COMPANY OVERVIEW

May 2021

Siklu

ZURICH
TECHNOLOGY SOLUTIONS

Company Snapshot

Siklu is a leading player in mmWave solutions

Founded:
2008

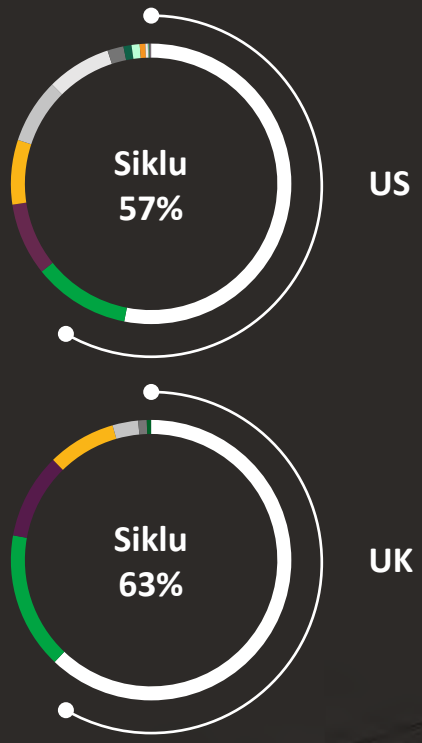
Employees:
+100; Headquarter in Israel; Presence in USA, CALA, EMEA and APAC

Technology:
Groundbreaking all-silicon innovations, mastering the art of millimeter waves fixed wireless networks

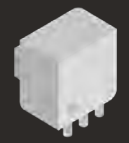
AI tools and apps for planning and design of Fixed 5G mmWave networks.

Leading E Band vendor in the US and the UK
According to FCC & OFCOM

2019



Most Comprehensive mmWave offering


60GHz
V-band PtP


60GHz
V-band PtMP


60GHz V-band
mesh with
SON/SDN


70-80Ghz
E-band PtP


Network Design and
Operations Tools

Most Deployed Links

45+
Countries

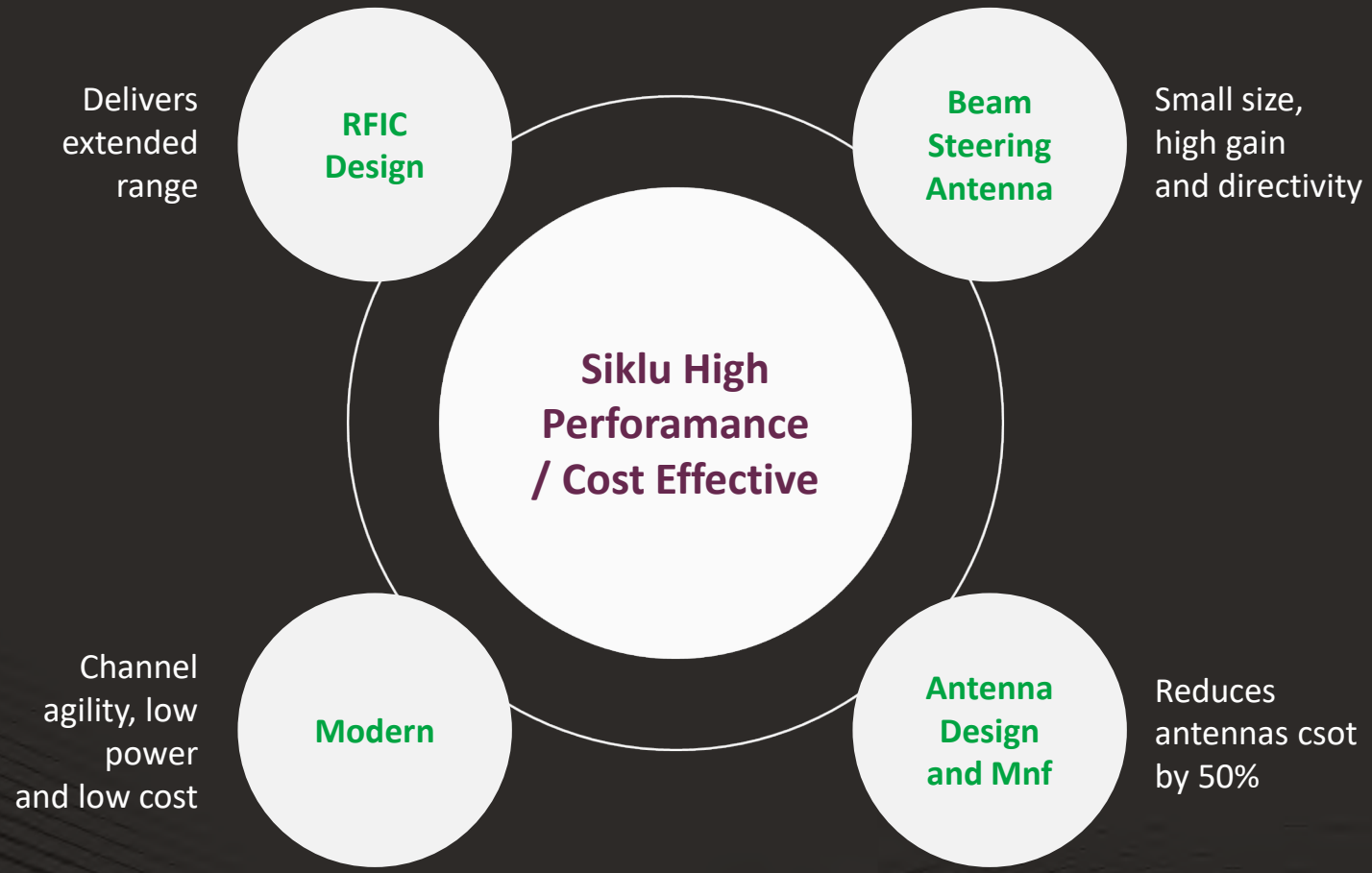
100K+
Deployed

250+
Smart Cities

40
Patents

Siklu Technology and Leadership

40 Patents



Systems and Boards

01

WHY WIRELESS FIBER

Gbps Connectivity Options

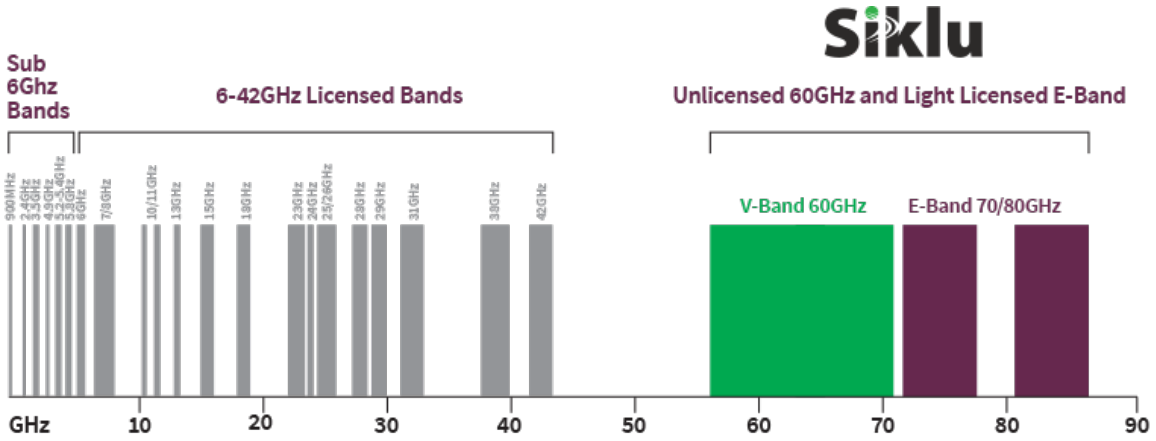
Siklu's Fixed 5G offers the best, most cost-effective solution vs. Fiber and Cellular

FIBER	LEGACY (5.xGHz) WIRELESS	Cellular 5G NR	Siklu mmWave Fixed 5G
+ Secure	− Easily hacked	+ Secure	+ Secure
+ Multi Gigabit capacity	− Limited capacity	+ Multi Gigabit capacity	+ Multi Gigabit capacity
− Expensive	+ Low cost	− High cost – Monthly Fees	+ Affordable
+ Very Low Latency	− High Latency	+ Low Latency	+ Very Low Latency
+ Reliable	− Interference	+ No Interference	+ Reliable, Immune to interference
− Slow time to market	+ Fast Time to market	− Time to Market - carriers	+ Fast Time To Market

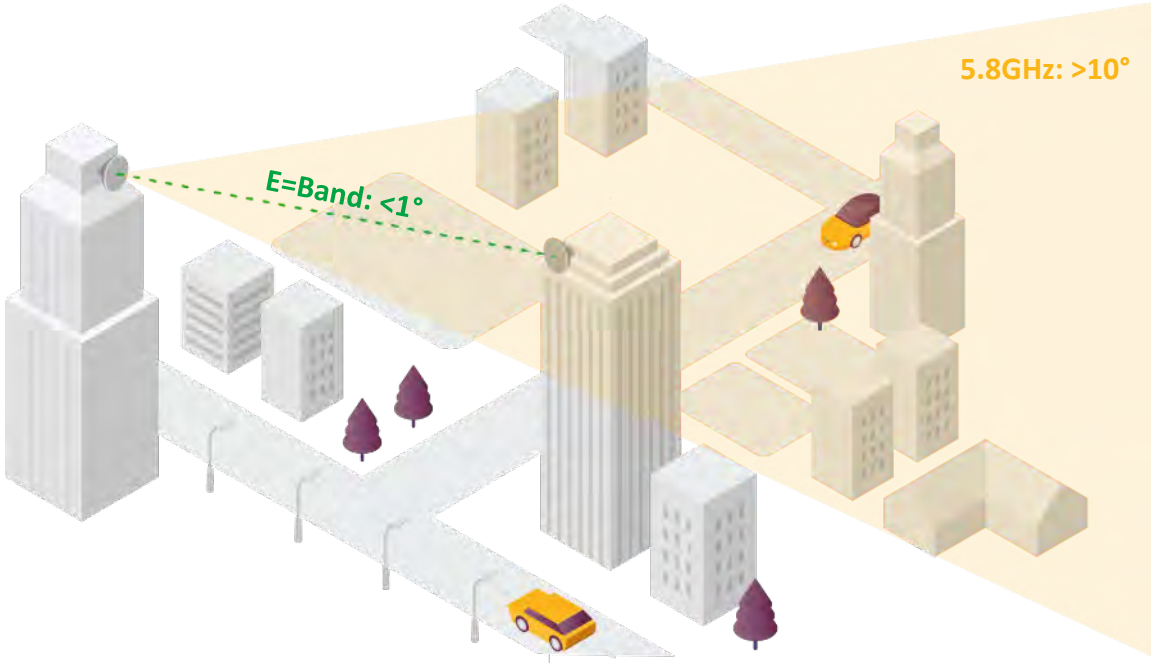
* Requires clear Line of Sight between radios

What is mmWave Wireless?

Widest spectrum - High capacity!



Narrow beams - No Interference!

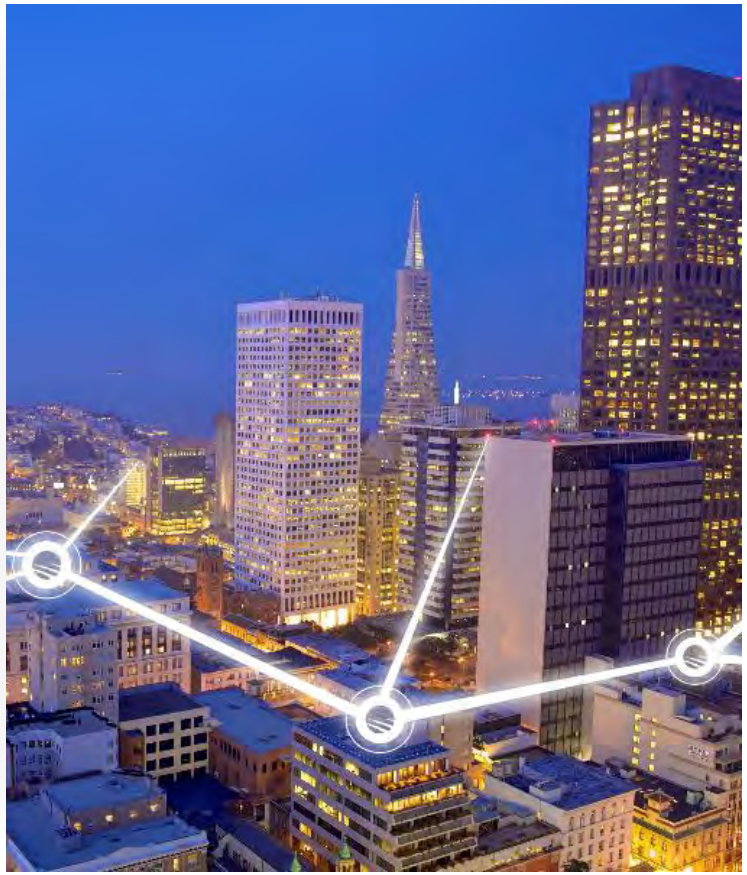


E-Band (70/8 GHz)
Lightly licensed , 10GHz

V-Band (60 GHz)
Unlicensed, 14GHz

Three Things to Remember About mmWave

Multi Gigabit Capacity



No Interference

New Revenue and faster ROI

02

PRODUCT OVERVIEW

Siklu Solutions

E-band and V-band PtP / PtMP / Mesh products

Roof Top High-Capacity
Point-to-Point

- Up to 10Gbps full duplex capacity
- 3 mi / 4.8 Km Range (6 mi / 9.6 Km with ExtendMM™)
- Different Antenna sizes

Street-level
Point-to-Point

- Internal Switch with Dual PoE-Out
- Up to 1Gbps aggregated capacity
- 0.6 mi / 1 Km Range

Street-level
Point-to-Multi-Point

- Auto alignment with no setup
- Up to 1.8 Gbps aggregated capacity
- ≤ 0.2 mi / 300 m Range

terragraph
certified

Street-level and Roofs
L2 SDN Mesh

- Self-Organizing (SON) with SDN
- Auto alignment with no setup
- Up to 16 Gbps aggregated capacity
- ≤ 0.3 mi. / 450 m Range

Coverage Summary

MultiHaul™

350m / 1150ft.

EH-600 / EH-614 / EH-500

0.5mi / 0.8km | *0.56mi / 0.9km* | *0.6mi / 1km*

EH-7X0 / EH-1200 / EH-2200

1ft. Ant 1mi / 1.6km | *2ft. Ant 1.6mi / 2.6km*

EH-2500

1ft. Ant 1.5mi / 2.4km | *2ft. Ant 2.1mi / 3.3km*

EH-5500 / EH-8010

1ft. Ant 1.3mi / 2km | *2ft. Ant 1.9mi / 3km*

99.99% availability; Chicago area (rain zone K) at half capacity

For performance at other locations, visit: www.siklu.com/tools/etherhaul_LBC

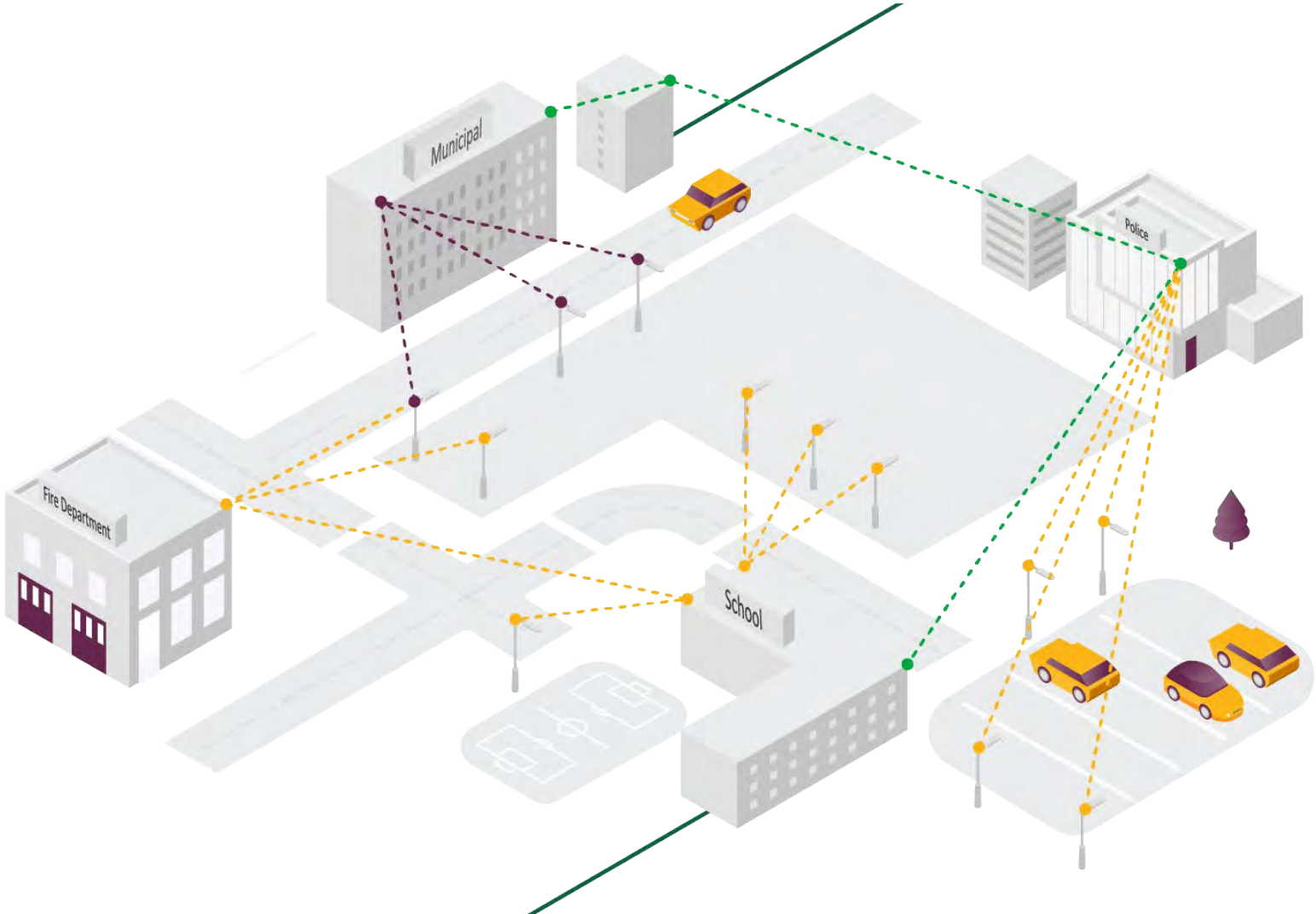
Gigabit Wireless Everywhere

PTP E-Band

PTP V-Band

PTMP V-Band

Fiber



02

Target Applications

Key Applications

Gigabit capacity is a key enabler of the connected society

Smart Cities

Municipal Networks

Video Security

IoT Wireless

Video Surveillance

Public Safety

Critical Infrastructure

Education

Backhaul Networks

Small Cell & Mobile BH

Enterprise Connectivity

Public Wi-Fi

Internet Access

Community Connectivity

Residential SFU

Rural Connectivity

Gigabit Internet Access

End-to-End solutions with Siklu PtP / PtMP portfolio

PtMP Terminal | Compact Node 360° | Mesh Node 360° | Fiber | PtMP | PtP up to 10Gb FD | PtP up to 1Gb

Mobile and Small Cell Backhaul

End-to-End solutions with Siklu PtP / PtMP portfolio

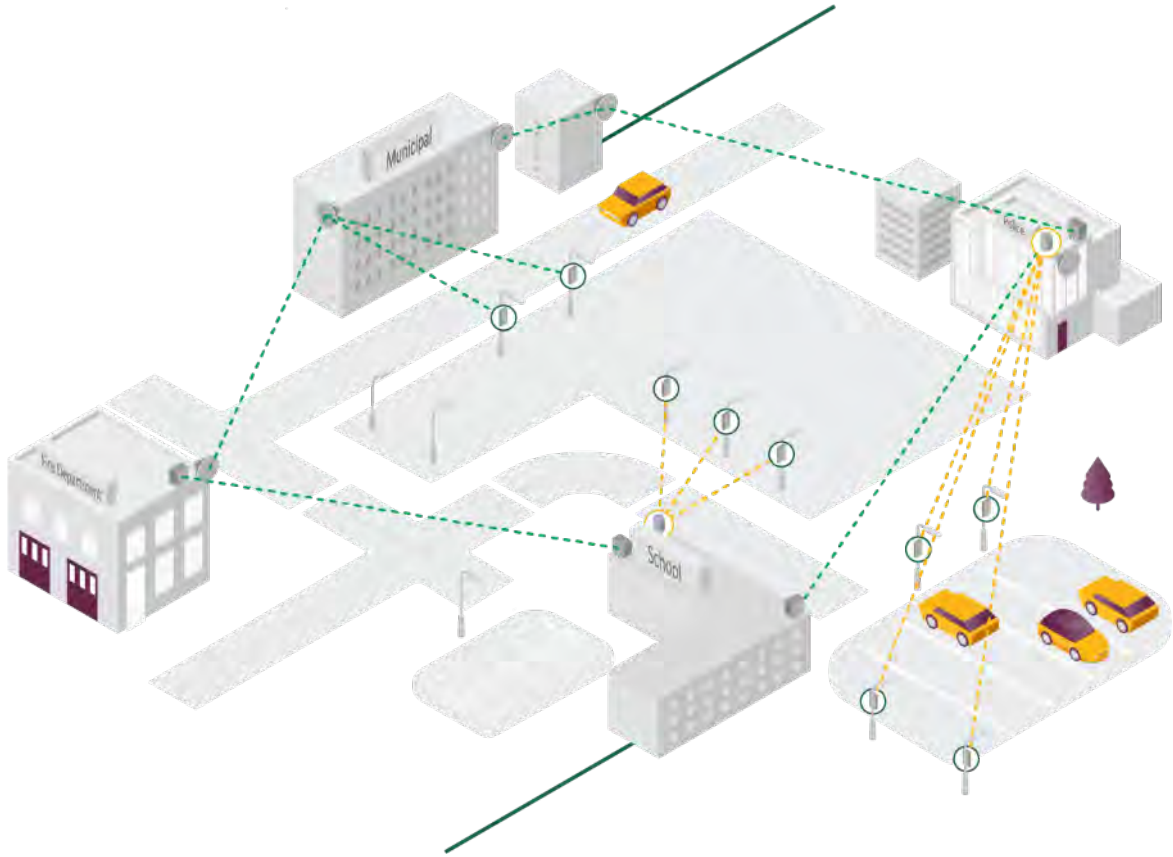
PtMP Terminal | Compact Node 360° | Mesh Node 360° | Fiber | PtMP | PtP up to 10Gb FD | PtP up to 1Gb

Smart Cities

Gigabit Wireless Everywhere

WiNDE

EMS



PtMP Terminal | Compact Node 360° | Mesh Node 360° | Fiber | PtMP | PtP up to 10Gb FD | PtP up to 1Gb

Bridging the Digital Divide: Cleveland, US

THE solution: 60GHz and MultiHaul™ TG

Cleveland is the 3rd Worst Connected City in America (Detroit and Memphis are even worse)

In 2019, there were approximately 50,000 households with no internet access

EmpowerCLE+, spearheaded by DigitalC (a nonprofit organization), is providing access to the internet, accompanied by digital skills training and access to devices

Target: connect first 1,000 homes in time for start of new school year in September!

Its not about connecting houses, buildings or even schools. Its about connecting people. In the age of COVID19 with isolation and quarantining, being able to do so virtually is not just a convenience it's a necessity. This gentlemen and his family now have gigabit access thanks to Siklu and DigitalC.

03

MultiHaul™
TG Overview

Siklu’s MultiHaul™ TG Product Line

Best in Class: Integration and Wireless Performance

Highest level of integration

360° coverage (4 x 90° sectors)

Simple single-cable installation

Built-in switch eliminates the need for external switch or 3rd party box

Integrates with billing and OSS practices (network name/ID assigned by the user, and not MAC address)

Best in-class radio performance

Short or Long range

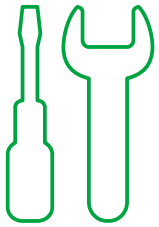
Beam-forming, 0.5ft, 1ft or 2ft antennas (field installable)

Siklu’s inhouse RF designs

Siklu’s MultiHaul™ TG Product Line

Best in Class: Ease of Operations and Networking Performance

Easiest to Operate

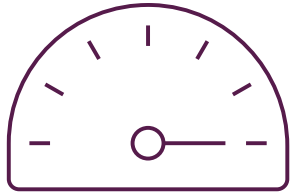


Works out of the box (NW controller is optional)

Ethernet only (like DSL/fiber/GPON; no routing), simplest to deploy or troubleshoot

IPv4 or IPv6, for management only

Best in-class networking performance



Lowest latency

Highest PPS

Full VLANs support

Provider bridge

MultiHaul™ TG for Scalable Networks

Neighborhood Coverage

- Fast, Flexible, Pay-as-you-grow

Self-backhauling

- Simple deployment

Redundancy

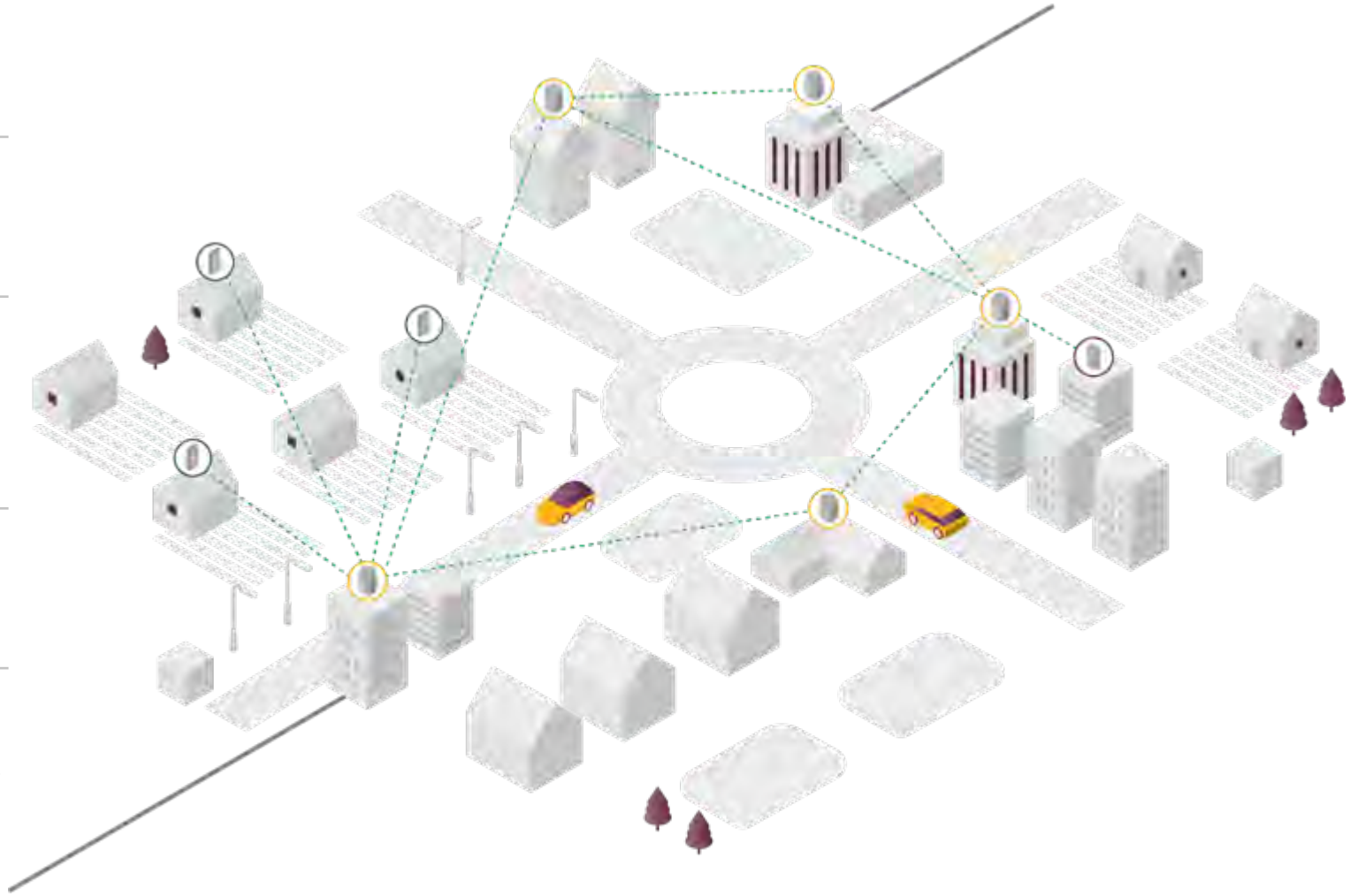
- Backhaul
- Access

Service with Nodes or TUs

- Series of TU models on the roadmap

Cloud Ready SON

- Integrated with SmartHaul™ WiNDE, ENMS & Runner
- Streamlined Planning, Deployment and Operations



03

SmartHaul™ - SaaS

SmartHaul™ Link Budget Calculator

Intuitive link planning tool for performance prediction of EtherHaul™ and MultiHaul™ millimeter-wave deployments.

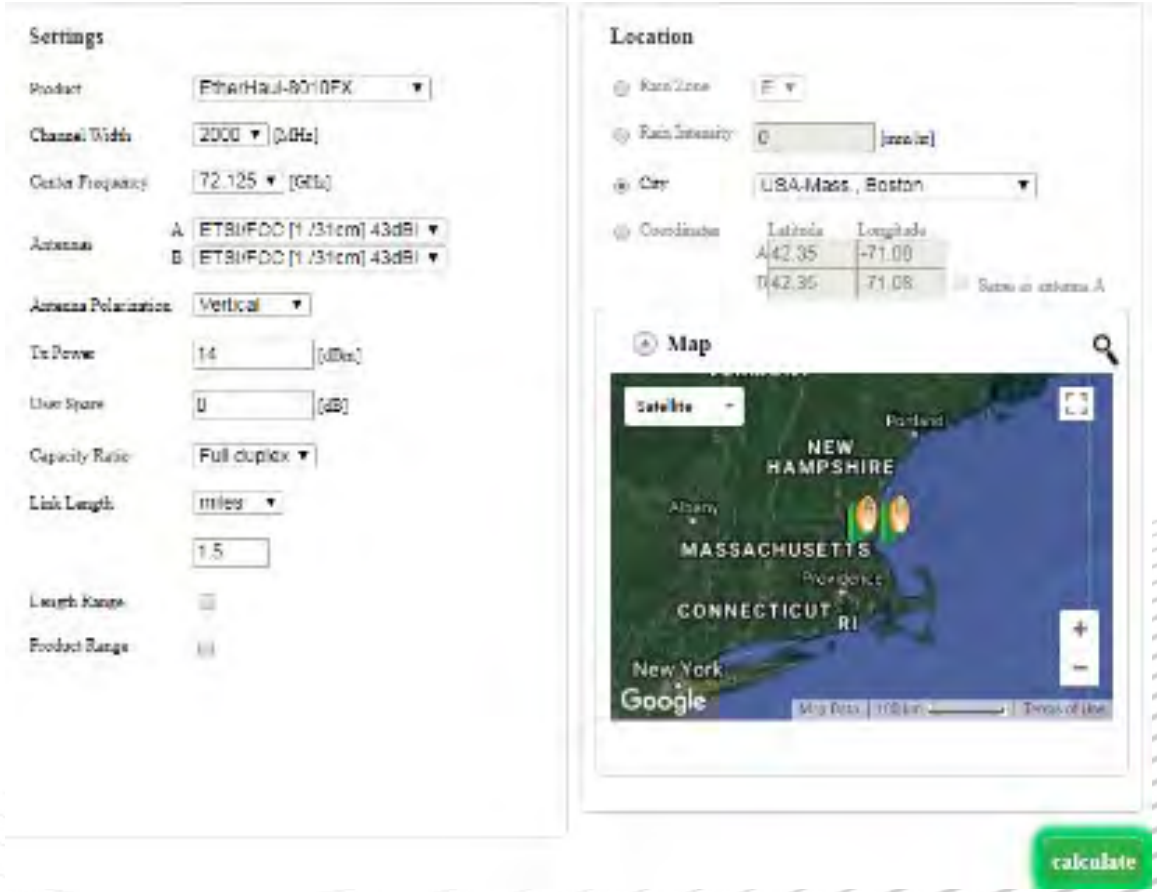
50 years of rain statistics from all over the world, based on official ITU data base.

Expected RSSi [dBm]	-39

Availability	99%	99.9%	99.95%	99.99%	99.995%	99.999%
Annual Uptime of Modulation Profile	361d 8h 24m	364d 15h 14m	364d 19h 37m	364d 23h 7m	364d 23h 34m	364d 23h 55m
Annual Downtime of Modulation Profile	3d 15h 36m	8h 46m	4h 23m	52m 33.6s	26m 16.8s	5m 15.36s
Rain Rates[mm/hr]	2.56	11.43	17.38	40.77	54.06	88.36
Rain Attenuation[dB]	4.44	12.98	17.53	32.30	39.55	56.25
Capacity [Mbps]	9550	8180	6820	1360	330	0

Length (mi)	Availability	99%	99.9%	99.95%	99.99%	99.995%	99.999%
1.50		9550	8180	6820	1360	330	0

PDF



SmartHaul™ Link Budget Calculator

Benefits

01

Evaluate the expected availability and capacity of any planned link, everywhere around the world

02

Quickly choose the right products for your network

03

Predicted performance charts (PDF)

04

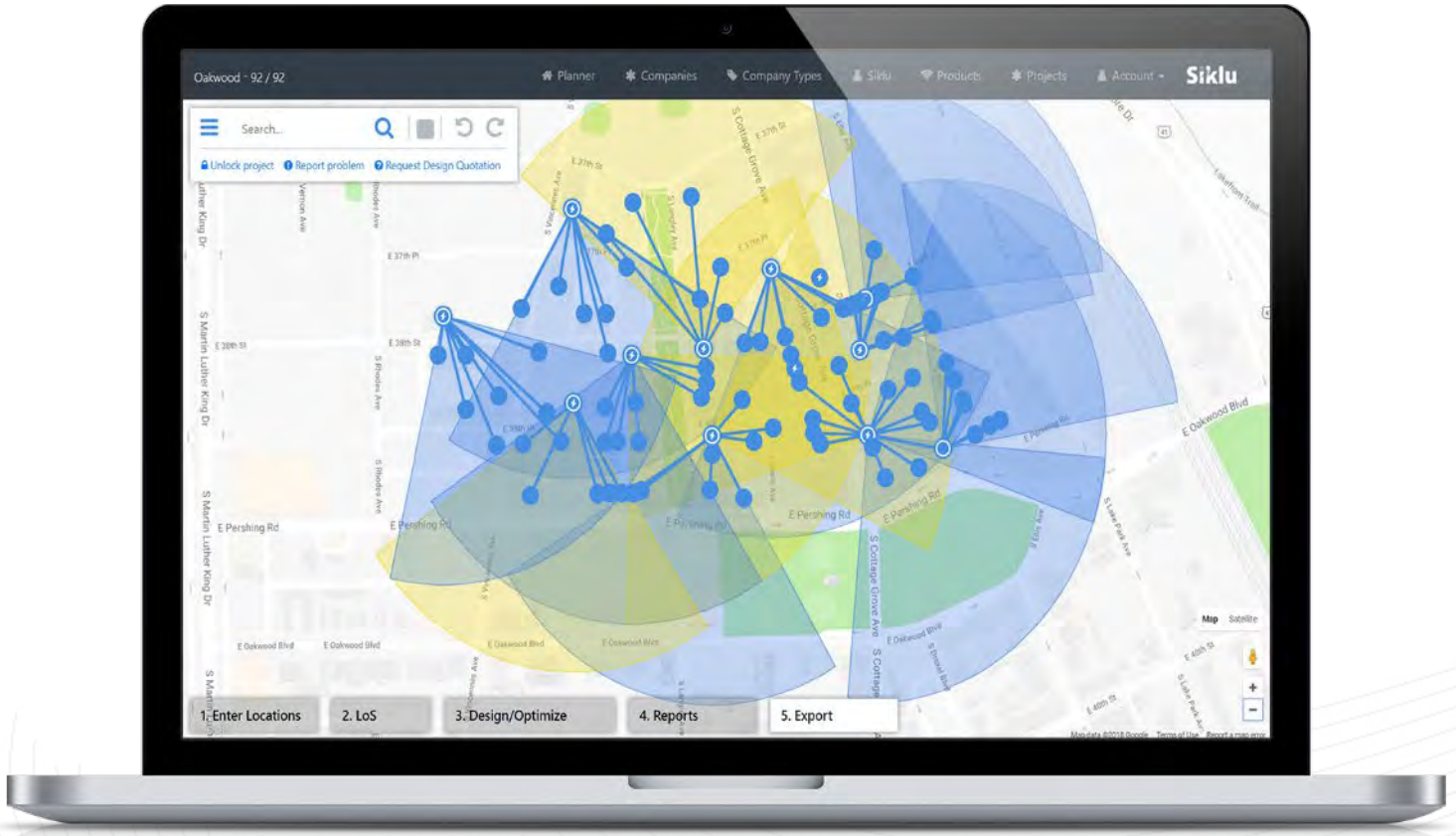
Service-Level-Agreement with customers

05

Validated based on real world comparisons including links operating during hurricanes, monsoons and typhoons

SmartHaul™

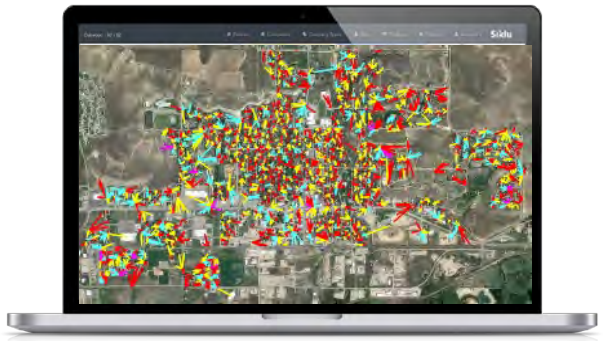
WiNDE



SmartHaul™ Wireless Network Design Engine

(WiNDE)

- Siklu's WiNDE is an easy-to-use intuitive tool created to ease the planning and deployment of Siklu's PTP and PMP products into an integrated network design
- Automatically considering hundreds of possible designs, WiNDE optimizes based on cost and performance and outputs recommended designs
- Automated home/building discovery, LOS validations
- Bill of Materials is generated from selected design, simplifying purchasing
- WiNDE also outputs configuration files for light-touch equipment configuration, "deploy as designed"
- WiNDE is cloud based, no installs, easy to access and use, always up to date



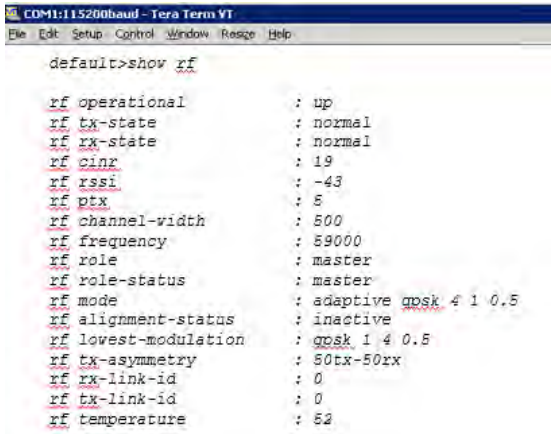
SmartHaul™ EMS Management Engine

- Whole network view: tree or maps
- Easily drill down to the single link or radio
- Reduce OPEX, focus on KPI
- Complete information, at the click of the finger
- Single product or batch large-scale automation
- SW upgrade, NW wide parameters
- Maximize network performance
- Reports: Performance, Resources, Inventory
- Scalable – from small size enterprise to large scale telco networks
- Flexible deployment – on-premises, cloud

System Monitoring and Configuration

Multiple Management Options

- Web-based management interface for linkmanagement
- CLI– commandlineinterface SNMP v.2 and SNMP v.3 –
- configuration, monitoring and northbound
- Straight-forward and easy integration to 3rdparty NMSvia SNMP:
  - Standard MIBs
  - Propriety RF MIB



01

APPLICATION CASE STUDIES

Smarting Up The City Of Arvada

From OPEX hungry slow leased-lines to city owned gigabit net

Introduction

The City wanted to address slow computer network speeds at remote offices, also resulting very slow Internet, ~1Mbps.

The cause of the slowness was city dependency on a legacy DS3 and T1 circuits

Challenge

- Build a reliable and affordable municipal gigabit network
- A network that would perform like fiber optics
- Avoid up front trenching costs indicative of fiber deployments

Solution

- Multi-gigabit EtherHaul™-1200FX and 1200TX P2P 70/80GHz radios
- Urban Renewal Authority, Majestic View Park, Lake Arbour Golf Club, Arvada Police, West Woods Golf and Ralston House, in one network

Results

- Complete city-owned network
- Future-proof gigabit capacity
- ROI vs. old 1.5mbps leased lines achieved within months

Upgrade Small Buildings to Gigabit Connections

Competitive edge to service providers in dense urban areas

Introduction

Monkeybrains, an innovative San-Francisco based wireless service provider who serves over 5,000 locations and adds 25 new locations every week, facing a growing demand for gigabit broadband

Challenge

- Add an offering for an affordable gigabit internet service
- Deliver a profitable gigabit service to buildings with just a handful tenants
- Fast and hassle-free installation

Solution

- Utilize the license-exempt 60GHz band
- Deploy Siklu's Point-To-Multi-Point MultiHaul™
- Backhaul with Siklu's EhterHaul™

Results

- Unique gigabit broadband offering for small MDUs
- Swift deployment times
- Interference-free service
- Positive ROI within months

Multi Gigabit for MDU

Connect a new exclusive building within hours

Introduction

Webpass, a Google-Fiber company, help residents and businesses by offering blazing fast, simple Internet in urban areas.

One of their unique selling points: ultra fast deployment time, even for a new buildings

Challenge

- Add a new building in Petco-Park (San-Diego) to the network ahead of an incumbent fiber competitor
- Maintain ultra-fast, competitive and reliable service, even in a dense-urban environment

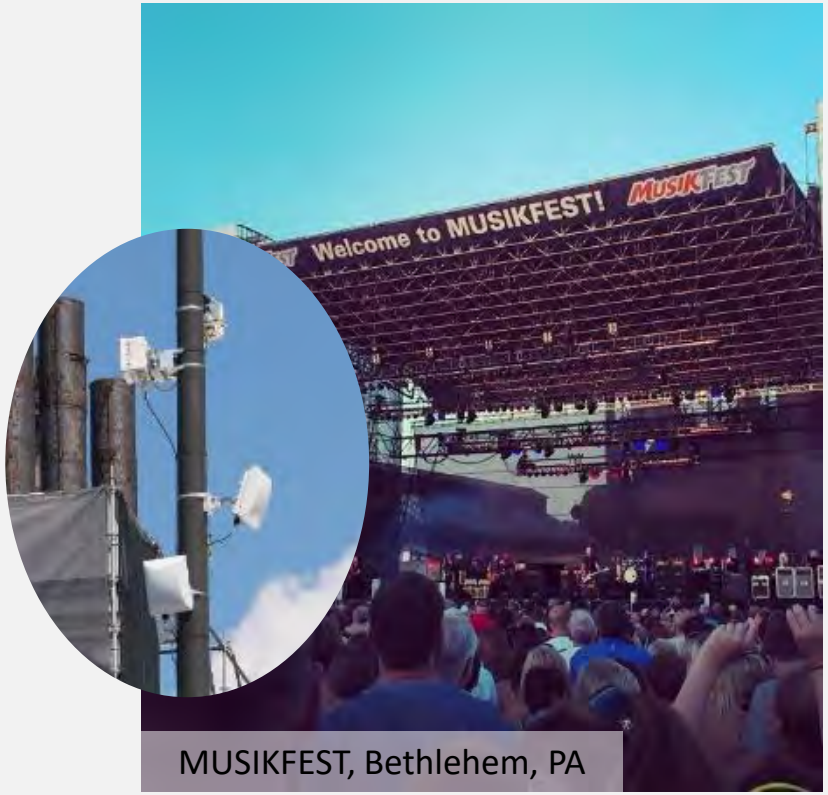
Solution

- Wireless fiber connectivity to Wepass' nearest PoP with line-of-sight
- Multi-gigabit EtherHaul™-2200FX P2P 80GHz radio

Results

- Over 2Gbps full-duplex from Bankers Hill to Petco Park in <8 hours from contract sign
- Further proof that fixed-wireless is faster than fiber to deploy

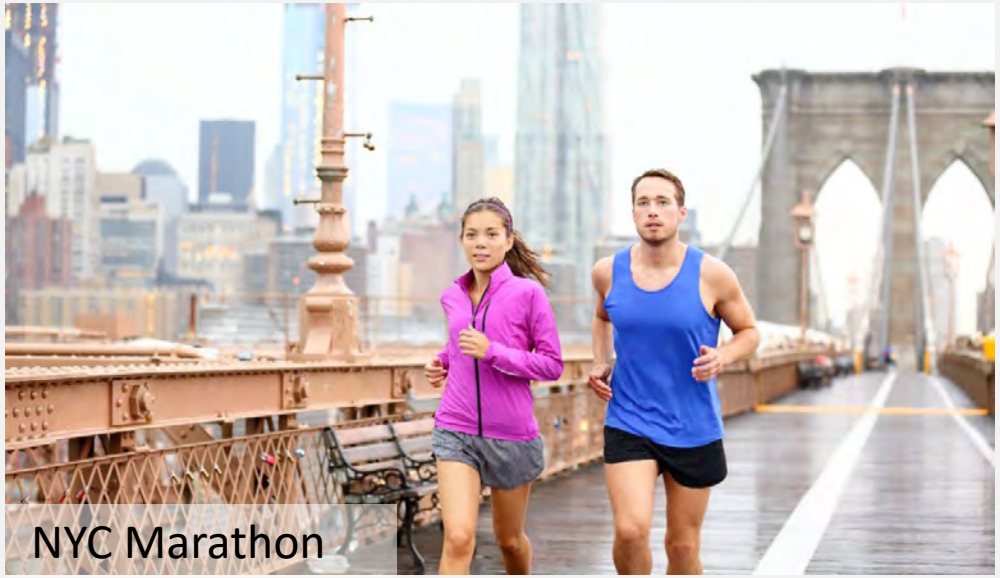
Backhaul for Events



MUSIKFEST, Bethlehem, PA

Installed within hours

Providing Wi-Fi to 1 million visitors


NYC Marathon

Video and network connectivity

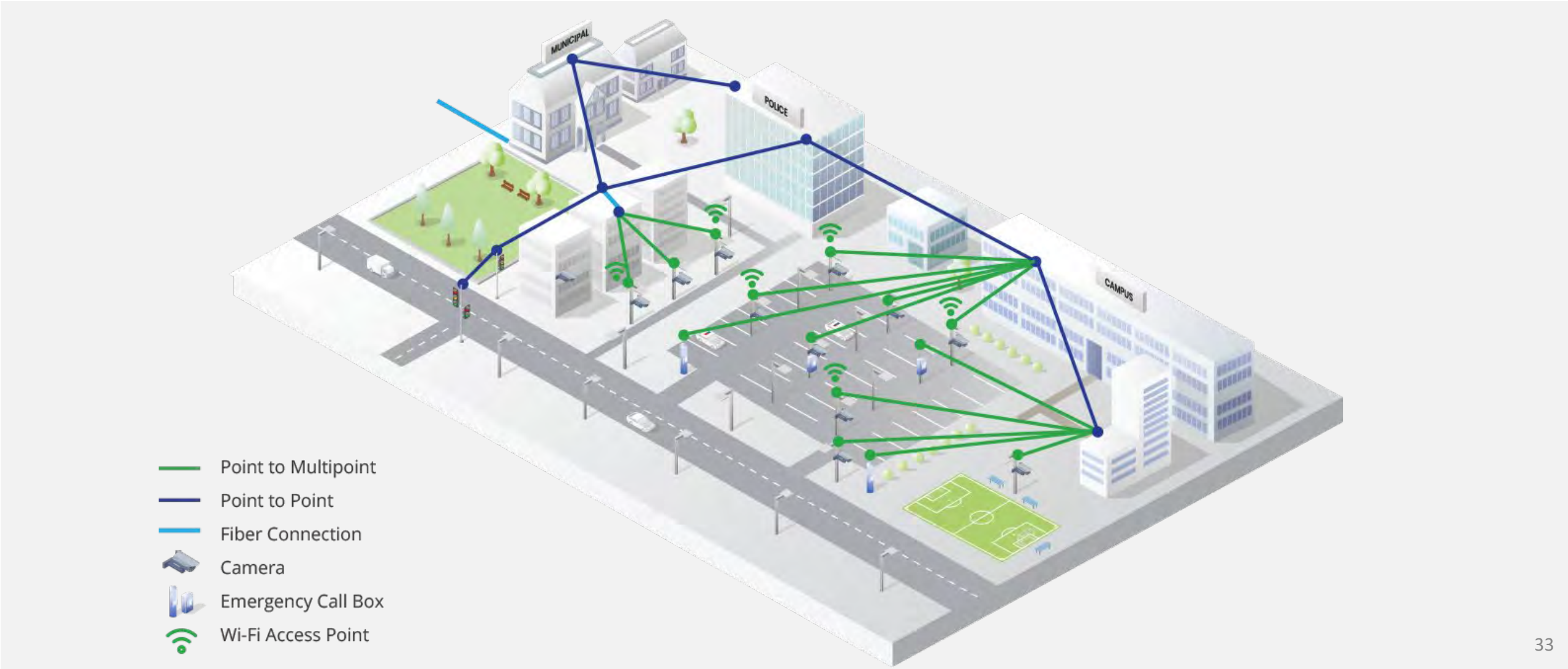
Installed day before the marathon started


Super Bowl LI

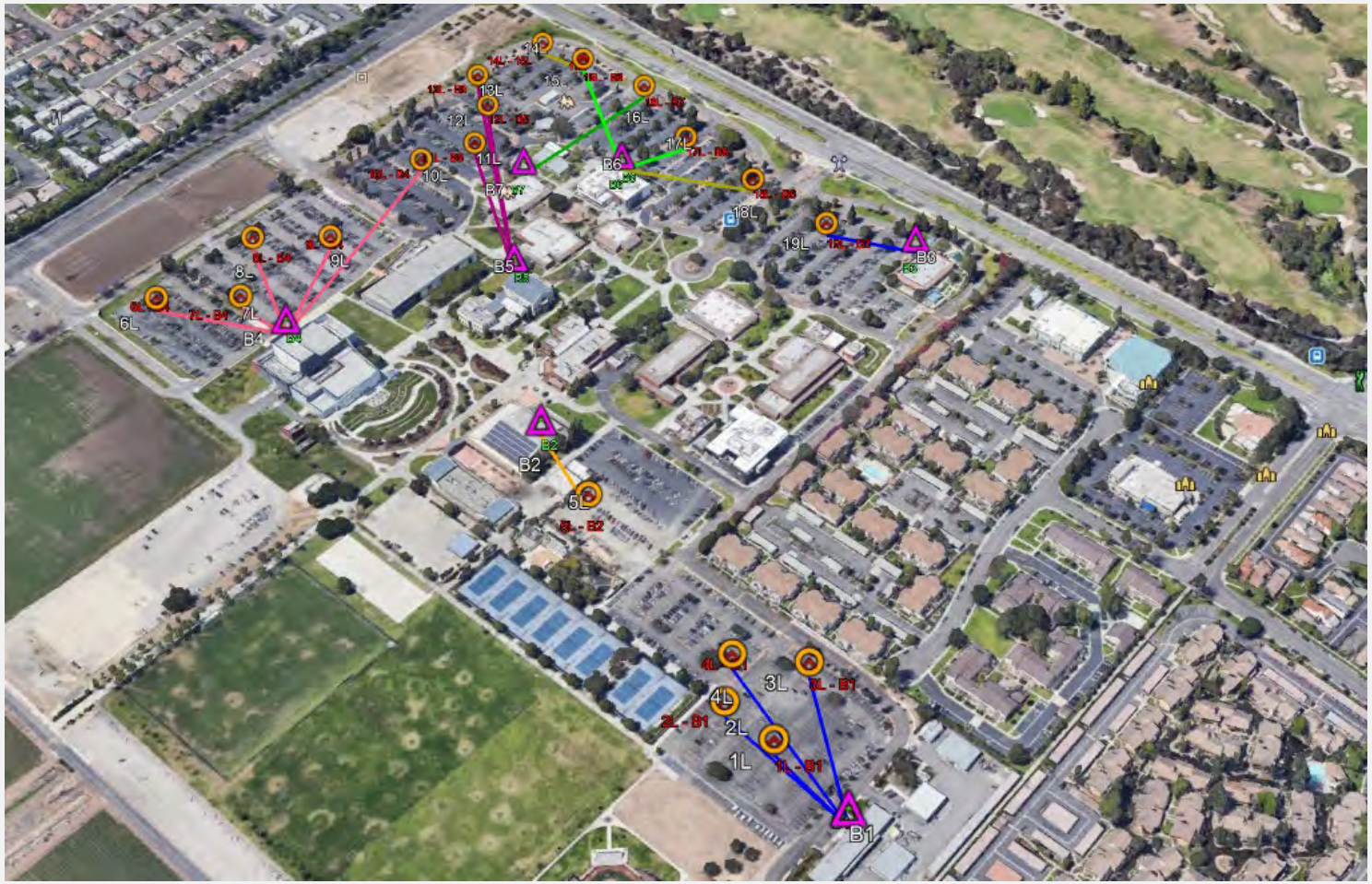
Backhaul video to Discovery Green Fan Zone

Monitored by Houston PD

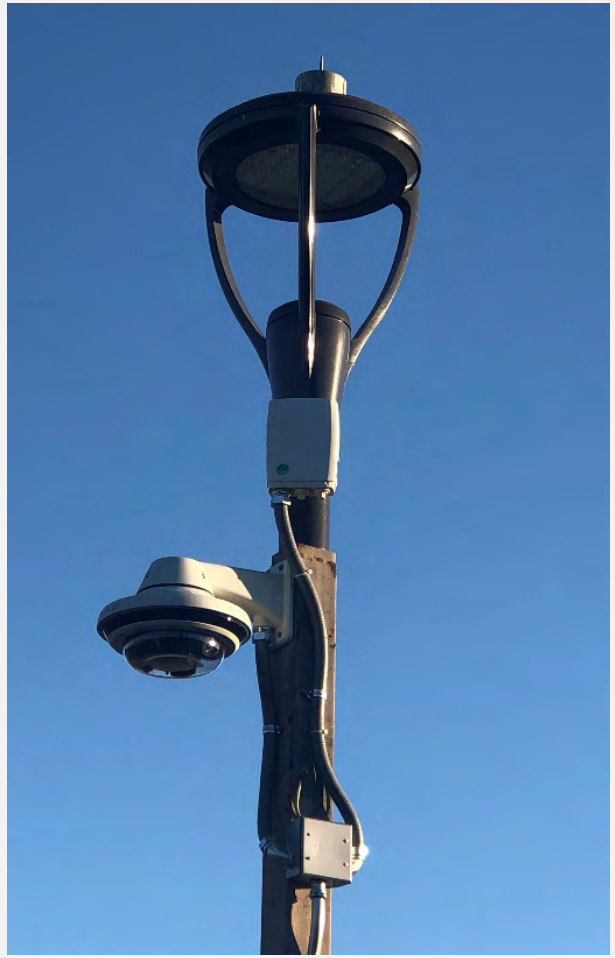
Physical Security Hybrid Fiber Wireless Network



Parking Lots
Irvine Valley College



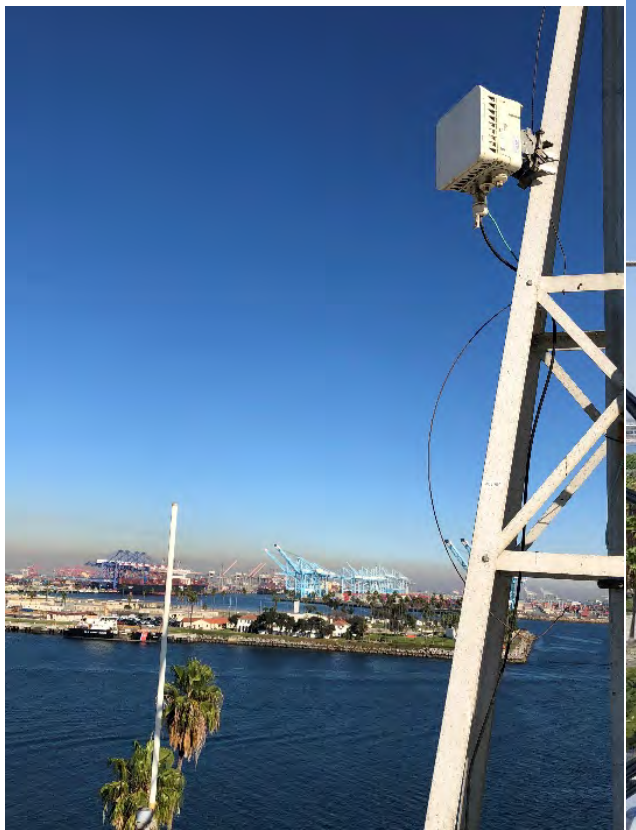
Simple, Aesthetic Installation



Port of Long Beach, CA

Surveillance & Fiber Redundancy

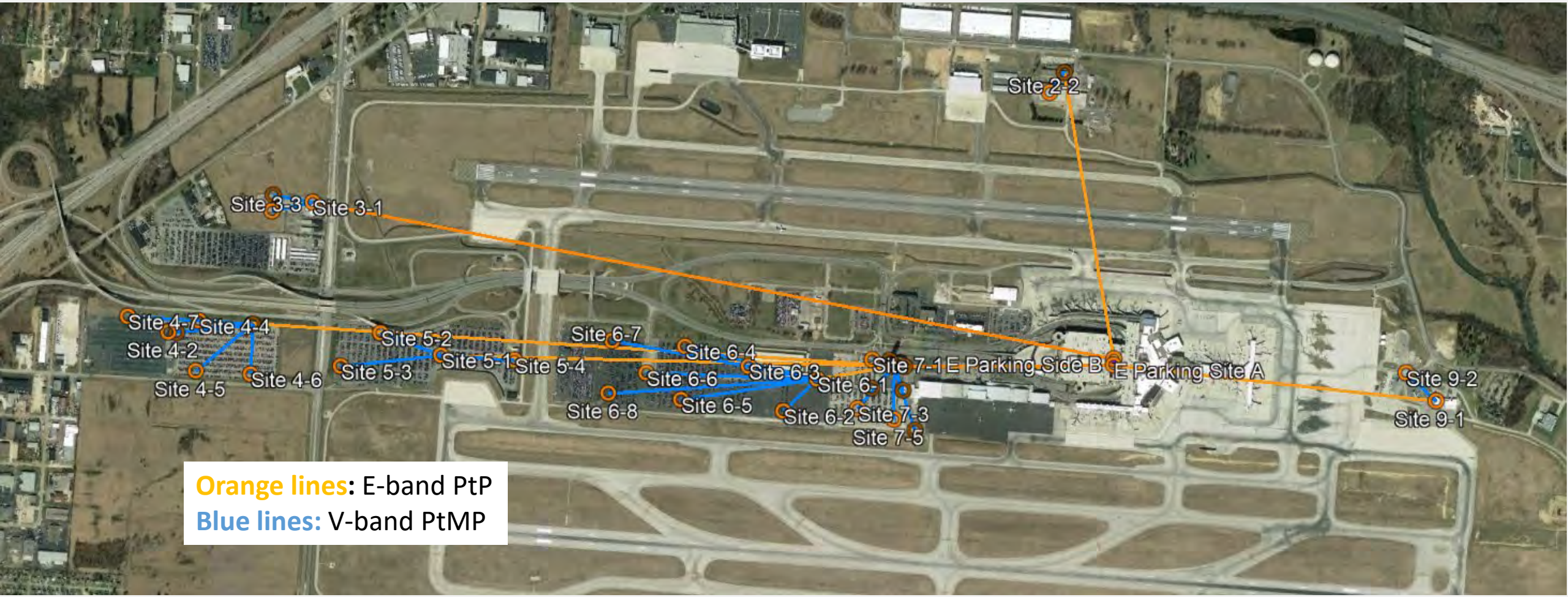
- The second-busiest container port in the USA
- Video Surveillance applications for Port Security
- Advanced 256-bit AES encryption
- Fiber backup and wireless to the Edge
- 60 Edge-based V-band and 70/80GHz E-band radios



The Port of Long Beach

Link to Case Study:
https://go.siklu.com/lp-case-study-port-of-long-beach-ca2018-lp

Security Cameras at the Service Areas and Parking Lots (in implementation stages)



John Glenn International Airport, OH
Airport Wireless Connectivity

Siklu

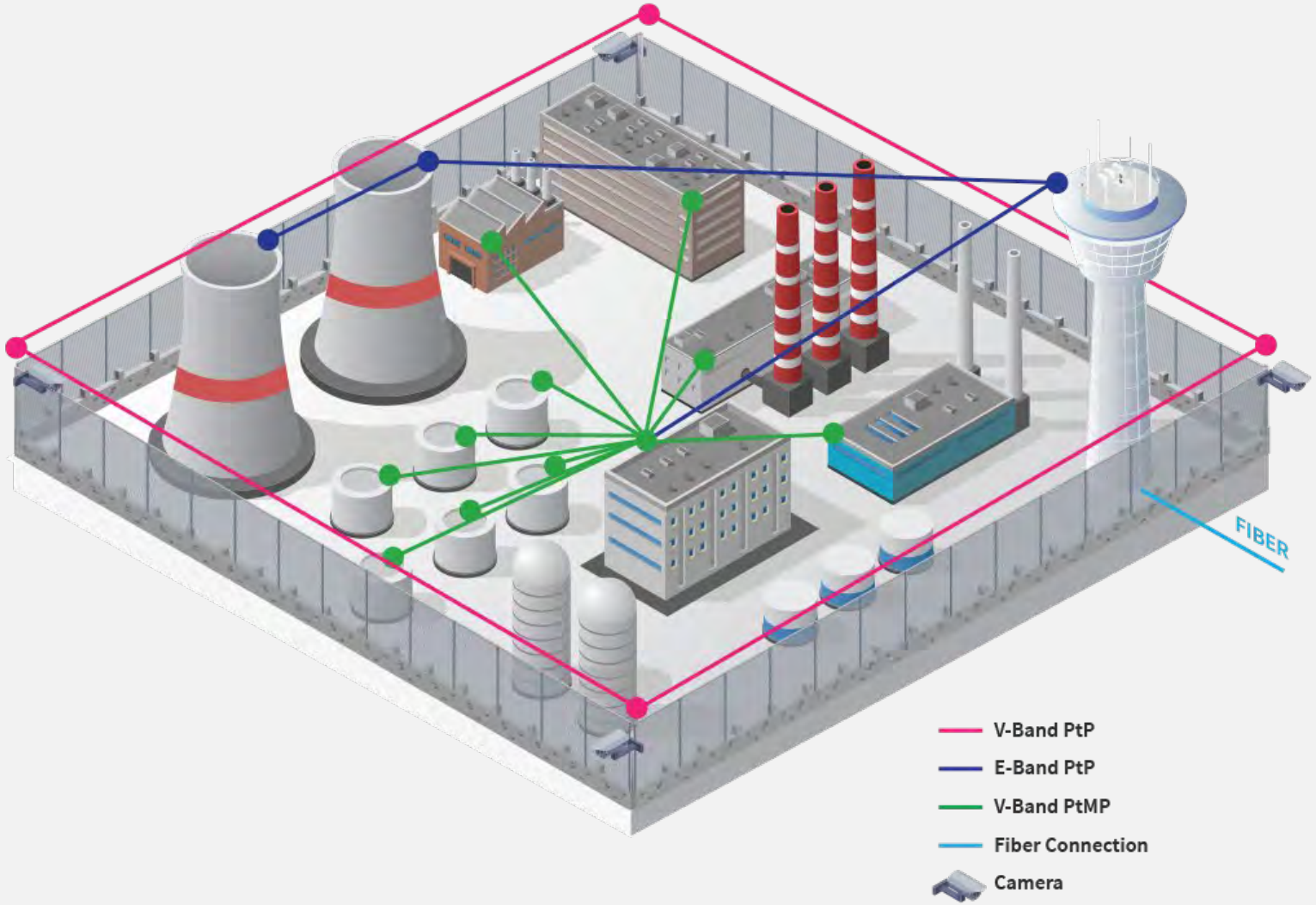
Airport LAN/WAN/VOIP/Security

- Backhaul for VOIP, Local Area Network & Internet
- Standardizing on Siklu mmWave wireless solutions
- Link to a PR

JOHN GLENN INTERNATIONAL

John Glenn International

Critical Infrastructure Topology by Siklu
Nuclear Plant



Nuclear Power Plant

Mission Critical Video Security

Introduction

The complex of three reactors maintained perimeter security with a large contingent of trucks and humans operating around the clock. The plant was looking for a way to provide equal levels of security but using a video network instead

Challenge

- There was a deadline to have the video network up and running within months
- Fiber was considered but installation was a long term project.
- Fiber had also experienced cuts and failures operating in this outdoor environment
- The solution had to be highly secure

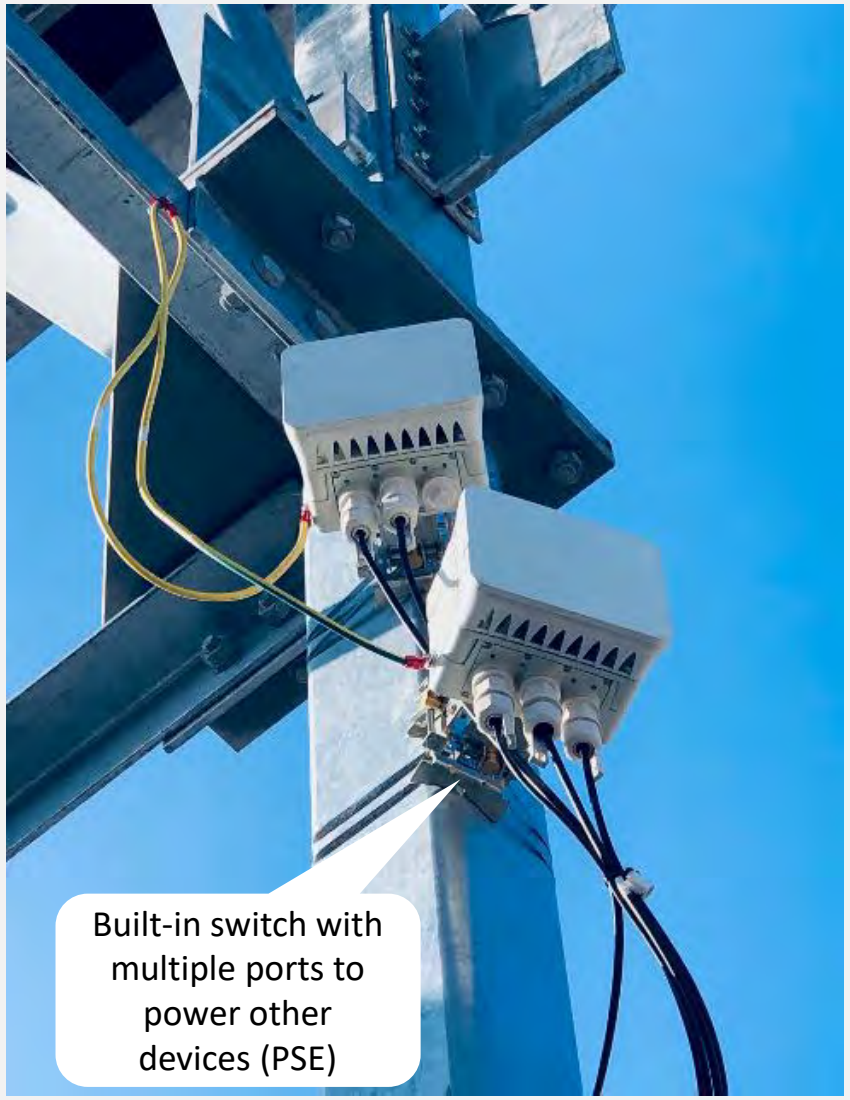
Solution

- Over 200 highly secure, IP67 rated 1Gbps radios installed supporting 230 cameras
- Deployed in weeks
- System is secure from hacking and jamming
- Low power consumption important given many sites are solar powered

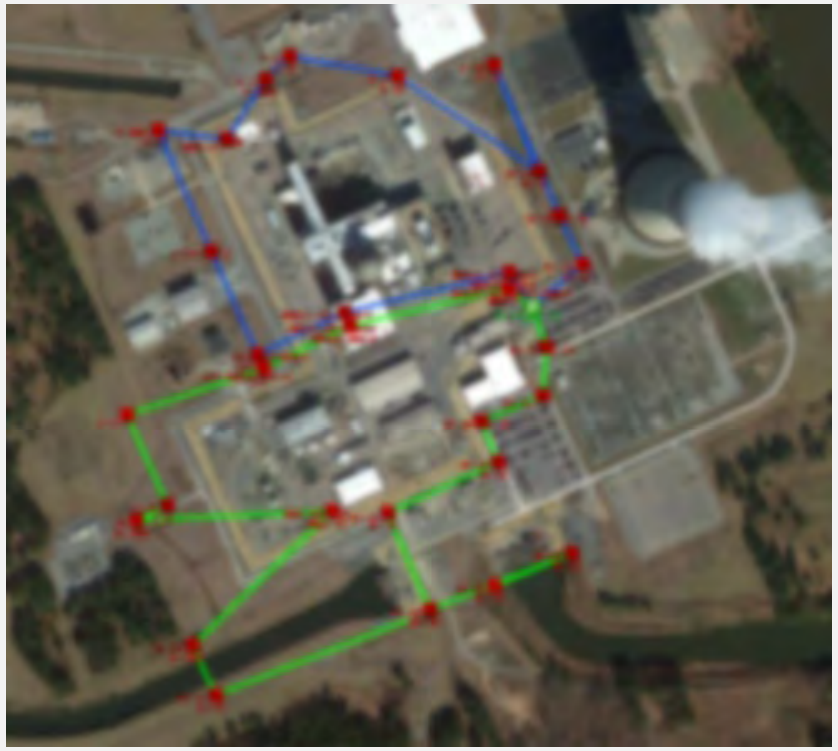
Results

- Perimeter security now 100% video based
- 1Gbps network transporting HD quality video with capacity to scale to 4K when ready
- System was approved by the NRC
- The plant has committed to expanding the solution to additional power plants

Nuclear Power Plant



Nuclear Power Plant



Hawaii Electric Company

- Siklu 60GHz MultiHaul™ and EtherHaul™ radios used for connecting Axis video surveillance cameras around multiple power generation plants and substations
- Cost saving versus deploying fiber
- Standardized on Siklu for connectivity purposes
- EtherHaul™ 70/80GHz radios being used for longer range deployments

Hawaiian Electric

Hawaii Electric Company


Siklu
Thank you