



FEBRUARY 5 - 6 • LOS ANGELES, CA

SMART PORTS

(INFORMATION TECHNOLOGY)



The port of tomorrow is part of a digital community

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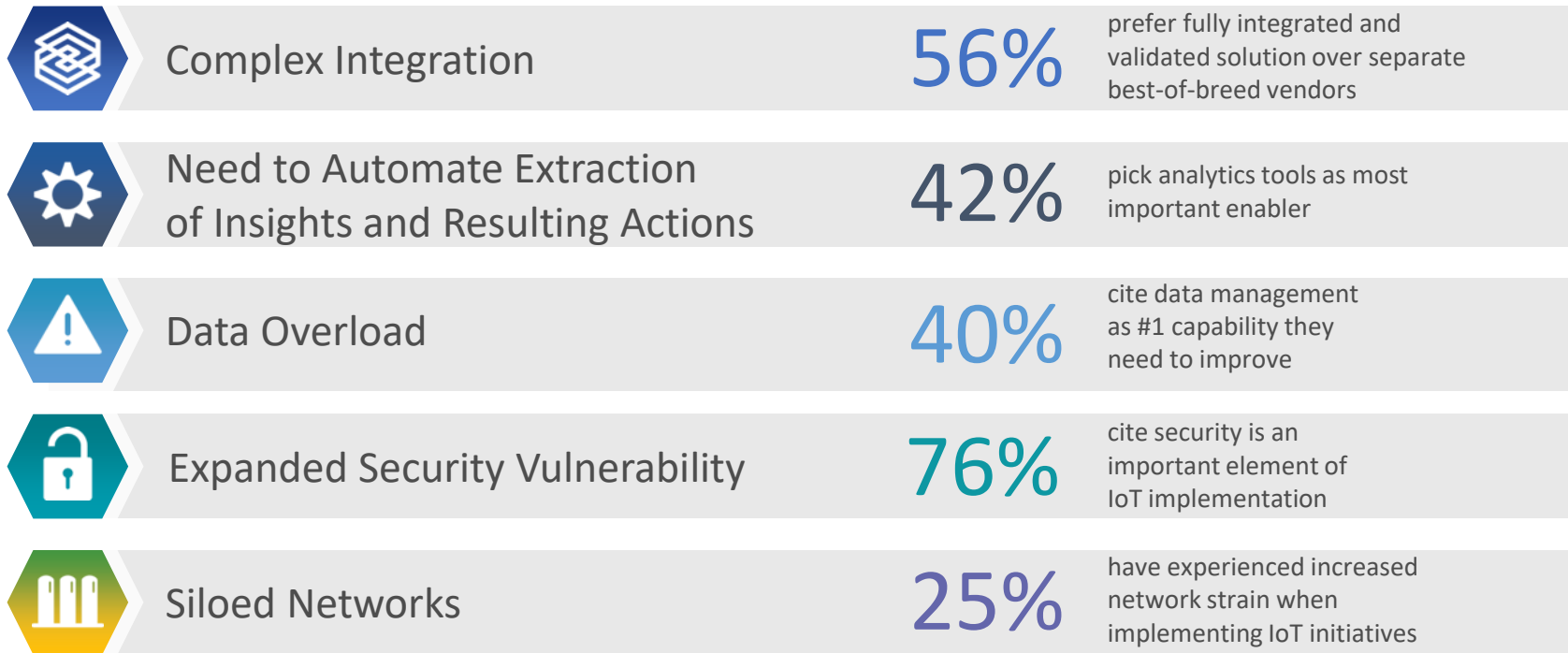
Connected Transportation Sectors

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Top Obstacles to Digital Transformation



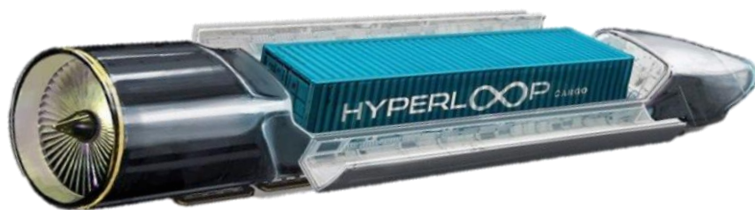


Port of Rotterdam

<https://youtu.be/PECbWmx3x0U>



The industry is changing





Bigger problems, need larger solutions

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Container Terminal / Intermodal Operations

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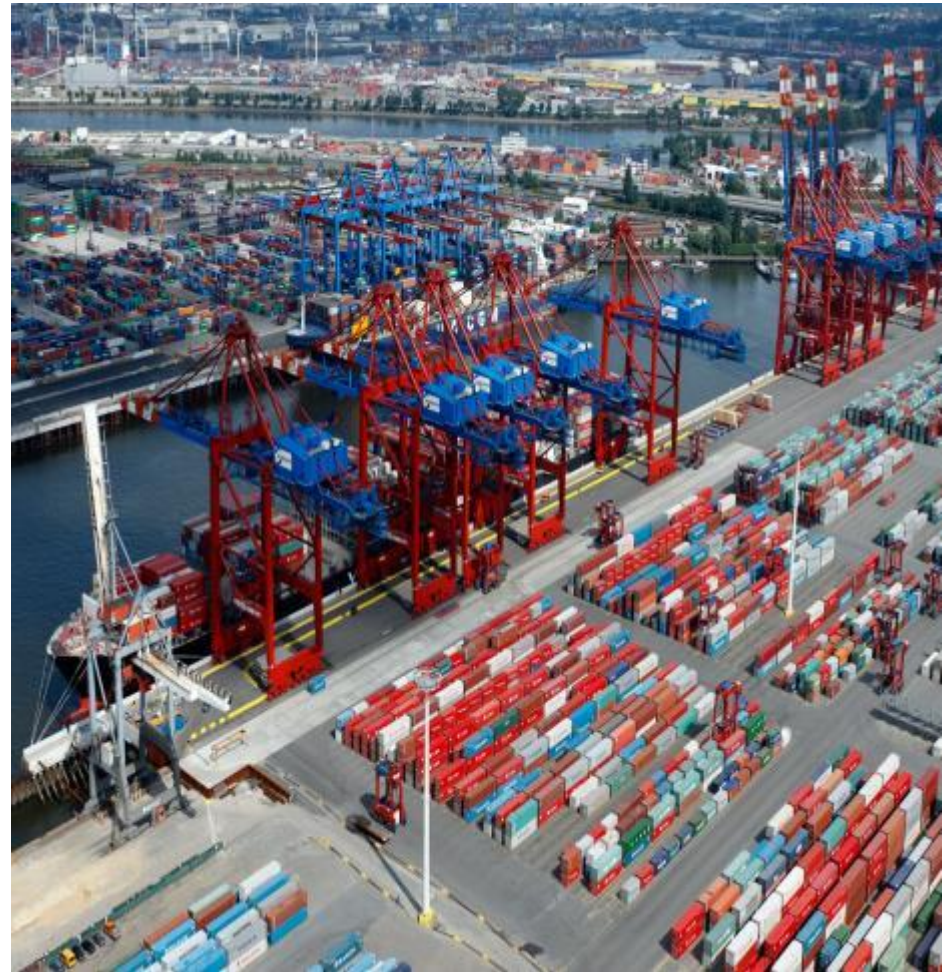
- Telemetry/Safety IO
- Cameras on **RTGs and Straddle Carriers** for remote operations
- AGV Vehicle Connectivity for full automation
- Reduce Costs by Removing Fiber Spools on Cranes
- Facilitate moving cranes between blocks
- Backbone network for WiFi APs for mobile workforce/handheld devices





Port of Hamburg

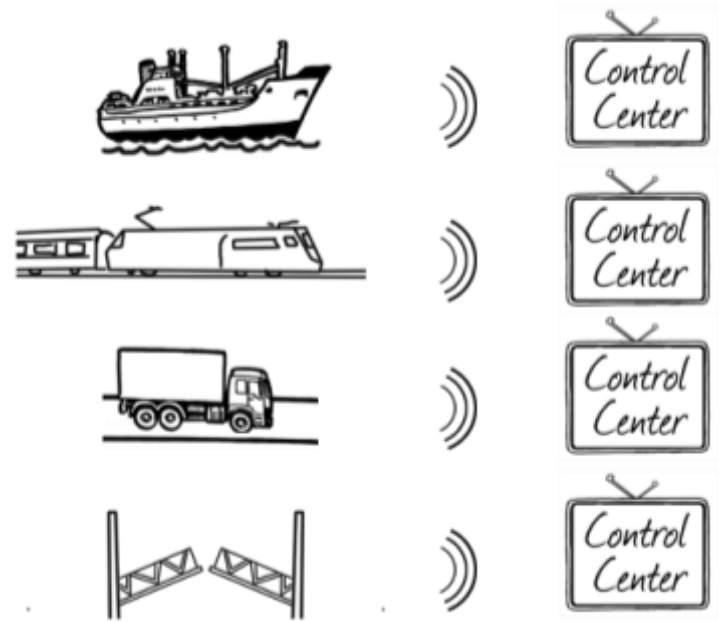
- One of the largest ports in Europe
Over 140 million tons total turnover per year
- Biggest railway port in Europe
200 freight trains with 5000 wagons per day
- 1900 employees
- 10,000 ships per year
- Connected to 900 harbors in 174 countries around the globe
- Strong growth in cruise ship tourism





Port of Hamburg – Legacy Issues

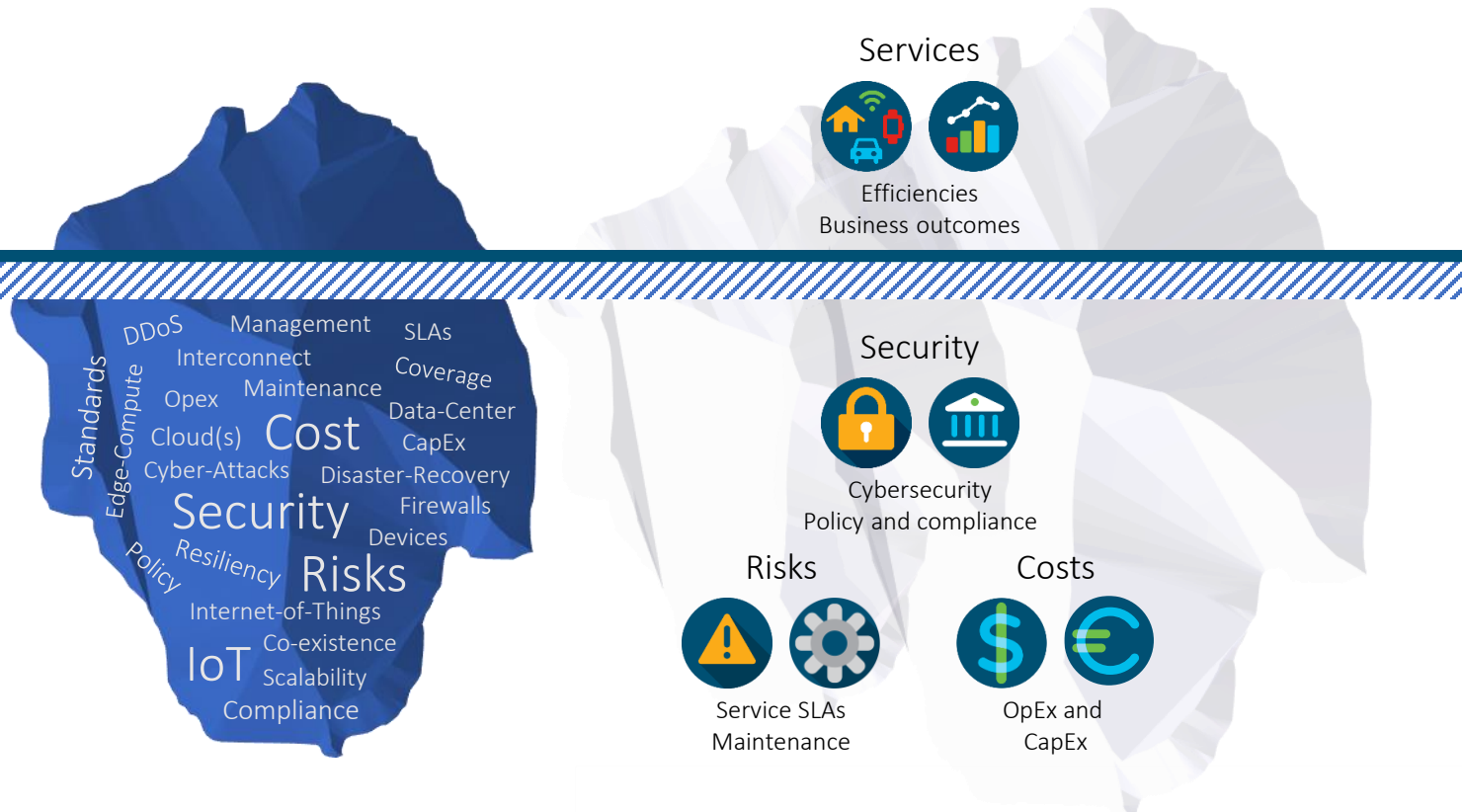
- 4 isolated control centers for
 - River
 - Railways
 - Roads
 - movable infrastructure
- About 300 traffic sensors
- 270 km of fiber optics
- First Hot Spots (WiFi)





Hidden cost of siloed services

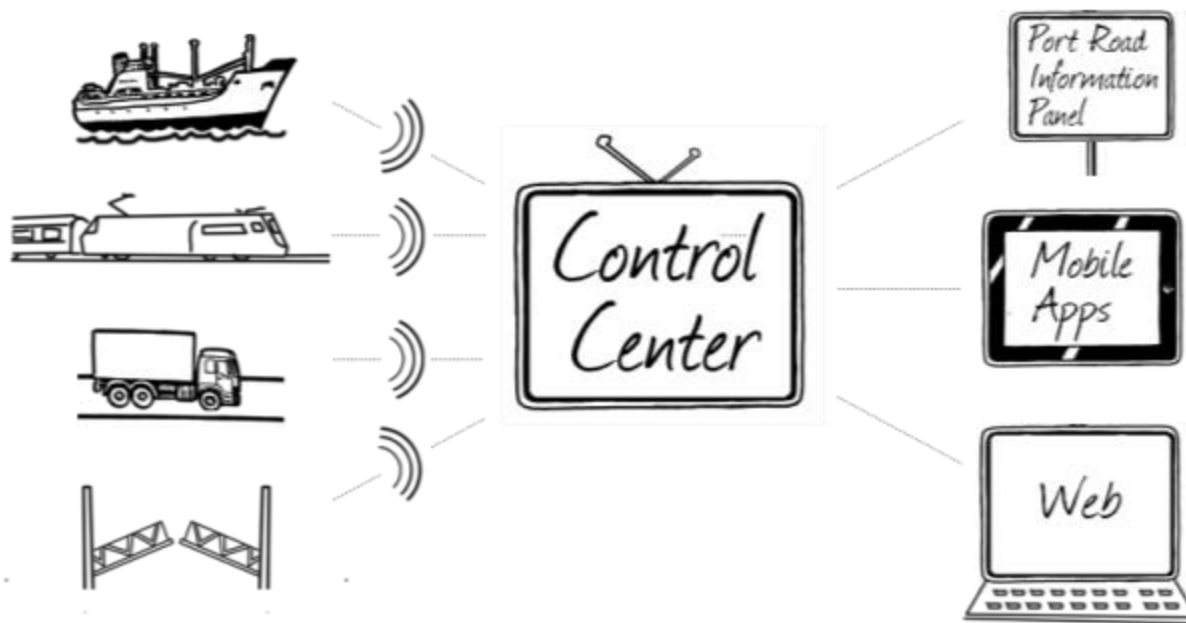
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Port of Hamburg – Deployed Port Traffic Center

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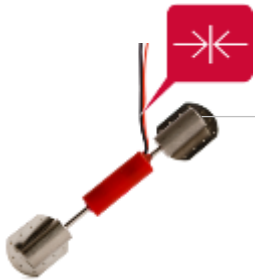
Port of Hamburg – Example Sensors

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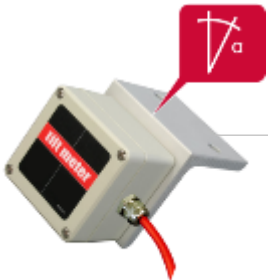


Port of Hamburg – Sensor Integration



Structural: strain gauges

Measuring the strain and stress on structural steel members.



Structural: tiltmeters

Settlements and relative displacements, tilt of piers and abutments.



Environment: air quality

Pollution level: NO, NO₂, SO₂, CO and PM₁₀.



Environment: weather

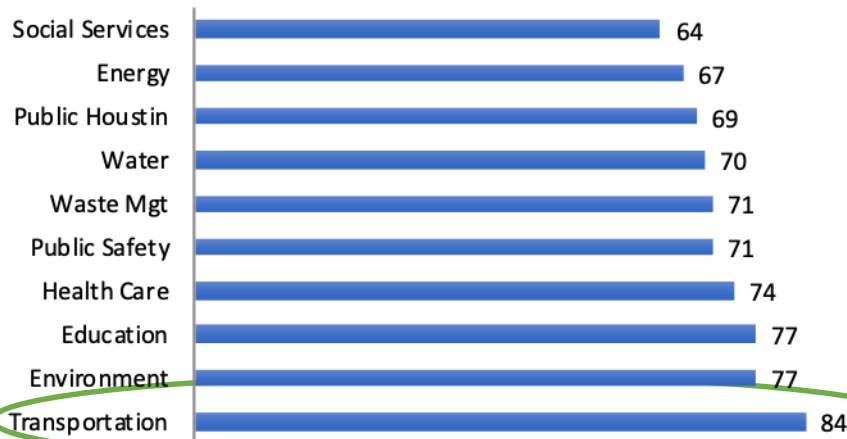
Rainfall, relative humidity, air temperature, wind speed/direction.



Transportation: The Top Priority for Cities

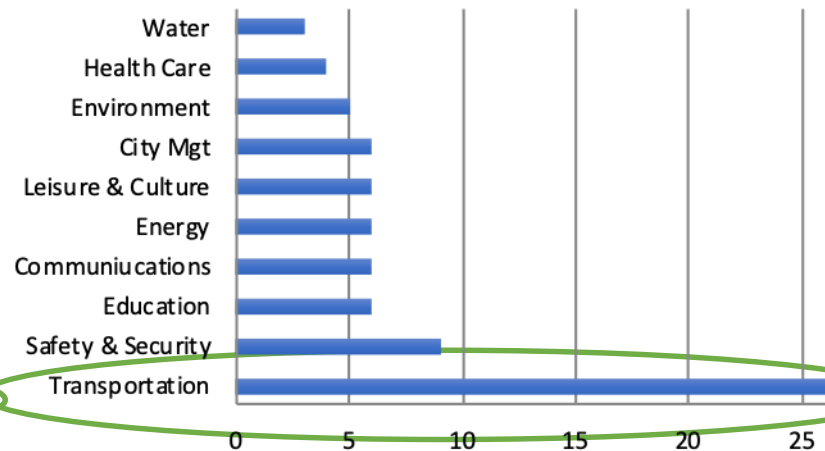
Need for investment over the next 5-10 years by infrastructure area

Needing Investment



Infrastructure area most important in attracting economic investment

Attracts Economic Investment

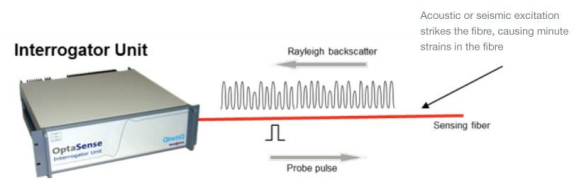
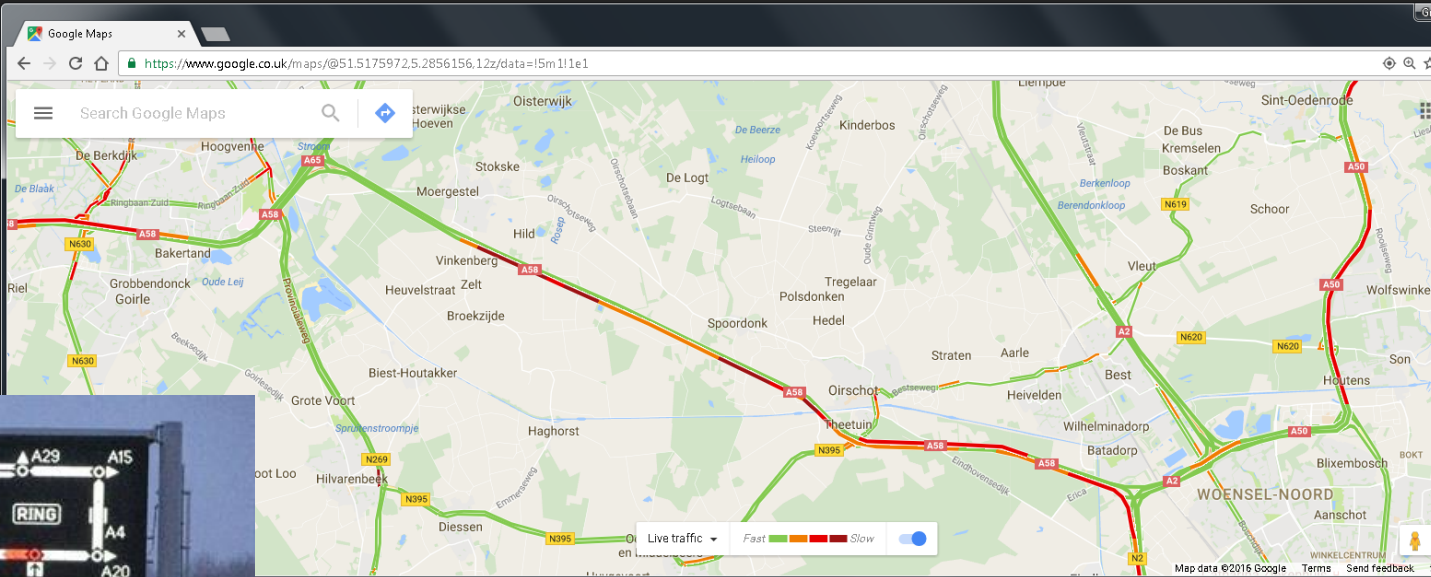
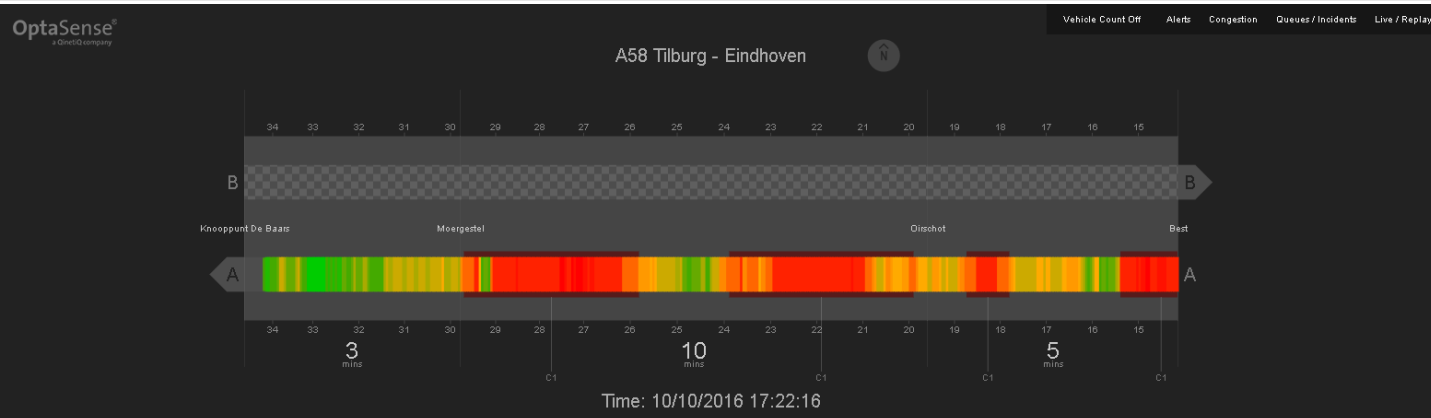


Survey of public & private sector stakeholders across world's top 25 cities



Connected Transportation Examples

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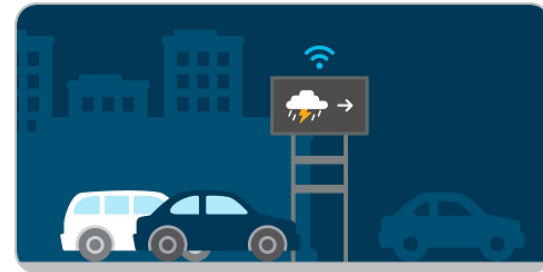




Fog Computing Example

Dynamic message sign automation

Real-time information on weather, traffic accidents, lane closures, work zones, and more via digital signage



Industry drivers

- Smart transportation and connected communities increasingly requiring dissemination of real-time information
- Dynamic message signs can share data from vehicles, sensors, and legacy devices to make roadways safer and more efficient for all travelers
- Automation enables more efficient traffic operations and operator safety

Business needs

- Legacy device integration—make use of existing signage to better communicate with travelers
- Connected vehicle applications—utilize dynamic messages signs to share data from vehicles-as-sensors e.g. DSRC

Capabilities

- Automate vehicle-as-sensor information, and provide notifications for all travelers
- Collect and disseminate real-time data streams including information on weather, queues, incidents, lane closures, and work zones
- Notify drivers, pedestrians, and operators in real-time

Business outcomes

- Fatality and crash reduction
- Prevention of secondary crashes
- Improved emergency response
- Improved operations and system efficiency
- A digital foundation ready for connected and automated vehicles
- Improved traveler communications

Stakeholders

- Traffic operators at DOT, City, and County
- Chief Engineer, District Engineers, Chief of Operations/Intelligent Transportation Systems



Fog Computing Example

Automated and connected vehicle notifications

Data collection that increases the safety of drivers and pedestrians in real time



Industry drivers

- Smart transportation and connected communities incorporating vehicle-as-a sensor e.g. DSRC technologies
- AASHTO SPaT Challenge for DSRC in all states by 2020
- Toyota and GM deploying DSRC on new vehicles
- Planning for automated vehicles

Business needs

- Data collection for real-time and predictive analytics
- Improve roadways and traffic signals today for future connected and automated vehicle applications
- Provide data to connected vehicle applications

Capabilities

- Collect and evaluate vehicle data in real-time
- Relay connected vehicle to infrastructure data for vehicles in real-time
- Visualize data on mapping applications and in existing traffic management centers
- Identify emergency needs in real time

Business outcomes

- Improve traveler notifications and reduce crashes
- Identify emergencies and respond to vehicles in real time
- Improve access and mobility
- Lower total costs for data collection, analysis, and predictive applications
- A digital foundation ready for connected and automated vehicles

Stakeholders

- Traffic operators at DOT, City, and County; potentially emergency responders and police departments
- Chief Engineer, District Engineers, Chief of Operations/Intelligent Transportation Systems



Fog Computing Example

Automation of roadway infrastructure

Integrated and normalized data across multiple sensors that delivers real time traveler information



Industry drivers

- Trends of connected and automated vehicles, changing mobility needs, and need for better traveler information
- Traffic fatalities on the rise since 2014
- Legacy ITS systems, roadways, and operations centers

Business needs

- Need to identify and report road weather changes in real-time
- Ability to utilize existing sensor technology to enhance traffic operations
- Advanced data collection and analysis
- Planning for future automation and legacy sensor integration

Capabilities

- Notify drivers, pedestrians, and operators of changing weather conditions in real-time
- “Single click” for operator intervention
- Automate responses and system changes based on real-time conditions

Business outcomes

- Maximize system efficiency, safety, and throughput
- A digital foundation ready for connected and automated vehicles
- Improved incident response

Stakeholders

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Fog Computing Example

Dynamic monitoring, metering and pricing

An efficient and effective means to maximizing traffic throughput and reducing roadway accidents



Industry drivers

- System efficiency and air quality standards
- System operations as a priority
- Need for traffic calming and queue smoothing

Business needs

- Need to manage recurring and non-recurring congestion based on real-time and predictive information
- Ability to change system operations including lane control, lane reversals, and speed limits

Capabilities

- Control the rate at which vehicles enter the freeway
- Monitor arterial traffic conditions and queuing
- Dynamically allocate lane access, lane merge control, and reversible lanes
- Enable hard shoulder running
- Support queue warning
- Enable active traffic management and dynamic speed limits

Business outcomes

- Maximize system efficiency and throughput
- Improved safety
- Queue reduction

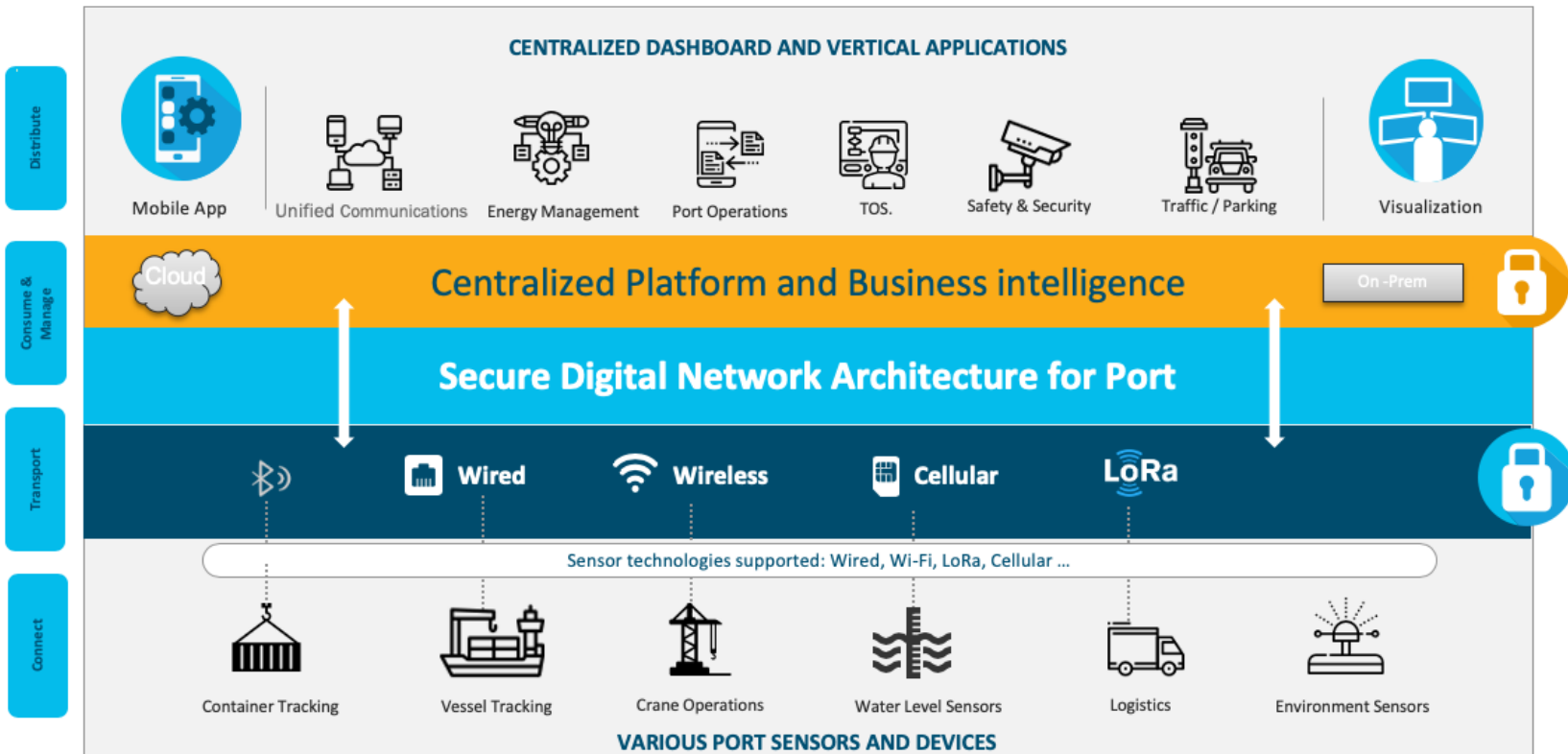
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Cisco's Integrated Port Architecture

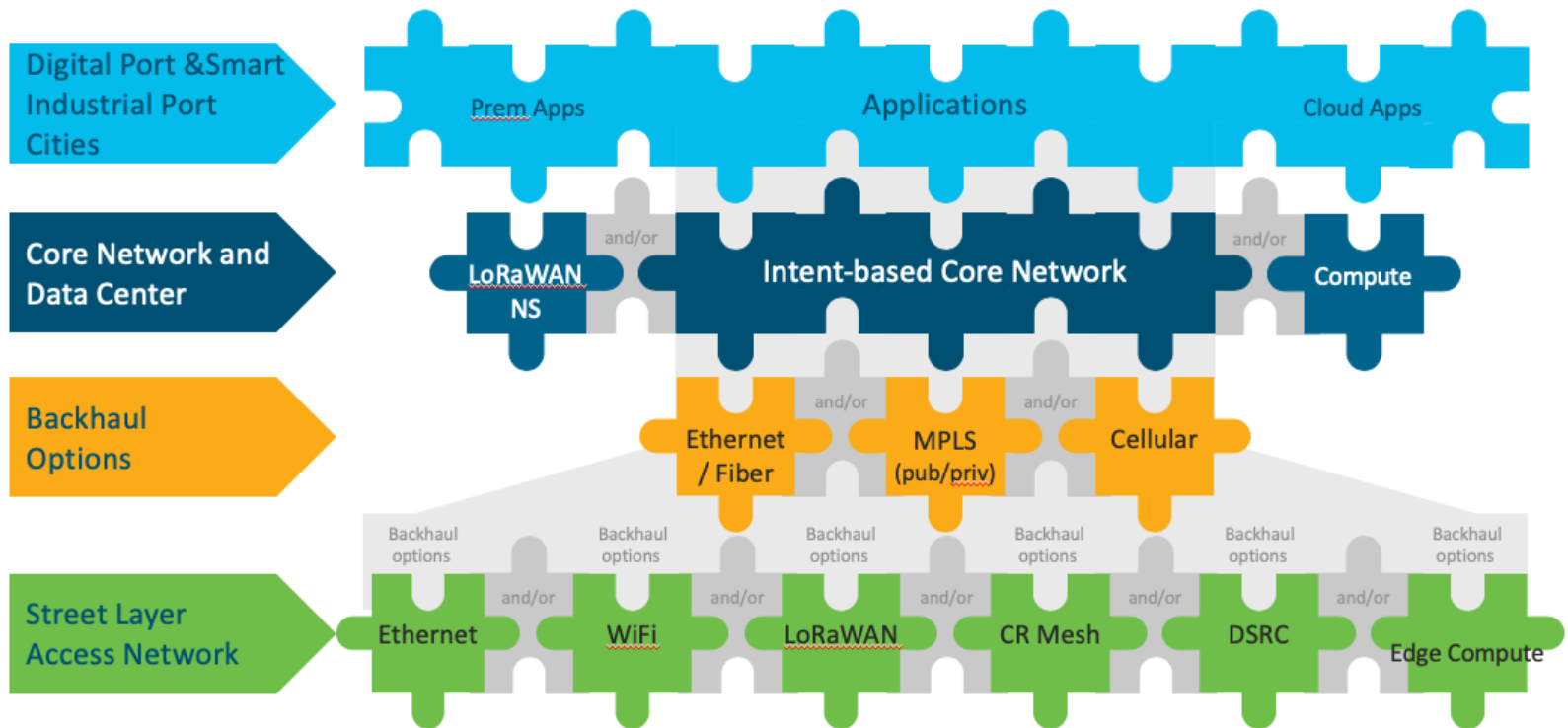
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Modular Architecture

Modular Architecture

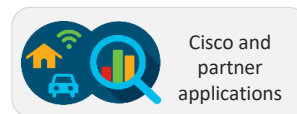




Cisco Connected Communities Infrastructure

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



Lighting



Safety and security



Roadways and urban mobility



Waste



Parking



Environment and water



Cisco® Connected Communities Infrastructure

Cisco intent-based networking and Software-Defined Access



Catalyst IE3300, IE3400, IE4000 and IE5000 series

Ethernet and fiber



IW 3702, Aironet 1500 series

Outdoor Wi-Fi



IR1101, 829, 809 ISR Rugged

Cellular



Wireless Gateway for LoRaWAN

LoRaWAN



1240 CGR Router

Mesh



Third Party V2X

Vehicle to Infrastructure



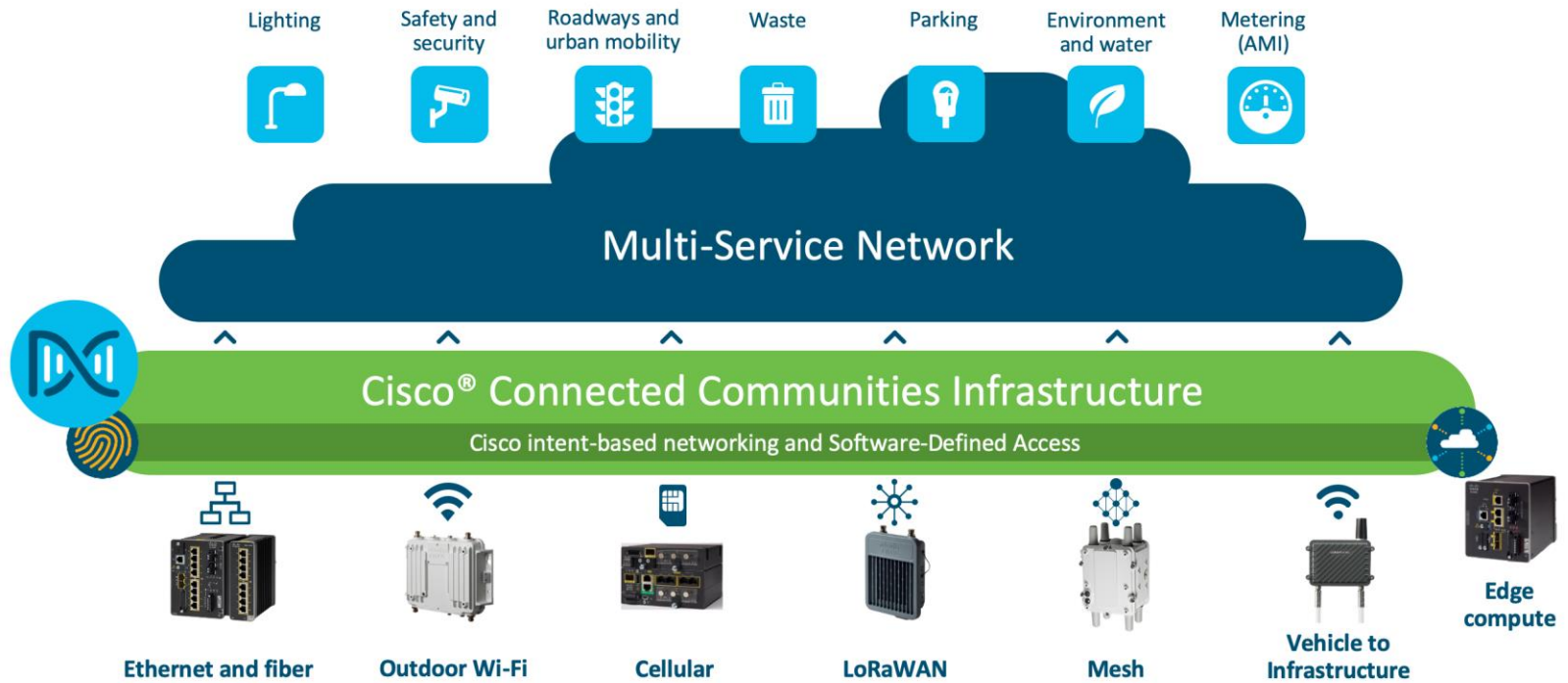
IC3000

Edge compute



Virtual Networks and Segmentation

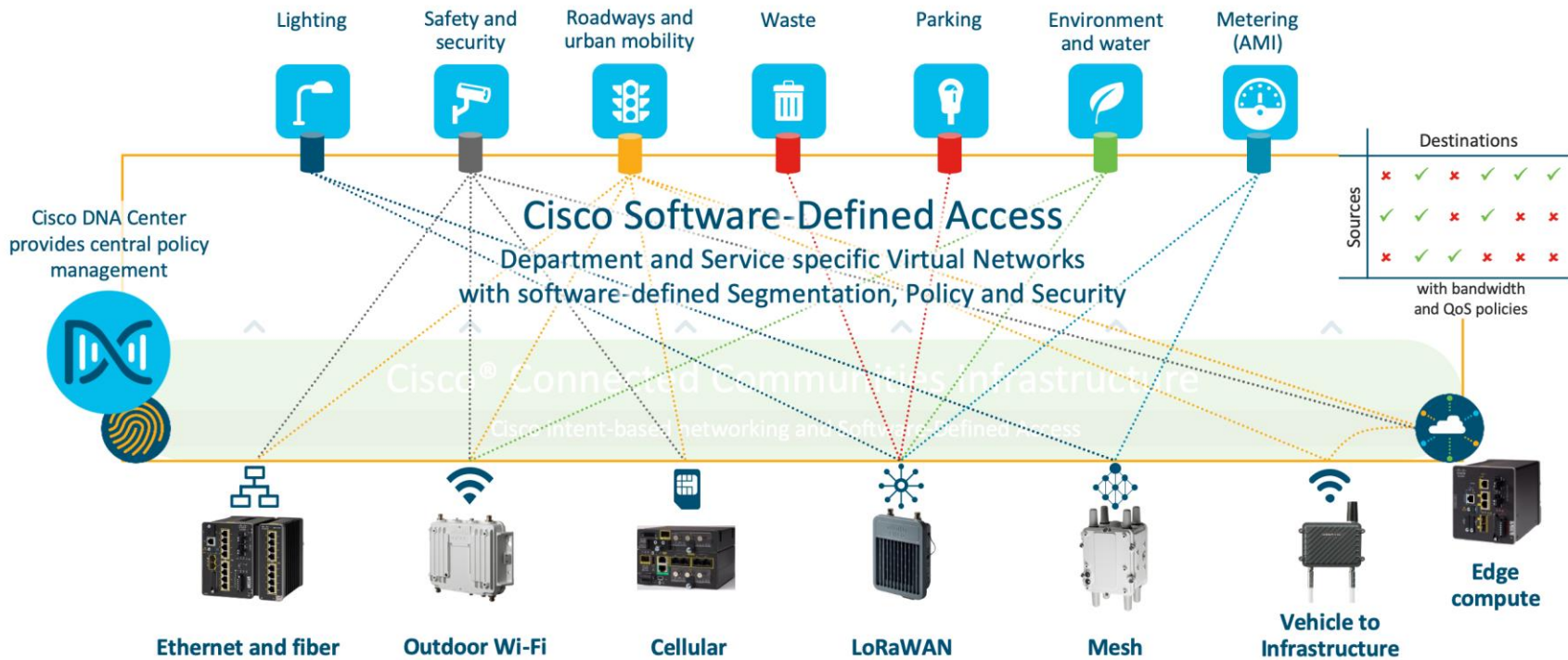
with Cisco Software-Defined Access





Virtual Networks and Segmentation

with Cisco Software-Defined Access





Benefits

Cisco Software-Defined Access benefits

Networking at the speed of software



67%

Savings in network provisioning time

80%

Less time to issue resolution

48%

Reduction in impact of security breach

61%

Lower operating expenses



Identity-based policy and segmentation

Security policy definition decoupled from VLAN and IP address



Automated network fabric

Single fabric for wired and wireless with workflow-based automation



Insights and telemetry

Analytics and insights into user and application behavior

*Source: Internal TCO analysis with large enterprise customer (actual results may vary)



Connected Communities Infrastructure

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Applications

Connected Communities 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

Cisco intent-based networking and Software-Defined Access



Ethernet and fiber



Outdoor Wi-Fi



Cellular



LoRaWAN



Mesh



V2X (Vehicle to Infrastructure)



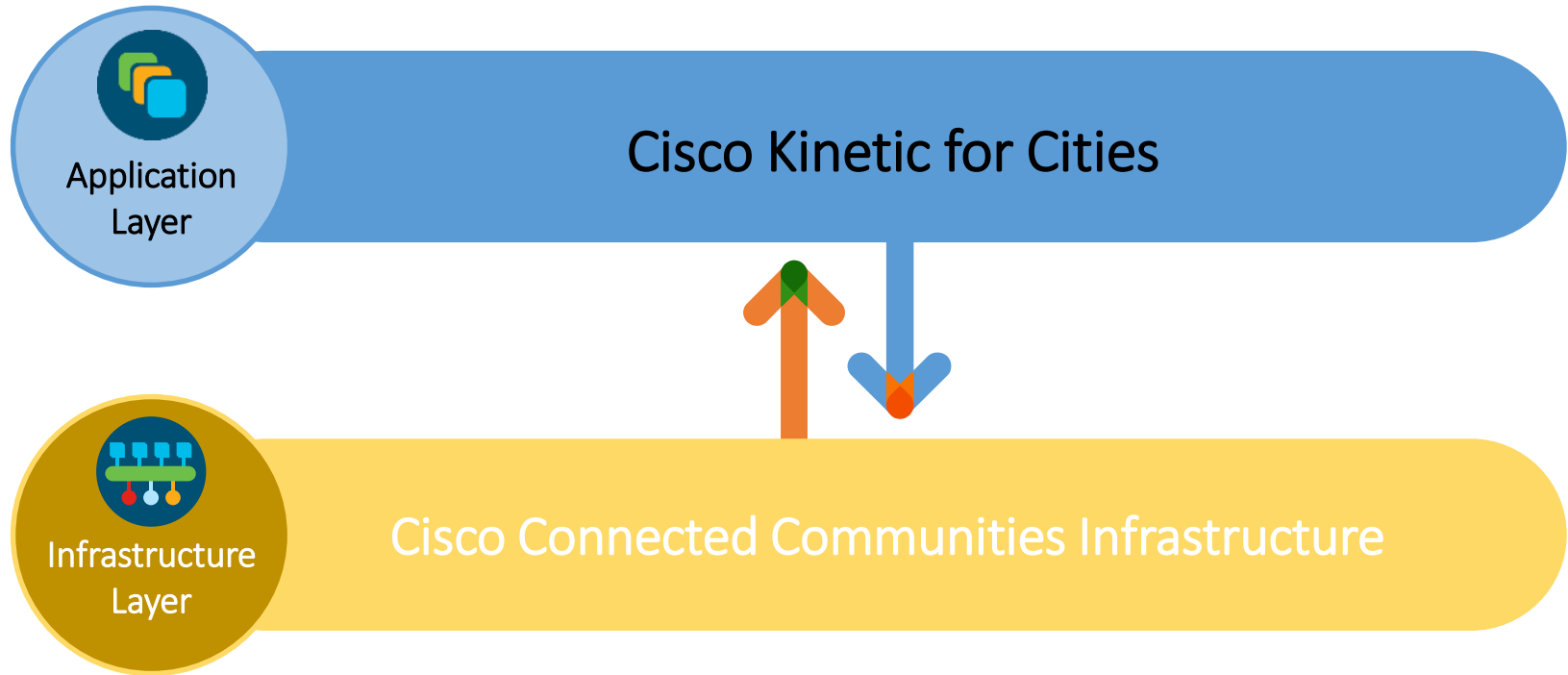
Edge compute



Backhaul options: Fiber | MPLS | Cellular



Cisco's Approach for Data Integration





Cisco's Approach for Data Integration

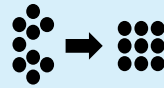


Data From Any Device



- Connect with any technology
- Aggregate and normalize data across multiple sensors
- Provide a digital model for the city

Cross-Domain Information



- Enable cross-domain contextual control (i.e., With outdoor lighting & crime)
- Process automation through policies

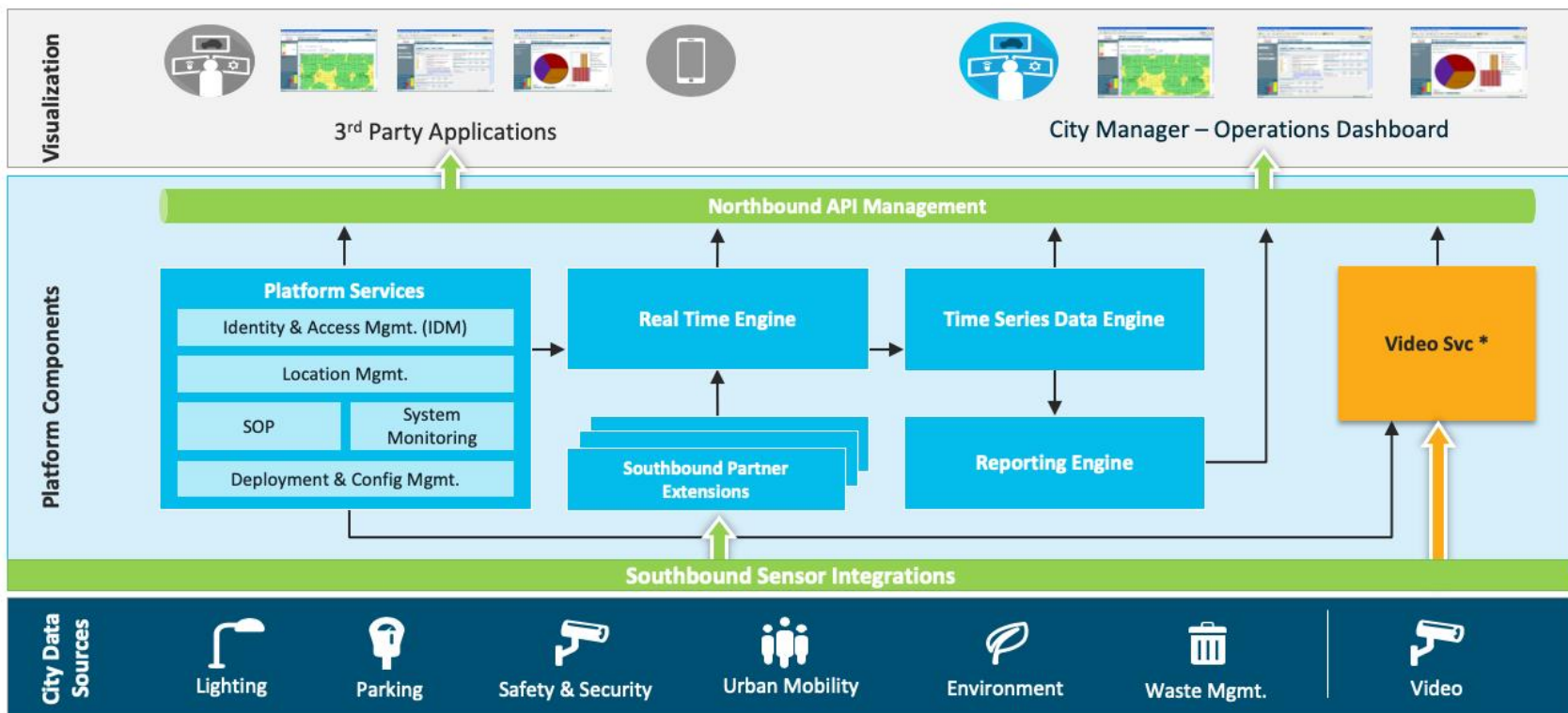
Open Ecosystem



- Expose APIs for local and global ISVs applications
- Secure key management and Role-Based Access Control



Cisco's Approach for Data Integration





Example Kinetic Front End

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The dashboard displays the following information:

- Location:** Jaipur
- Time:** 07:13 AM CEST, SAT 25 NOV 2017
- Language:** ENG
- Navigation:** Dashboard, Map View, Alerts, Policies, Events, Reports, SOP
- System Health Summary:**
 - Environment:** Health: 67% - Fair. All systems running optimally.
 - Lighting:** Health: 71% - Fair. 1455 of 2031 lights active.
 - Parking:** Health: 100% - Excellent. All Lots Active.
 - Traffic:** Health: 100% - Excellent. All systems running optimally.
 - Mobility:** Health: 100% - Excellent. All systems running optimally.
 - Safety & Security:** Health: 100% - Excellent. All systems running optimally.
- Maps:**
 - Environment Map:** Shows Air Quality Index (AQI) with a value of 182. Other metrics include CO, CO₂, SO₂, O₃, NO₂, PM₂₅, PM₁₀, Temperature, Humidity, Noise, and Lux.
 - Lighting Map:** Shows the state of Rajasthan with various districts labeled.
 - Parking Map:** Shows a detailed street map with a parking 'P' icon.
- Footer:** Dashboard: Default, Add Widget, Add Dashboard