Funding For Innovative Solutions To Bridge The Digital Divide And Improve Public Services

Secure, Ready to Deploy Broadband and IoT Solutions

Welcome!

NFF

SPEAKERS

- Vic Sprouse: Keynote – Federal Funds and Grants Director, West Virginia Department of Economic Development
- Daniel Turner – Chief Executive Officer and Founder, TRAXyL
- Dennis Robins – Public Funding Advisor, Cisco Systems
- Albert Garcia – Cisco Broadband Center
- Malik Ishak – Director, Smart City Connectivity, Signify North America
- Susan Case – Internet of Things Specialist, Cisco Systems
- Chris Wigley – Cisco Ultra-Reliable Wireless Backhaul
- Bobby Arkolakis – IoT Solutions Architect, Cisco Systems
- Mark Knellinger – Transportation Solutions Architect, Cisco Systems
- Chris Peabody – Chief Strategy Officer, Networking For Future

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AGENDA

- Speaker Introductions and NFF Overview
- Keynote Address: West Virginia's Landmark Billion-Dollar Broadband Strategy
- Navigating the Government Funding Terrain for Broadband Projects
- Rural Broadband – Bridging the Digital Divide
- Connected Government – Case Studies
  - Smart Transportation
  - Securing Critical Infrastructures
- Innovative Technologies To Accelerate The Journey
  - TRAXyL FiberTRAX "Paints" Optical Fiber Directly Onto Paved Surfaces
  - Cisco Ultra-Reliable Wireless Backhaul (formerly Fluidmesh)
  - Signify Broadband Luminaires, IoT Smart Poles, and Interact
- Questions and Answers – Submit via Chat

NFF

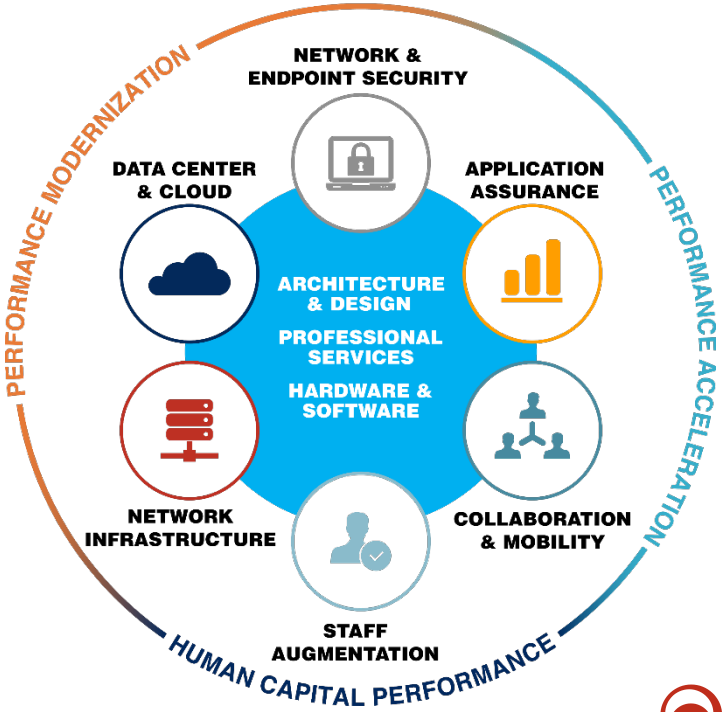
OVERVIEW

Networking For Future, Inc. (NFF)

- Founded in 1996
- Headquartered in Washington, DC
- 130+ Employees
- ISO 9001:2015 Certified
- 77% of workforce hold industry certifications

Offering a performance-focused approach to delivering transformational IT business solutions.

IT Business Solutions



OVERVIEW

Strategic Partners

- Cisco Gold Integrator Partner
- NetApp Gold Partner
- VMware Enterprise Partner
- Splunk Partner
- Microsoft Partner
- Dell Partner
- Gigamon Partner
- Riverbed Premier Partner
- Aternity Partner
- IET Corporation Partner
- F5 Networks Partner
- Citrix Silver Solution Advisor
- CoreSite Partner
- TRAXyL Partner
- Catapult Partner
- CoastTec Partner

Strategic Contract Vehicles

- GSA Schedule 47QTCA21D0047
- District of Columbia Supply Schedule
  - MOBIS and ITES
- Maryland Education Enterprise Consortium (MEEC)
- Maryland Consulting and Technical Services (CATS+)
- Fairfax County Public Schools
- Maryland Department of Information Technology (DoIT) Hardware Master Contract
- Cisco Virginia Association of State College and University Purchasing Professionals (VASCUPP)
- Federal Reserve Board 202000834

CISCO TOP-FIVE MID-ATLANTIC SLED PARTNER 2019 & 2020

CISCO OUTSTANDING SOLUTIONS PARTNER OF THE YEAR 2016

ISO 9001:2015

QUALITY JOBS CHAMPION

HALL OF FAME AWARD

Keynote Address: West Virginia's Landmark Billion-Dollar Broadband Strategy

Vic Sprouse
Federal Funds and Grants Director
West Virginia Department of Economic Development

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WEST
VIRGINIA
Economic Development
WestVirginia.gov

West Virginia's Challenges

Challenges include:

- Mountainous Terrain
- Rural Areas with Low Population Density
- Legacy Systems Tied to Aging and Antiquated Technology

  - Project Costs are Higher in Rural Areas: **LESS** Density = **HIGHER** Cost Per Location
  - Project Costs are Increasing: Historic **INVESTMENT**=Supply Chain Limitations

Pending Federal Applications

Pending Federal Applications

FCC Emergency Connectivity Fund (ECF)

Coordinated by the WV Department of Education
$48.1 Million Requested

- $21.2 Million Requested by the West Virginia Department of Education
- $25.5 Million Requested by 24 West Virginia Counties

NTIA Broadband Infrastructure Program

Four Applications Pending
$46 Million Requested
WV Ranked 16th in the Nation for the Amount of Funds Requested by States

ARC Power

Two Applications Funded/One Pending
$6.5 Million Requested

$95 Million Pending

Awarded Federal Funds

Federal Broadband Investment in West Virginia

USDA ReConnect
4 Winning Projects I $40 Million Investment I 11,935 Households

USDA Community Connect
4 Winning Projects I $11 Million Investment I 7,952 Households

USDA Distance Learning and Telemedicine
$5.8 Million I 14 Projects in West Virginia

FCC CAFII
3 Winning Bidders I $12 Million Investment

ARC / ARC POWER
4 Winning Projects I 1 Pending Project

$60 Million Awarded

Typical Cost Comparisons

SAMPLE of APPROVED APPLICATIONS				Per Location
• USDA ReConnect	$14 Million	205 Square Miles	2,500 Locations	$5,600
• USDA Co/Connect	$3.5 Million	56 Miles	600 Locations	$5,833

AEP: Logan & Mingo Project				
• AEP & GigaBeam	$86.3 Million	400 Miles	13,000 Locations	$6,638
			Avg. per Location	$6,023

Approx. number of unserved locations in WV = 300,000

Estimate to reach all unserved locations = $1,806,900

*Based upon current/previous gov't awards

West Virginia Broadband Investment Program

FOUR PROPOSED PROGRAMS DESIGNED TO MEET WEST VIRGINIA'S NEEDS AND ALL ARPA REQUIREMENTS

1. **Line Extension Advancement and Development (LEAD)**
   - Expansions of existing fiber and cable networks
2. **Major Broadband Project Strategies (MBPS)**
   - New networks or major expansions of existing networks
3. **GigReady Incentive**
   - A state incentive for ISP and local governments and organizations to pool ARPA allocations or other local funding
4. **Wireless Internet Networks (WIN)**Not eligible for Capital Projects Funding; State Funds Only**
   - Expansions or upgrades of existing fixed wireless networks

Estimated Timeframe

PROGRAM ROLL-OUT FALL 2021

- LEAD Program: Applications in multiple rounds though the end of January 2022
  - Funding decisions in late 2021 through early 2022
- GigReady: Applications on a rolling basis through the end of January 2022
  - Funding decisions in multiple rounds starting in early 2022 through fall 2022
- MBPS: Applications in one round due by the end of January 2022
  - Funding decisions early 2022
- WIN: Applications in multiple rounds, following roll-out of other programs
  - If State funds are allocated
  - Funding decisions through early 2022

Timeframes may change due to sources of funds and timing of funds availability.

Proposed Funding Levels – TOTAL FUNDING

Funding Levels Subject to Change Depending on Appropriations & U.S. Treasury Rules

Program	LEAD	GigReady	MBPS	*WIN
Funding	$40 Million	$90 Million	$90 Million	$10 Million (State only)
Eligible Applicants	ISPs Operating Cable or Fiber Network	County, Municipal Governments, EDCs, EDAs, RPDCs, Private Partnerships Strongly Encouraged	ISPs Local Governments and Affiliated Organizations	ISPs with Existing Wireless Network *Subject to ARPA Rules
Speed Requirements	At Least 100/20, scalable to 100/100 Mbps 1000/500 Mbps Preferred	At Least 100/20, scalable to 100/100 Mbps 1000/500 Mbps Preferred	At Least 100/20, scalable to 100/100 Mbps 1000/500 Mbps Preferred	At Least 25/3, preferably 100/20 Mbps
Match Requirements	At Least $500 per Passed Premise	At Least 25 Percent of Project Cost	At Least $500 per Passed Premise	At Least $400 per Covered Premise

Monitoring and Oversight

OVERSIGHT OF PROJECTS AFTER AWARD WILL BE AS IMPORTANT AS SELECTION OF PROJECTS

ARPA Projects are Subject to 2 CFR 200

- Federal compliance and reporting
- Strong oversight
- Progress reporting to meet state and federal obligations

Key Program Requirements

- Participation in state broadband mapping
- Submission of network designs and as-builts
- Review of expenses and requests for reimbursement
- Field audits to verify construction and quality control


Q & A

WEST VIRGINIA
Economic Development

West Virginia Development Office
State Capitol Complex
1900 Kanawha Boulevard East
Building 3, Suite 600
Charleston, WV 25305

(304) 558-2234

westvirginia.gov

Navigating the Government Funding Terrain for Broadband Projects

Dennis Robins
Public Funding Advisor
Cisco Systems

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CARES 1.0

Coronavirus Aid, Relief, and Economic Security Act

Passed 3/27/20

CARES 2.0

Consolidated Appropriations Act of 2021

Passed 12/27/20

ARPA / CARES 3.0

American Rescue Plan Act of 2021

Passed 3/11/21

State and Local

CARES ACT

TREASURY Coronavirus Relief Fund - $150B

- States, Local gov't >500K pop.
- Direct response to public health emergency
- Broad range of allowable use including broadband
- Expiration date - 12/31/21

FCC Telehealth - $200M

- Public/private health
-
- …

CRRSA – CARES 2.0

Broadband Infrastructure Program - $288M

Connecting Minority Communities Pilot Program - $268M

Tribal Connectivity Fund

AMERICAN RESCUE PLAN ACT

State/Local Fiscal Recovery Fund - $219B (State), $130B (Local)

- Two allocations:
  - 50% - 2021
  - 50% after 1 year, May 2022
- Allowable use includes:
  - Broadband
  - Restoration of tax $ losses
  - Expiration date – 12/31/24

Capital Projects Fund - $10B

- For projects (including remote options) enabling: Work, Education, Health
- State filing due 12/17/21

K-12 Education – Funding for Broadband Connectivity

FCC Emergency Connectivity Fund

$7.1B Total
Spend deadline: 9/30/30

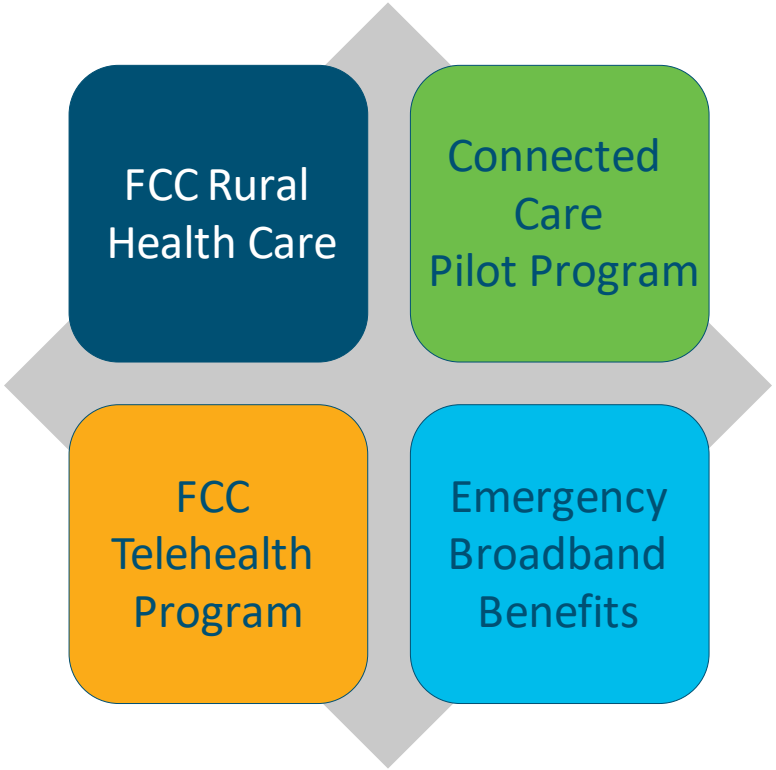
- Supports broadband internet service and equipment used for remote learning
- For use by students, school staff & libraries
- USAC to operate the program
- Complementary to E-rate

E-RATE

$4.2B per year
Annual application

- Funds Internet access and WAN costs
- Funds equipment including switching/routing and wireless networks
- 20-90% discounts
- K-12 and Libraries

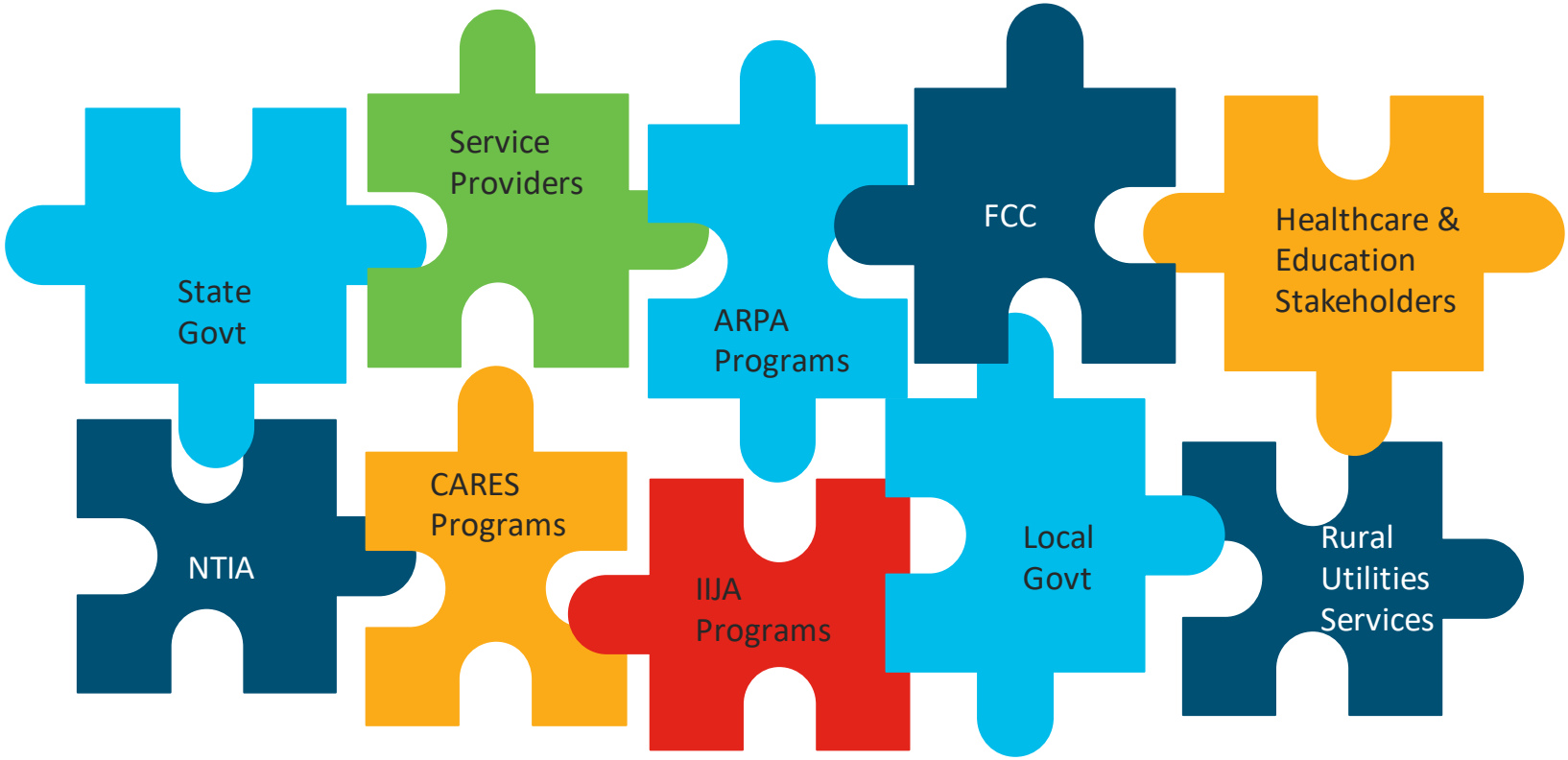
Healthcare Funding – Broadband Related



Infrastructure Investment and Jobs Act (IIJA)

Broadband Equity, Access, Deployment Program	$42.45B to states thru NTIA; target unserved/underserved areas
Middle Mile Grants Program	$1B to states
Tribal Connectivity Fund	$2B, add'l funding
State Digital Equity Capacity Grant Digital Equity Competitive Grant Program	- $1.5B to states to develop/implement plans - $1.25M to states for local initiatives

Bold Initiative – Big Challenges



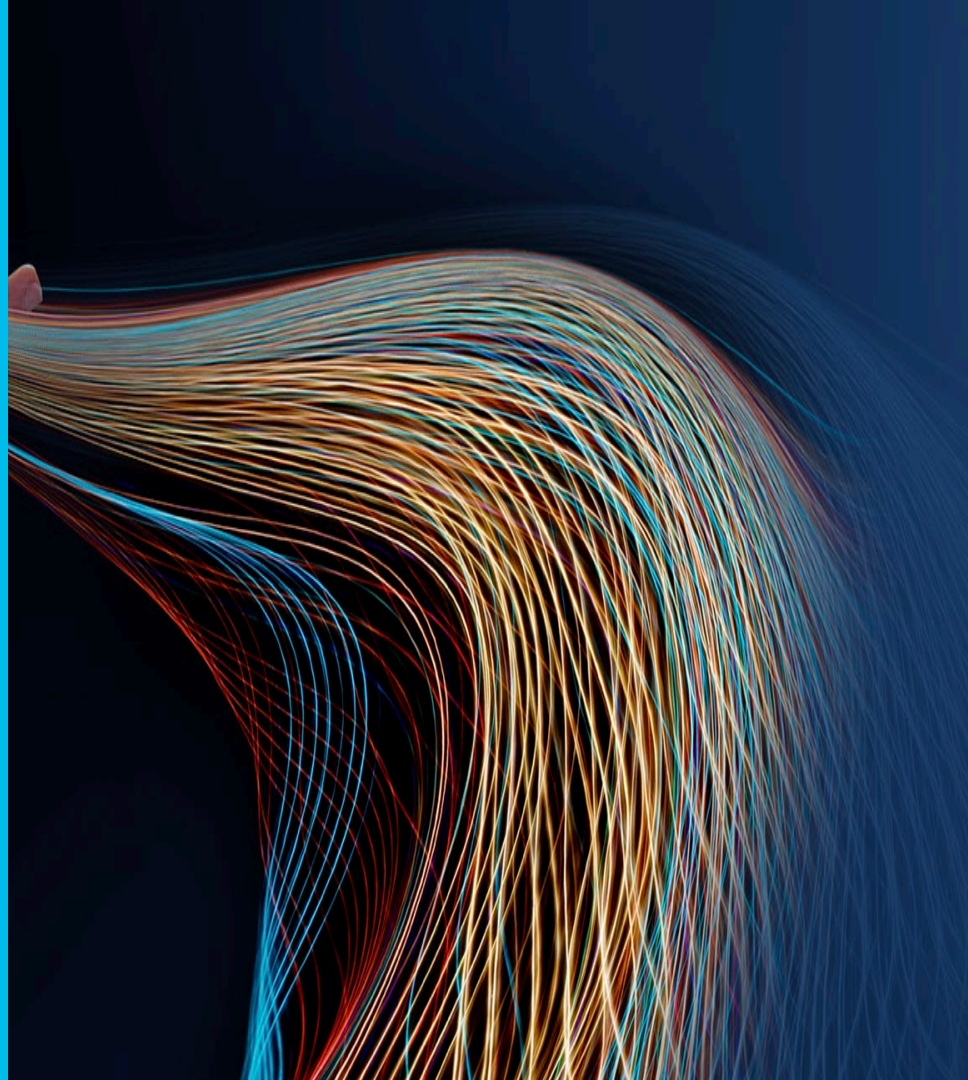
Rural Broadband – Bridging the Digital Divide

Albert Garcia
Cisco Broadband Center
Cisco Systems

Cisco Broadband

Albert Garcia

Business Development Manager



Current State of Digital Divide

01 Business alone cannot solve the digital divide

02 Accessibility to education and health care is critical

03 Broadband access is tied to economic opportunity

04 Digital divide requires multidimensional approach.

"Students face substantial barriers to doing their homework and the sick and elderly can't access remote health care"

President Biden 2021

12M

Students that could not learn during the pandemic.

Americans with inadequate internet speeds

120M

Americans with no internet access.

36M

People under the poverty level without internet access

17%

Community Impact

Elements of success

Inclusive Community

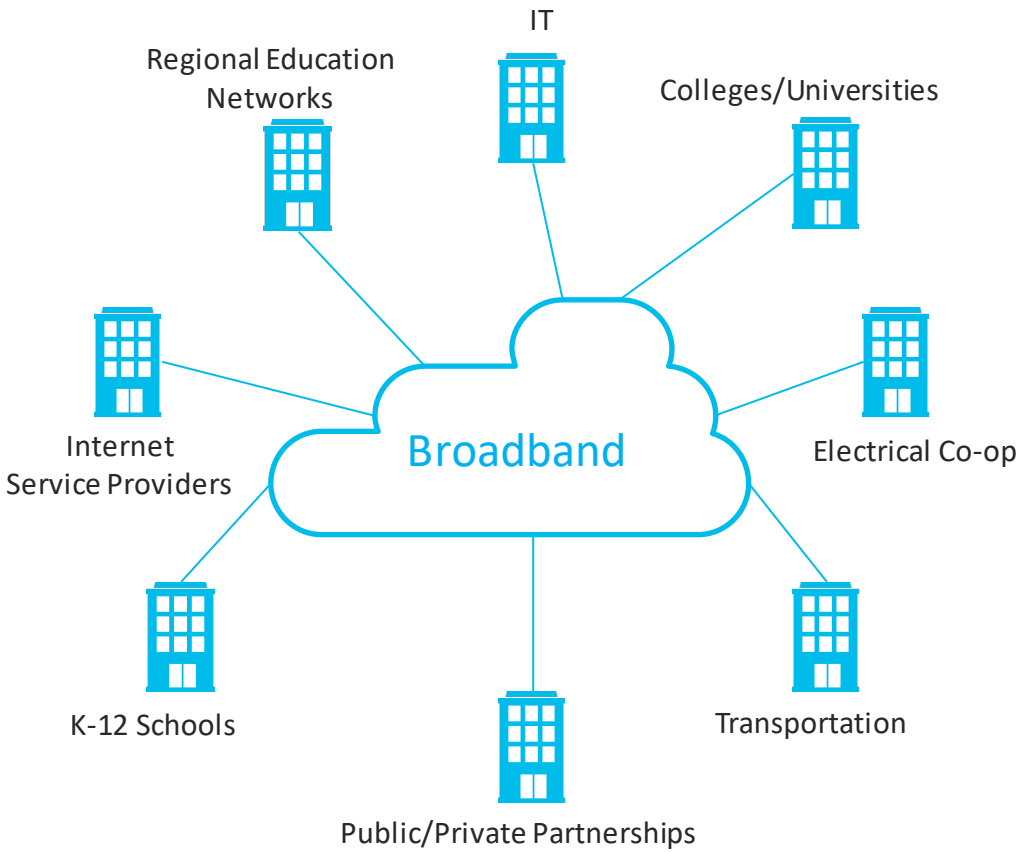
- Economic prosperity for all
- Access to economical, educational, and health opportunities
- Break down cultural barriers so everyone can thrive

Smart & Connected City/State

- Smart lighting, traffic management, video surveillance, gun shot detection, public safety monitoring
- Citizen Engagement
- Digital Entitlement Services
- Telehealth and educational services

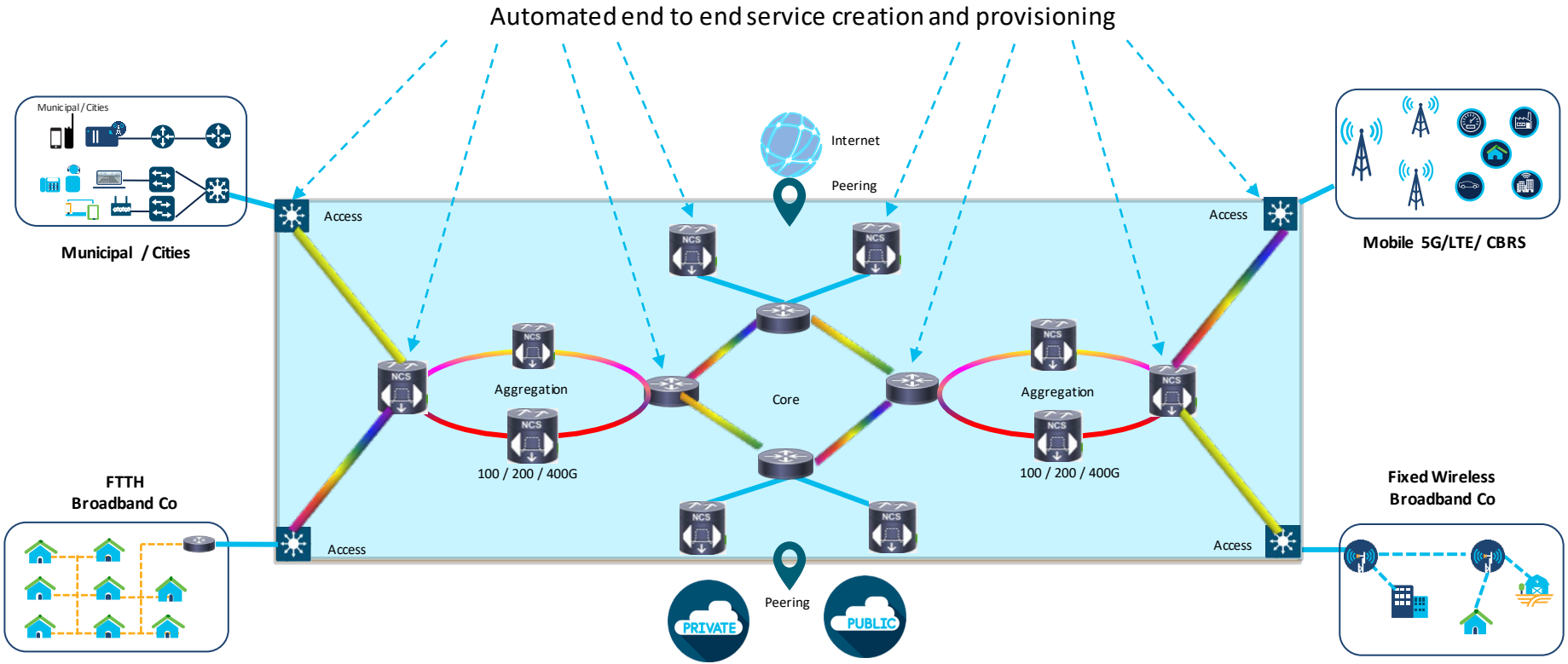
Accessibility, Affordability, and Education

Coalition of the Willing

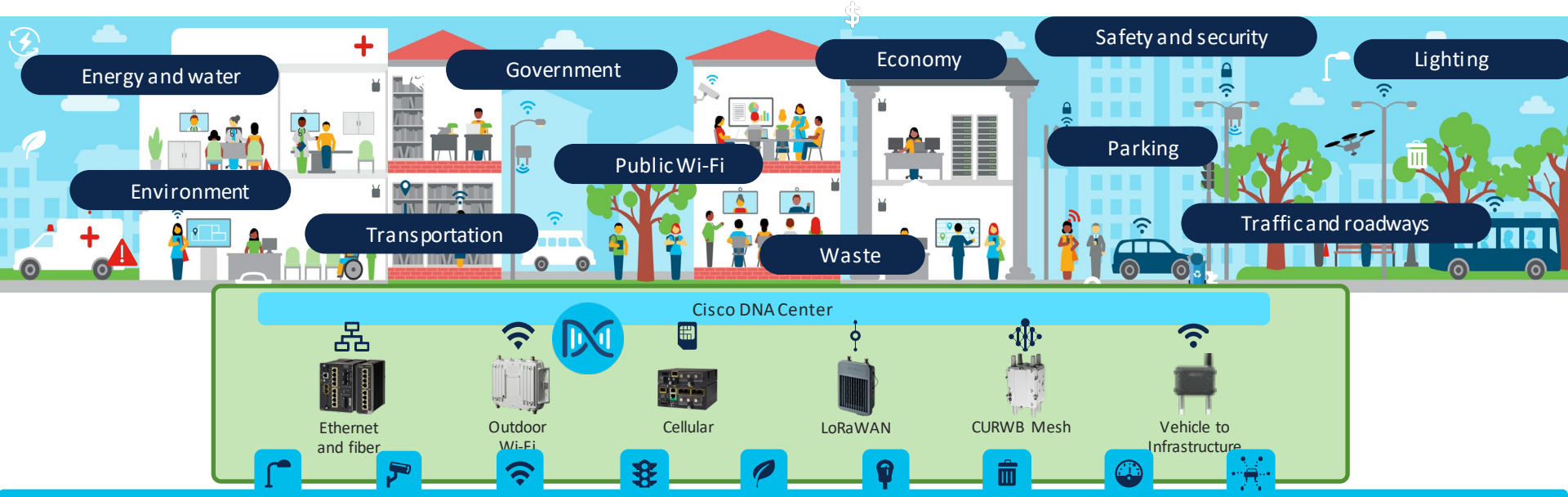


Building the multi-service core infrastructure

Cisco's blueprint for Government's open access fiber network



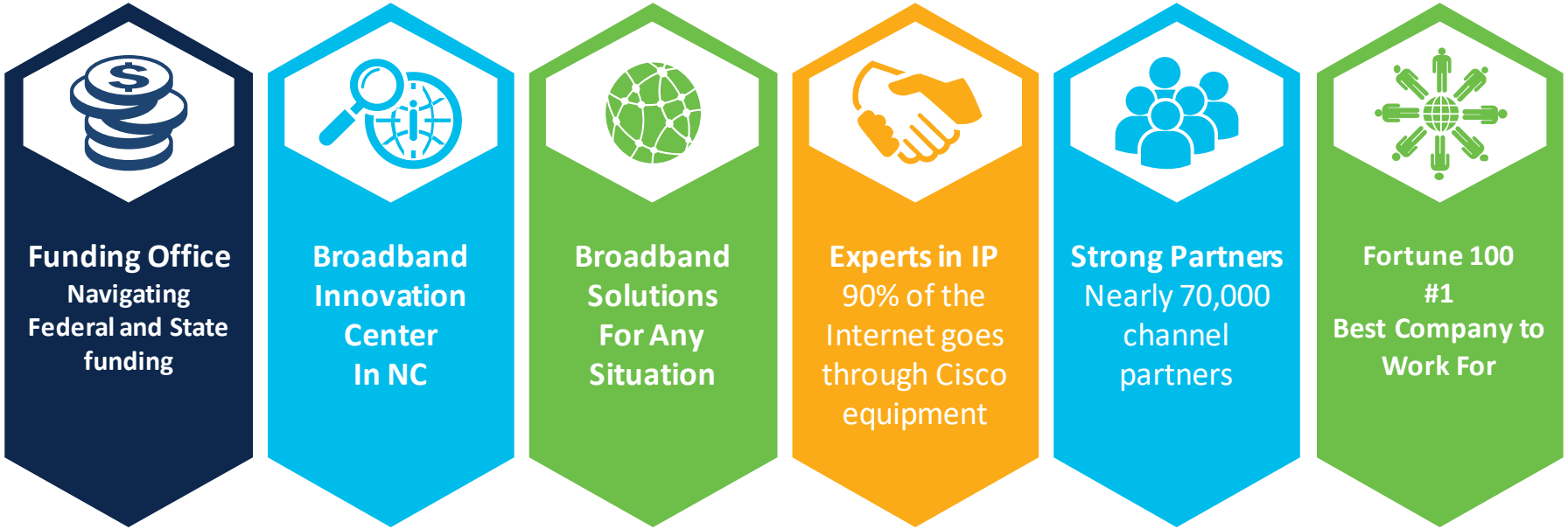
Cisco Integrated Communities



Common infrastructure deployed once can be used for multiple use cases

- Improved citizen safety
- Safer roadways and intersections
- Protecting and improving city water supply
- Flood monitoring and mitigation
- Better Data and metrics for planning
- Better citizen engagement

The Cisco Difference



The Best Innovation Partner


CISCO

Connected Government – Case Studies

Susan Case
Internet of Things Specialist
Cisco Systems

Connected Government – Case Studies

Smart Transportation

Mark Knellinger
Transportation Solutions Architect
Cisco Systems

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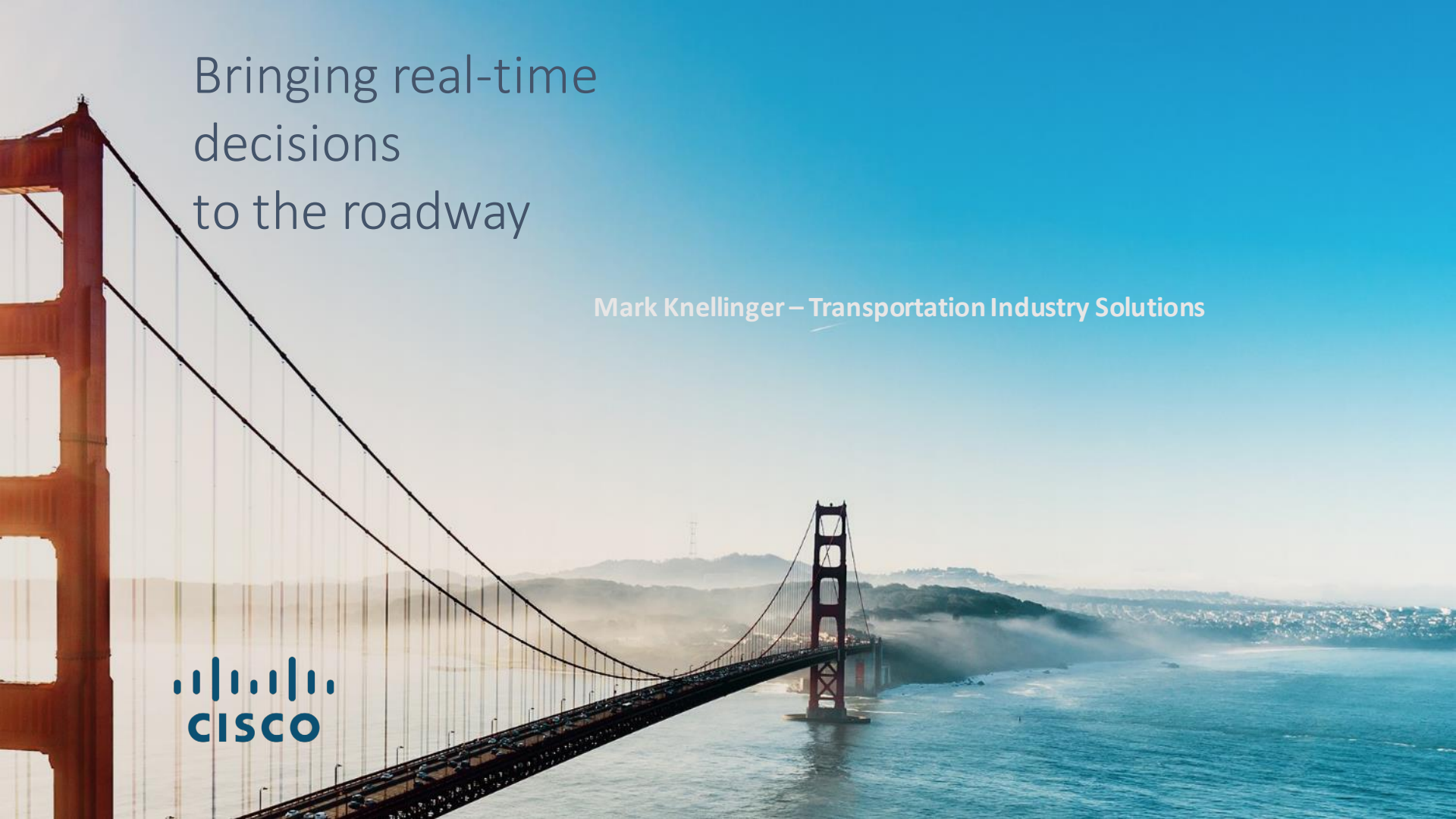
Bringing real-time decisions to the roadway

Mark Knellinger – Transportation Industry Solutions



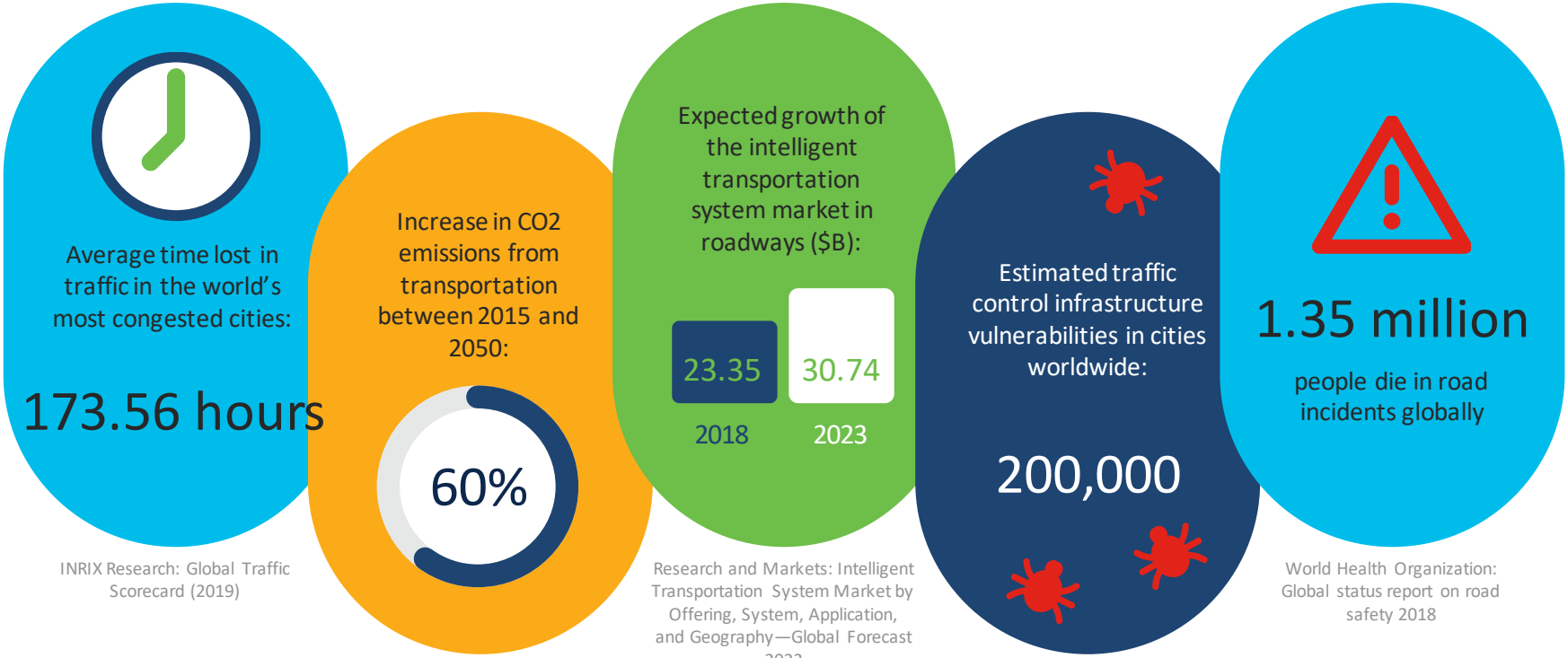
Except during times of disruption

Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives.

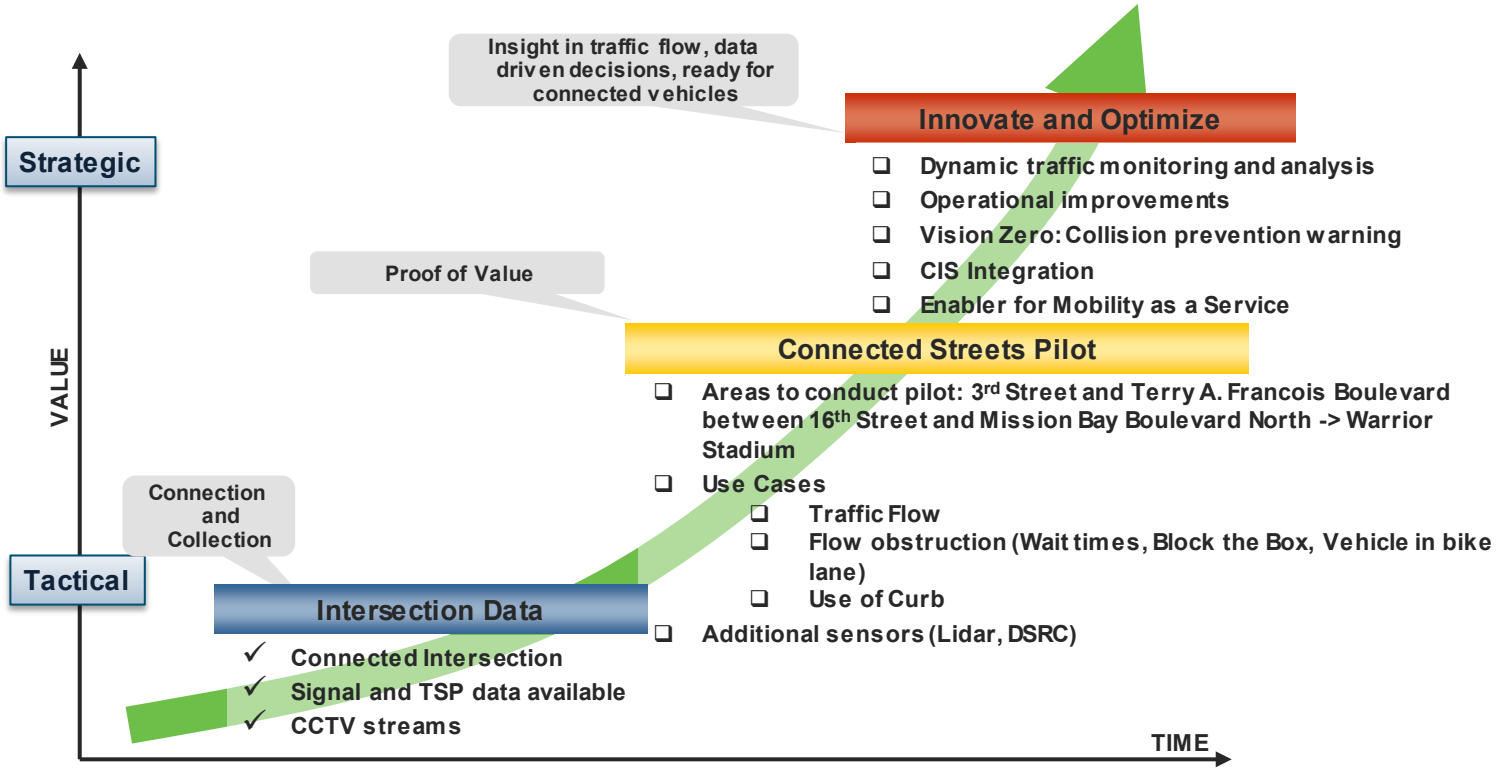
Easter 1913. 5th Avenue after disruption
Spot the horse.

Transportation – always changing, always the same



Technology Enablement to improve Traffic Flow and Street Design

Converge, Visualize and Analyze Large Data Sets



Roadway trends: Transportation agencies need Cisco in 3 primary areas

Cisco connects and secures devices, data, people, & processes

1.)Roadside Infrastructure → 2.) Roadside Intelligence → 3.) Management and Ops

Connect Devices

- **Connect and secure signs, signals, and devices for transportation system management and operations**
- **Provide opportunities for rural broadband and multi-agency connectivity with optical scale**

Process Data

- **Connected and automated vehicles (CAV) require edge compute to secure, filter, and take low-latency action**
- **Enable seamless and secure connections from network edge to traffic management centers and the cloud**

Manage and Operate

- **Traffic operators can access traffic management centers securely and remotely**
- **Line of business/ traffic managers can deploy safety and other vehicle to infrastructure (V2I) applications**

For highway safety applications, detection to action

Needs to Be:

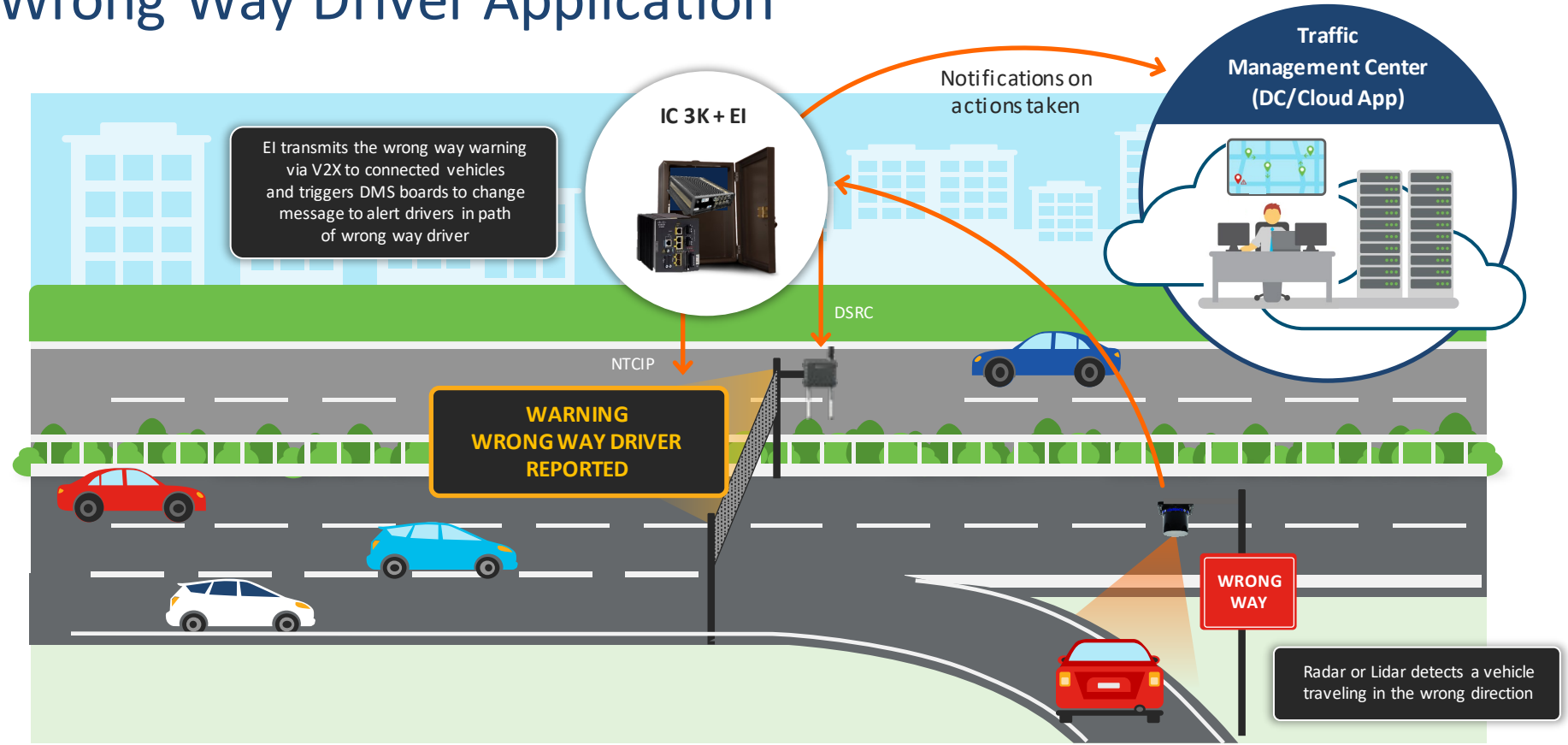
MILLISECONDS

NOT

SECONDS

Roadways and intersections

Wrong Way Driver Application



Bipartisan Infrastructure Bill
Transportation Funding Opportunities

Opportunity Area	Solution	Grant Program	Amount
Roads, Bridges & Major Projects	S+CC/IoT	➢ Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants ➢ National Infrastructure Project Assistance grant program ➢ Infrastructure for Rebuilding America (INFRA) Grant Program	**$7.5B** **$5B** **$3.2**
Public Transit	Mobility, Collaboration, S+CC/IoT	➢ Transit Accessibility for Seniors and Persons with Disabilities	**$2B**
Transportation Resiliency	S+CC/IoT, Core	➢ Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) grant program	**$8.7B**
Safety & Research	S+CC/IoT, Mobility, Collaboration	➢ Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program	**$500M**
Energy Infrastructure	S+CC/IoT, Cybersecurity, Core	➢ Smart Grid Investment Matching Grant Program ➢ Rural and Municipal Utility Advanced Cybersecurity Grant and Technical Assistance Program ➢ WaterSMART Water and Energy Efficiency Grants	**$3B** **$250M** **$400M**
Water Infrastructure	S+CC/IoT, Core	➢ Drinking Water and Clean Water State Revolving Funds ➢ Advanced Drinking Water Technologies grants ➢ Clean Water Infrastructure Resiliency and Sustainability Program	**$23.4B** **$10M** **$25M**

Note: This information is preliminary, and we still have a ways to go before we have final approved legislation. In many cases the full opportunity for Cisco will not be known until guidance documents are developed, solicitations are released, and the full spectrum of allowable and ineligible expenses is known.

Connected Government – Case Studies

Securing Critical Infrastructures

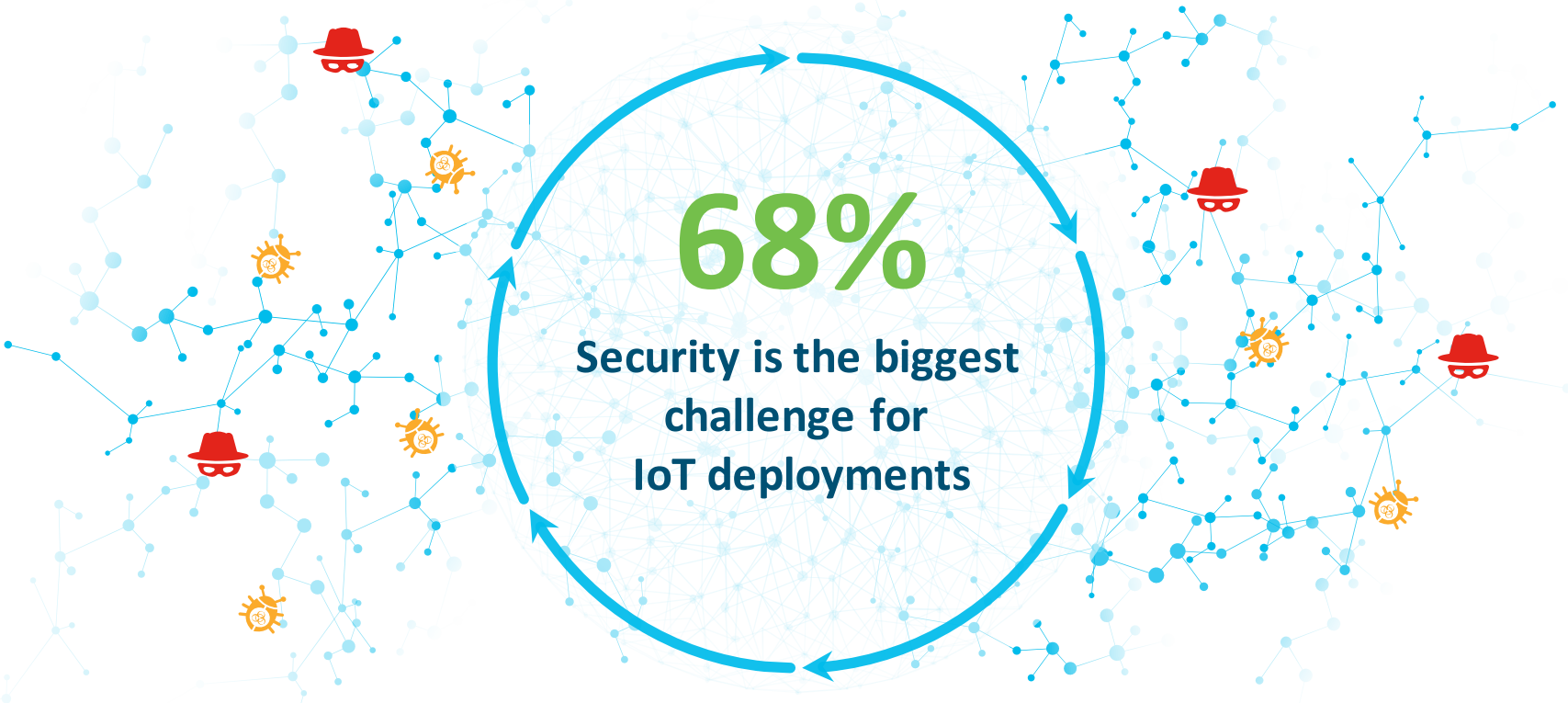
Bobby Arkolakis
IoT Solutions Architect
Cisco Systems

Cisco IoT

Securing Critical Infrastructures

Bobby Arkolakis, Technical Solutions Architect

Digitization is accelerating **seamless movement of data across Enterprise**



Digitization Increases **The Attack Surface**

Industrial Networks Are a New Target for Hackers

The Malware Used Against The Ukrainian Power Grid Is More Dangerous Than Anyone Thought

Researchers have discovered a new powerful —and dangerous—malware that targets industrial control systems.

Stuxnet worm heralds new era of global cyberwar

Attack aimed at Iran nuclear plant and recently revealed 2008 incident at US base show spread of cyber weapons

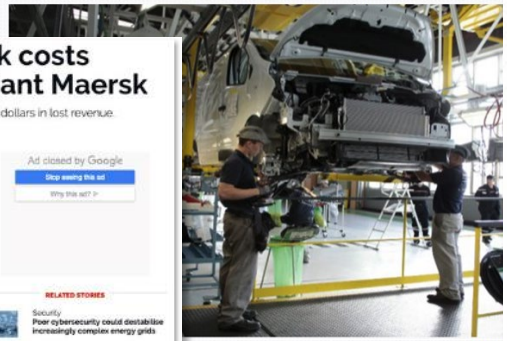
▲ The Stuxnet worm appeared to use contaminated hardware in an attempt to cripple Iran's nuclear programme. Photograph: Matthew Baker/PA

Europe

France's Renault hit in worldwide 'ransomware' cyber attack

Share 151 | Tweet | Share | submit | Share

French Renault car maker production plant in Sandouville, northern France, was shut down on saturday due to the wave of global cyber attacks.

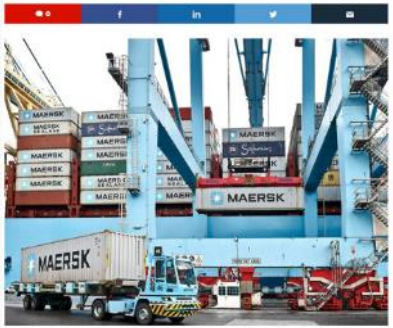


Text b

Petya ransomware: Cyberattack costs could hit $300m for shipping giant Maersk

June's cyberattack will cost the international shipping firm hundreds of millions of dollars in lost revenue.

By Danny Palmer | August 16, 2017 -- 13:28 GMT (13:28 BST) | Topic: Security



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RELATED STORIES

Security
Poor cybersecurity could destabilise increasingly complex energy grids

Security
PM flags My Health Record 'reassurances' as RACGP expresses concern

Enterprise Software
Medicare hits My Health Record opt-out while Health complains about Part Library

Security
Flaw let researchers snoop on Swann smart security cameras

NEWSLETTERS

Maersk shut down a number of its operations due to the Petya cyberattack

Technology

Hack attack causes 'massive damage' at steel works

29 December 2014 | Share

The hack attack led to failures in plant equipment and forced the last shut down of a furnace

A blast furnace at a German steel mill suffered "massive damage" following a cyber attack on the plant's network, says a report.

Cisco IoT

You cannot secure what you don’t know

55% of industrial organizations don’t know all devices in their network

List all the assets you are defending

Identify asset communication issues

Detect bypass or leaks in the IDMZ

Spot vulnerable assets

Build compliance reports

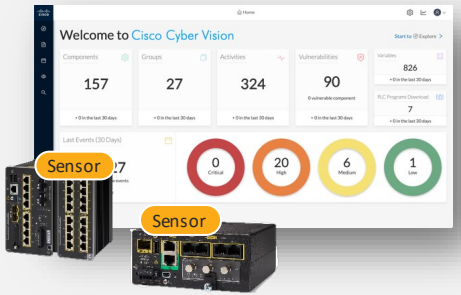
Gain visibility to detect threats, take corrective actions, build security policies and drive best practices

Cisco IoT

Foundational Components of Industrial Security

Discover and Detect

Cyber Vision



OT asset inventory
Track industrial processes
Detect attempts to modify assets

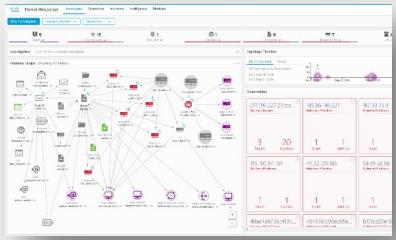
Segment and Detect

ISA 3000

Prevent propagation of threats
with best of breed
industrial protocol IPS/IDS

Respond

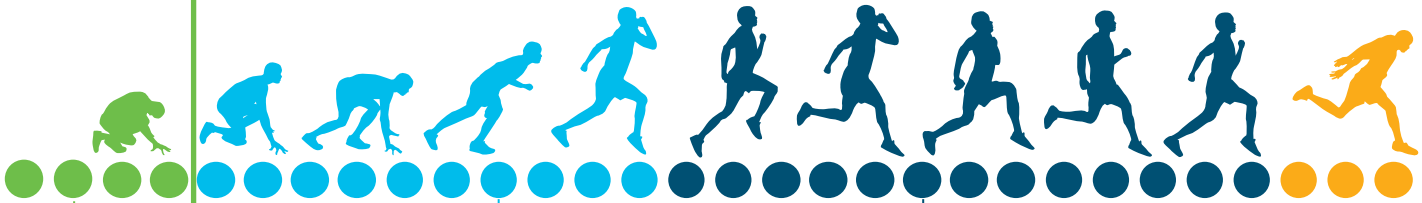
SecureX



Enable IT-SOC to investigate industrial
threats through integration with
Cyber Vision and ISA 3000

Powered by Cisco TALOS threat intelligence

Steps to successfully securing your infrastructure



Discover

- Catalog Asset Inventory
- Find them on the network
- Patch their vulnerabilities

Baseline & Segment

- Know who is talking to whom
- Baseline normal behavior
- Create segments based on communication patterns

Detect

- Get alerts on violation to the baseline

Enforce

- Automate enforcement to quarantine misbehaving assets

Cyber Vision
Vulnerability Detection

ISE - Centralized
Segmentation Policy

Firepower IPS
Zone Segmentation

TrustSec
Micro Segmentation

Cyber Vision
Anomaly detection

Firepower/Cyber Vision
Intrusion Detection

AMP / Threat Grid
Malware Detection

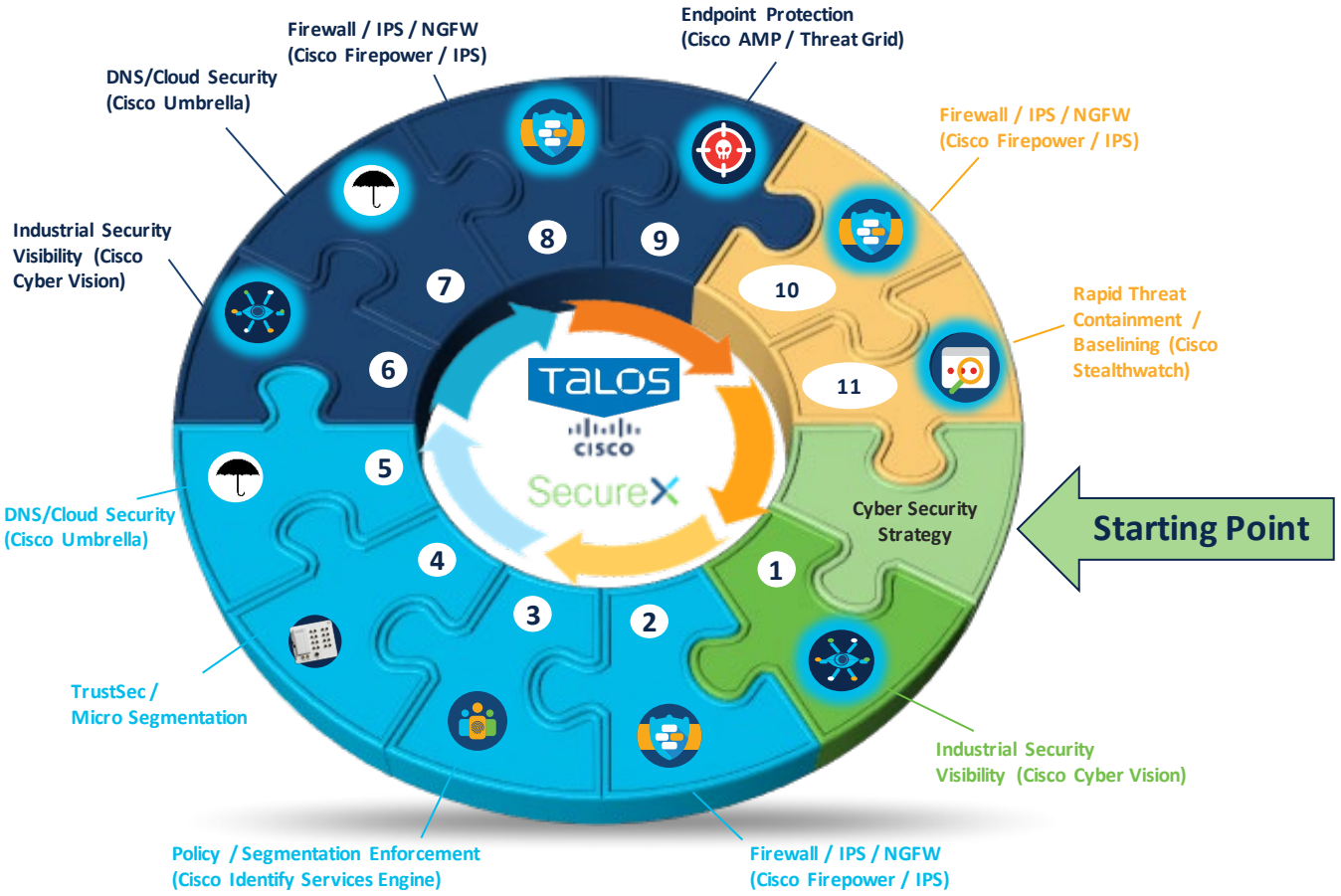
Cisco
Stealthwatch

Firepower NGFW

TALOS Threat Intelligence

Cisco IoT

Holistic Approach to Industrial Security



Identify / Discover:
Identify systems, people, assets, data, and capabilities and their cybersecurity risk

Protect / Segment:
The ability to limit or contain the impact of a potential cybersecurity event

Detect:
Anomalous activity is *detected* in a timely manner and the potential impact of events is understood.

Respond:
Taking actions regarding a detected cybersecurity incident

Cisco Customer Experience/Services

Cisco Cyber Vision

Cyber Vision understands application flows

Cisco's Deep Packet Inspection understands all process information even when using proprietary protocols

Cisco Cyber Vision

Visibility & Threat Detection for the Industrial IoT

Protect your industrial control systems against cyber risks

Visibility

Asset inventory
Device vulnerabilities
Risk scoring

Operational Insights

Track process/device modifications
Record control system events
Map communication patterns

Threat Detection

Behavioral anomaly detection
Snort IDS with Talos signatures
SecureX threat investigation

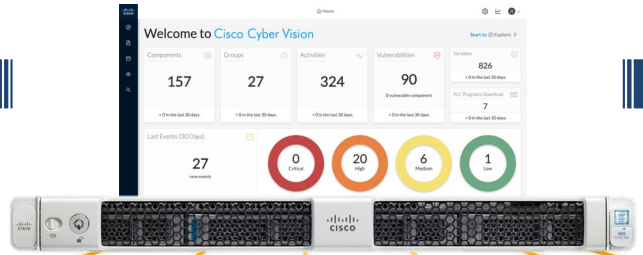
Cisco IoT

Security that scales with your infrastructure

Visibility and threat detection built into your industrial network

Cyber Vision Center

Centralized Analytics & Data Visualization



Cisco Integrations

ISE , StealthWatch, Firepower, DNA-C

Third Party Integrations

SIEM, CMDB ICS Vendor Software

Lightweight Metadata

IC3000 Industrial Compute

Hardware-Sensor

DPI via SPAN to support brownfield

IE3400 Switch

IE3400
IP67 Switch

IE3300
10G Switch

IR1101
LTE Gateway

Catalyst 9000 Series
Aggregation Switch

Network-Sensors

Deep Packet Inspection built into network-elements eliminating the need for SPAN

Cisco Cyber Vision **portfolio**

Cyber Vision **Center**

Hardware Appliance
UCS based servers with Hardware RAID

CV-CNTR-M5S5
- 16 core CPU
- 64 GB RAM
- 800GB drives

CV-CNTR-M5S3
- 10 core CPU
- 32 GB RAM
- 480GB drives

Software Appliance
Virtual Machines

VMWare ESXi OVA

HyperV VHD

AWS

Minimum requirements
Intel Xeon, 4 cores
16GB RAM and 200GB SSD
1 or 2 network interfaces

Minimum requirements
Intel Xeon, 10 cores
32GB RAM and 1TB SSD
1 or 2 network interfaces

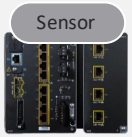
Cyber Vision **Sensors**

IC3000 Industrial Compute

Hardware Sensor
(SPAN based to support brownfield)

IE3400 Switch

IE3400
IP67 Switch



IE3300
10G Switch

IR1101
LTE Gateway

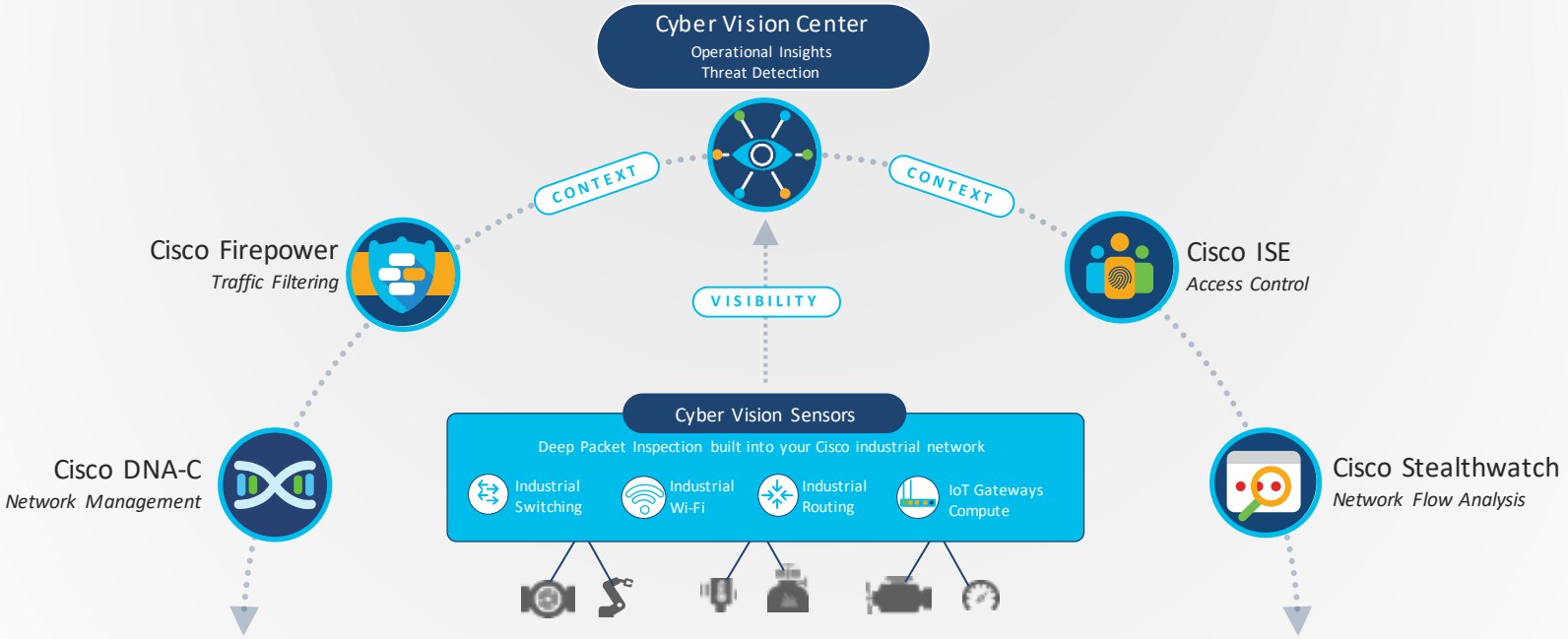
Catalyst 9300/9400
Aggregation Switch

Network Sensors
(Deep Packet Inspection built into network-elements eliminating the need for SPAN)

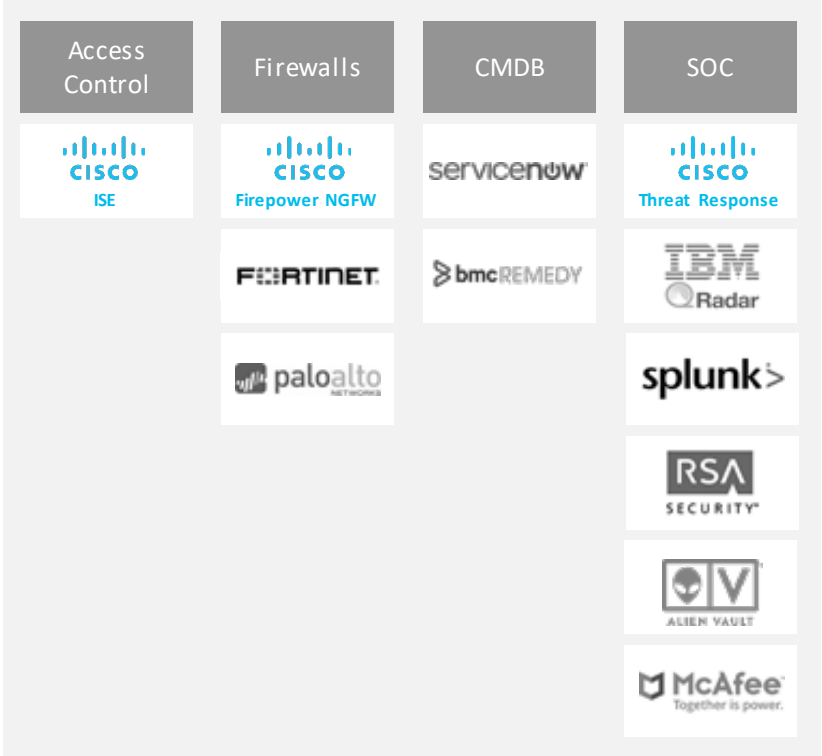
Cisco IoT

A fully **integrated IT-OT security** solution

Working together to define & apply IoT security policies



Cyber Vision integrates with your existing security platforms

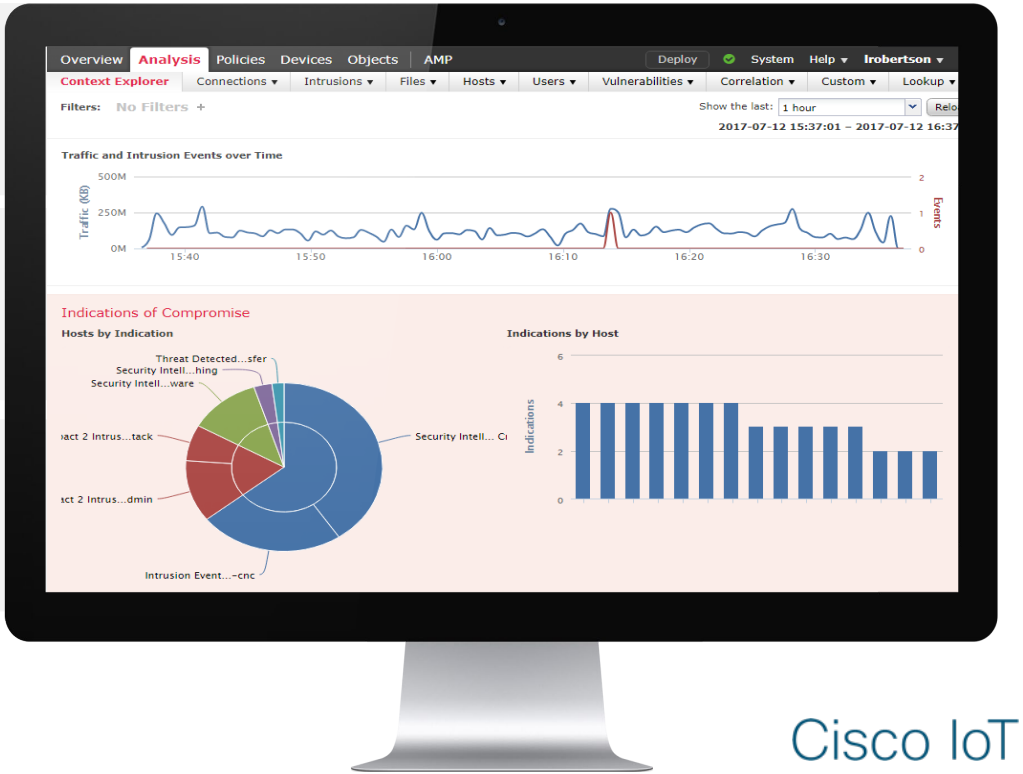


Firepower Management + Cyber Vision

Identify anomalous flows in Cyber Vision and **kill FTD Firewall sessions**

Map **ICS device identity** to Hosts in Firepower for use in FMC correlation policy

Map ICS device IP to named objects (PLC, IO, Drive) in Firepower for use in access policy*



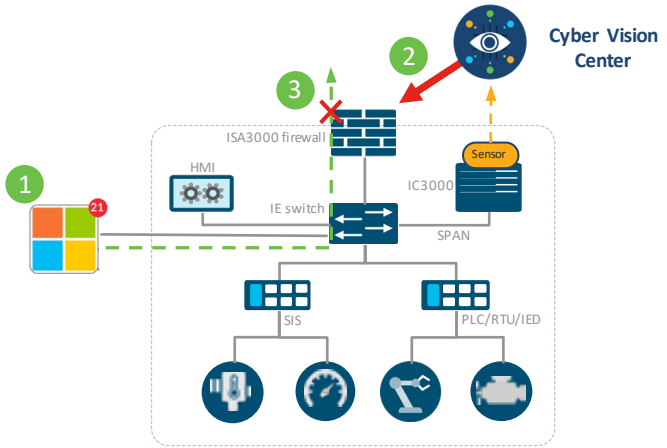
Integration available with Cyber Vision 3.1.0+

* *Available in winter 2020*

Cisco IoT

Firepower Threat Defense (FTD) – Kill Sessions

1. Cyber Vision detects event
   - Baseline change
     - New component
     - New activity
     - New variable
   - Snort alert
2. Cyber Vision sends command to Firewall to kill associated session
3. Firewall blocks session



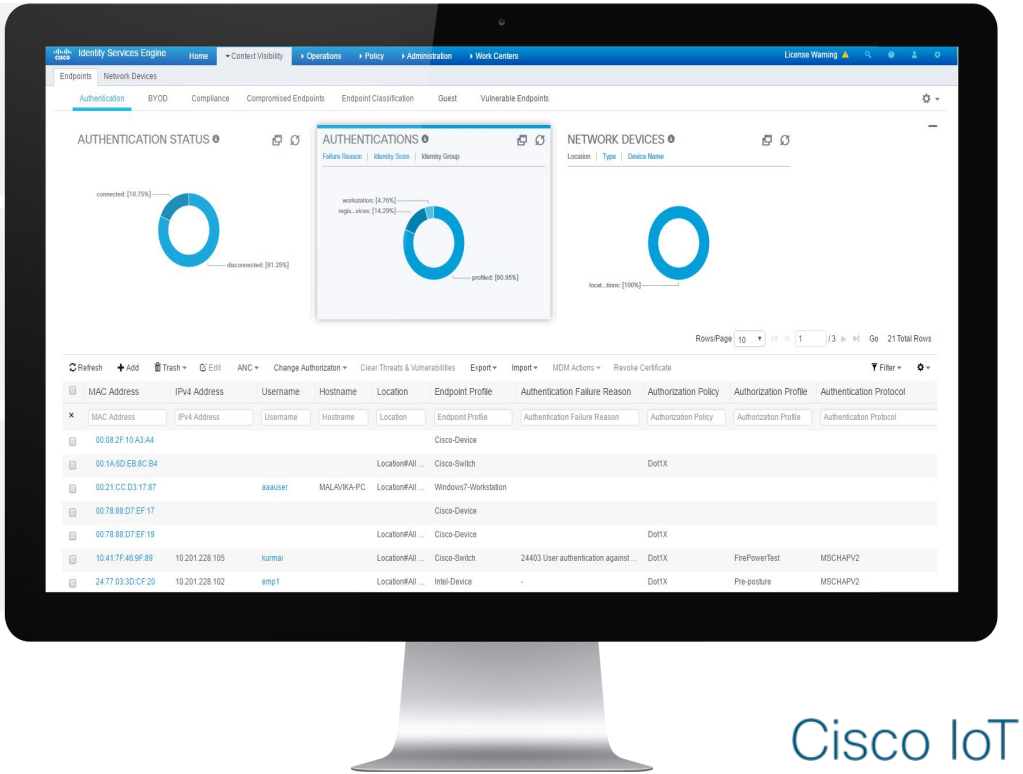
Cisco IoT

Identity Services Engine + Cyber Vision

Enrich endpoint attributes in ISE with rich context from Cyber Vision

Use custom attributes to **map industrial process context** like Cells and Zones for profiling endpoints

Enforce **Network Access Control** through dynamic assignment of VLAN and dACLs or **micro-segmentation** with SGT / TrustSec



Integration available with Cyber Vision 3.0.0+

Stealthwatch + Cyber Vision

Enrich host-groups in Stealthwatch with rich context from Cyber Vision

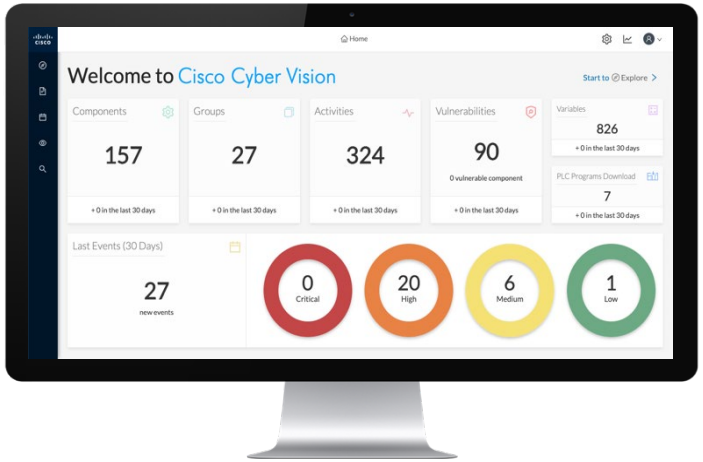
Easily **identify flows mapped to industrial endpoints** with host-group attributes (Logix Controller made by Rockwell Automation in Cell-3)

Use host-group attributes like Cells and Zones to create **alarms for inter cell/zone traffic violations**

Integration available with Cyber Vision 3.0.0+

Cisco IoT

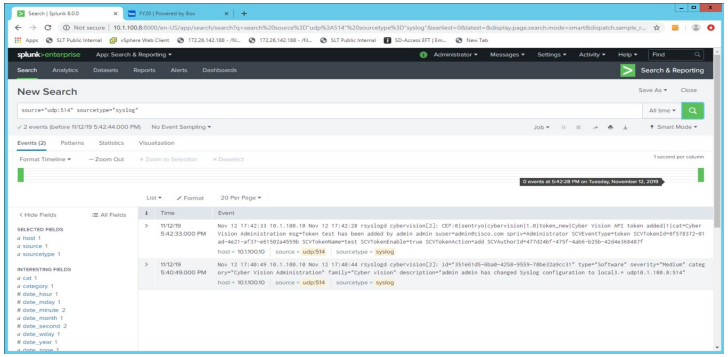
Unified IT/OT security events management in SIEM



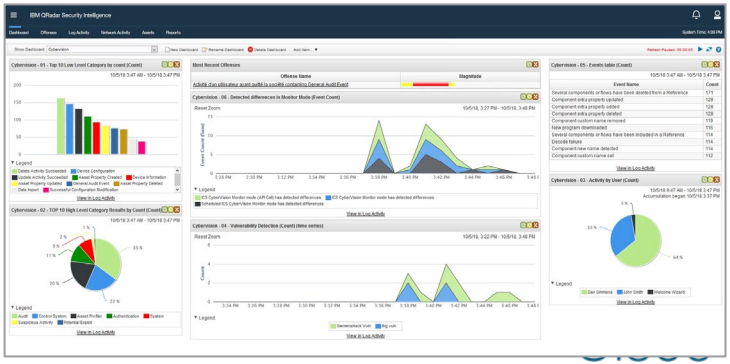
ICS visibility

Syslog

Splunk integration



IBM QRadar integration



The bridge to possible

~1985 BROADBAND INNOVATION

Broadband Innovation 2021

NFF

Innovative Technologies To Accelerate The Journey

TRAXyL FiberTRAX “Paints” Optical Fiber Directly Onto Paved Surfaces

Daniel Turner
Chief Executive Officer and Founder
TRAXyL

TRAXyL
Here to anywhere.

NFF

daniel@traxyl.com +1 (844) 4 TRAXYL

Leadership

Daniel Turner - *CEO*

Engineering

Telecommunications & optical fiber expert

Stephen Carter - *COO*

Business

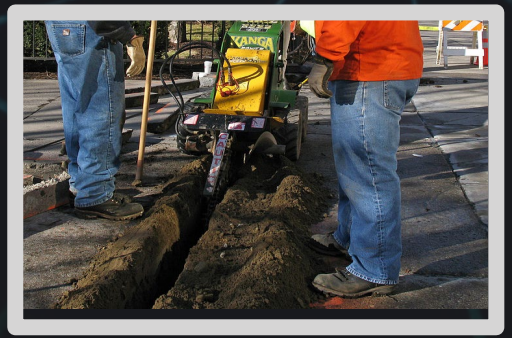
Digital controls & system integration


Optical Fiber
5 G
ISPs
ACCESS

Fiber is a key driver to new technologies, yet installation is:

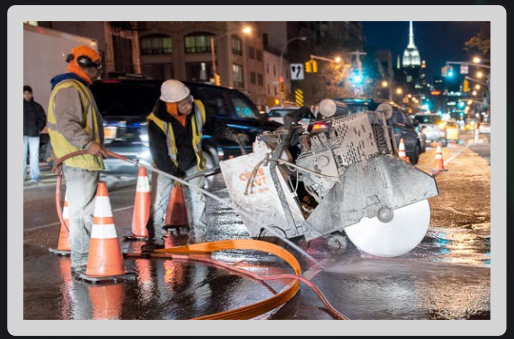
Expensive

Months of time at $15 to $150 per foot



Disruptive

Closures, detours, and delays



Destructive

Property, utility, and environment damage

FiberTRAX®:

"Painting" fiber on paved surfaces

The *Fiber*TRAX Advantage

Rapidly deployed surface mounted fiber protected by durable coatings.

Efficient

On-demand install at low cost

Convenient

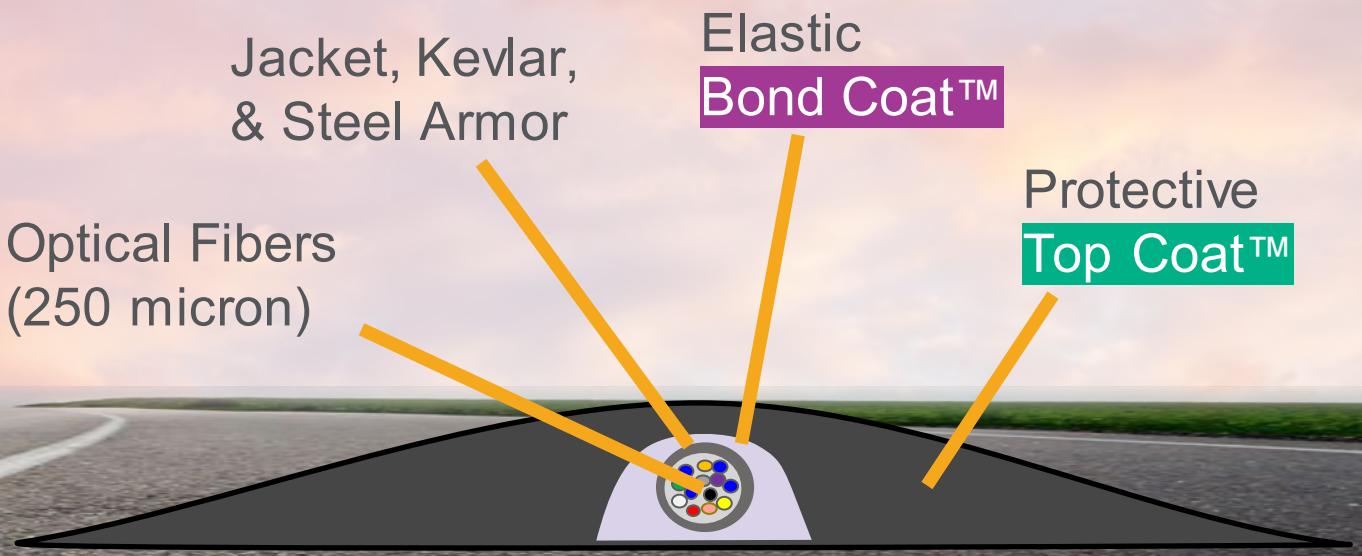
Easy to use and deploy

Versatile

New pathways for fiber

TRAXyL

FiberTRAX Cross-section



DIMENSIONS:

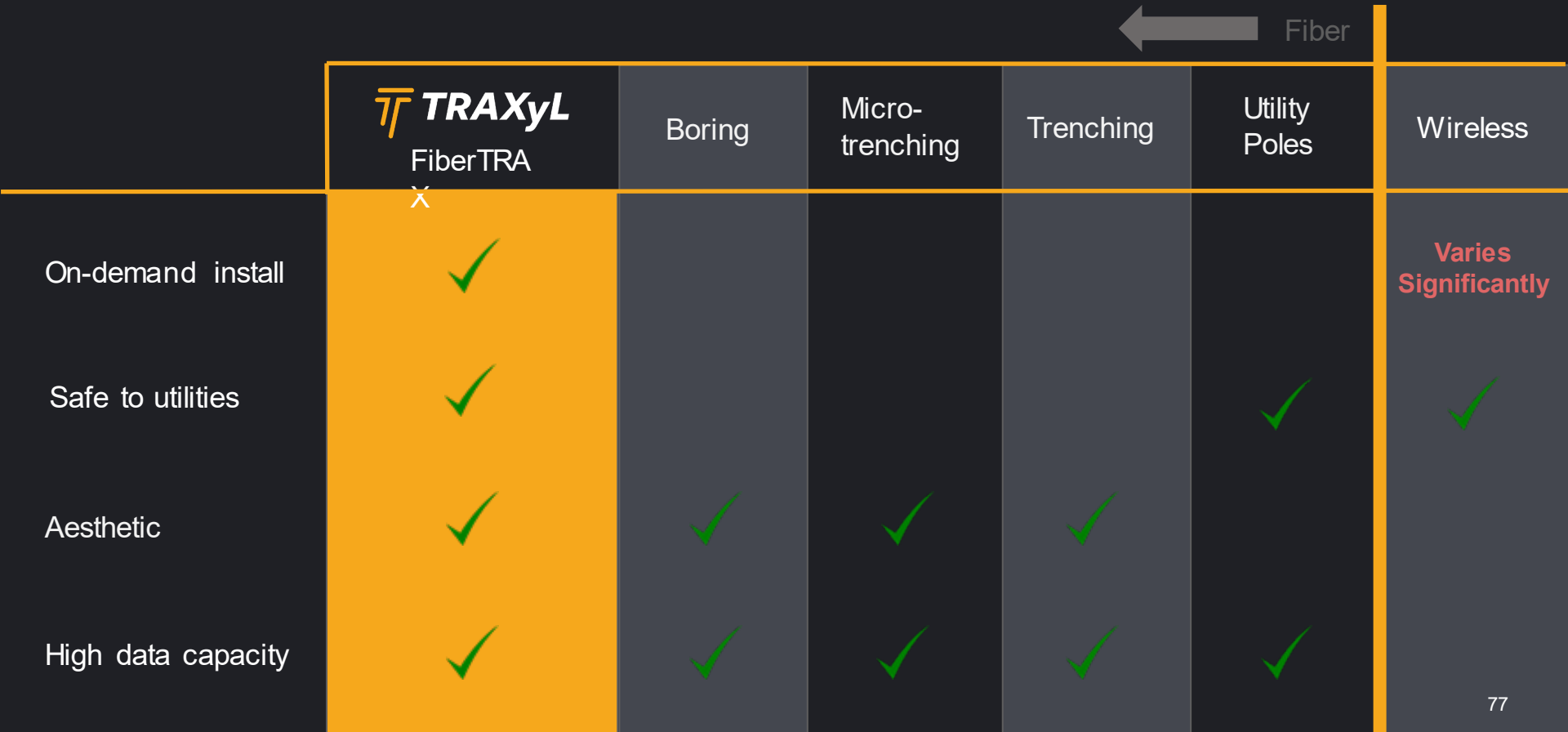
FiberTRAX
width: ~100 mm

FiberTRAX
height: ~8 mm

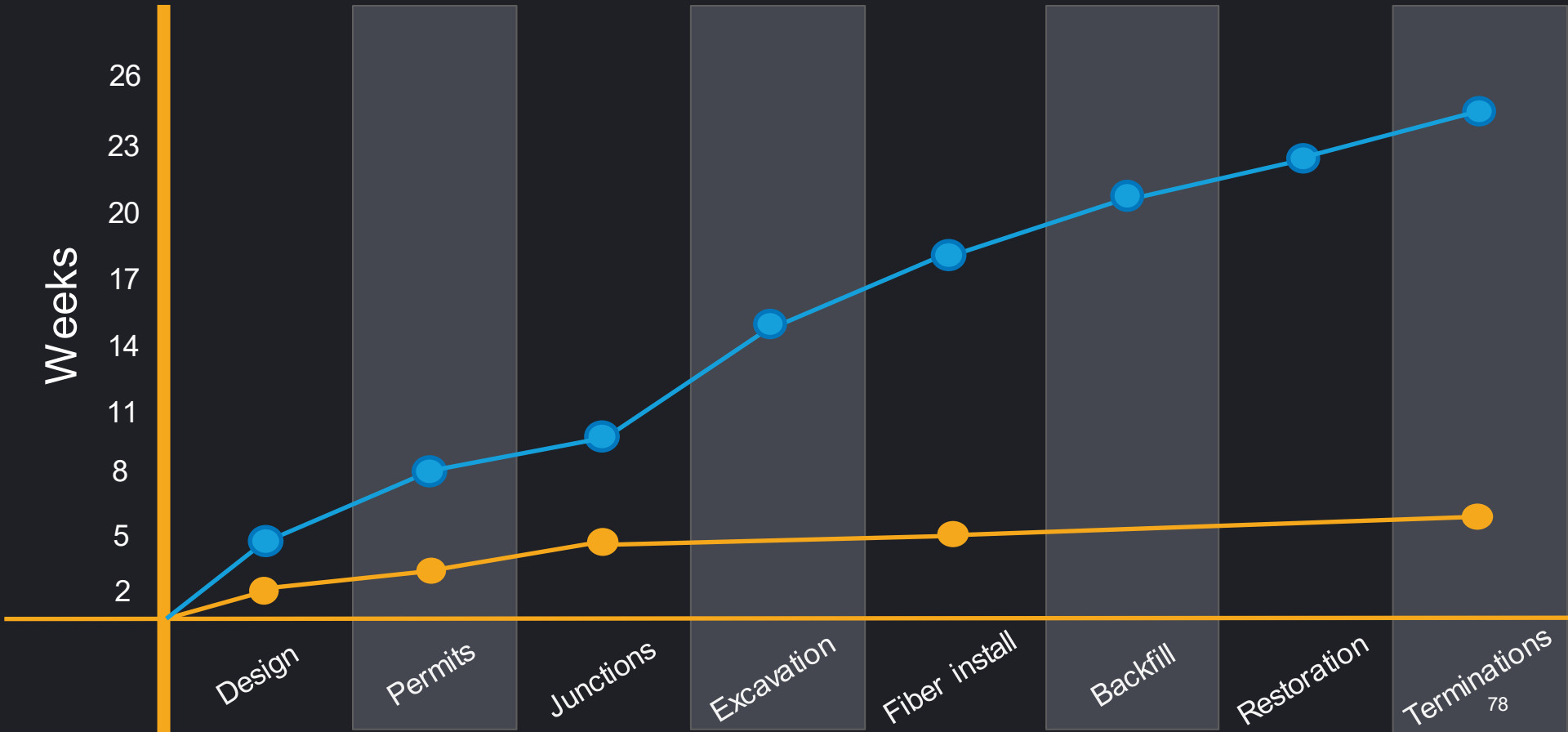
Cable
diameter: 3-5 mm

Size exaggerated, not to scale.

FiberTRAX vs Conventional Methods



Mile of FiberTRAX vs Conventional



TRAXyL's Model:

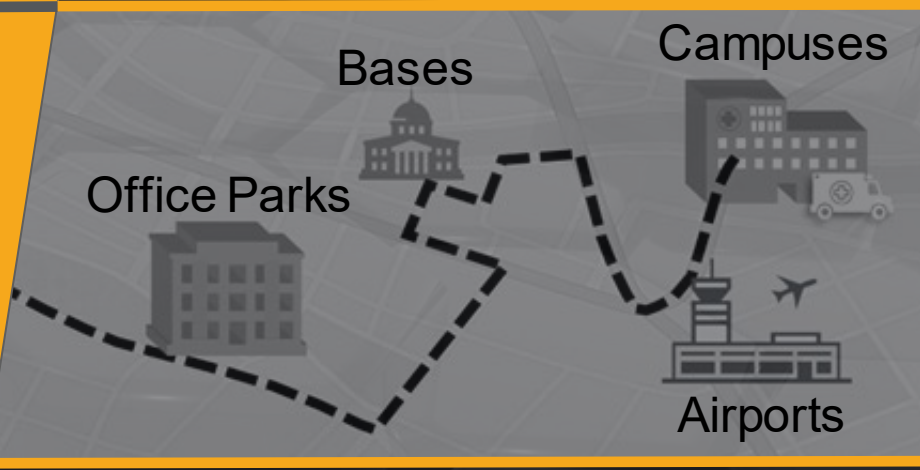
- Lease Equipment
- Sell Fiber and Coatings
- Training & Certification

Initial Customer Focus

Customer Needs

- Last mile
- Network extension
- Fast or immediate install

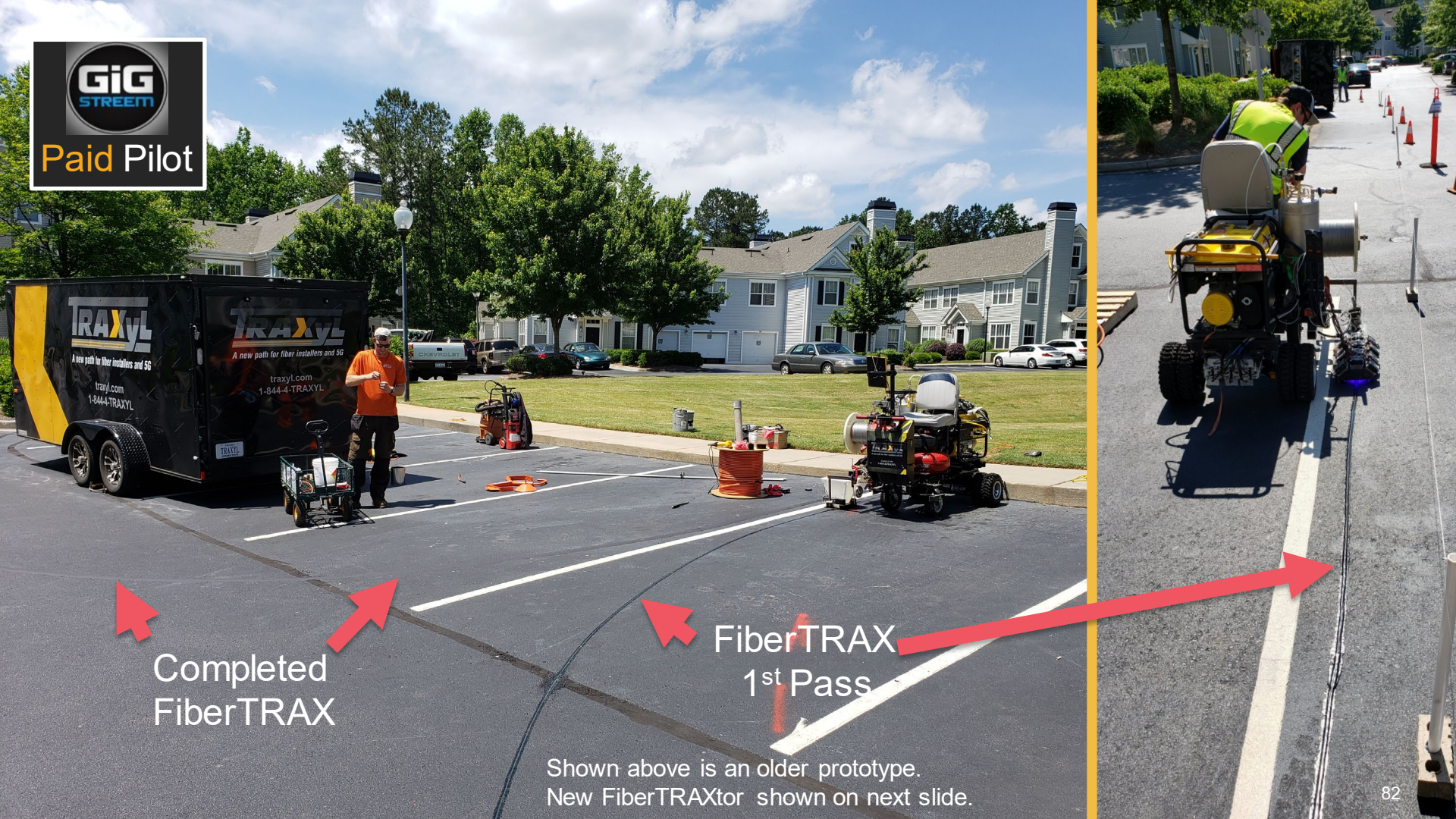
Customer Locations



Customer Acquisition

- Distribution & Channel Partners
- Education
- Partner with Installers & ISPs


NSF
SBIR
Phase 1
Grant


GiG STREEM
Paid Pilot
TRAXyL
A new path for fiber installers and 5G
traxyl.com
1-844-4-TRAXYL
Completed FiberTRAX
FiberTRAX 1st Pass
Shown above is an older prototype.
New FiberTRAXtor shown on next slide.

CASE STUDY: DULLES AIRPORT CAR RENTAL

Overview
- Car Rental Agency – Dulles Airport

Objective
- Provide network connectivity to two recently acquired buildings
- Time = $$
- Permitting / Approval challenges
- Avoid the things that could “blow up” under the surface (ex: fuel tanks)
- Limited budget

Solutions Explored
- MicroTrenching
- TRAXyL

Results
- TRAXyL deployed in one night
- No downtime
- No permitting issues – because no trenching

Advice
- Explore all your deployment options, make sure you include TRAXyL

CASE STUDY: OHIO BRIDGE

Overview:
- Ohio DOT Bridge near West Milton, OH

Objective:
- Connect ISP fiber to new home plan, cell tower, other businesses, and municipality
- Approaching Deadlines for Project Milestones
- Permitting / Approval challenges
- Limited budget

Solutions Explored:
- Conduit on bridge
- HDD under river
- TRAXyL

Results:
- TRAXyL deployed in two days
- Redundancy included
- Ohio DOT approval of FiberTRAX

Advice:
- Utilize FiberTRAX for last-mile and be on lookout for high-count fiber developments


elys'an f'ber
Partner
Training


AF
Flight Line
5110
TRAXyL

Data and Beyond

Help government, businesses, and communities get access **faster**.

- Identify pilot projects
- Support industry adoption
- Schedule a FiberTRAX demo


TRAXyL
Here to anywhere.
daniel@traxyl.com
+1 (844) 4 TRAXYL

Innovative Technologies To Accelerate The Journey

Cisco Ultra-Reliable Wireless Backhaul (formerly Fluidmesh)

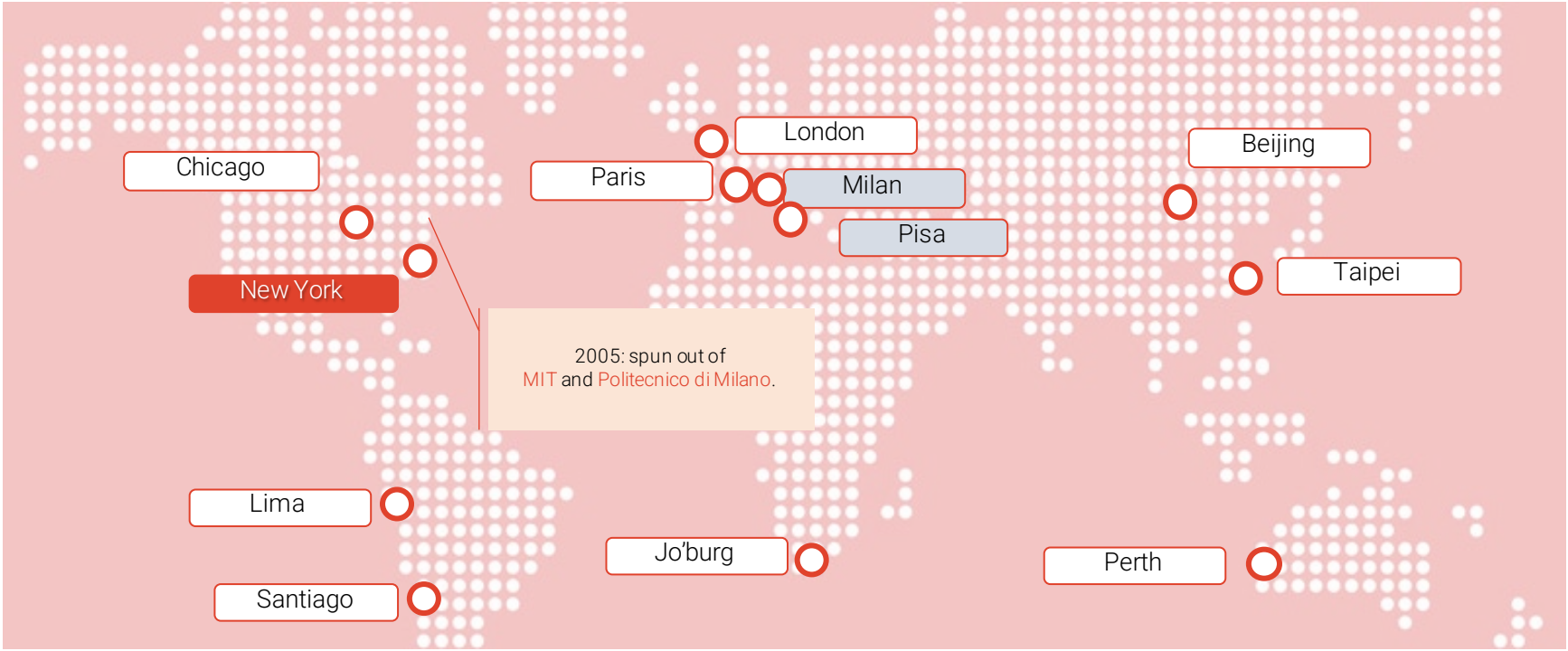
Chris Wigley
Cisco Ultra-Reliable Wireless Backhaul
Cisco Systems

NFF

FluidMesh Cisco Ultra-Reliable Wireless Backhaul

Chris Wigley – CURWB Product Sales Specialist

FLUIDMESH GLOBAL PRESENCE – ACQUIRED BY CISCO (JULY 2020)



Global Partnerships

6 Continents

75 Countries

CISCO

FLUIDMESH NETWORKS

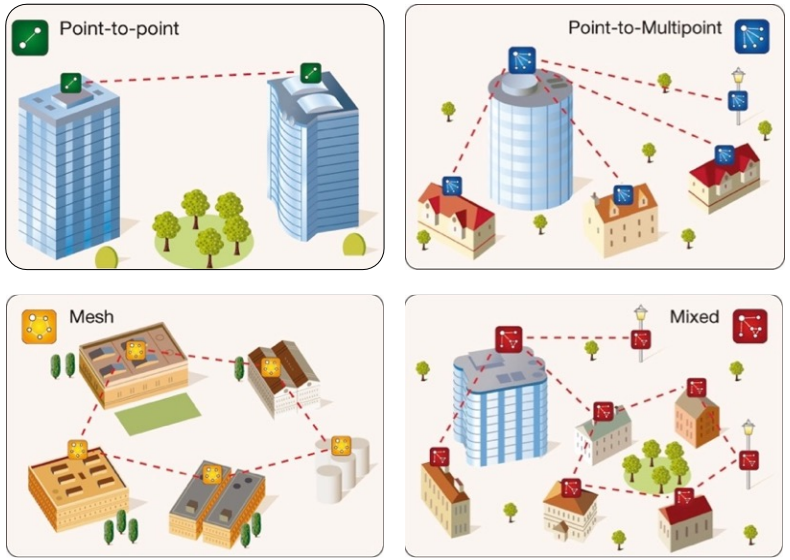
FLUIDMESH NETWORKS → Cisco Ultra-Reliable Wireless Backhaul

Why did we choose Cisco Ultra-Reliable Wireless Backhaul?

- The market is clamoring for 5G
- The new name links the product to 5G's Ultra-Reliable Low-Latency Communications (URLLC) capabilities
- Makes it easier for customers to understand its value
- They can have 5G URLLC-like capabilities today!

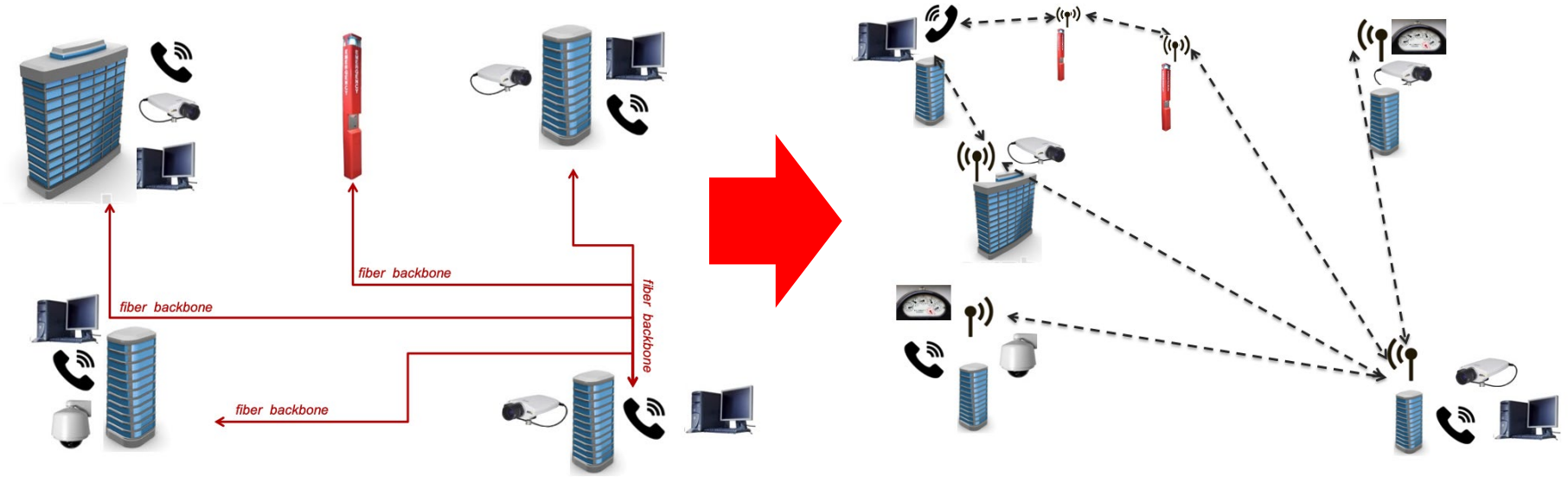
Technology Benefits

Wireless Fiber-Like Connectivity
Extending highly reliable network connections where wired Layer 1 can't go.

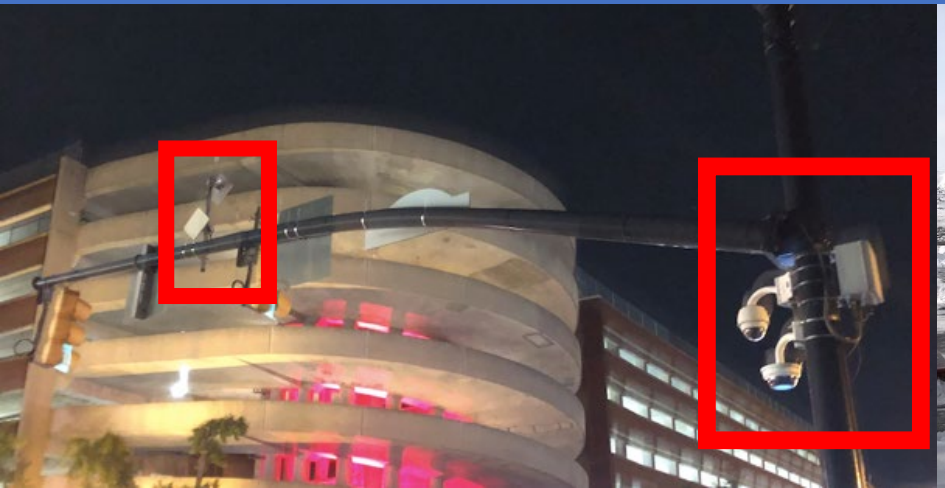


- Long Range and High Bandwidth Connectivity
  (up to 15 miles @ 500 MB)
- **Fast and Accurate Roaming**
  (0ms handoff, up to 225 Mph)
- Support for real-time sensitive traffic. Zero Loss-Low Latency.
- Pay as you go bandwidth consumption model.
- Support multiple backhaul topologies – PtP, PtMP, Mesh, and Mobility
- Secure MPLS based proprietary protocol with QoS support

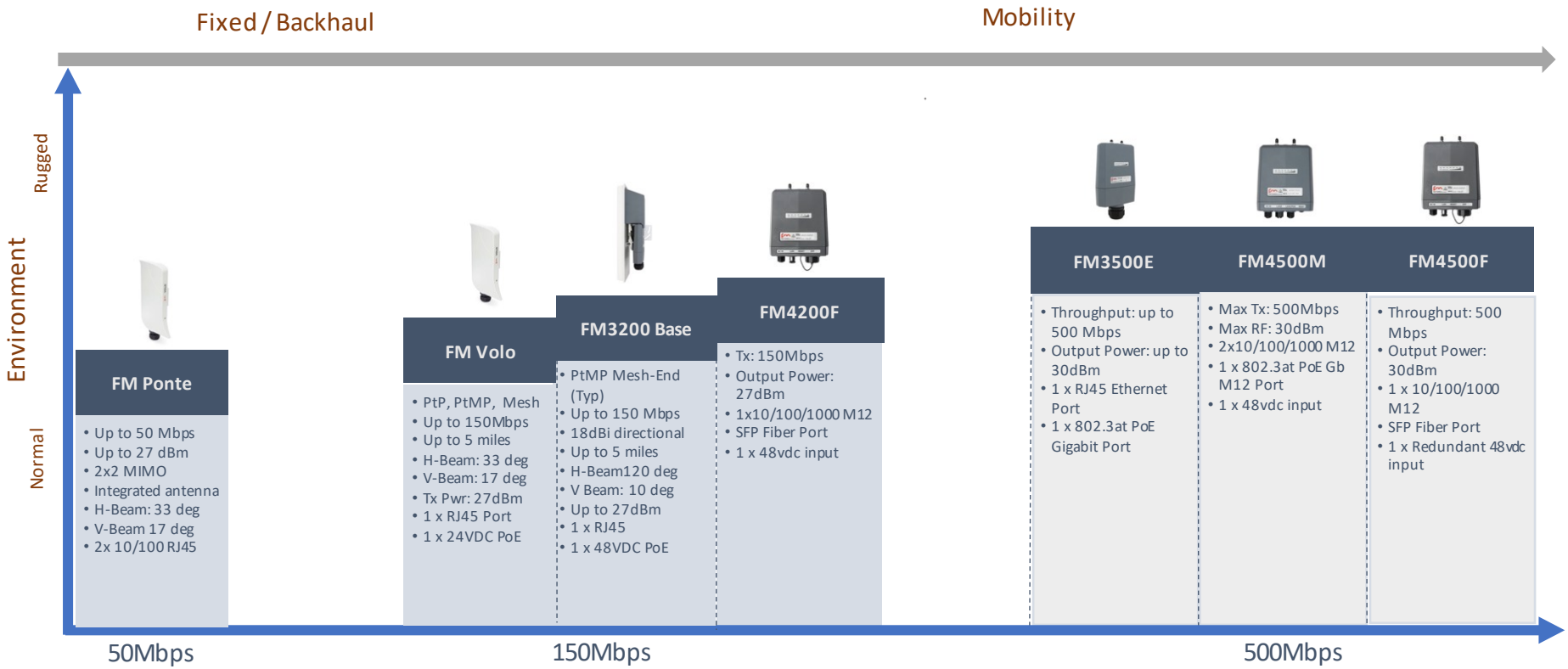
Why Use Cisco Wireless Backhaul?
Alternative or Replacement for Layer 1



ENTERPRISES REQUIRE NETWORK CONNECTIVITY OUTDOORS



Radio Portfolio: 4.9-5.8GHz Solutions



Bridging the Digital Divide

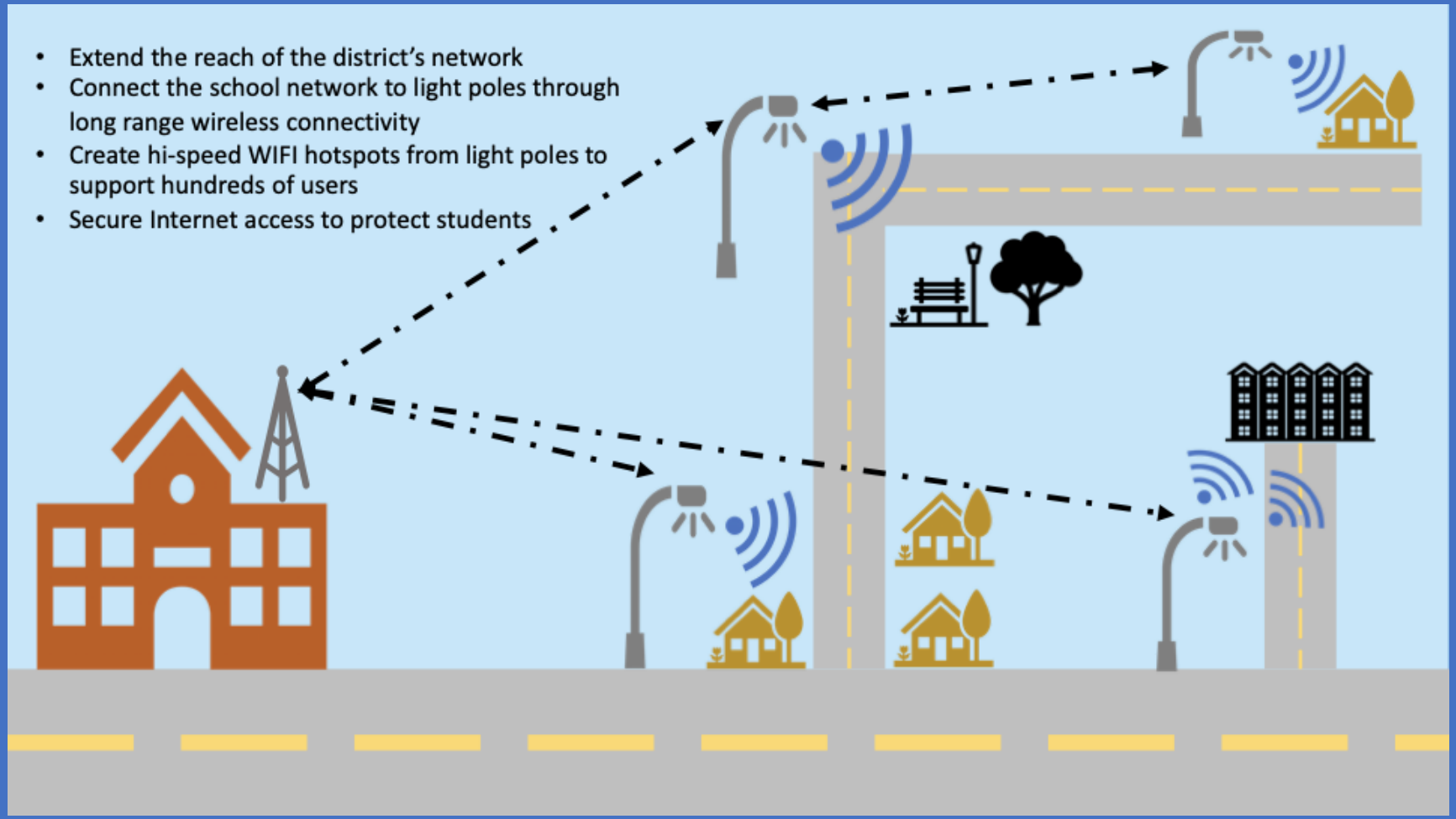
Challenge: Connect the Communities - Provide remote learning to every child during the pandemic

Outcomes & benefits for our customers

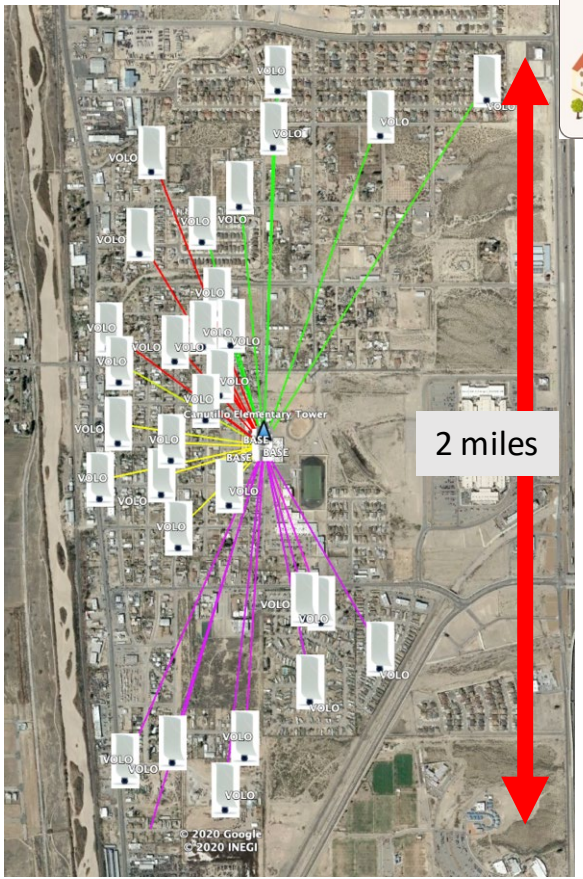
- Extend the private, secure school network to students' homes
- Fiber-free backhaul across the district with directional RF coverage for maximum distance
- Allows students the flexibility to use any Wi-Fi device to connect and learn
- Increased bandwidth parity across the student body
- Enables safe, secure distance learning for all
- Gateway to additional opportunities for campuses, hospitals, and businesses.

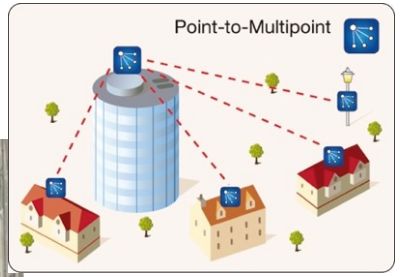
Digital Divide - Extending WiFi Reach

- Extend the reach of the district's network
- Connect the school network to light poles through long range wireless connectivity
- Create hi-speed WIFI hotspots from light poles to support hundreds of users
- Secure Internet access to protect students

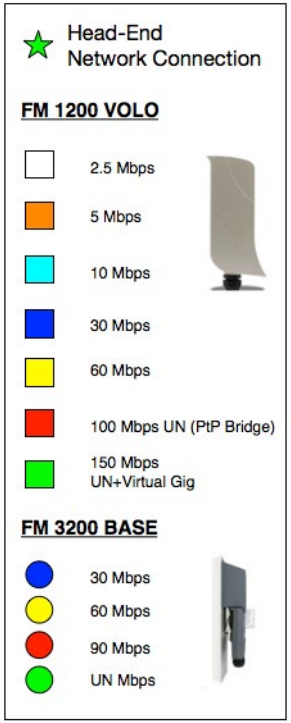


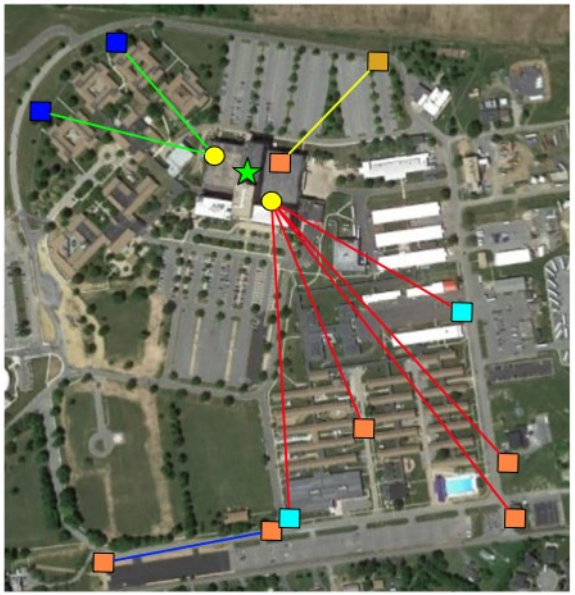
Digital Divide - Extending WiFi Reach





Typical Fixed Infrastructure - Mixed Architecture





Typical Medical Center Design
Fixed Infrastructure Coverage

cisco FLUIDMESH NETWORKS

FLUIDMESH NETWORKS

Innovative Technologies To Accelerate The Journey

Signify Broadband Luminaires, IoT Smart Poles, and Interact

Malik Ishak
Director, Smart City Connectivity
Signify North America

Signify

NFF


Signify
Light becomes a new intelligent language
Smart grid of the future
The digital pathway of the modern city

BrightSites

by signify

The Smart Grid of the Future

The Grid of the Future

Presented by:

Malik.Ishak@Signify.com

(571) 528-5910

Nov. 10, 2021

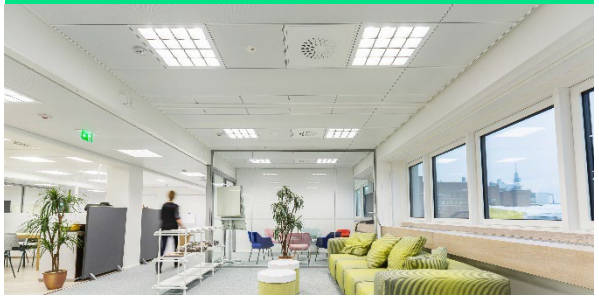
To learn more, go to
www.signify.com/brightsites

Signify is the world leader in lighting (2016 Spinoff of Philips professional Lighting Division)

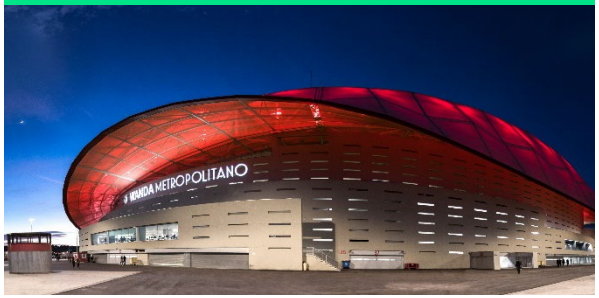
We provide high-quality energy efficient lighting products, systems and services

Light sources

Luminaires



Systems and Services



No. 1

Connected, LED, Conventional

€6.5bn

sales in 2020, ~5% reinvested in R&D

38,000

people in 74 countries

100%

Carbon neutral operations

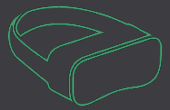
Evolution of the wireless industry

1G or "first generation" wireless was an analog cellular system that Launched commercially on Oktober 13, 1983

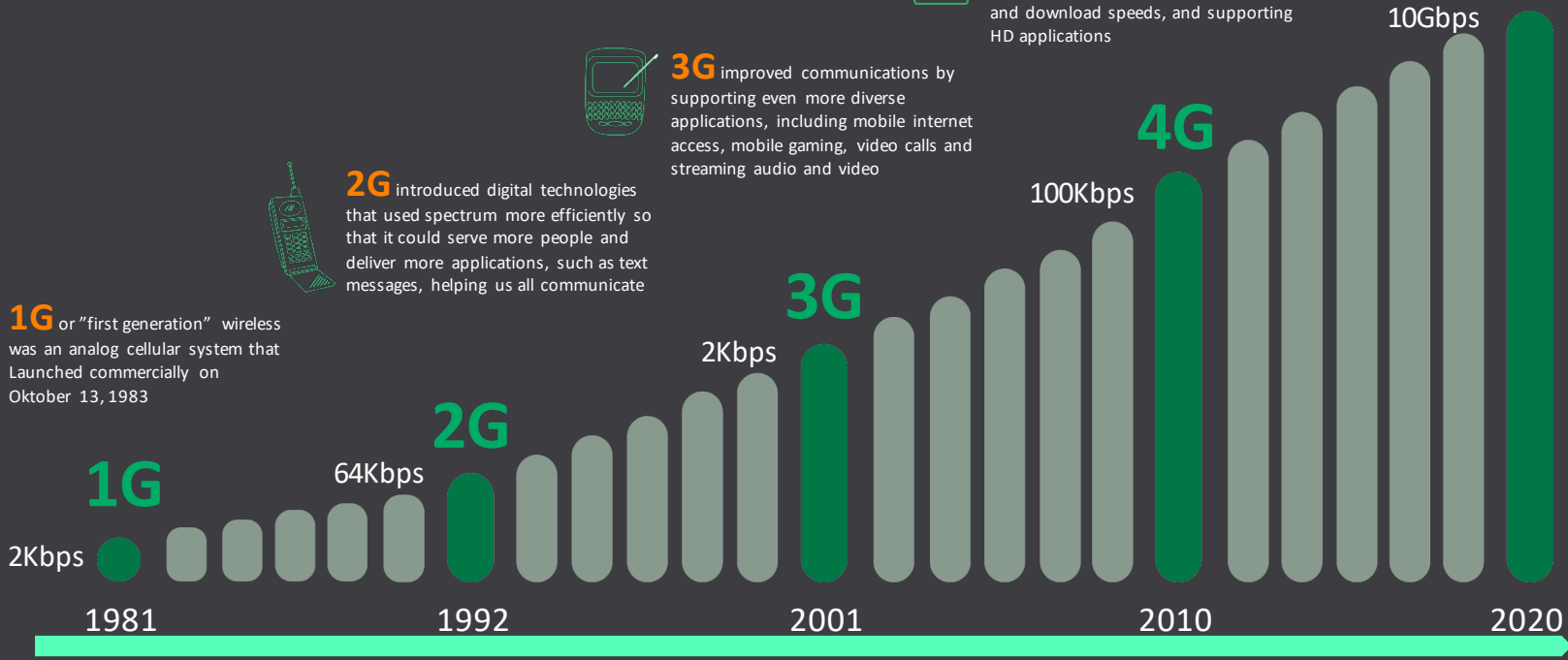
2G introduced digital technologies that used spectrum more efficiently so that it could serve more people and deliver more applications, such as text messages, helping us all communicate

3G improved communications by supporting even more diverse applications, including mobile internet access, mobile gaming, video calls and streaming audio and video

4G delivered even faster speeds, improving experiences for customers when using data-intensive applications, increasing data upload and download speeds, and supporting HD applications

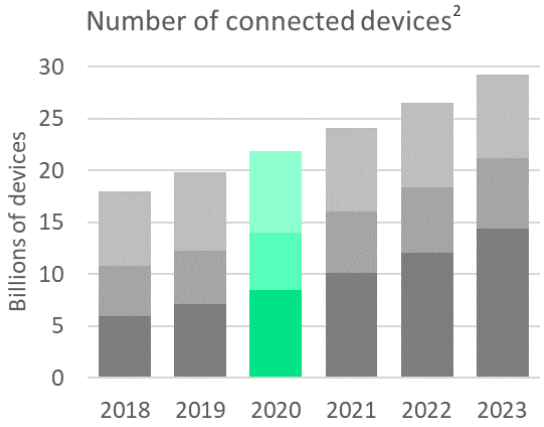


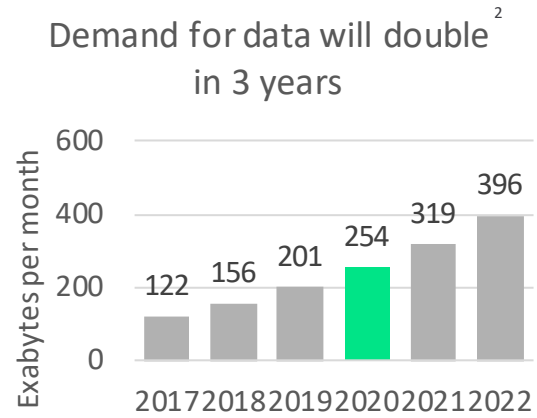
5G will support more diverse applications and more connections; providing more capacity, lower latency, and increased speed. 5G will handle the exponential growth in demand for capacity, connectivity, and capability – delivering a better, faster experience for all



Demand for connectivity in cities

- 4 Four times growth by 2025[1]
- Number of connected devices grows to 30 Bn. in 3 years, driven by IOT devices (consumers, smart cities, autonomous vehicles etc.)
- 5G and WiFi6 are new standards to enable this growth.
- Many more antennas and radios closer together (100's meters vs of several miles).





[1] Source: Aparavi Research 2020
[2] Source: Complete VNIIP Traffic Forecast Update, 2017-2022 white paper

How do you Quickly & Cost Effectively Implement & Deploy THE LAST MILE

As part of your Digital Transformation Strategy

(and create a neutral host backbone that can be monetized)

without trenching fiber and disrupting city landscapes, etc.?

(Challenges = Aesthetics, Permitting, Fiber, Power, Metering)

There must be a better way

Signify

BrightSites

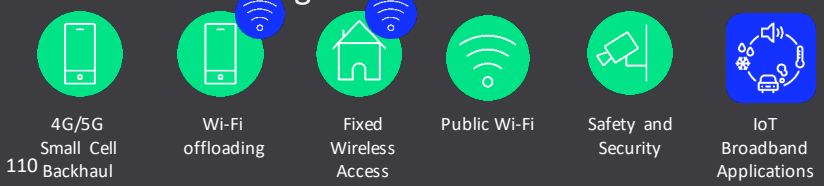
by signify

Light becomes a new intelligent language

Broadband Luminaire

The fastest and low TCO connectivity option for last mile coverage (without trenching fiber)

- No permit needed for aesthetic consideration
- Fastest way to deploy wireless mesh network
- Wireless backhaul and PoE completely integrated into fixture
- Plug'n play installation, no special training required
- ≤ 0.3 mi. / 450 m Range
- 360° coverage, self optimizing mesh network
- Built-in PoE switch eliminated the need for external switch or 3rd party box
- Power Metering



Broadband Luminaires

(sample designs)

Wireless fiber
Self-optimizing mesh
60GHz 3.8Gbps

Bright Sites Hub Tower

- Connectivity: Telco grade WiFI / 4G-5G / CBRS
- HyperEdge Compute Power & IoT Gateway
- Single or dual kiosk display with touch
- Microphone, speakers, camera
- Security camera 2 x 360° (PTZ)
- USB/wireless charging for mobile phones
- NFC sensor for ticketing / payments
- Programmable light elements
- Uplink: fiber, ethernet or wireless
- Programmable push-button
- Customizable color schemes
- Optional: Sensors (e.g. environmental), cameras (thermal, crowd analytics)

Hub Tower (neutral host)

- Height 4.5m + (15 Ft.)
- Diameter 0.7m
- 55” upper displays
- 32” kiosk
- Wireless charging docks

Height advantages:
- ✓ Unblockable
- ✓ Signal Propagation
- ✓ Oversight Surveillance

40 Nieuwstraat - Google Maps

Telecom Pole

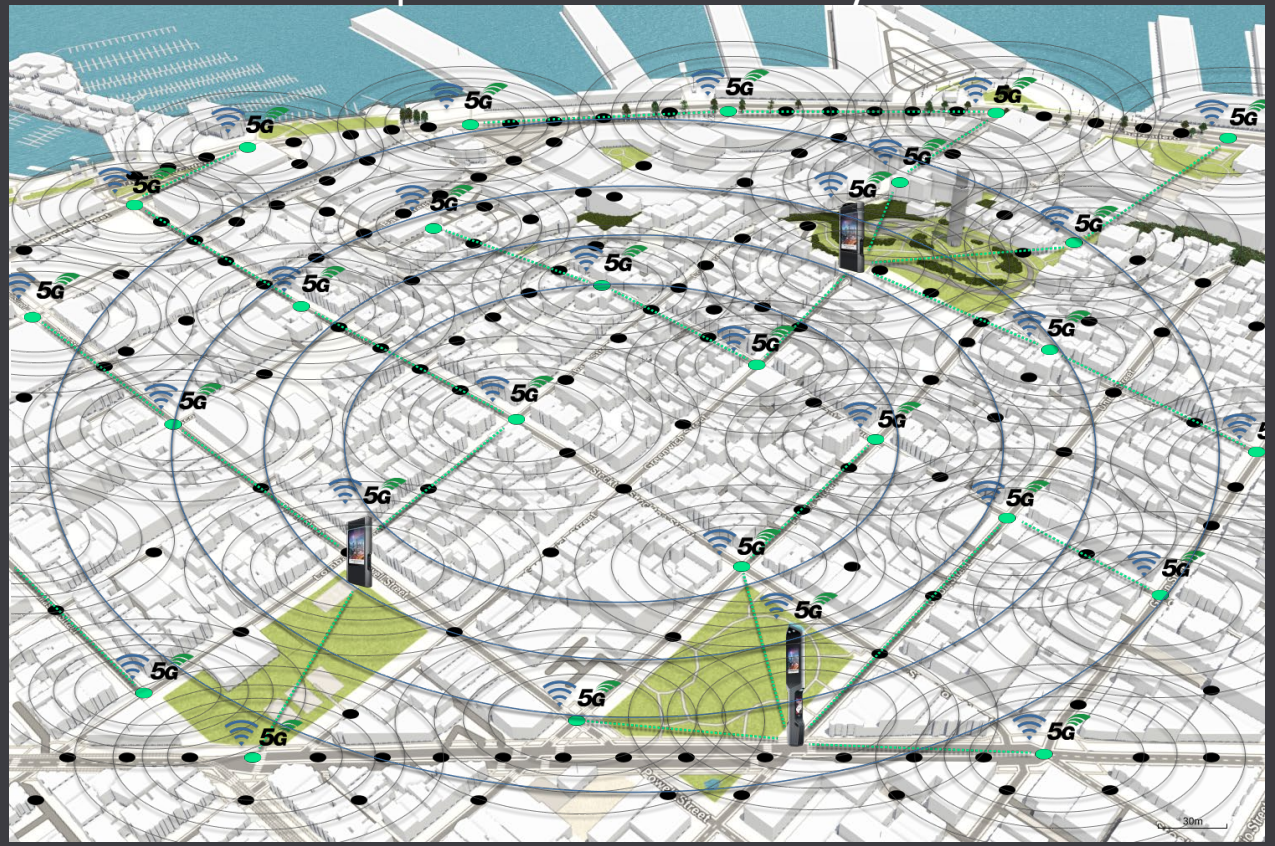
(LA Convention Center)

IOT Pole

Our vision: lighting as the connectivity grid of the future

Transforms lighting infrastructure into a platform of connectivity

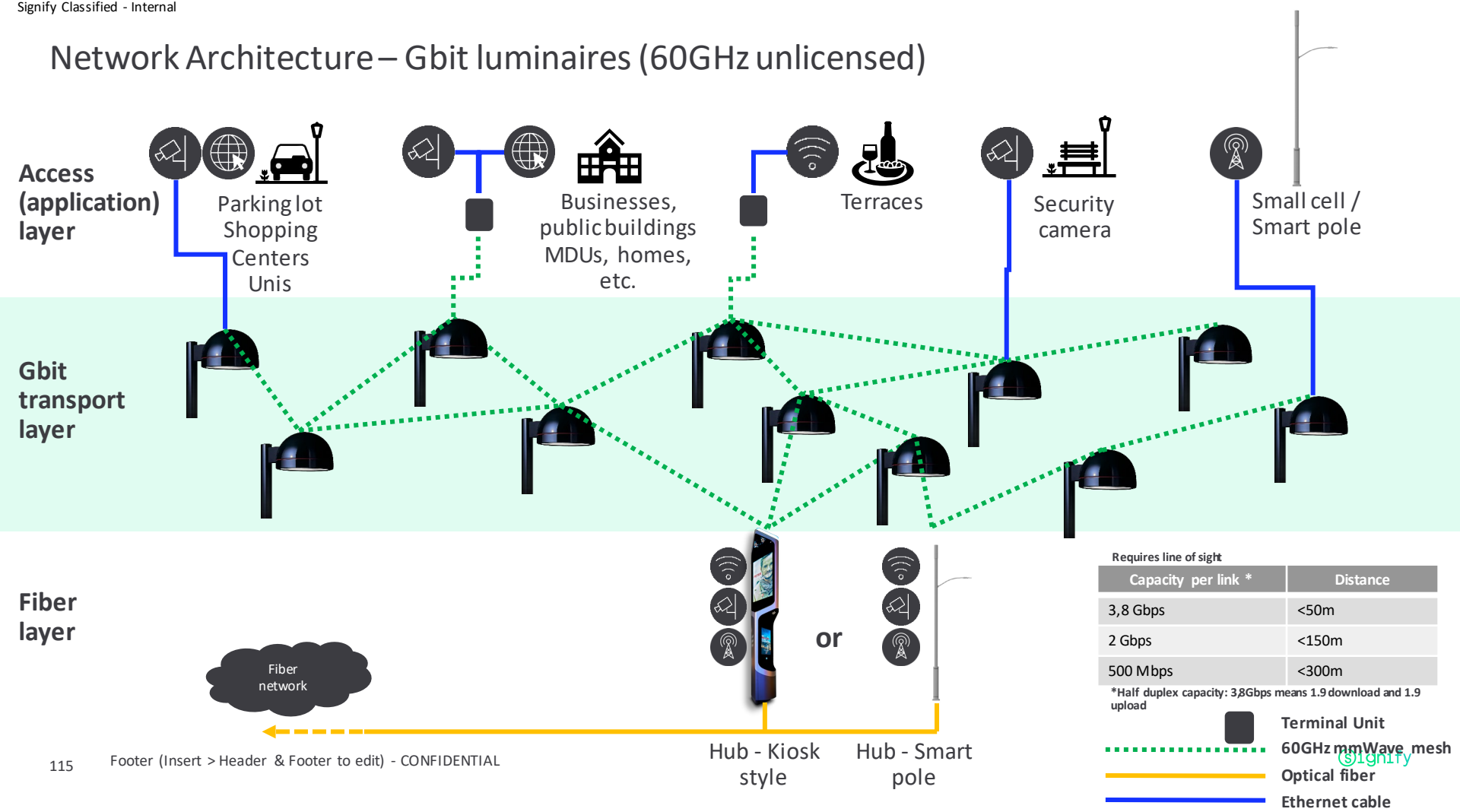
1. Light pole grid
2. Smart Hub
3. Upgrade pole
4. Activate pole
5. Meshed network / Neutral Host Backbone



Lighting is Ideal……

- Proximity: It is close to people and traffic
- Scale: It is already available
- Granularity: Spacing is 30-50m
- Elevation: For signal propagation, out-of-reach
- Uniformity: Enables general “blanket” permitting

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

Fiber vs Gbit Luminaire

	Fiber	Gbit luminaire
Security	✚ Secure	✚ Secure
Bandwidth	✚ Multi Gbps	✚ Multi Gbps
Network design	⊙ accessibility	⊙ Line of sight
Cost	✖ Expensive	✚ Affordable
Installation	✖ Slow, complex	✚ fast, Retrofit
Aesthetics	⊙ Underground / across poles	✚ concealed
Bandwidth/Latency	✚ High bandwidth, ultra low latency	⊙ High bandwidth, variable latency

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
- Lighting asset management
- Offer narrow band IoT services through Interact

The Grid of the Future - YouTube

The Grid of the Future - YouTube

Final Thoughts

Questions and Answers
(submit via chat)

Your performance improvement is our measure of success.

Thank You!

NFF