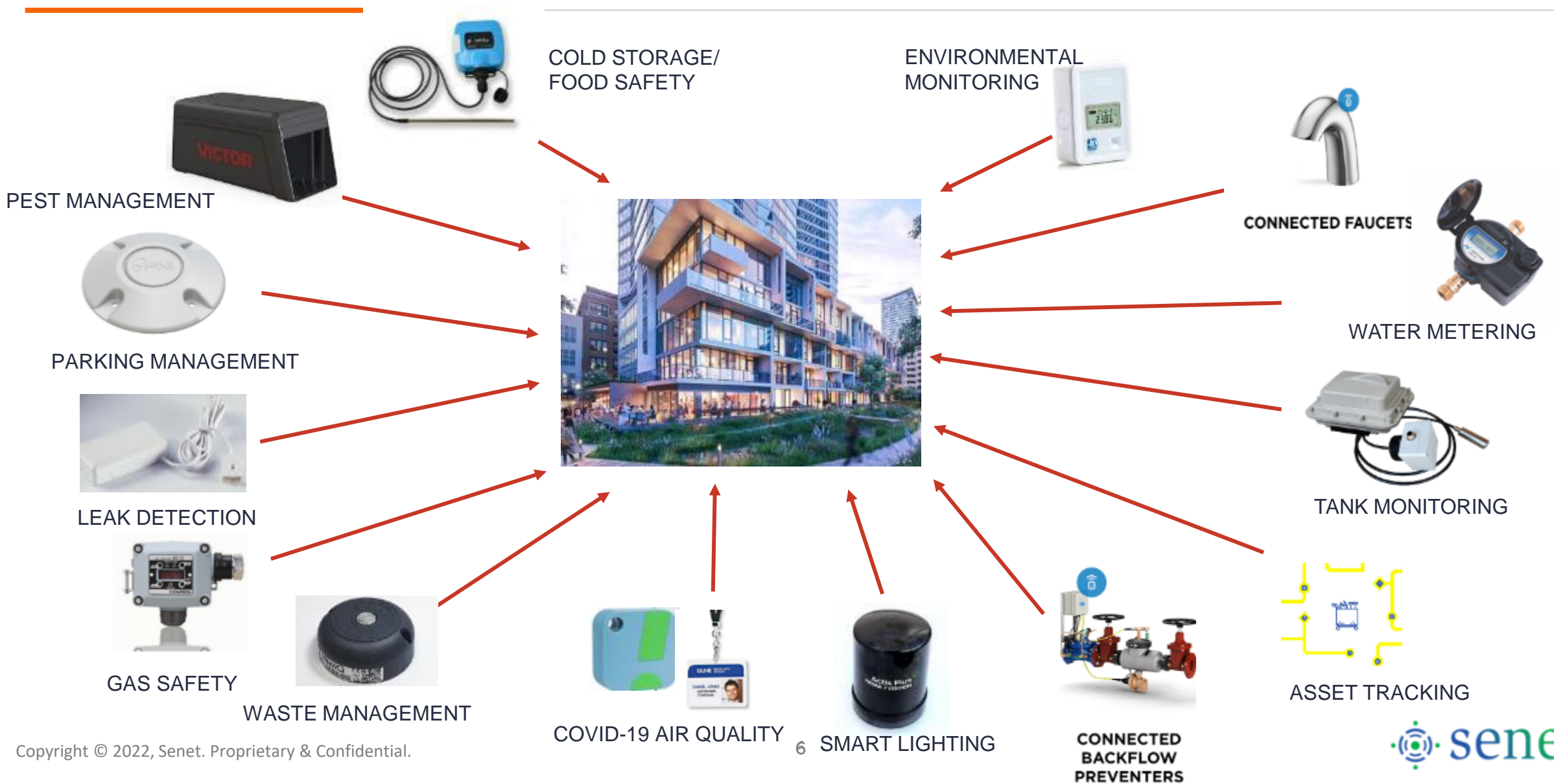


For maximum building and staff efficiency systems have to work together
Integration of systems is the foundation of any Smart Hospital

Smart Hospital Integration Layer



Connected City/Enterprise/Campus Opportunities



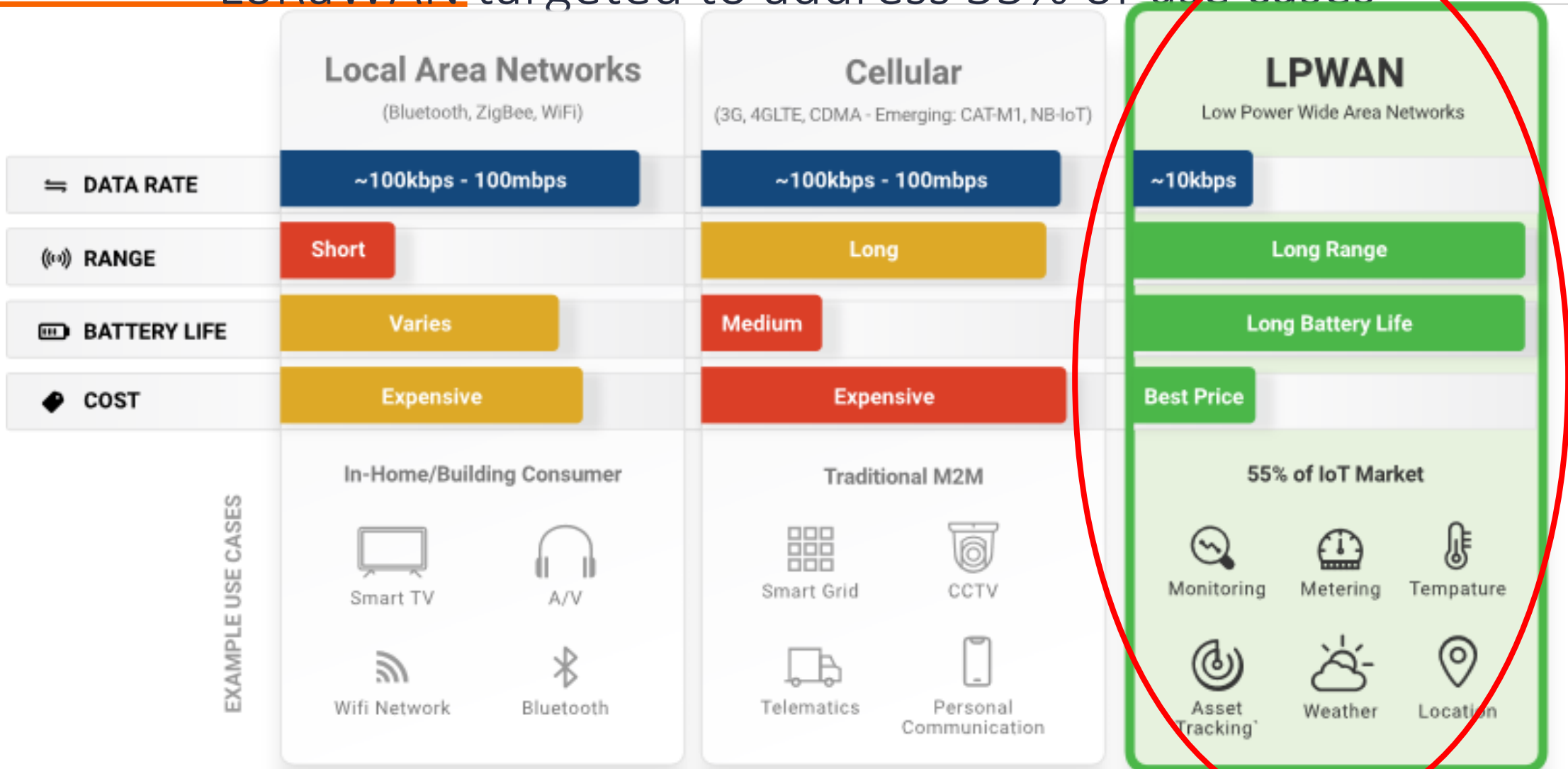
Long Range Wide Area Network



- Designed for low power devices to communicate over long range wireless connections
- Unlicensed radio bands (915 MHz in North America)
- Protocol is defined by the LoRa Alliance and formalized in the LoRaWAN specification
- Declared a global communications standard by the ITU (International Telecommunications Union) in 2021

IoT Connectivity Industry Landscape

LoRaWAN targeted to address 55% of use cases

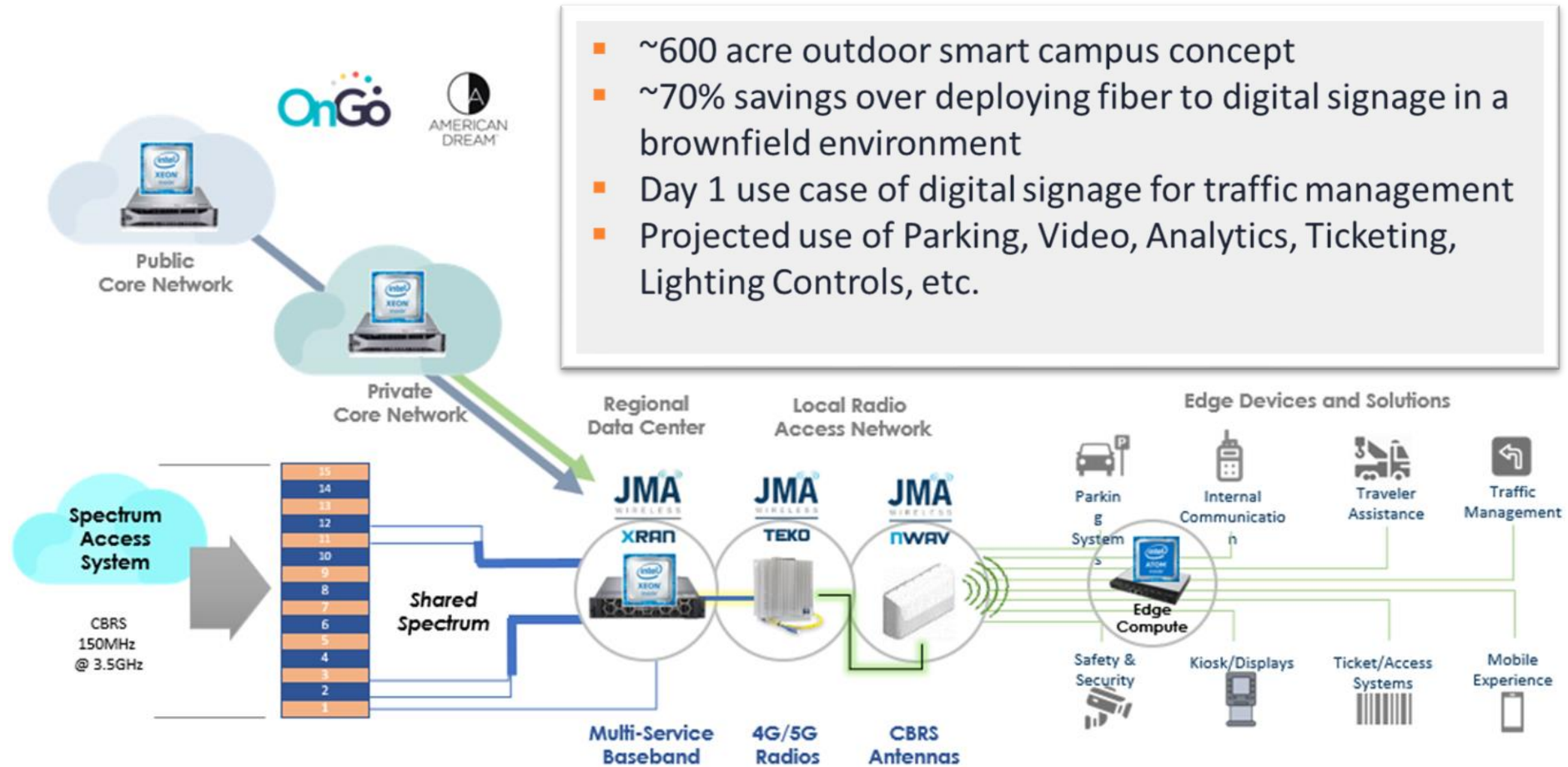


Smart Building Private 4G and 5G Networks

- ❑ CBRS based private 4G LTE and 5G networks
- ❑ Fiber-like connectivity and quality of service with the ability to deploy flexibly
- ❑ Network segmentation to support
 - ❑ Security for heating, lighting, sensors, building automation
 - ❑ Video and communications
 - ❑ Point of sale and tenant services
 - ❑ Path to carrier roaming



American Dream Entertainment & Retail Experience



- ~600 acre outdoor smart campus concept
- ~70% savings over deploying fiber to digital signage in a brownfield environment
- Day 1 use case of digital signage for traffic management
- Projected use of Parking, Video, Analytics, Ticketing, Lighting Controls, etc.

CASE STUDY: Water Metering & Mgmt.

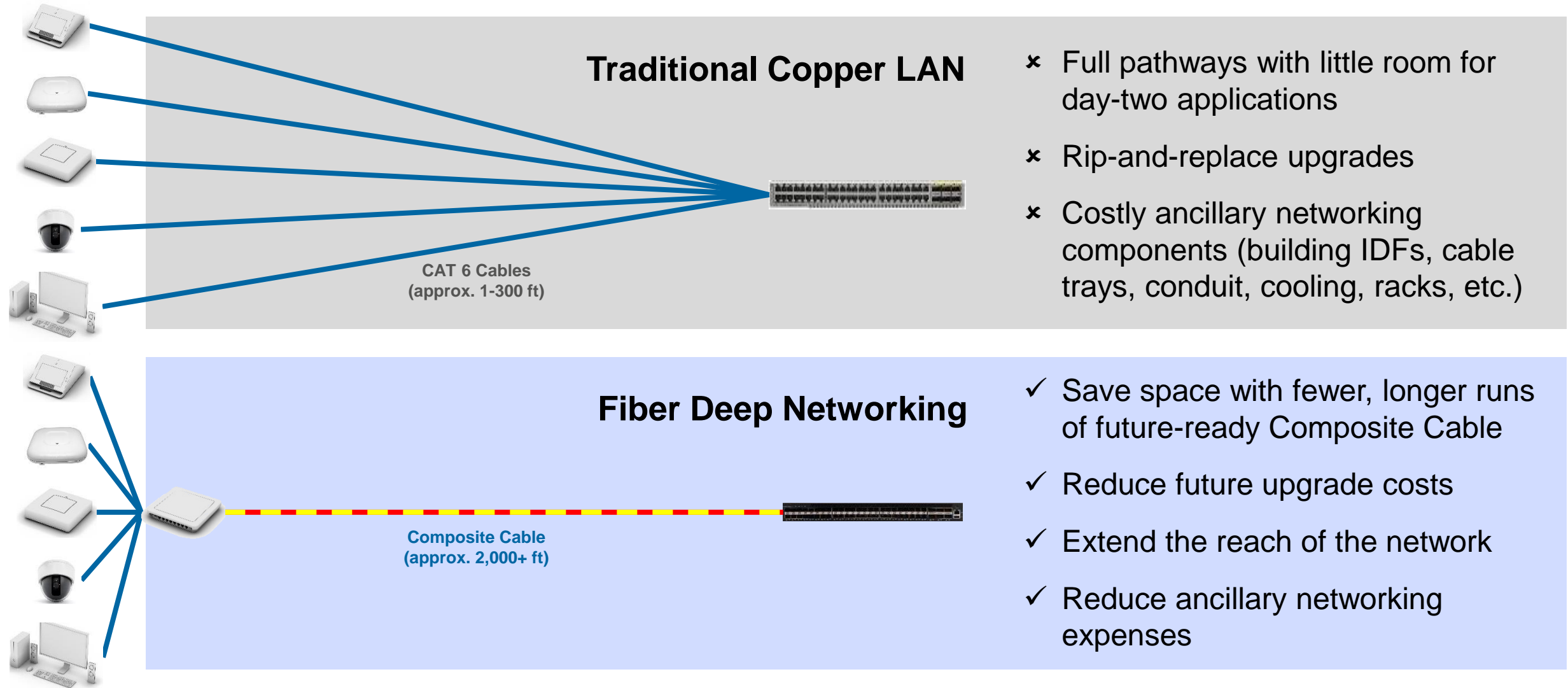
SENET PRODUCT: NaaS, LVN



- Connected water meters help utilities and municipalities boost efficiencies and accelerate sustainability efforts at the best possible total cost of ownership
 - Move from manual walk-by and drive-by systems (AMR) to fixed infrastructure (AMI)
 - Monitor significantly more assets with low-cost battery powered end devices
 - Provide visibility into the health of the distribution network
 - Use detailed, near real-time data and analytics to deliver more predictive and proactive services
 - Make better informed decisions in support of regulatory compliance requirements
 - Increase billing accuracy, and operational and management efficiencies

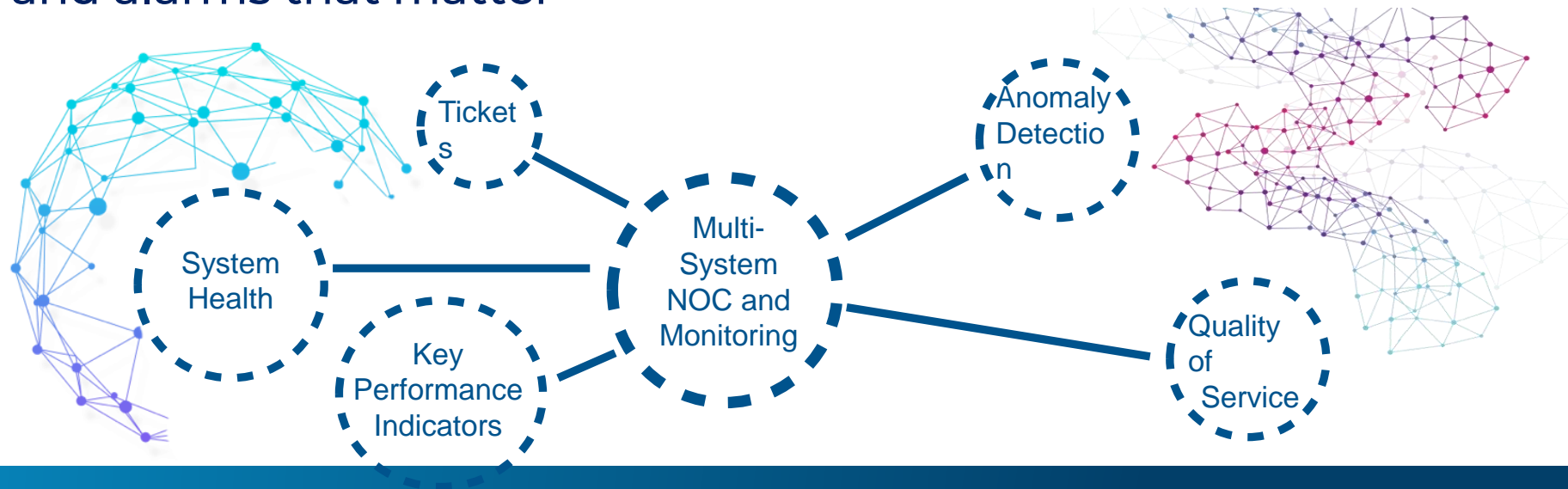


Smart Buildings Need Smart Networks



Systems Monitoring and Visibility

- ❑ System agnostic monitoring and maintenance to ensure uptime and business continuity across platforms in the smart building
- ❑ Knowledgeable NOC with tight processes and a flexible monitoring platform
- ❑ Proactively identify issues before customer complaints
- ❑ Single-pane of glass for multiple systems with the key performance indicators, tickets, and alarms that matter



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www.densenetworks.com



Julia Richman
State of Colorado



John McGrath
Network Connex



Ryan Trujillo
Colorado Spring



Tim Scott
Boulder/Centennial



CURRENT PROGRAMS:

Federal Communications Commission

1. Connect America Fund Program
2. Schools and Libraries (E-Rate) Program
3. Rural Health Care Program
4. Lifeline Program
5. Rural Digital Opportunity Fund
6. 5G Fund for Rural America
7. Emergency Connectivity Fund
8. Affordable Connectivity Program*
9. COVID-19 Telehealth Program

Rural Utilities Service (USDA)

1. Rural Broadband Access Loan Program
2. Telecommunications Infrastructure Loans Program
3. Community Connect Grant Program
4. ReConnect Program*
5. Distance Learning and Telemedicine (DLT) Grant Program*

National Telecommunications and Information Administration

1. Connecting Minority Communities
2. Broadband Infrastructure Program
3. Tribal Broadband Connectivity Grant Program*

Treasury Department

1. Coronavirus State and Local Fiscal Recovery Funds
2. Coronavirus Capital Projects Fund

Over \$100 Billion in Funding

*Renewable



FCC Internet Benchmarks

Qualifies for Federal & State Investment

Date Adopted	Minimum Download	Minimum Upload	FCC Commissioner
2015	25 Mbps	3 Mbps	Tom Wheeler, D
2010	4 Mbps	1 Mbps	Julius Genachowski, D
1996	200 Kbps	200 Kbps	William Kennard, D

Federal Construction Requirements

Reliable 100/20 Mbps scalable to 100/100 Mbps (symmetric)



American Rescue Plan Act (ARPA) – Treasury Department

Program	Funds Allocated	Program Details	Eligible Recipients	Application Window
State and Local Fiscal Recovery Funds	\$350 billion	<p>Program seeks to support urgent pandemic-response efforts, replace lost revenue for state and local governments, strengthen support for vital public services, and address public health and economic challenges.</p> <p>Allows recipients to use funds for broadband infrastructure, among other investments such as public health, replacement of public sector revenues, premium pay for essential workers, etc.</p> <p>Requires networks symmetrical speeds of 100 Mbps, unless exemption, then 100/20 Mbps but scalable to symmetrical 100 Mbps.</p>	<p>Grants awarded to states</p> <p>No restrictions on eligibility for subgrants</p>	<p>States received 50% of funds in mid-2021, will receive rest in mid-2022.</p> <p>States will administer own subgrant programs, but all funds must be expended by end of 2024.</p>
Coronavirus Capital Projects Fund	\$10 billion	<p>Program designed to allow recipients to invest in capital assets, including infrastructure, that meet communities' critical needs in the short- and long-term.</p> <p>Key priority of program is for broadband infrastructure and other digital connectivity technology projects.</p> <p>Requires networks symmetrical speeds of 100 Mbps, unless exemption, then 100/20 Mbps but scalable to symmetrical 100 Mbps.</p>	<p>Grants awarded to states</p> <p>No restrictions on eligibility for subgrants</p>	<p>Application window for states closed December 27, 2021; for Tribal governments, will close June 1, 2022.</p> <p>Sub-grantees may begin receiving funds in 2022 from state programs.</p>

Allocation	Amount	Agency
Federal Broadband Infrastructure Funding	<i>\$65 Billion allocated (\$0.06 billion for other)</i>	NTIA
Middle-Mile Broadband Deployment Grant Program	\$1.0B	NTIA
Digital Equity Competitive Grant Program	\$1.25B	NTIA
State Digital Equity Capacity Grant Program	\$1.5B	NTIA
Distance Learning, Telemedicine, and Broadband (DLT) Program & ReConnect Program	\$2.0B	USDA
Tribal Broadband Connectivity Program	\$2.0B	NTIA
Affordable Connectivity Program	\$14.2B	FCC
Broadband Equity, Access, and Deployment Program	\$42.45B	NTIA



What is the range of options?

\$150M

Investment and Risk

Ontario: fiber master plan 2013: = projected \$6.7M; \$905K annual enterprise revenues Estimated payback: 84 mos.

Ontario, CA

Retail Provider Residential

Town of Breckenridge CO

Retail Provider Business Only

Centennial: since 2016 - \$5.8M capital cost Goal - annual O&M covered by leases

Centennial, CO

Open Access Provider

Any Town or City

Public-Private Partnerships

Risk and Reward - Tradeoffs

?

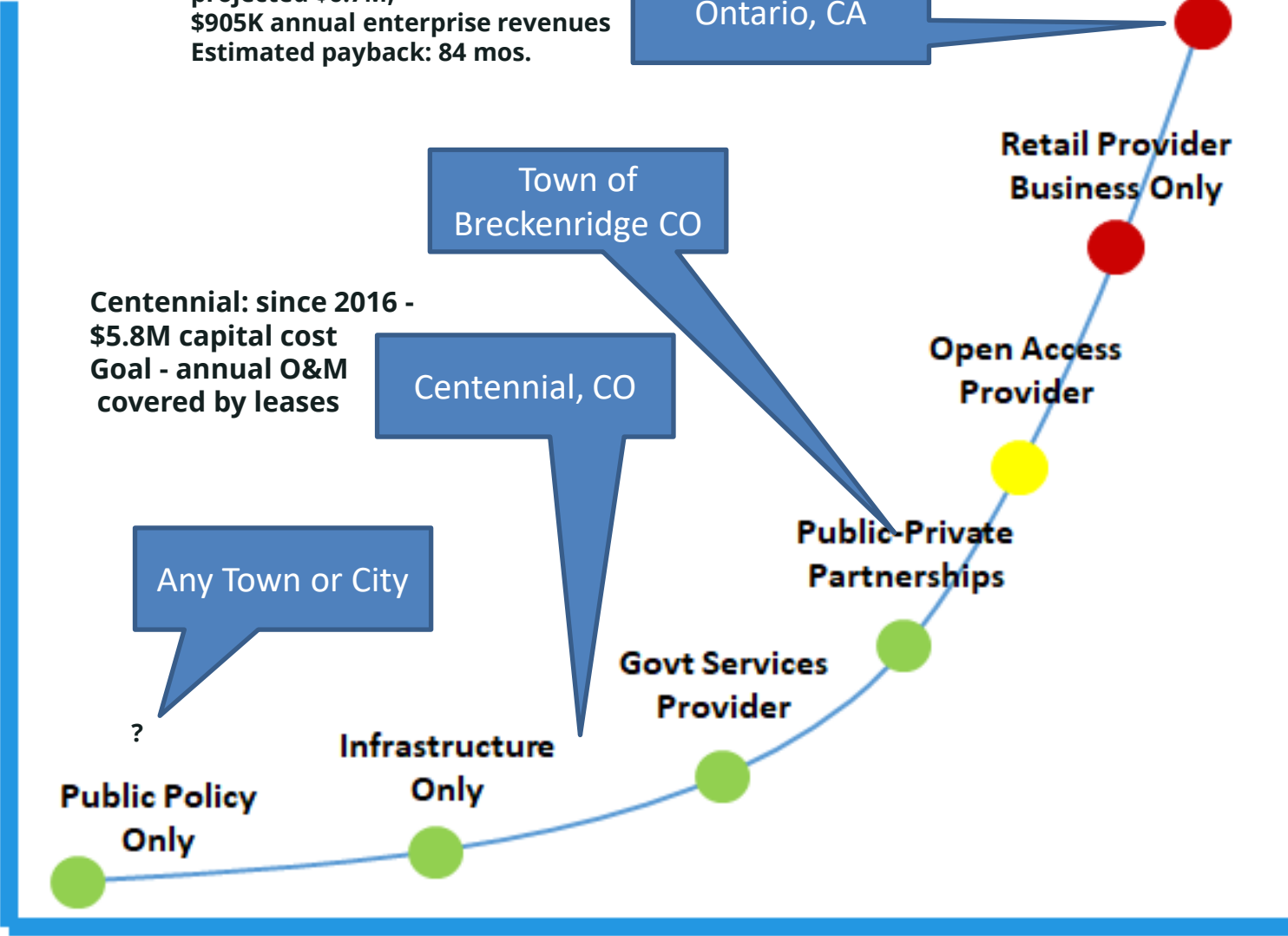
Govt Services Provider

Public Policy Only

Infrastructure Only

\$0

City Control & Community Benefit



SmartCOS Roadmap



SMART DATA



SMART ENVIRONMENT



SMART ENERGY

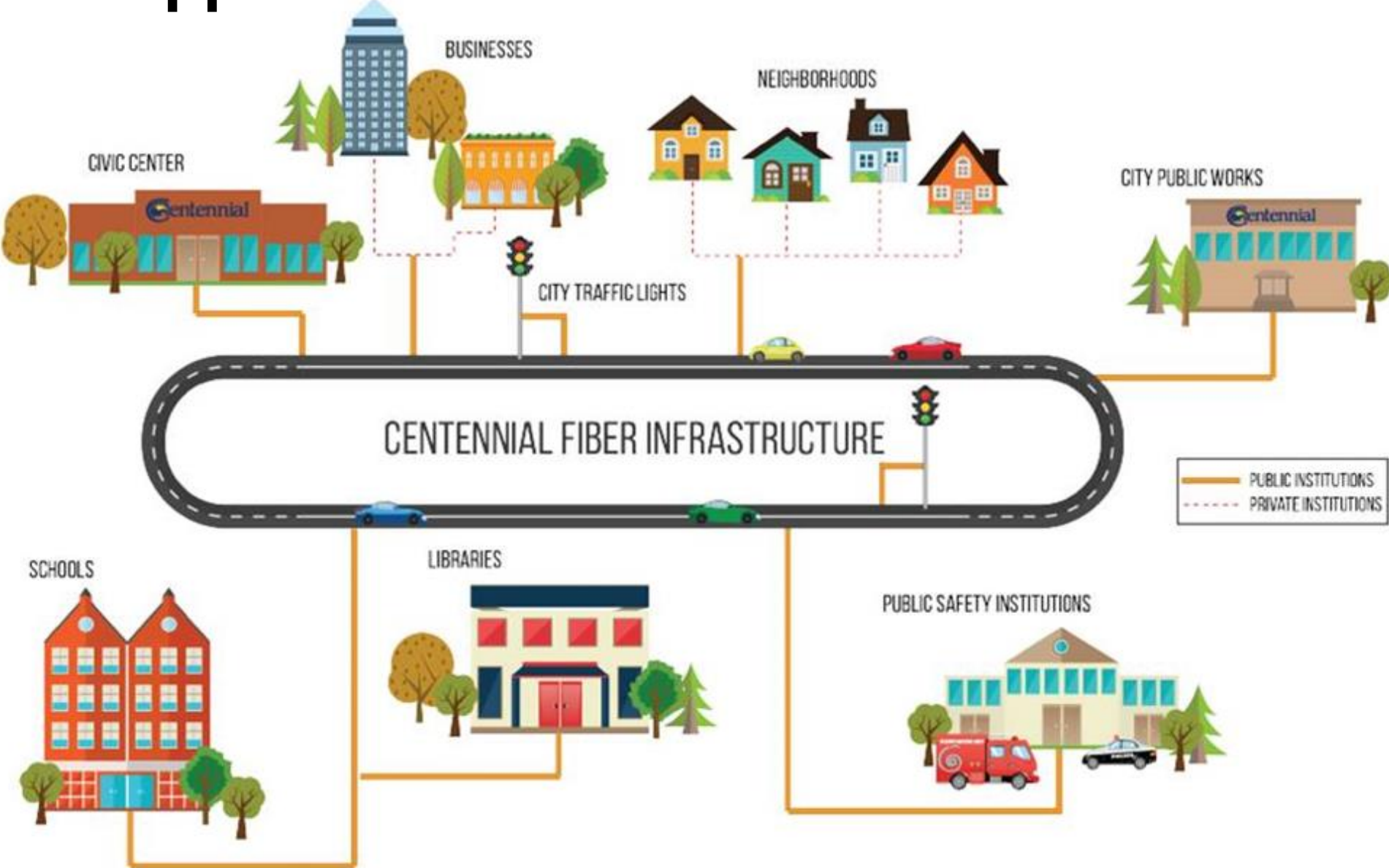


SMART ECONOMY

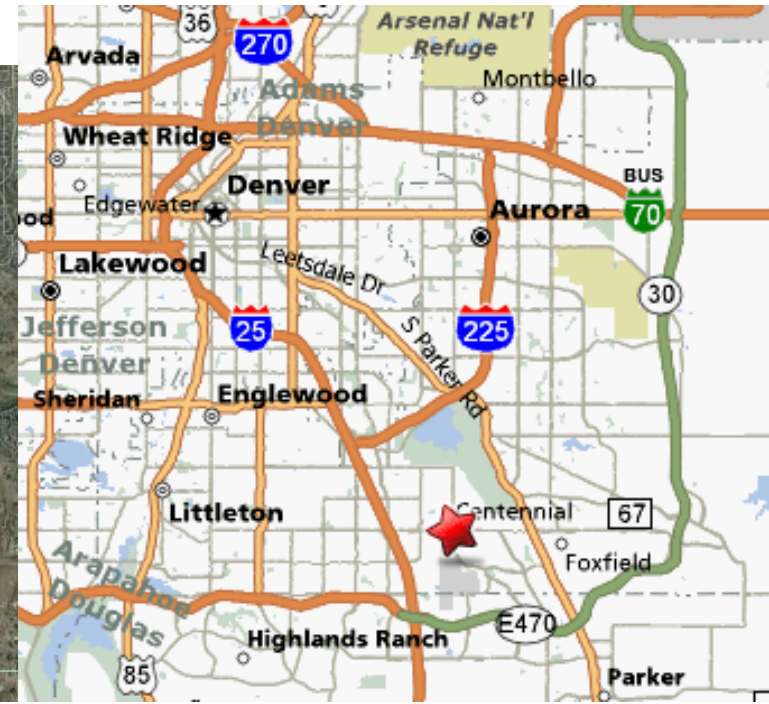
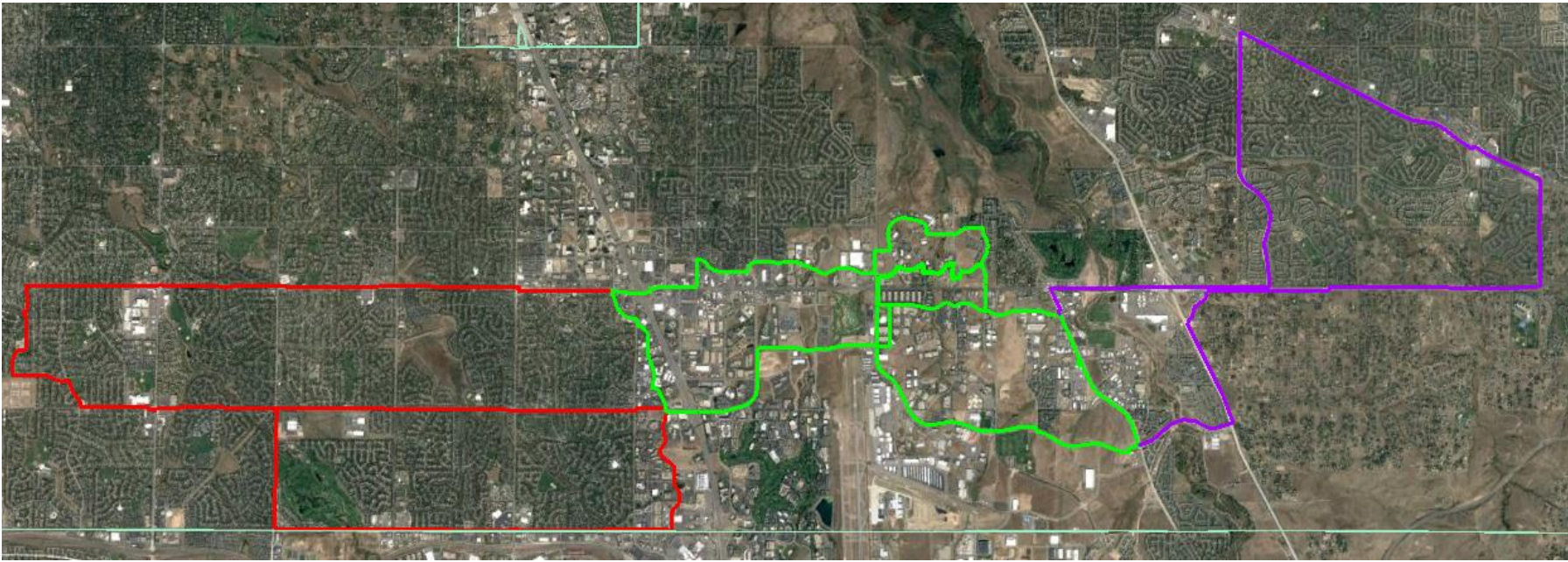
Why this plan?

Our SmartCOS Roadmap launches a conversation in the City and community about how the Office of Innovation can improve organizational processes, implement creative solutions to overcome organizational obstacles, and ensure a sustainable and resilient future for Colorado Springs.

Opportunities & Decision Points





Fiber Backbone Open Access Model



CENTENNIAL
FiberWorks

Fiber Backbone – Rings and Status

-  Central Ring – Constructed
-  East Ring – Under Construction
-  West Ring – Under Construction

Digital Infrastructure

Fiber

IoT

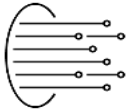
Cell-Macro, Small & DAS

Wi Fi

Private LTE & 5G

Smart Poles

Devices



LoRa®



Lighting +



Cameras



Kiosks



Computers/Tablets



Sensors

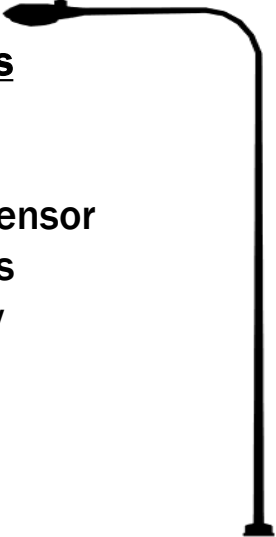
San Jose Broadband Strategy

STREETLIGHT

Light/Safety

Properties

- Height
- Power
- Light Sensor
- Lumens
- Density

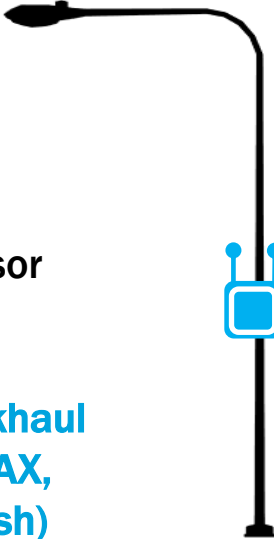


SMALL CELLS

Broadband Digital Infrastructure

Properties

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

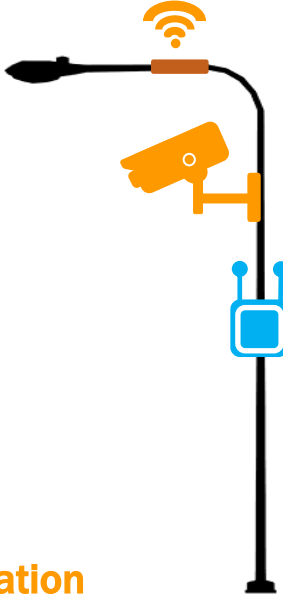


INTERNET OF THINGS

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

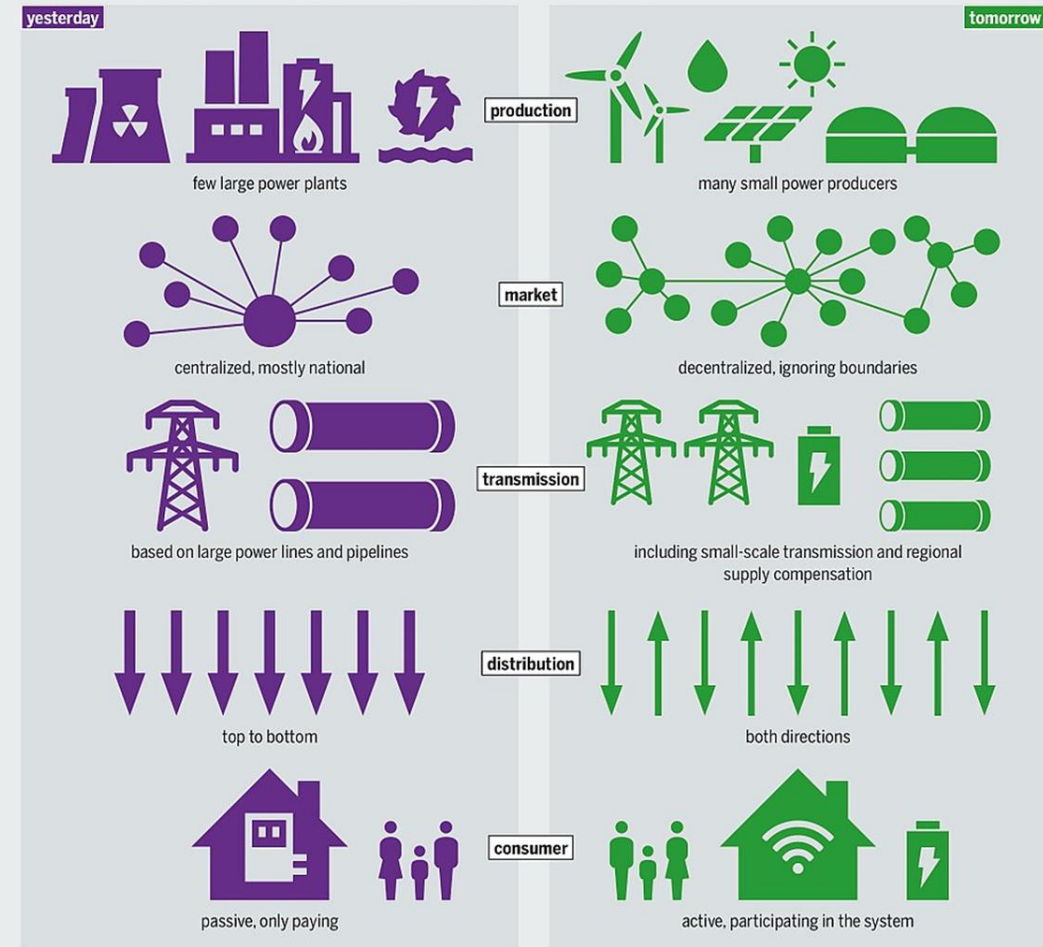
Seek to Understand with Knight IoT Grant

Utility Lease Model



STAYING BIG OR GETTING SMALLER

Expected structural changes in the energy system made possible by the increased use of digital tools



Utility Lease Model



Utilities of the Future:

- Over 2,000 miles of fiber buildout over the next 6 years
- Demand Side Management
- Distributed generation
- Advanced Metering Infrastructure

Fiber connectivity available to:

- Every address
- Every signalized intersection
- Every street light

Enabling infrastructure:

- High speed
- Low latency
- Highly secure
- Highly reliable

Office of Innovation





Broadband in COS



FiberWorks Network Users



Broadband & Digital Equity



Bridging the Digital Divide

1. Affordable, robust broadband internet service
2. Internet-enabled devices that meet the needs of the user
3. Access to digital literacy training
4. Quality technical support
5. Application & online content designed to enable and encourage self-sufficiency, participation and collaboration



Digital Equity



A Programmatic Approach to Digital Equity

- \$800k ARPA funding
- Developing tools and resources for our citizens
 - Digital literacy
 - Cybersecurity
 - Cyber-bullying
 - Telehealth
 - Technical support





Office of Innovation

Smart Data

Emphasize technology-enabled solutions that are data-driven and committed to democratic processes that maximize collaboration and trust between residents and local government.

- Broadband & Digital Equity
- 5G
- Data Management Program





Office of Innovation

Smart Environment

Adopt practices that incentivize clean energy, investment in existing infrastructure, and new projects that are environmentally responsible to enhance the health and longevity of our City, its residents, and visitors.

- SustainableCOS
- Environmental Sensors
- Smart Waste





Office of Innovation

Smart Energy

Partner with Colorado Springs Utilities and other stakeholders to embrace energy choices that will allow the City to develop and thrive sustainably.

- Electric Vehicle Readiness Plan
- Smart Streetlights
- Advanced Metering Infrastructure





Office of Innovation

Smart Economy

Foster an inclusive and sustainable economy that supports responsible resource use, diverse employment opportunities, and a resilient workforce.

- Multi-Modal Transportation Counters
- Smart Kiosks



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www.densenetworks.com



Scott Swisher

Signify



Scott Jackson

Graybar



Dr. Mo Shakouri

Joint Venture Silicon Valley



Piyush Raj

SBA



Alex Freylekhman

Telrad



Fiber, Power & Poles are the Foundation for a Smart City



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 ml. / 450 m Range



Lighting

Energy efficiency connected luminaires

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

Residential Broadband Technology

Best Available Technology Class

- Fiber | Speeds \geq 100 Mbps/100 Mbps (symmetric)
- Cable (DOCSIS 3.1+) | Speeds \geq 100 Mbps/100 Mbps (symmetric)
- Cable (DOCSIS 3.0) | Speeds \geq 100 Mbps/20 Mbps
- Cable (DOCSIS $<$ 2.0) | Speeds \geq 25 Mbps/3 Mbps
- VDSL (Fiber-To-The-Curb) | Speeds \geq 10 Mbps/1 Mbps
- ADSL2, ADSL2+ | Speeds \geq 6 Mbps/1 Mbps
- Fixed Wireless | Speeds \geq 10 Mbps/1 Mbps
- ADSL | Speeds \geq 3 Mbps/768 kbps
- No Internet Service Available
- Zero Households



Copper & Fixed Wireless

Copper technology (xDSL) cannot deliver reliable 25/3. End of useful life.

Fixed Wireless requires optimum conditions to exceed 25/3; however, it delivers *Speed to Access* meaning that high need areas have the potential to get coverage fast while physical connections to each house are built.



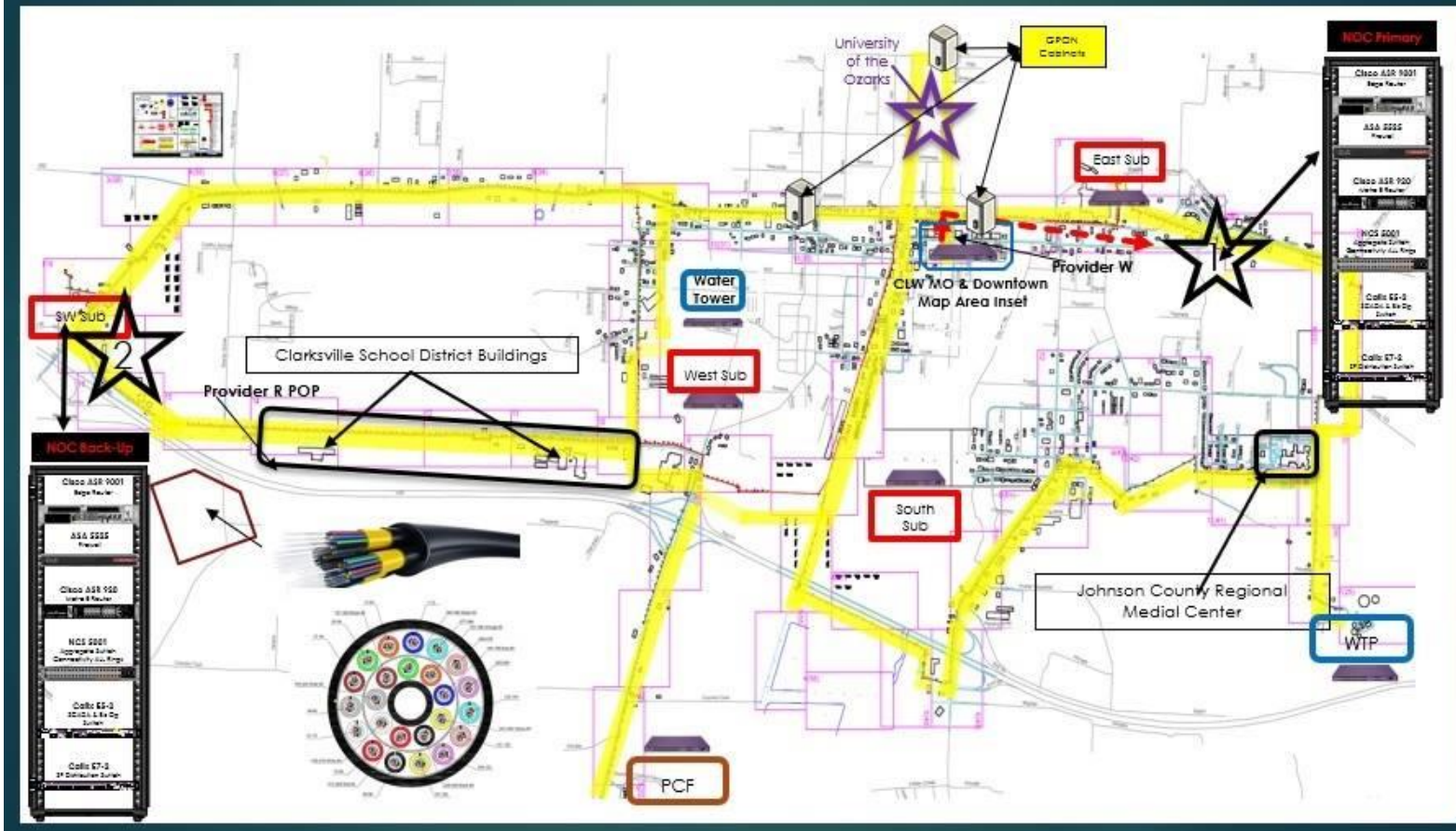
No Internet Options Exist

This has nothing to do with affordability!
Customers in these areas cannot receive service at their physical address.



17+ Miles Fiber Optic Network, Already Installed

Yellow Highlight Indicates the Exist "Core" Route around Clarksville



CLARKSVILLE
CONNECTED UTILITIES



DenseNetworks.com

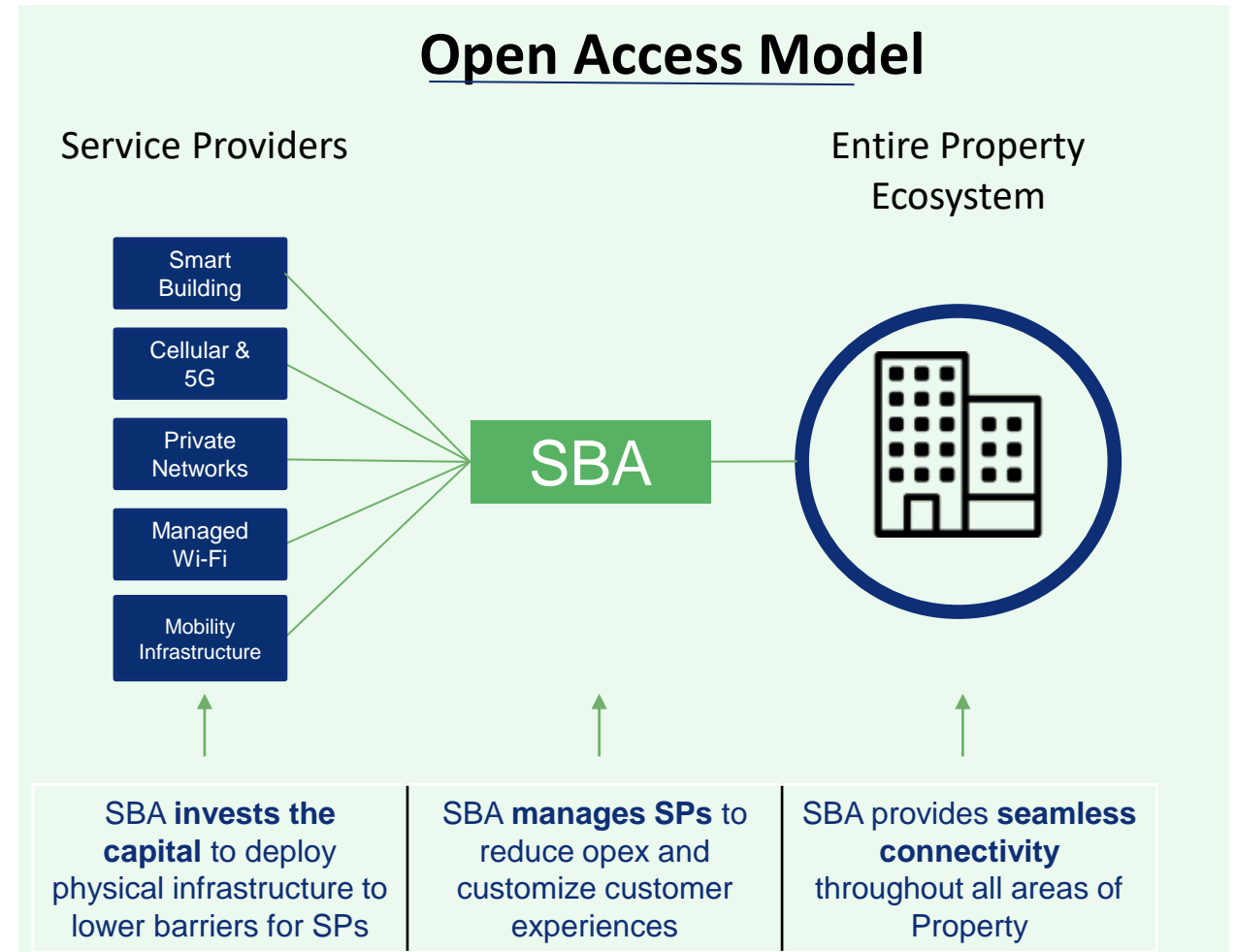
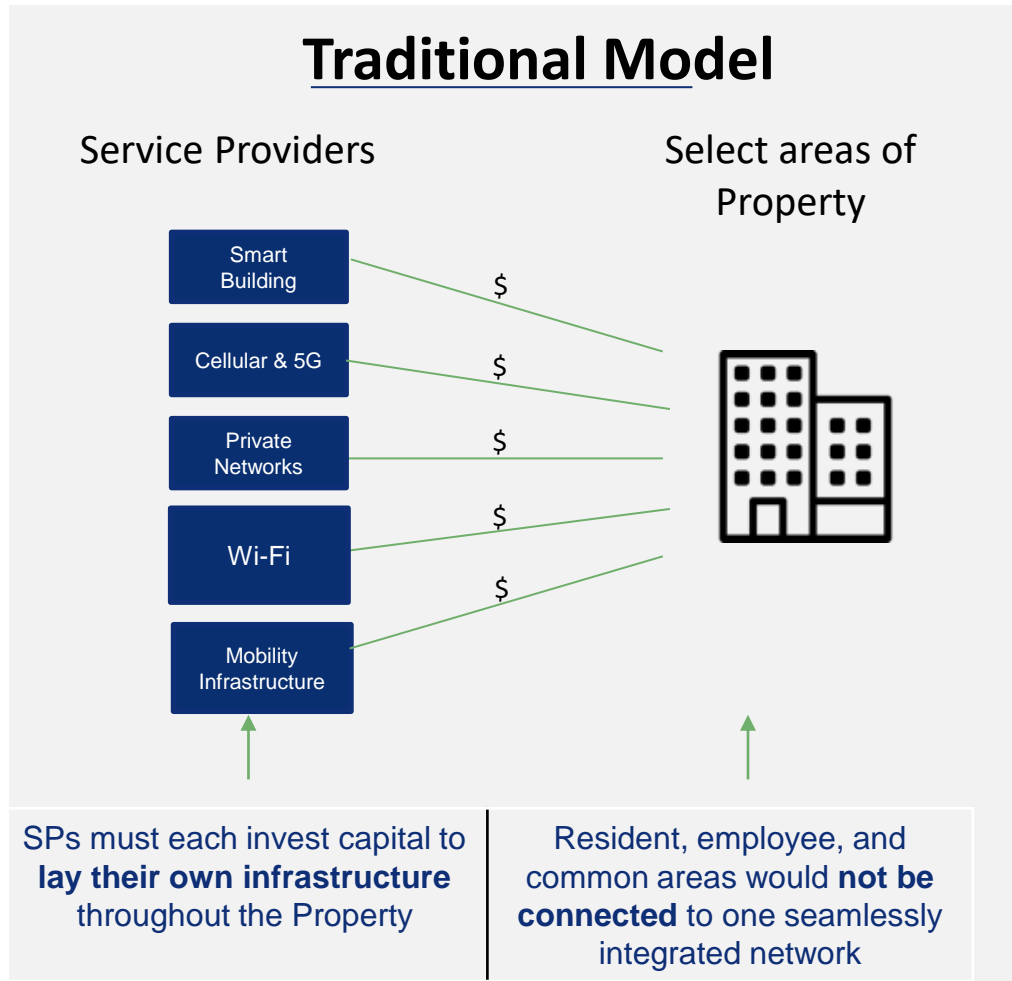
Hybrid Private Network



The Open Access Model – How it Works



Traditional connectivity models require one or more carriers to invest in infrastructure; SBA's open access model provides the investment and leaves room for all types of service providers

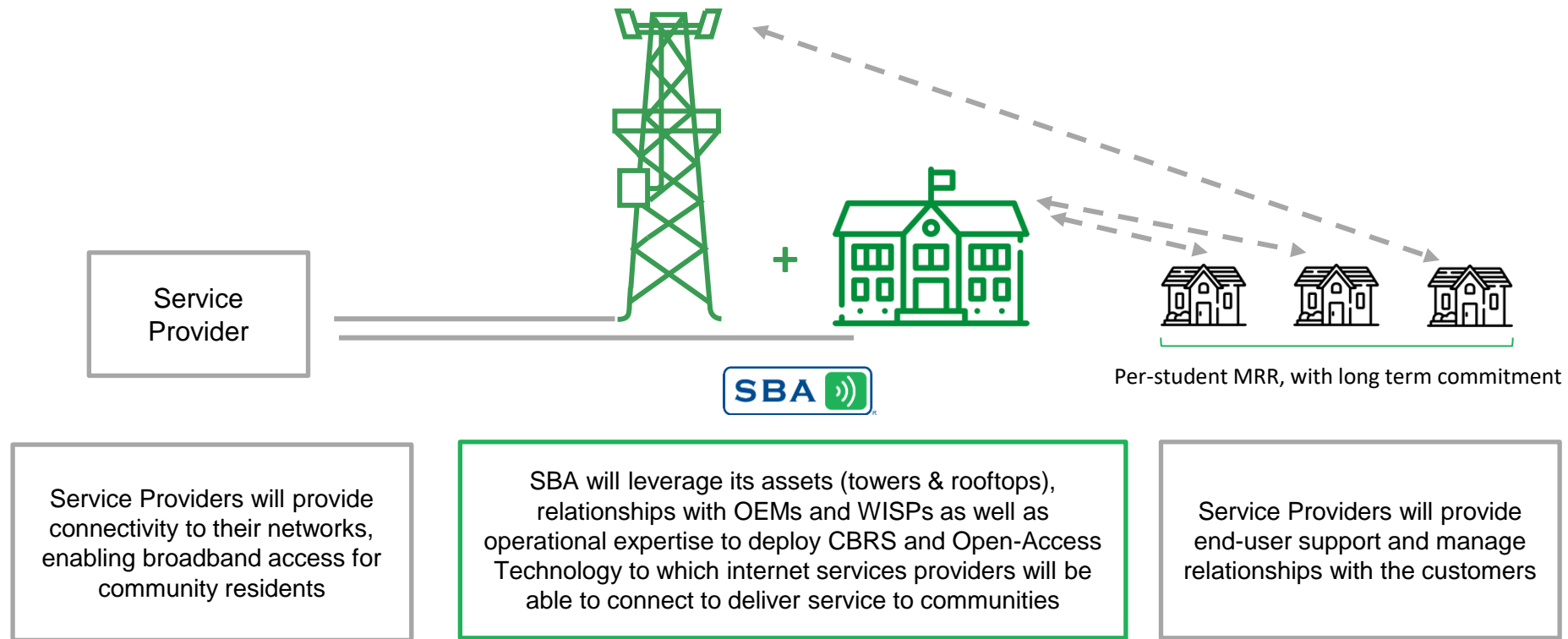


SBA is also responsible for all infrastructure maintenance, replacement, and upgrades

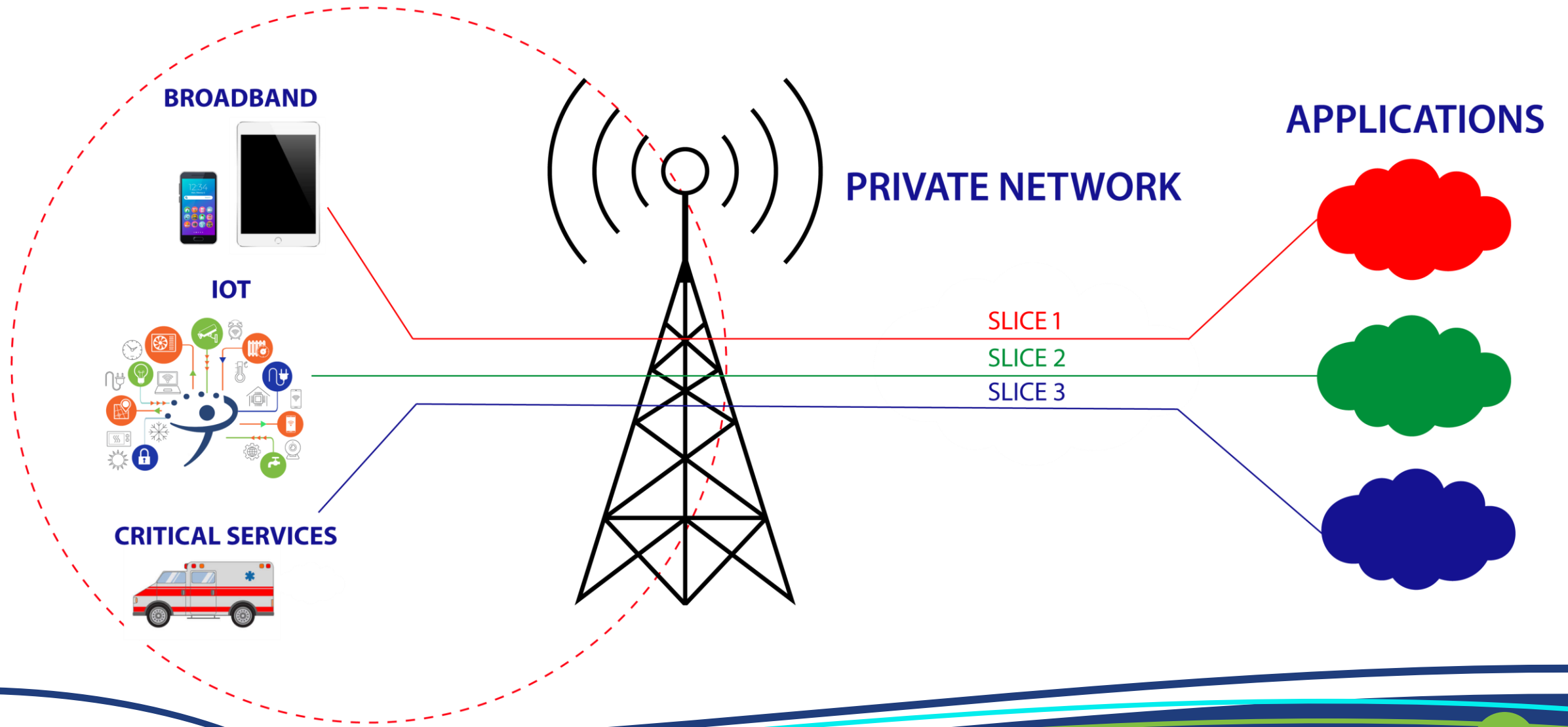
How the Open Access Model Works



With an ecosystem of partnerships, SBA is positioned to deliver a valuable solution to distributed connectivity needs; in the proposed model, SBA and Internet Service Providers will enter into a long-term agreement to provide broadband connectivity to local students using CBRS and Open-Access Technology



Network Ownership and Slicing



📶 [P] TLRD pLTE LTE

📶 [V] Verizon



98% 



Vendor Agnostic RAN

Seamless roaming between public and private networks

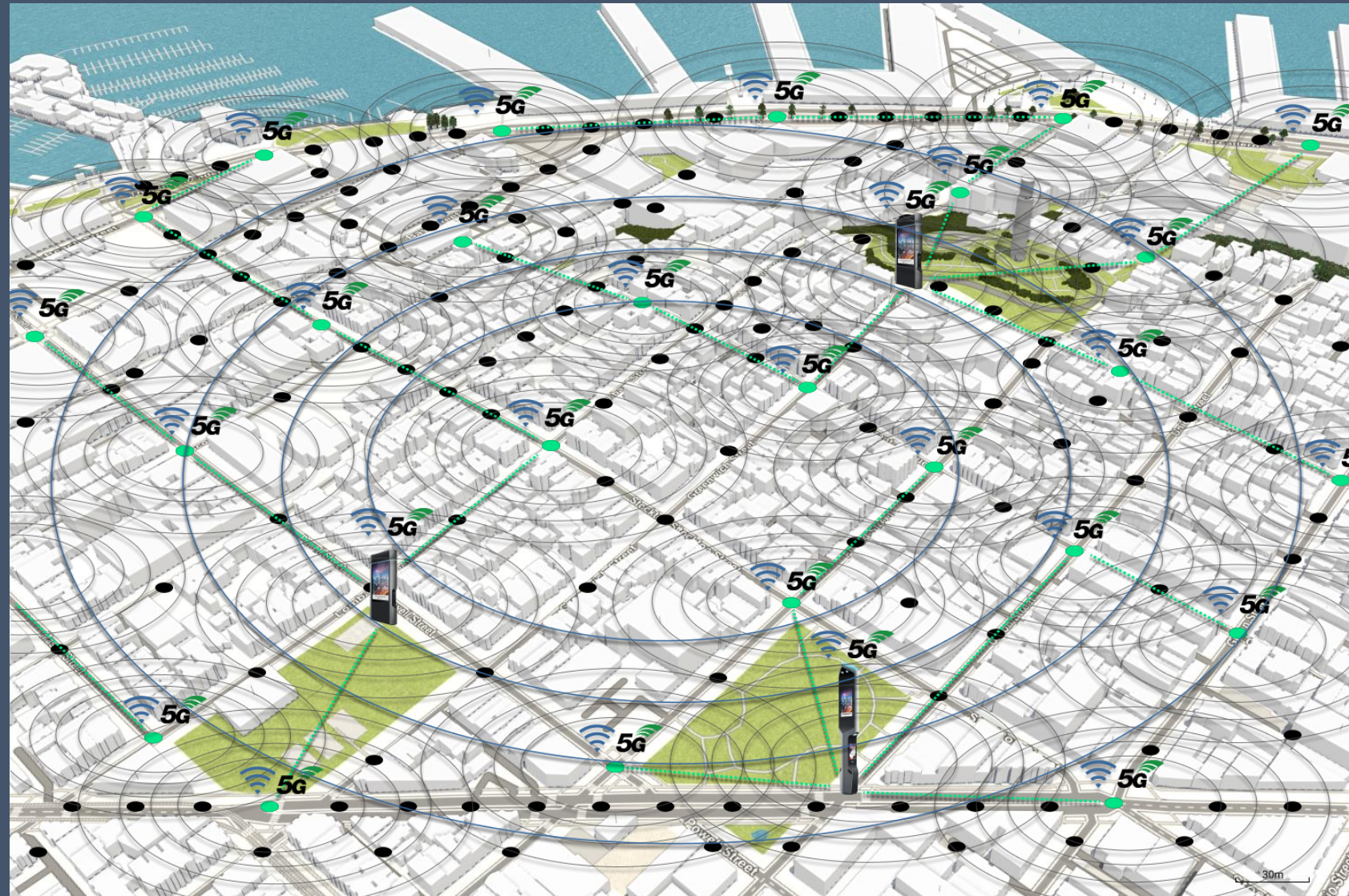
Enhanced Security Features

APIs and integrations to other cloud/services

Any Phone, Any UE, Any SIM physical SIM, eSIM and iSIM

Lighting is the key enabler for the connectivity grid of the future

- 1 Light pole grid
- 2 Smart Hub
- 3 Upgrade pole
- 4 Activate pole
- 5 Meshed network



[The Grid of the Future - YouTube](#)

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

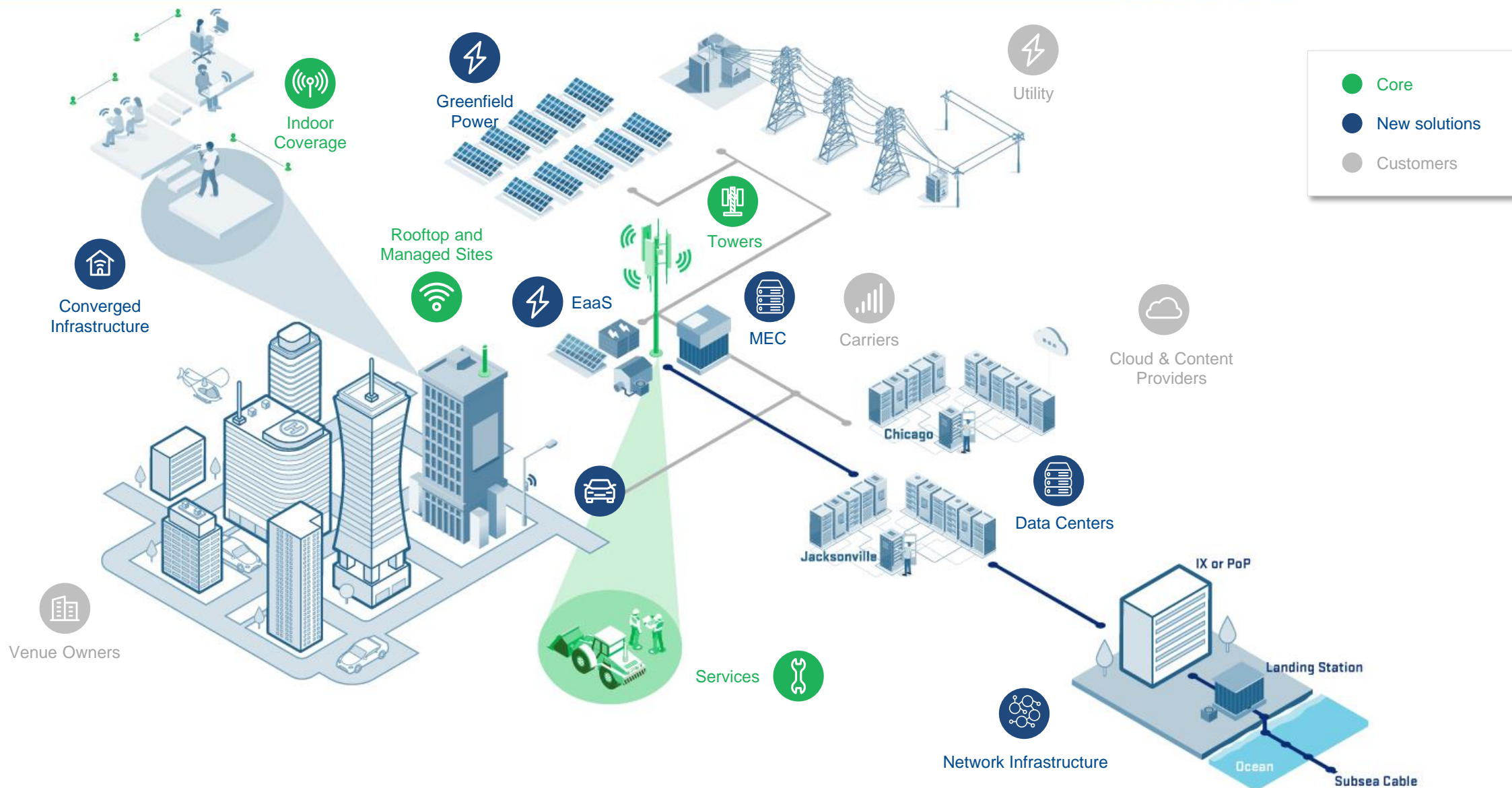


C7011 –
Gardco Form 10



C7012 –
Hadco PureForm

SBA is focused on enabling 5G connectivity through communications infrastructure assets and solutions



OMNIA

PARTNERS

POWER. ACCESS. TRUST.

**OMNIA
PARTNERS
PUBLIC SECTOR
COOPERATIVE
PROGRAM**



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