Defiance
Smart Water Workshop

Rocky Smith
Business Solutions Architect

November 2019

Overview

Making a difference in your communities

Water is essential for life. A precious resource of finite quantity. Now more than ever, effective access, security, quality, health, and safety of our water supplies are under pressure. But you can do something about this.

Why now? The water landscape is changing

$114B

To get clean water and working toilets to everyone on the planet by 2030

30 %

Potable water lost to leakage and theft

$17.6B

US water utilities could save implementing intelligent water

40 %

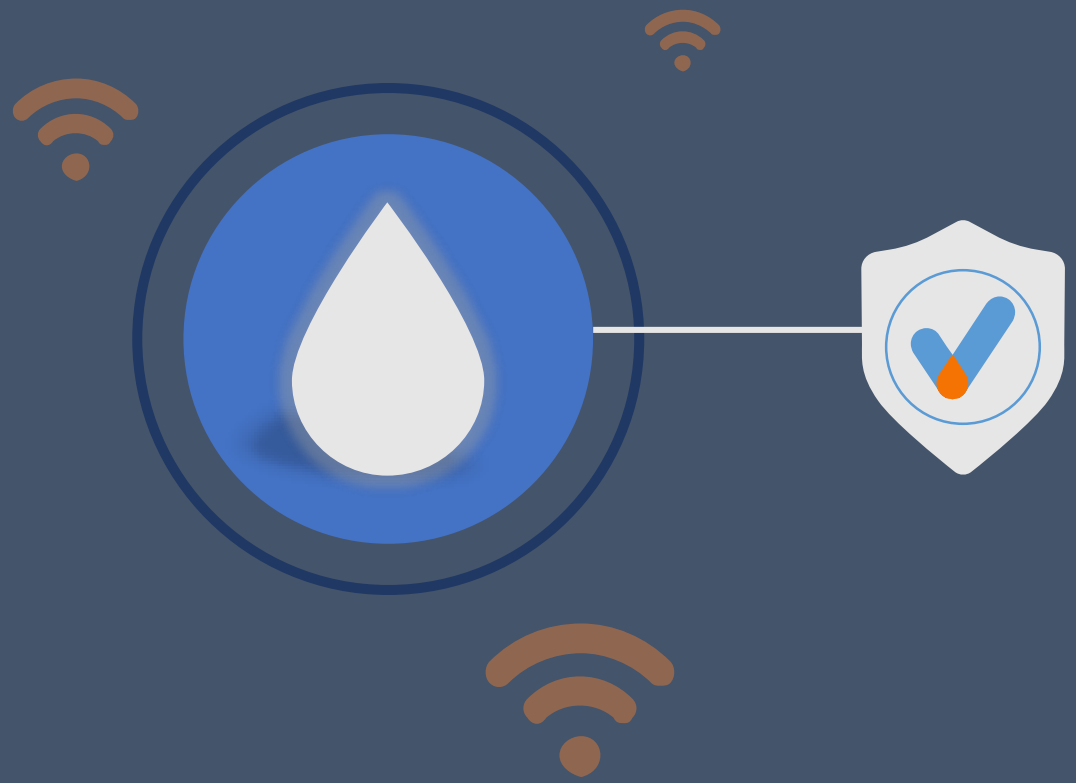
Gap in freshwater needed to support the global economy by 2030

$40B

Annual cost of flood damage worldwide

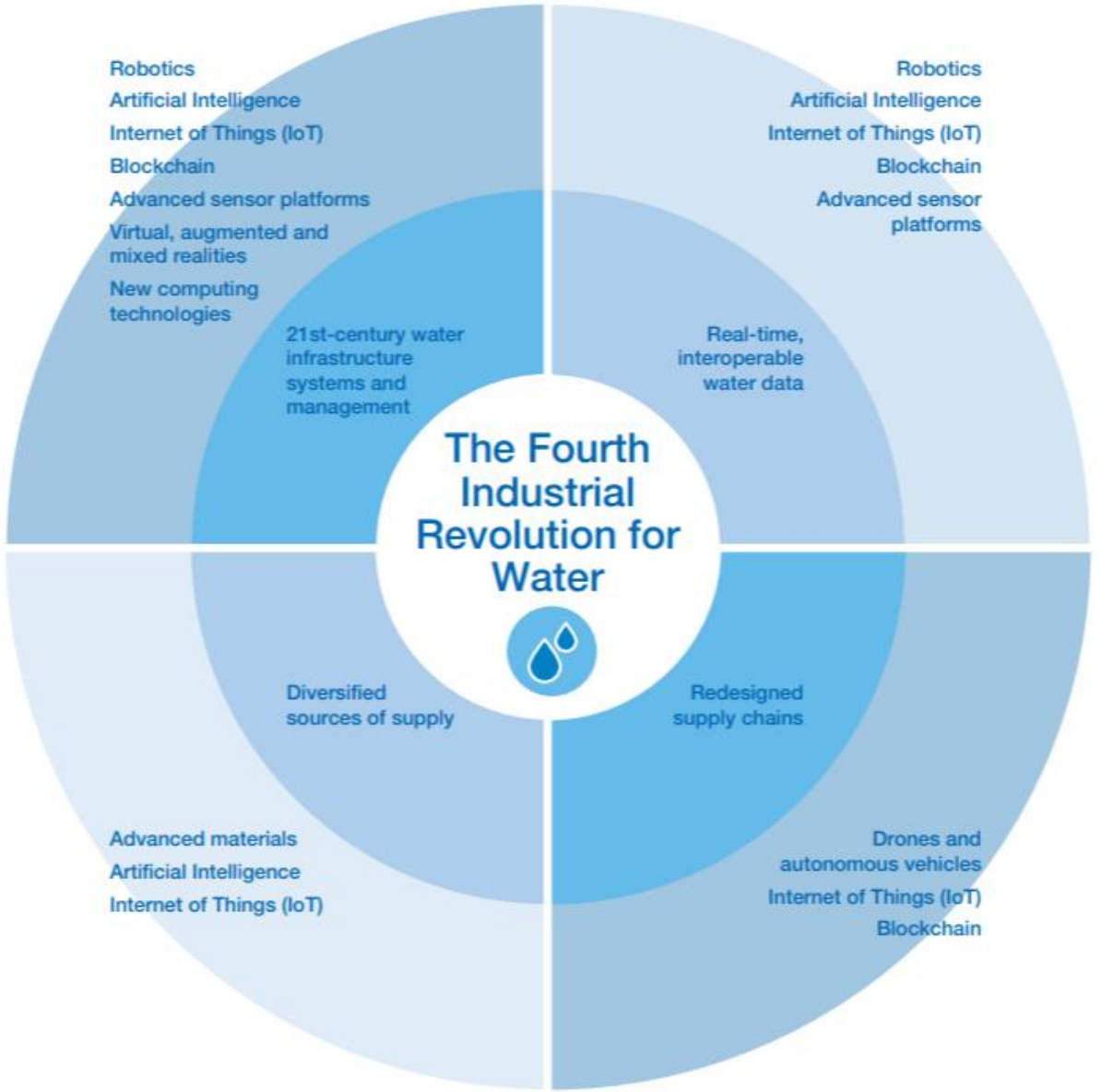
“Adding lanes to solve traffic congestion is like loosening your belt to solve obesity”

Lewis Mumford - 1955



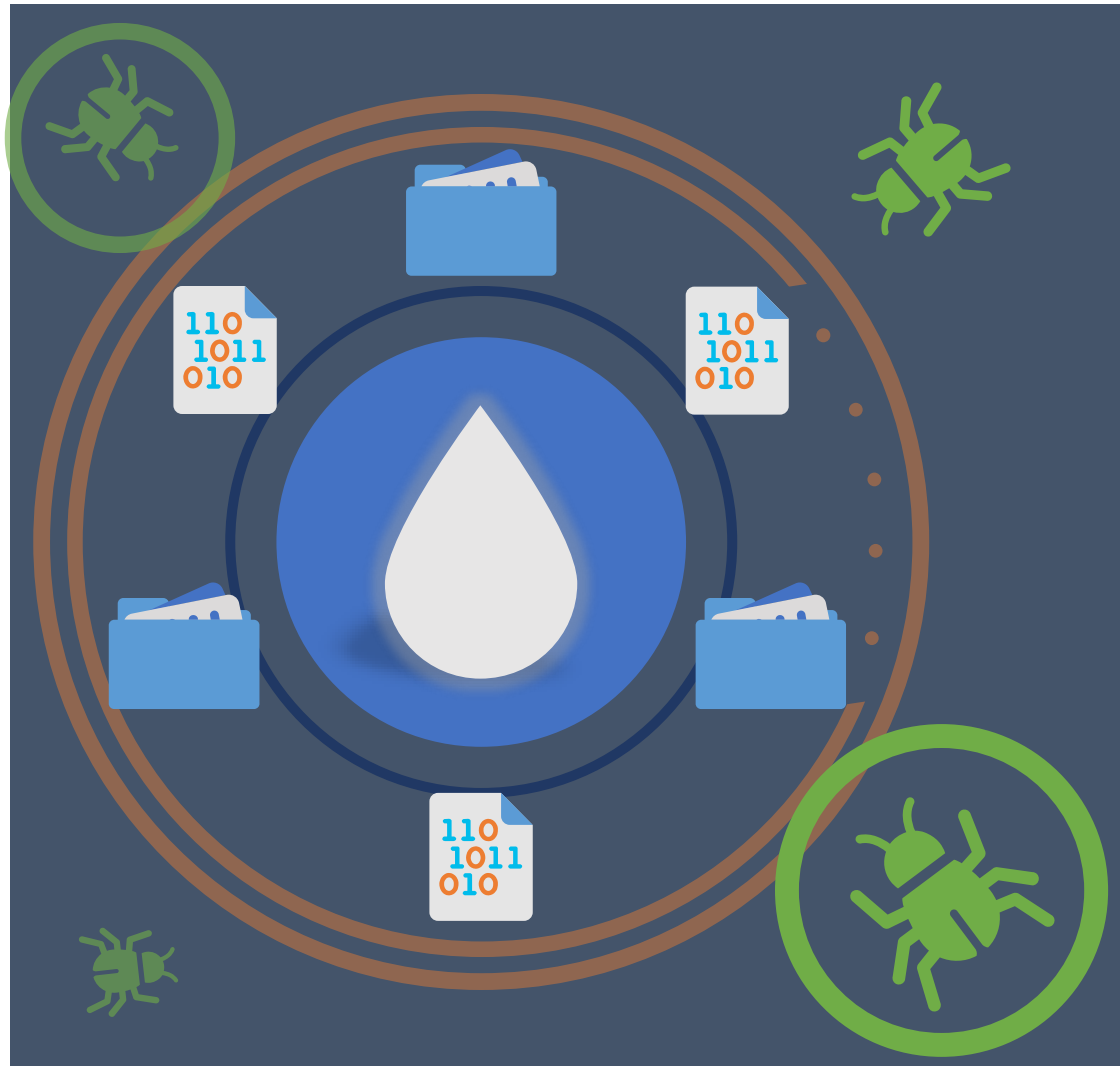
Technology is the key to improving the ultimate challenge for a unique resource that underpins all drivers of growth.

Empowered communities of the future



Source: World Economic Forum Report 2018

Continuously access diagnostic information to improve efficiency, mitigate errors, and safeguard people and assets.



Make water information and network data instantly available to those who need it…
while being secure from those who do not.

People Demand it

Of all natural disasters are water-related.

90%

Of countries report insufficient financing to meet national WASH* targets.

80%

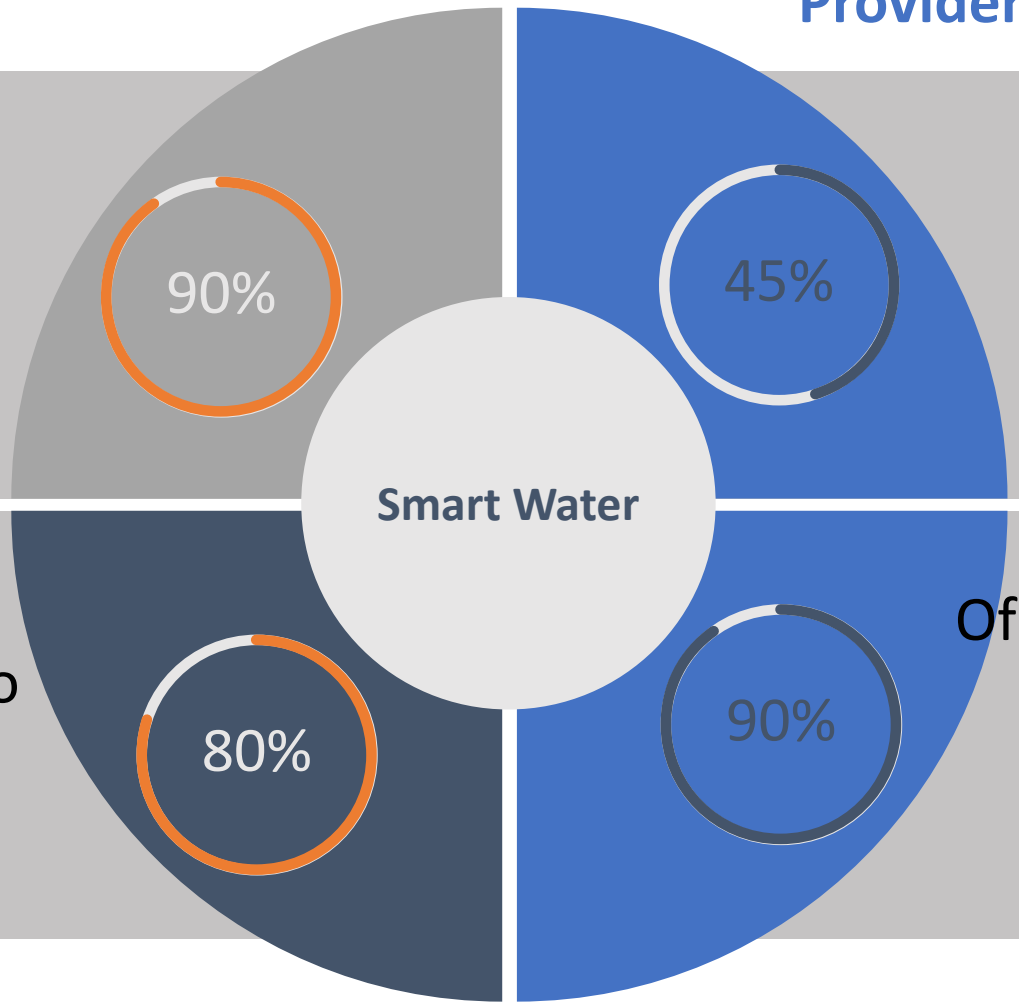
Providers want to scale it

45%

Of cities and communities will adopt IoT-enabled water management by 2024.

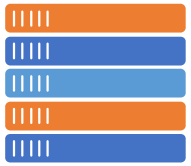
90%

Of cyber attacks are caused by human error or behavior.



* Water, sanitation and hygiene

The value of smart water



SCADA systems

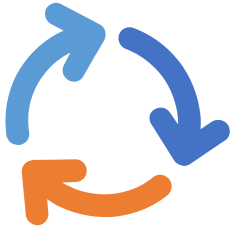
- Extend asset life
- Improve efficiencies
- Increase security

Quality monitoring

- Assure ecosystem/ public health
- Identify risk zones
- Automate systems

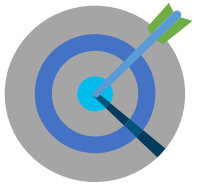
Asset management

- Automate systems
- Proactive maintenance
- Extend asset life



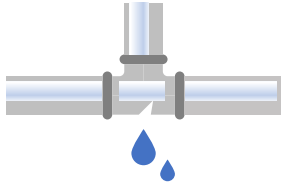
Equitable access and continuity

- Right to water
- Right to sanitation



Energy optimization

- Prioritize infrastructure spending
- Increase capacity without overextending resources



Water leak & theft detection

- Conserve water
- More efficient billing
- Improve response times

Emergency response

- Improve response times
- Proactively identify risk zones
- Protect public health and safety

System security

- Secure critical infrastructure
- Understand & establish risk management framework
- Build resiliency

A human-centric approach

Security

- Secure IoT and water metering devices
- Defend critical infrastructure from attack
- Protect data and remain compliant

Public Health & Well-being

- Protect drinking water supply
- Adequate treatment and sustainable approaches to wastewater
- Alleviate flood risks
- Ensure secure access to water services

Consumer experience

- Give cost transparency and simplify billing
- Increase efficiency and capacity with more security
- Improve access to clean, safe water
- Dynamically monitor the health and life of assets
- Better detect and mitigate risk; improve incident and disaster response

IT & business operations

- Automate IT management
- Deploy and reliably run applications and workloads
- Streamline maintenance, information-sharing, and training
- Improve operational workflows

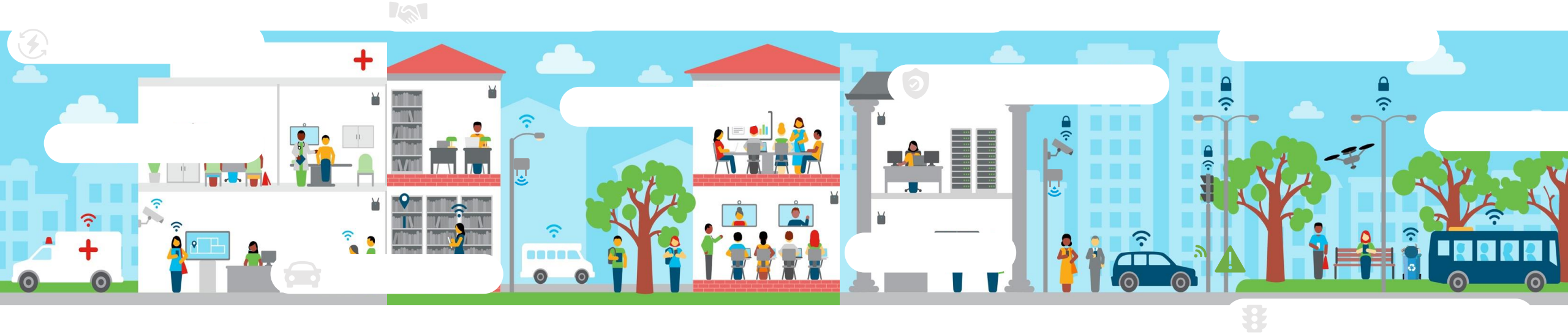
Purpose and Goals

Architecture

Common challenges

- One communication technology cannot solve all your smart city solution needs
- Network technology choice often inadvertently locks people into a vendor
- Technology choice is imperative to operational costs and future investments
- Many IoT and smart city technologies continue to evolve
- Budget and project planning are needed
- Technology and use case changes drive operational shifts and bring new considerations, such as:
  - Cybersecurity
  - Interoperability
  - New management requirements

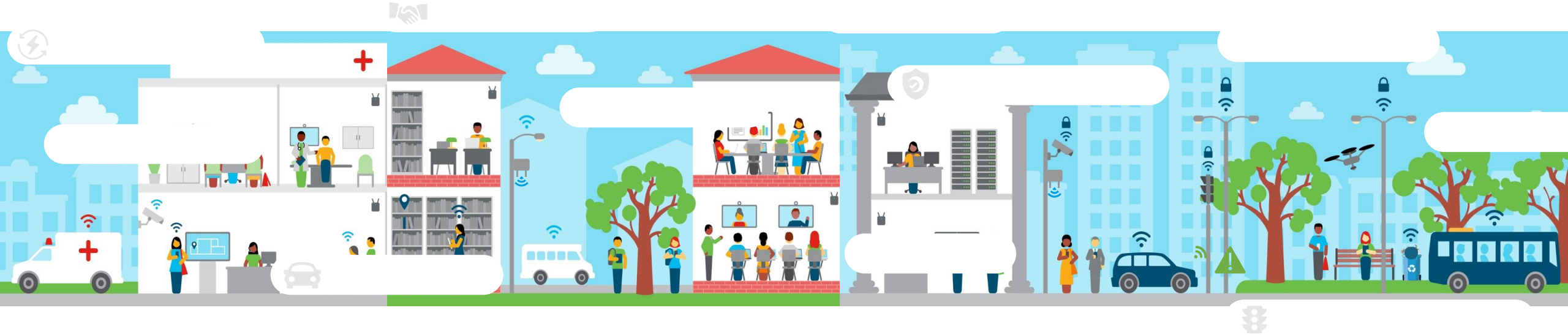
Cities, communities, and roadways



Many varied applications and use cases for

- Efficiencies and cost savings
- Improved citizen and road safety
- New services and citizen engagement
- Data and metrics for planning

Cities, communities, and roadways



And the technologies shaping them

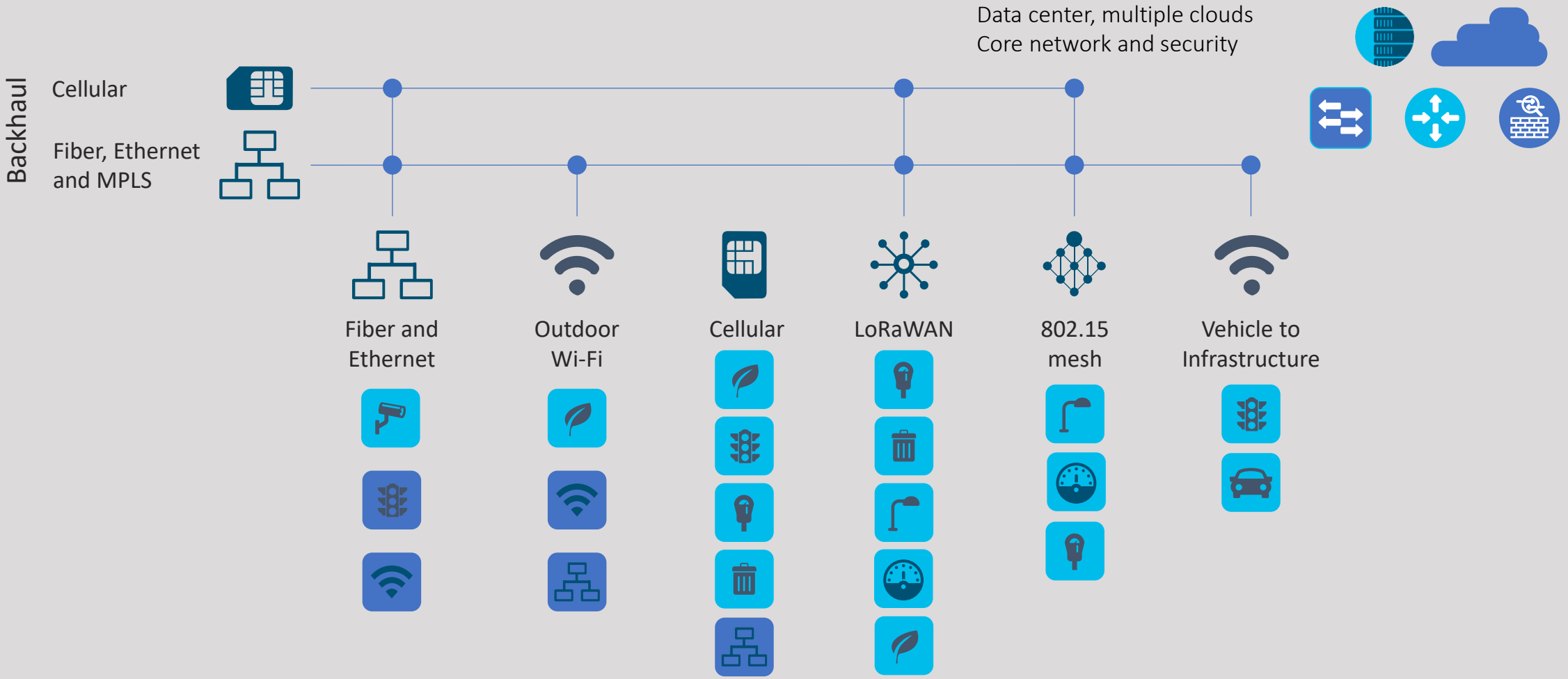
- Long-range WAN (LoRaWAN)
- Mesh networking
- Fiber and Ethernet
- Artificial and machine learning
- 5G and Narrowband IoT
- Designated Short-Range Communications (DSRC) and V2X
- Distributed ledger and blockchain
- Clouds – public, private, hybrid
- Edge computing
- Video and video analytics
- Cybersecurity and data protection

CCI Introduction

The Why: Connectivity technology and options

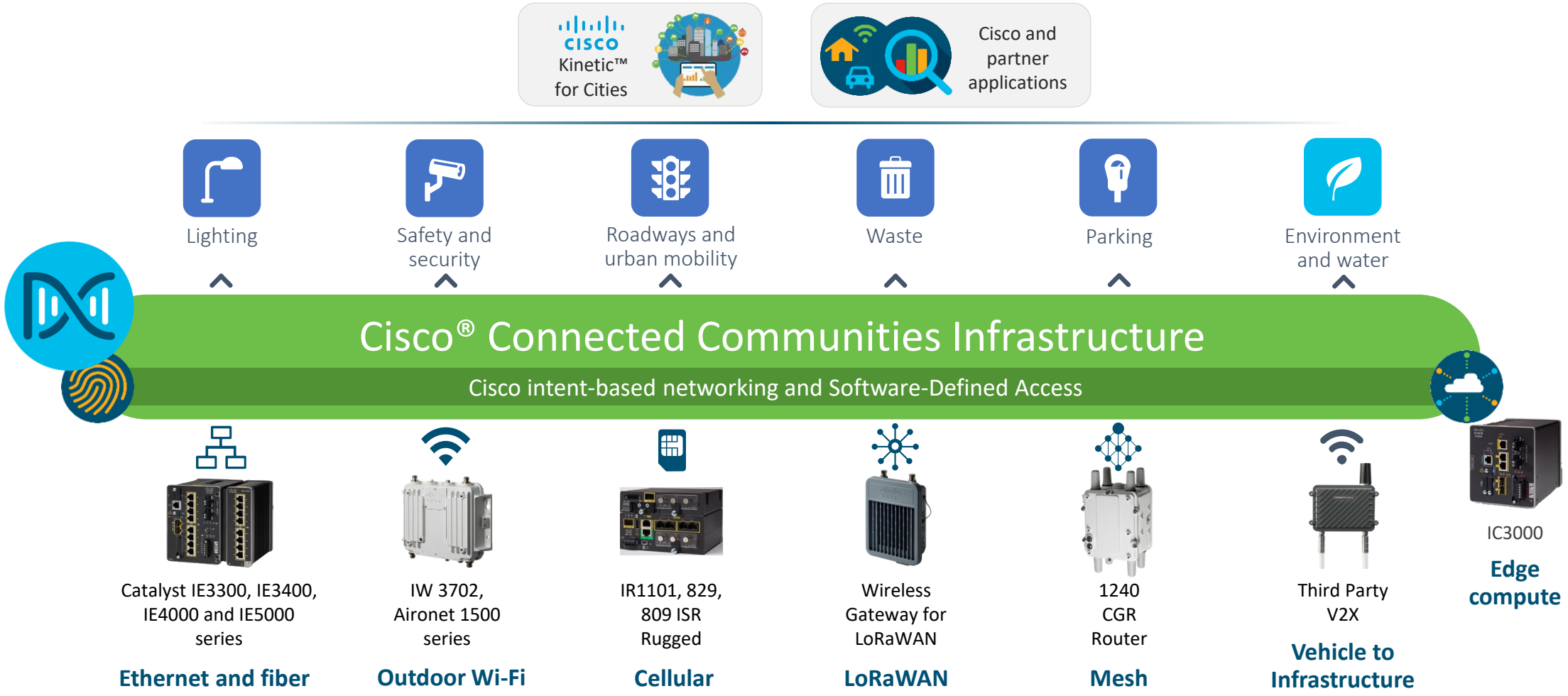
Cellular 3G, 4G, 5G	• Variable to high bandwidth, easy to deploy • Variable monthly cost, dependent on mobile SP
NB-IoT, public LoRa	• Long range, low power, low bandwidth • Variable coverage and monthly cost, dependent on mobile SP
LoRaWAN, mesh	• Long range, low power, low bandwidth • Great for sensors with small data payload
802.11 Wi-Fi	• High bandwidth, broadly supported • Public spectrum, prone to interference
Fiber or wired Ethernet	• Highly versatile, high bandwidth, long range • Costly to deploy unless fiber already available

One connectivity option can’t meet all needs

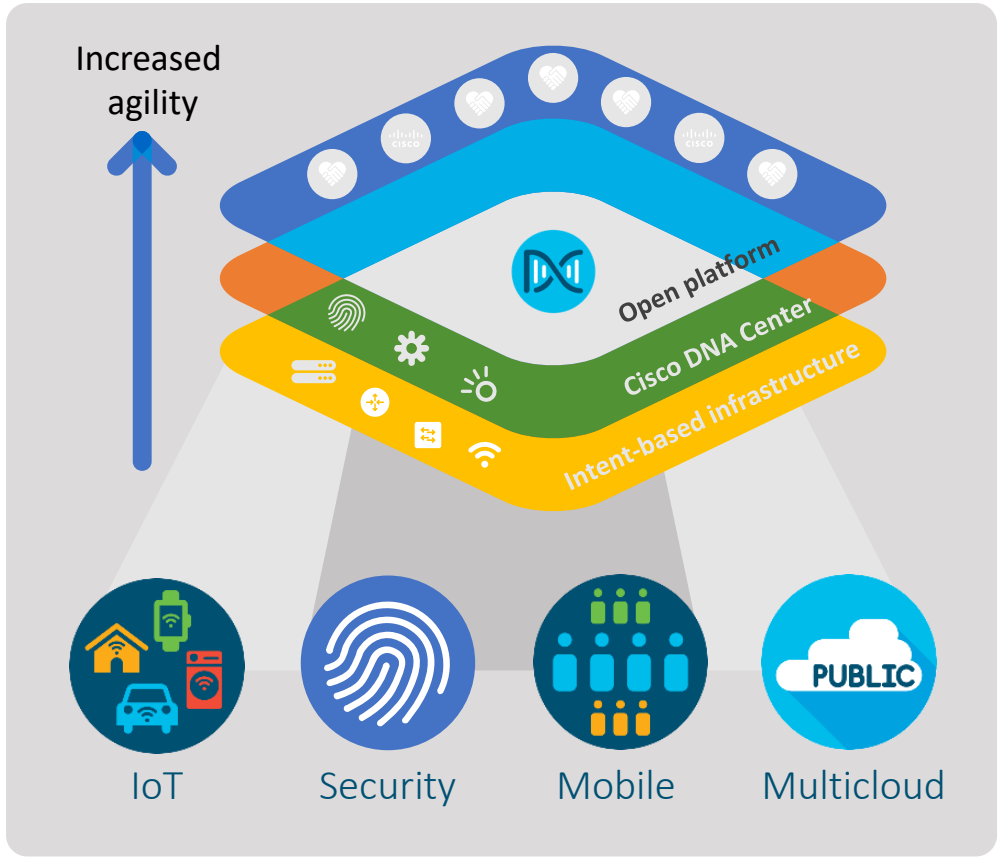


Cisco Connected Communities Infrastructure

A Cisco Intent-Based Network for Smart Cities and Connected Roadways



Intent-based networking overview



Business goals

Insights

Cisco DNA Center

Translation

Capture business intent, translate to policies, and check integrity

Activation

Orchestrate policies and configure systems

Assurance

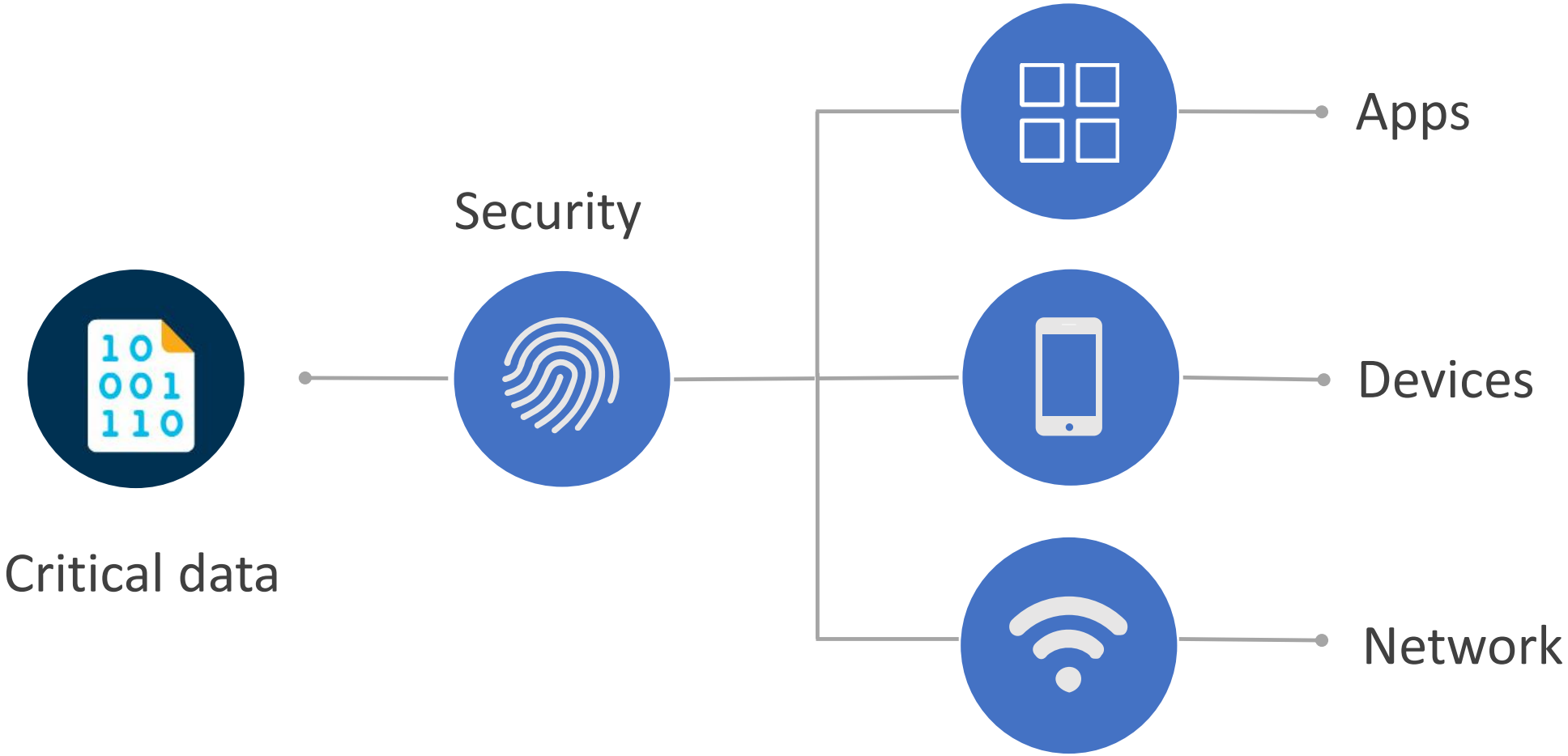
Continuous verification, insights and visibility, and corrective actions

Powered by intent. Informed by context.

Cisco IOT Platforms – Security Features

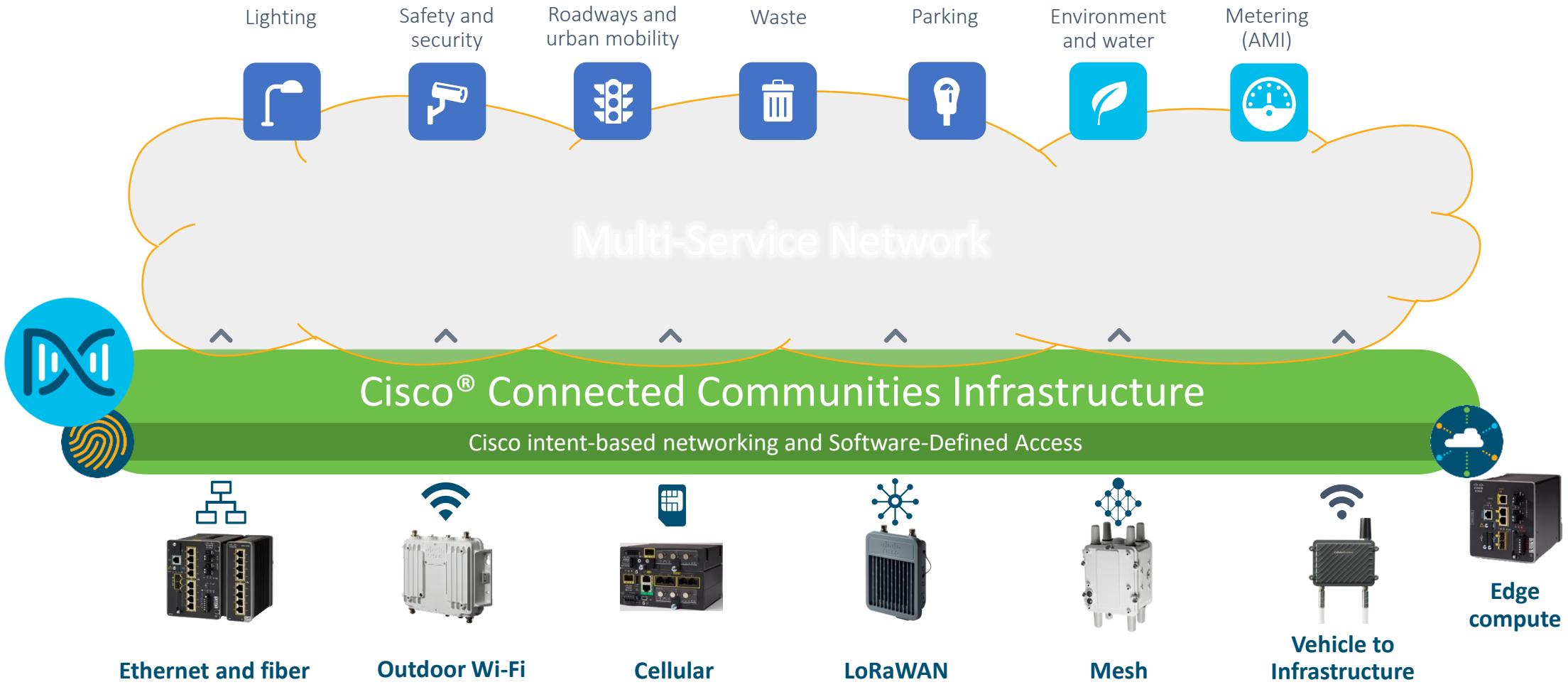
Hardware Mechanical and sensors	**Hardware** Processors and electronics	**Software** Applications and resources
Accelerometer and gyroscope	Trust Anchor module (ACT2 chipset)	Application-level firewall
Input alarm for digital sensors	Fast hardware-based encryption	Secure Boot
GPS asset tracking and geo-fencing	SUDI validation	Cisco® process (CSDL, vulnerability testing, PSIRT, TALOS group)
Sim card locking plate	Hardware-based Trust Anchor	Hosted app lifecycle security with Cisco IOx

Keeping what matters secure



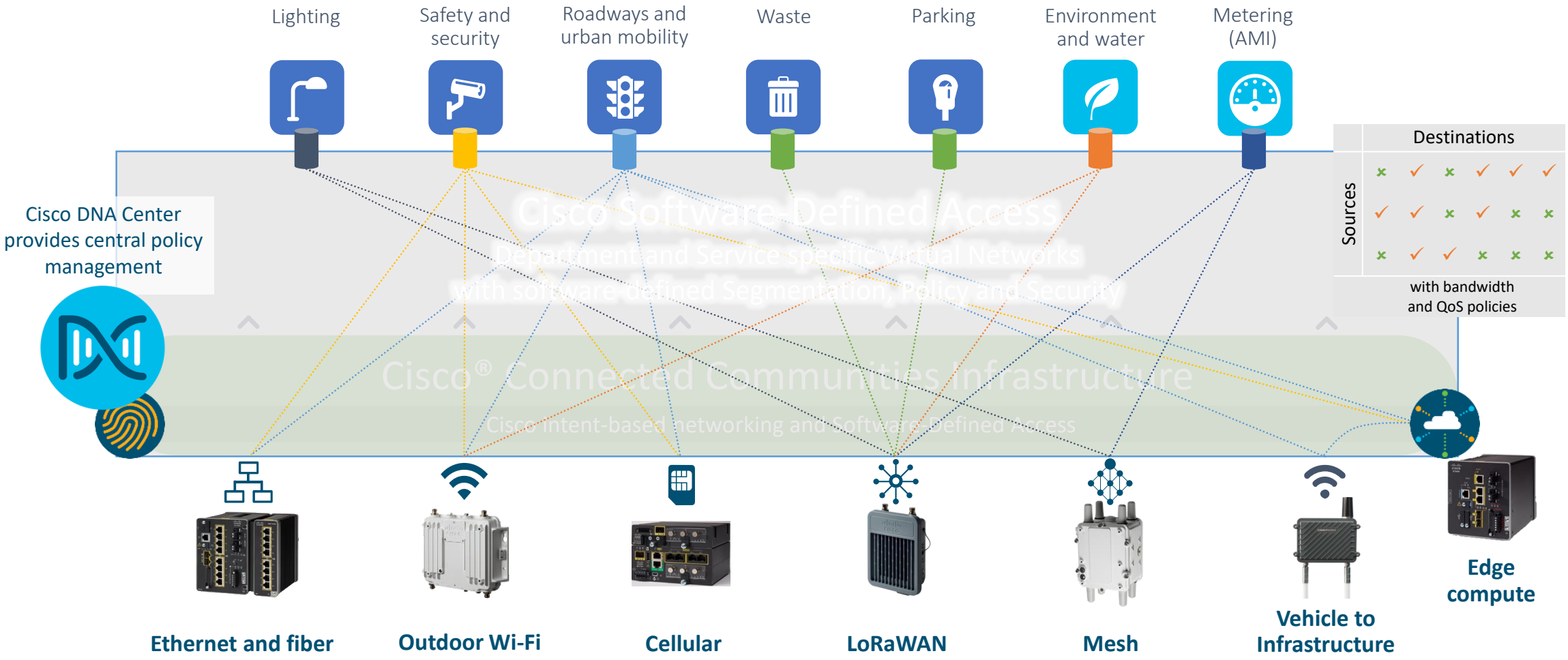
Virtual Networks and Segmentation

with Cisco Software-Defined Access



Virtual Networks and Segmentation

with Cisco Software-Defined Access



Cisco Connected Communities Infrastructure

A secure multi-service network for cities and roadways

Cisco Validated Design

Applications

Support for Cisco and partner applications

- Cisco Kinetic for Cities
- Smart City and Connected Roadways use cases
- Compatible with Cisco Services offers

Central Infrastructure

Cisco intent-based networking

- Simplified deployment and management
- Secure, segmented network for each service or department as needed

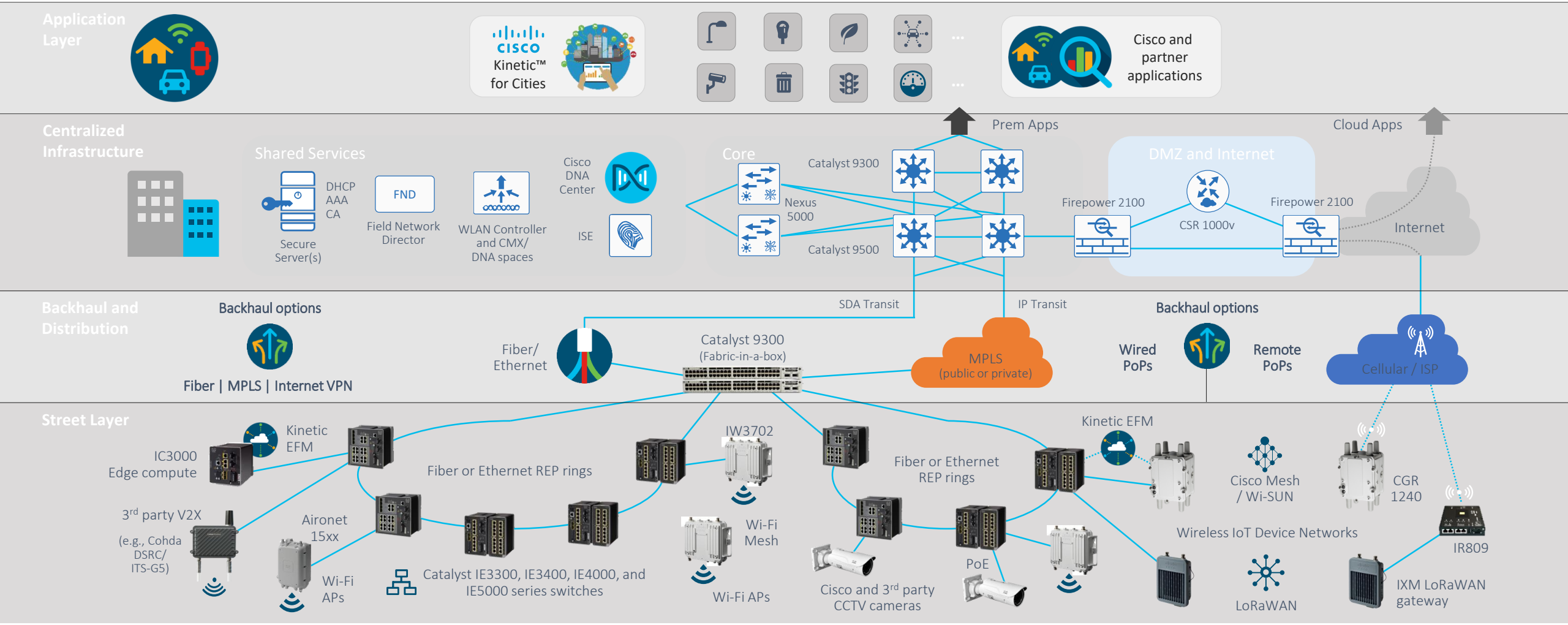
Street level

Modular Access Network

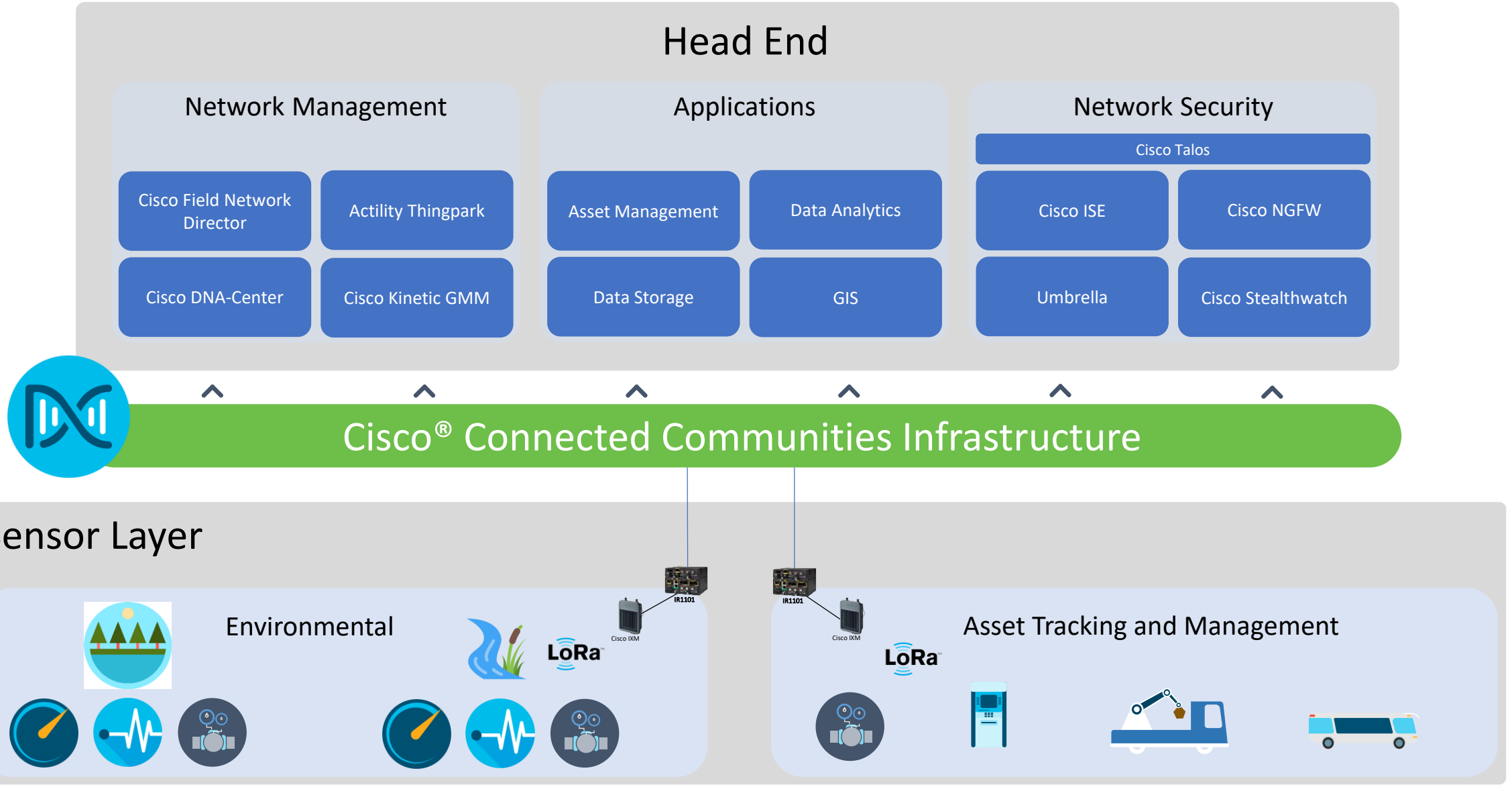
- Connect a broad range of systems and devices
  - Wired, Wi-Fi, wireless IoT and V2X
  - Edge compute capabilities
- Ruggedized outdoor network devices
- Modular architecture – deploy only what's needed

Cisco Connected Communities Infrastructure

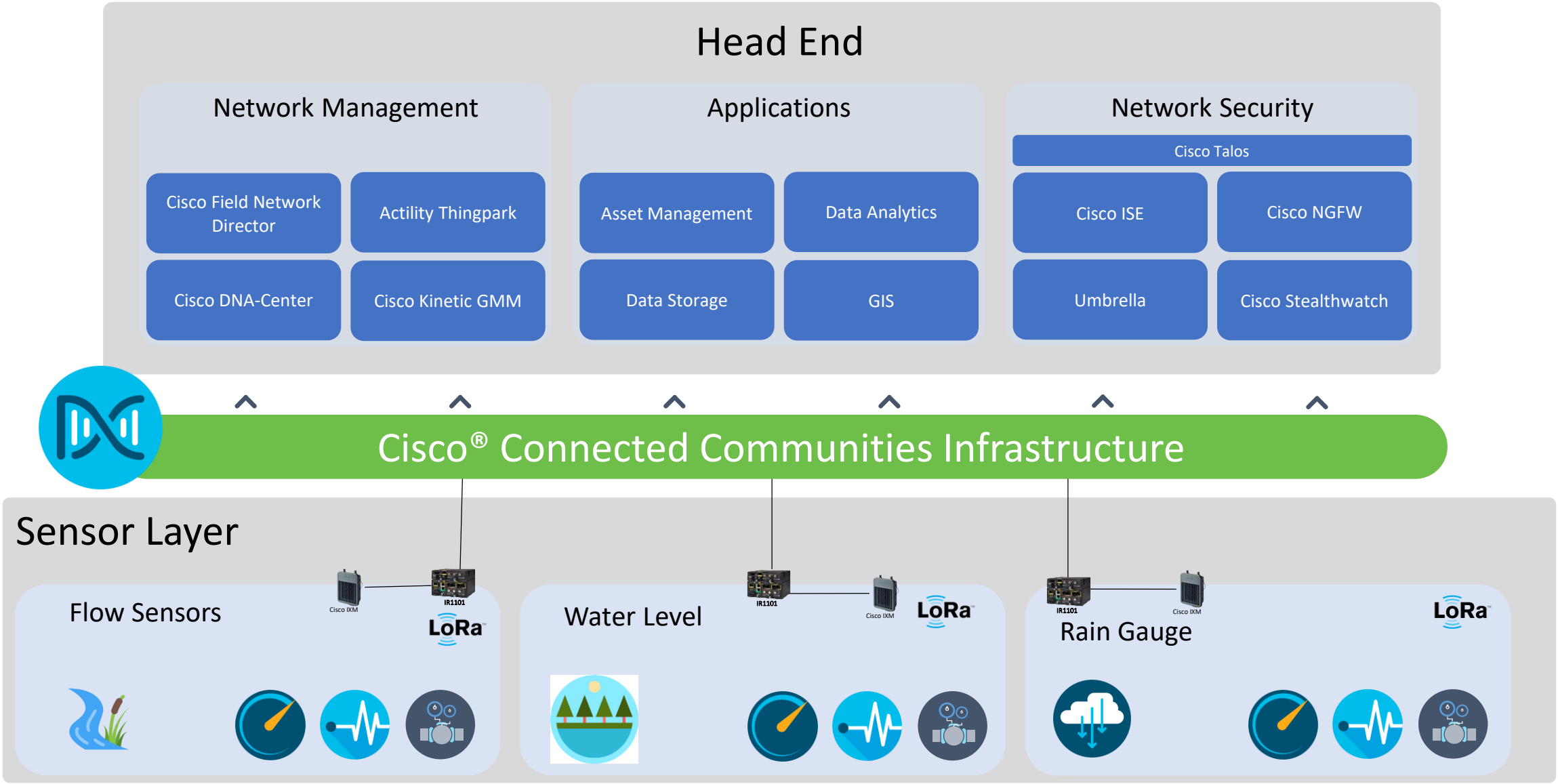
High-Level Architecture



Use Case: Water Quality Monitoring



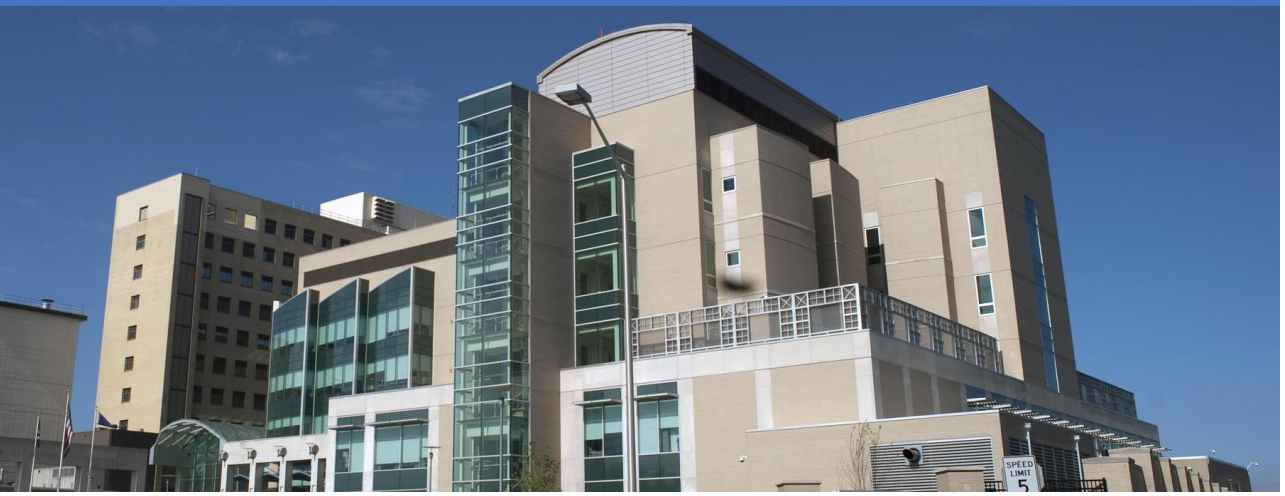
Use Case: Flood Monitoring



Pittsburgh VA Hospital

Pittsburgh, PA
302,407 population

The Pittsburgh Veteran's Hospital has a fully protective approach for their patients as well as compliance with the VHA Directive 1061.



Customer Story

Challenge

Problems maintaining the hospital water system and issues with legionella growth resulting in 22 patient illnesses and 4 deaths.

Solution

S::CAN sensors record water temperature, conductivity, pH, and chlorine at 15 stations. Cisco's network conveys this data in real-time to a wireless dashboard providing visibility.

Impact

- Decreased response time to water quality anomalies
- Improved water quality and safety

JACOBS s::can Intelligent. Optical. Online.

cisco

Cairns Regional Council

Queensland, Australia
156,901 population

Cairns Regional Council (CRC) has modernized water distribution systems to support the *Reducing Urban Impacts on the Great Barrier Reef initiative* under the Australian Government's inaugural Smart Cities and Suburbs Program.

Customer story

Challenge

Protect the Great Barrier Reef by facilitating automated and targeted management of water quality, proactive leak detection at every point in the distribution system, and energy efficiency.

Solution

Cisco and Itron offered a state-of-the-art IoT network and 52,000+ ultrasonic water meters deployed at homes and businesses that have discharges entering the Great Barrier Reef Marine Park. The solutions was powered by a Cisco IPv6 network.

Impact

- Water companies no longer have to spend months on costly manual inspections over miles of pipe
- People get a better sense of their water usage and a nudge to conserve more

Itron

cisco

CONSERVE UK

Glasglow, Scotland
598,830 population

CONSERVE (Contingency Operations for Strategic Infrastructure and the Vulnerable) focuses on inter-agency operability during times of crisis, including flooding.

Customer Story

Challenge

Slow response time to flooding and lack of inter-agency coordination led to infrastructure damage, billions of pounds lost, and millions of people affected.

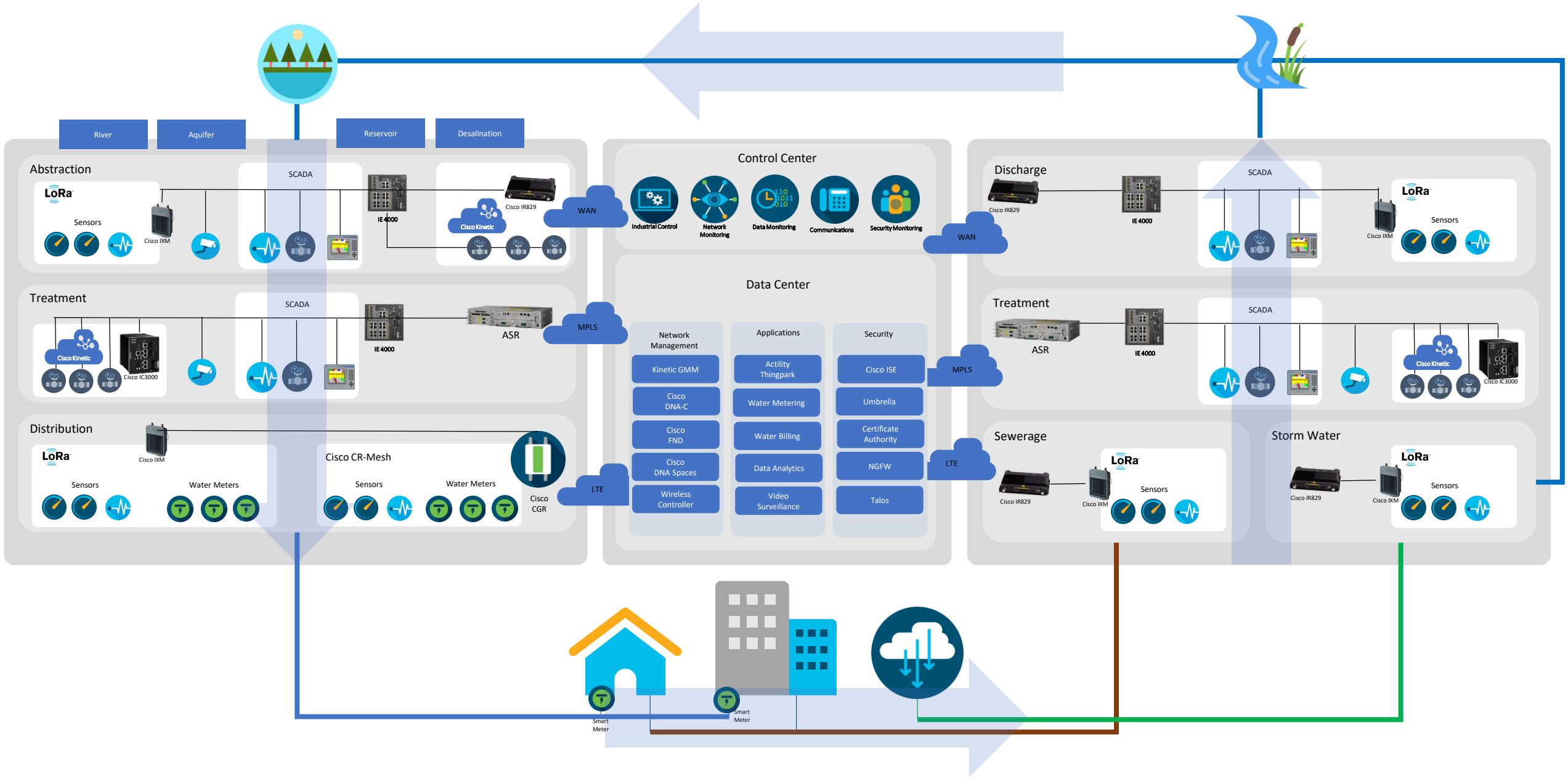
Solution

Integrated platform that predicts and helps coordinate first responders and put real-time information in their hands during disaster situations such as floods.

Impact

- Instant response to rises in water levels
- Improved resourcing in complex and time-critical scenarios
- Clearer visuals for first responders during disastrous events

Technology Reference Architecture Water



Data Collection

What is LoRaWAN?

A disruptive wireless technology for low data rate secure communication

RF unlicensed spectrum

Long Distance Connectivity

Low Data Rate

Low Power Solution

Cisco is a Founding Member of the LoRa Alliance

- An open, nonprofit association of members that believes the Internet of Things era is now (https://www.lora-alliance.org)
- Mission: To standardize LPWA networks being deployed around the world to enable Internet of Things (IoT), Machine-to-Machine (M2M), Smart City, and industrial applications
- Cisco is a founding member and serves on the Board of Directors as well as in the Technical Committee
- LoRa Alliance specifies the LoRaWAN protocol above the physical layer and network architecture, and assures interoperability between devices and operators in one open global standard
- **LoRa Alliance specifications: v.1.0.2, including 1.0.2 regional RF parameters in separate document. 1.0.3 published with additional clean-up, 1.0.4 under work**
- **LoRa 1.1 specifications - published (10/2017) – 1.1 Core specifications, 1.0 backend interfaces, 1.1 regional RF parameters**

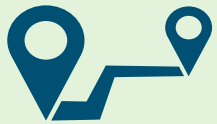
LoRaWAN Use Cases Overview

Measure Data

Gather Device Data

Report Events

Report a State



Track

Provide Asset Location with or without GPS

- Enable Innovations
- Generate New Revenues
- Decrease Operating Costs
- Improve Customers Satisfaction
- Increase Productivity and Operations
- Preserve existing Assets

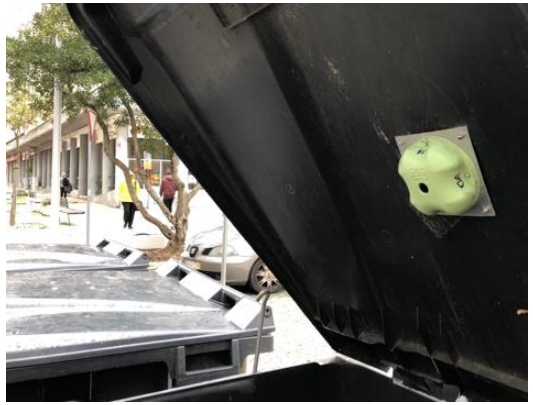
Metering (water, gas, …) and sub-metering

Measure

Smart Parking

Industrial and Environmental monitoring

Feedback



Waste Management

Connected Mouse Trap

Security

Report Events

Optimize operations and reduce busy time to improve business efficiency

Thefts prevention

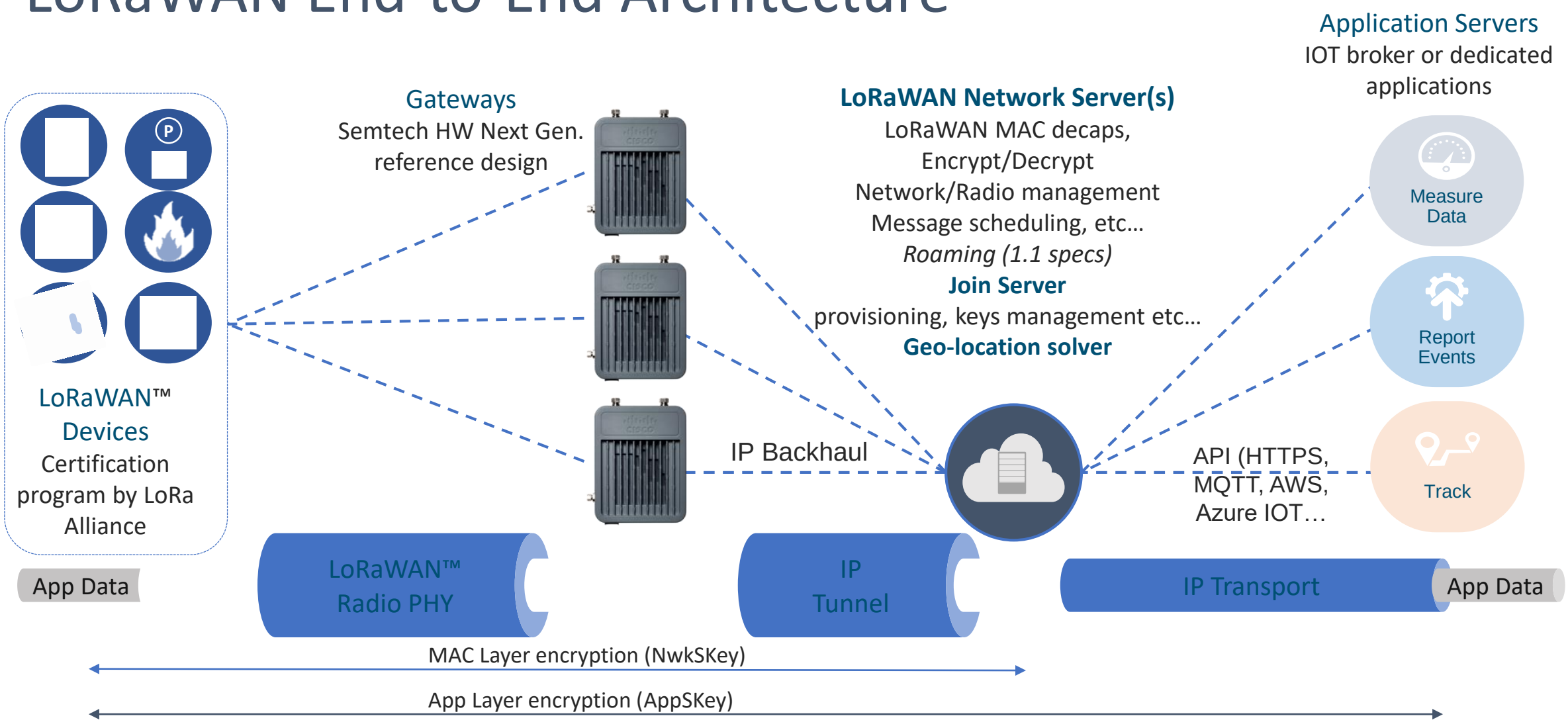
Smart Agriculture and Natural Parks

Track

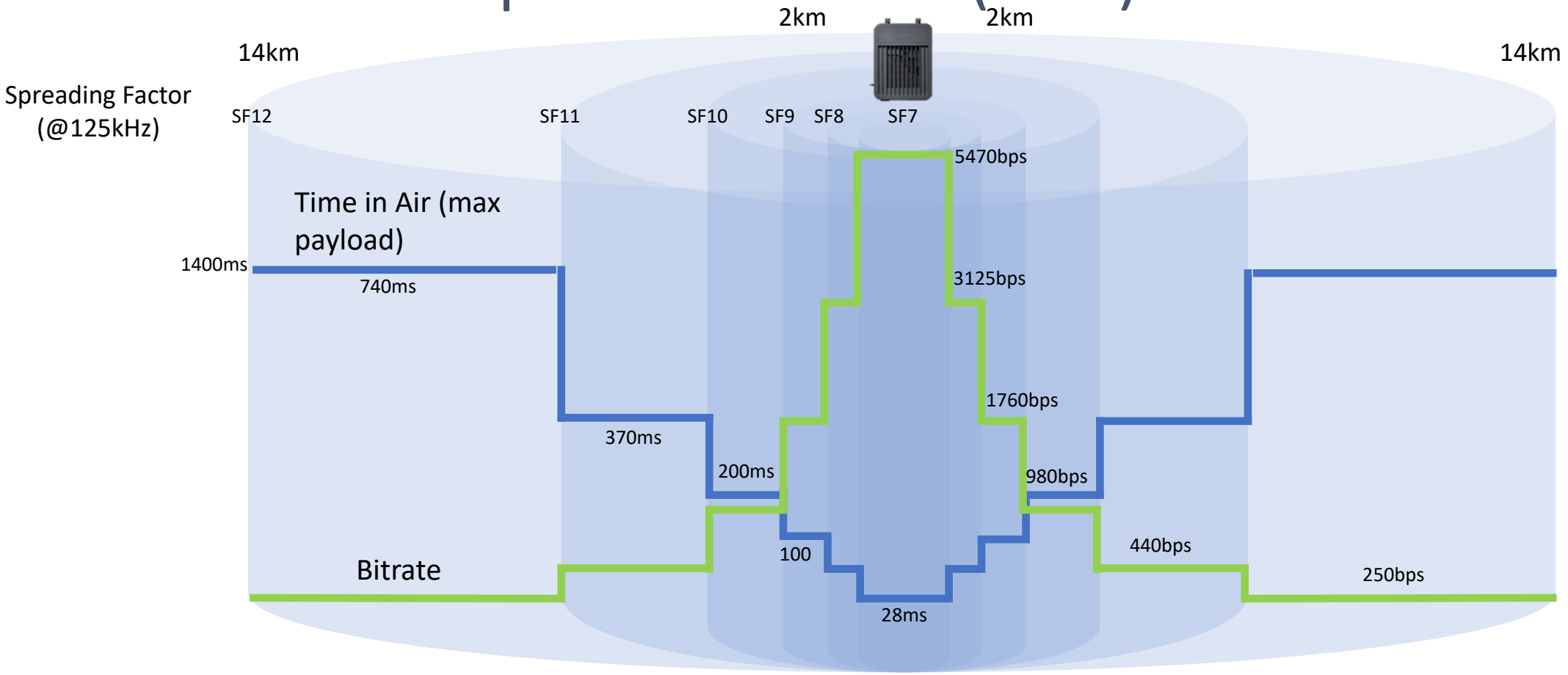
Vehicle Tracking

Use geolocation to protect
and monitor assets

LoRaWAN End-to-End Architecture



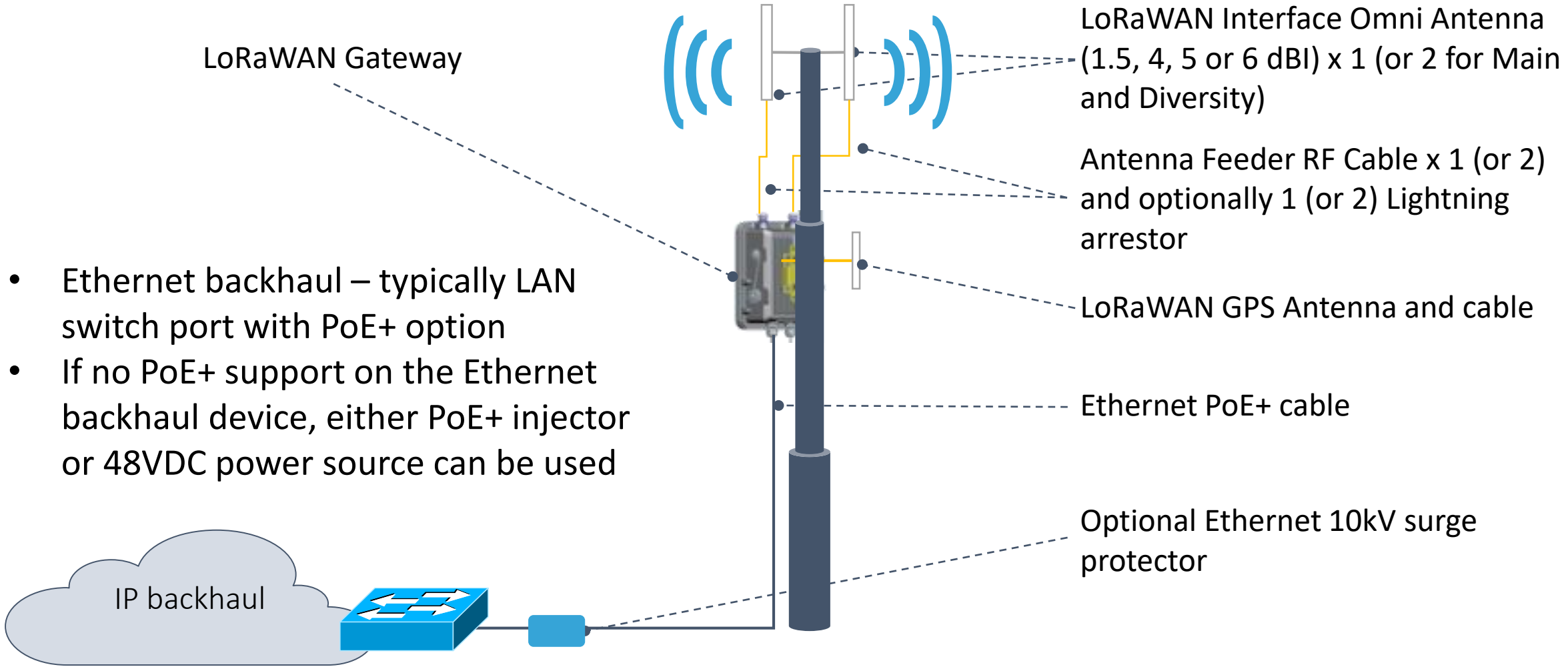
LoRaWAN Adaptive Data Rate (ADR)



- ADR maximises battery life overall & network capacity
- ADR manages the data rate and RF output for each device

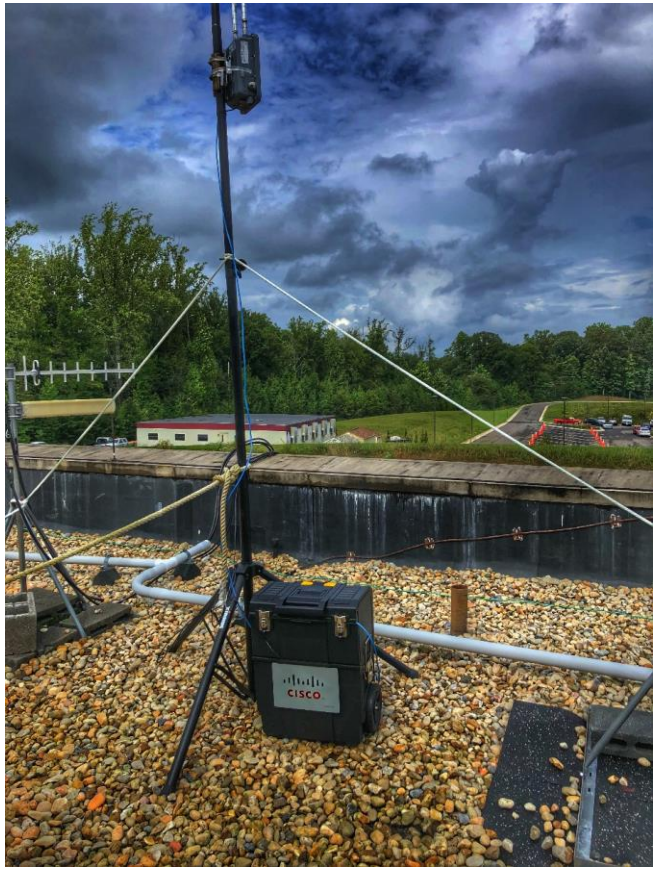
Acknowledgement: Actility for diagrammatic representation

Cisco IXM LoRaWAN – Standalone Deployment



- Ethernet backhaul – typically LAN switch port with PoE+ option
- If no PoE+ support on the Ethernet backhaul device, either PoE+ injector or 48VDC power source can be used

Field Deployment



Roof-top deployment of a Cisco LoRaWAN gateway utilizing autonomous power and LTE uplink.

Cisco LoRaWAN gateways placed at the apex of tents used to house the MDM 2018 expo.


CISCO