Smart Cities IoT Assets Management System

Oleg V. Pekerman

IoT Era

In the era Internet of Things (IoT) technologies and IoT market grow from 3T in 2015 to 16T in 2022 with expectation to be over 50T by 2025. The rapid growth of the IoT infrastructure creates benefits for society and open new horizon for the ITS Assets Management.

Major IoT Communication Protocols

AMQP

Advanced Message Queuing Protocol is an open standard protocol used for more message-oriented middleware. As such, it enables messaging interoperability between systems, regardless of the message brokers or platforms being used. It offers security and interoperability, as well as reliability, even at a distance or over poor networks. It supports communications, even when systems aren't simultaneously available.

Bluetooth and BLE

Bluetooth is a short-range wireless technology that uses short-wavelength, ultrahigh-frequency radio waves. It had most commonly been used for audio streaming, but it has also become a significant enabler of wireless and connected devices.

Another option is Bluetooth Low Energy, known as either Bluetooth LE or BLE, which is a new version optimized for IoT connections. BLE consumes less power than standard Bluetooth, which makes it particularly appealing in many use cases.

Cellular

Cellular is one of the most widely available and well-known options available for IoT applications, and it is one of the best options for deployments where communications range over longer distances. Cellular provides high bandwidth and reliable communication. It's capable of sending high quantities of data, which is an important capability for many IoT deployments. However, those features come at a price: higher cost and power consumption than other options.

Major IoT Communication Protocols (Continued)

LoRa and LoRaWAN

LoRa, for long range, is a noncellular wireless technology that, as its name describes, offers long-range communication capabilities. It's low power with secure data transmission for M2M applications and IoT deployments.

Wi-Fi

Wi-Fi is a frequently used IoT protocol. It offers fast data transfer and is capable of processing large amounts of data. Wi-Fi is particularly well suited within LAN environments, with short- to medium-range distances. Moreover, Wi-Fi's multiple standards - the most common in homes and some businesses being 802.11n - give technologists options for deployment.

XMPP

Dating back to the early 2000s when the Jabber open-source community first designed its Extensible Messaging and Presence Protocol for real-time human-to-human communication, XMPP is now used for M2M communication in lightweight middleware and for routing XML data. XMPP supports the real-time exchange of structured but extensible data between multiple entities on a network.

IoT Cyber Security

IoT Attacks

Devices

Devices can be the primary means of launching attacks. Memory, firmware, physical and web interfaces are all areas where vulnerabilities can occur. Attackers can also exploit insecure default settings, obsolete components, and insecure update mechanisms.

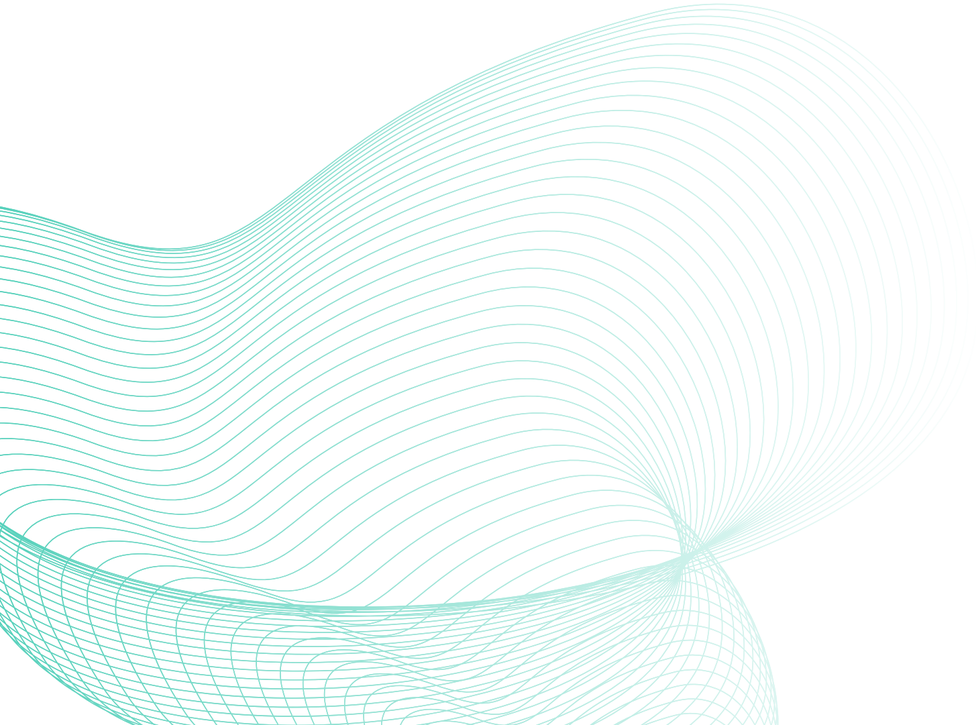
Communication Channels

Communication Channels Attacks on IoT devices can originate in the communication channels that connect IoT components.

Software

Software components - vulnerabilities in applications and related software can compromise systems.

IoT Cyber Security Breaches



Mirai

Mirai - can infect a device if the default username and password are not changed.

Stuxnet

Stuxnet is a sophisticated computer worm designed to detect specific nuclear machinery.

"I want to hack this Jeep"

"I want to hack this Jeep" approach - Automotive Cybersecurity

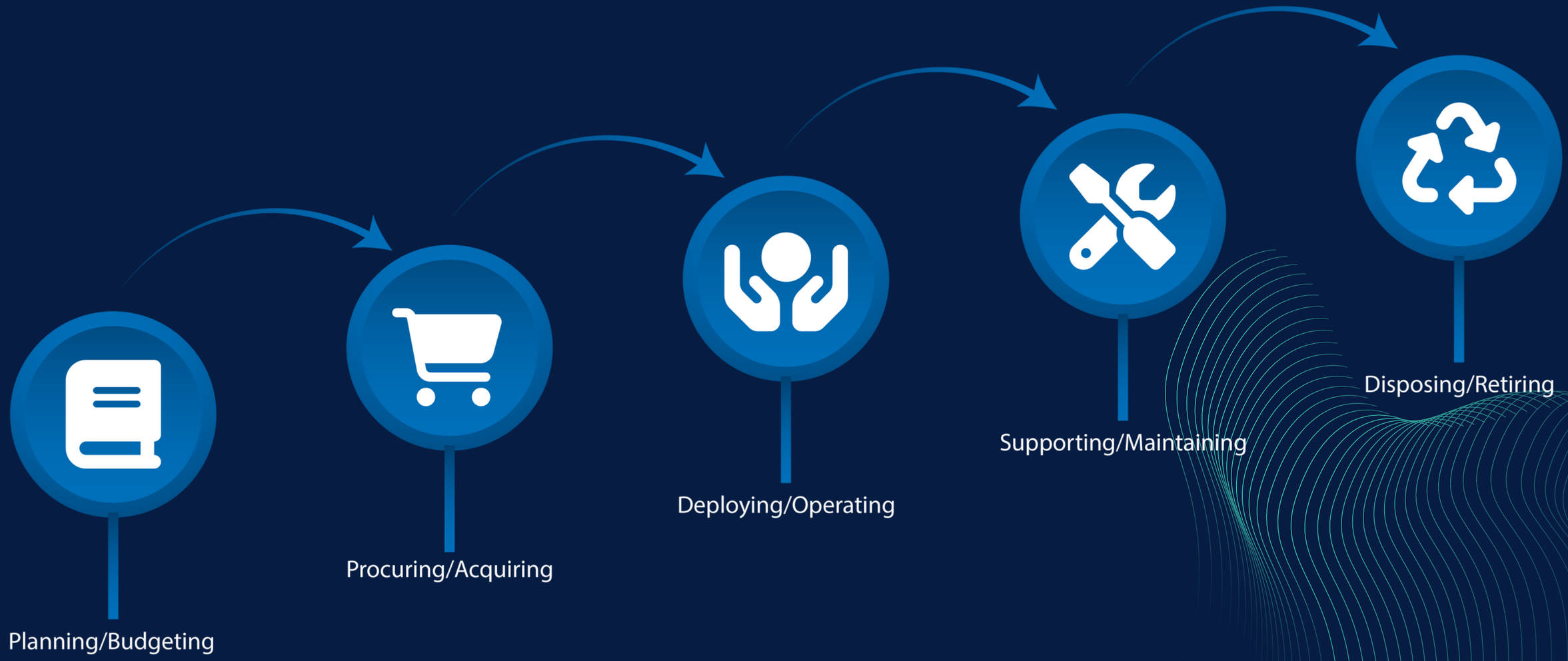
Vulnerabilities Medical Device Cybersecurity

Implanted Medical Devices Vulnerabilities - Medical Device Cybersecurity

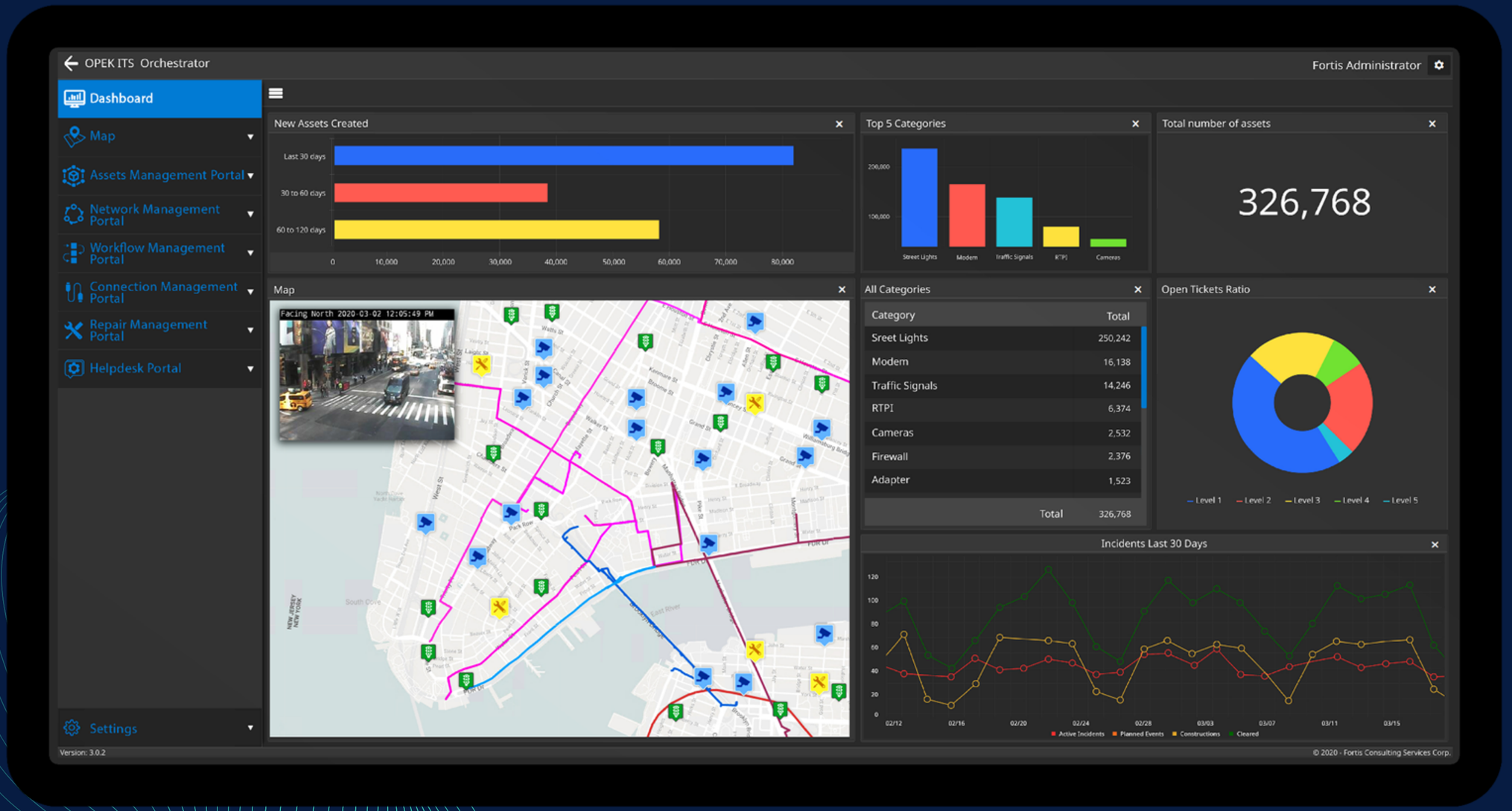
How to protect IoT devices

- Certify devices and applications before implementation and after every software or hardware change
- Change Default Passwords
- Examine the Default Settings
- Maintain Device Updates

IoT Assets Management Concept

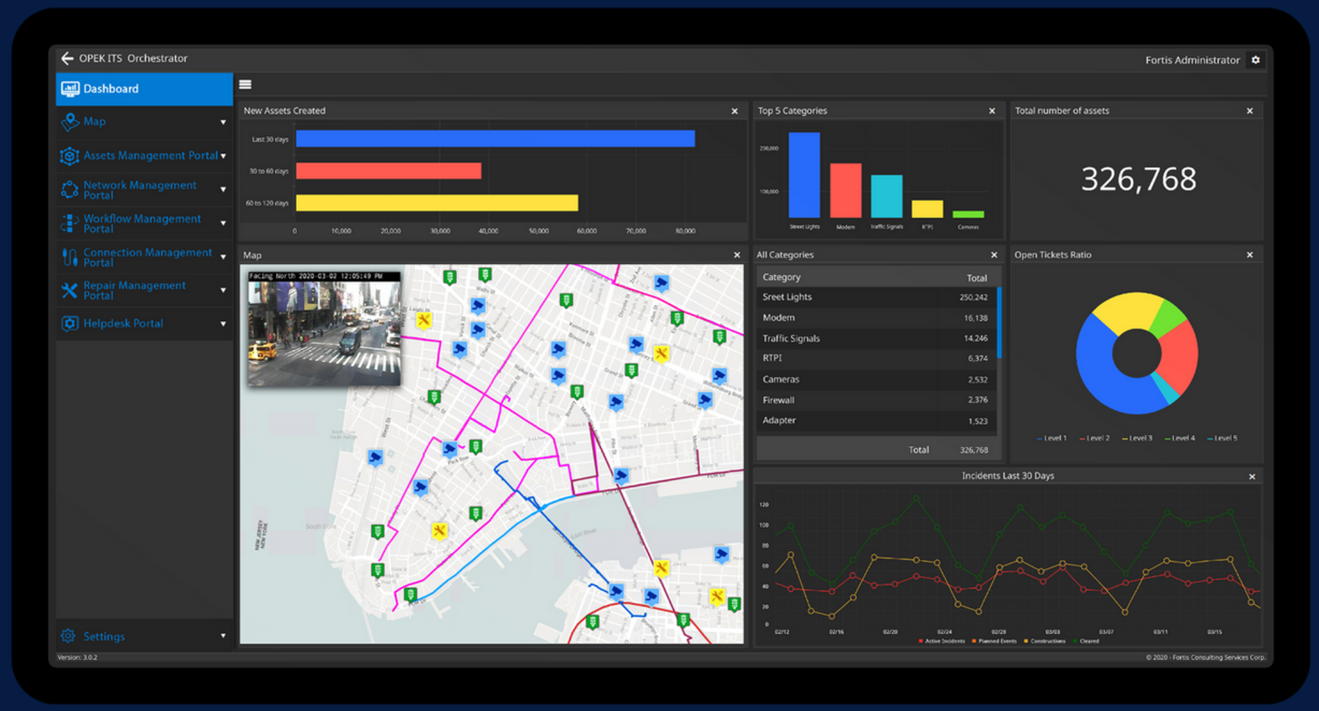


Assets Management Portal (AMP)



AMP (Continued)

1. Track in real-time physical and technological characteristics, as well as contractual and financial aspects of the assets.
2. Store and manage a variety of asset specific documents (purchase orders, invoices, pictures).
3. Automated service contracts and warranty management.
4. Generate a variety of custom financial and technical reports.



5. Includes alarms, manual and automated assets monitoring capabilities.
6. Provides clear, concise, and easy way to locate asset components across multi-location and multi-agency environments.

Environmental Management Portal (EMP)

EMP (Continued)

1. The Environmental Management Portal (EMP) is designed to monitor power infrastructure (UPS's, PDU's, Generator's, Charging stations, Solar panels) and environmental conditions (temperature, humidity, etc.) across facilities and outside environments

2. EMP minimizes maintenance effort and arterial closures times.

3. The portal enables organizations to reduce power consumption and its environmental impact and increase its operation efficiency.

Network Management Portal (NMP)

NMP (Continued)

1. Scales to support very high network monitoring data ingest volumes.
2. Supports detailed IoT device monitoring data.
3. Provides detailed status of wireless point, data usage, and audits wireless providers.
4. Dynamic dashboards allows the user to display and monitor a selected network view, display devices, and interface with devices from the dashboard.
5. Reports on performance by presenting graphs or/and GIS views.

Repair Management Portal (RMP)

RMP (Continued)

- Smart City RMP automates detection of repair related issues and allows for the tracking and scheduling of maintenance activities.

- Permit maintenance personal to update repair statuses, enabling tracking of services rendered by contractors and consulting organizations.

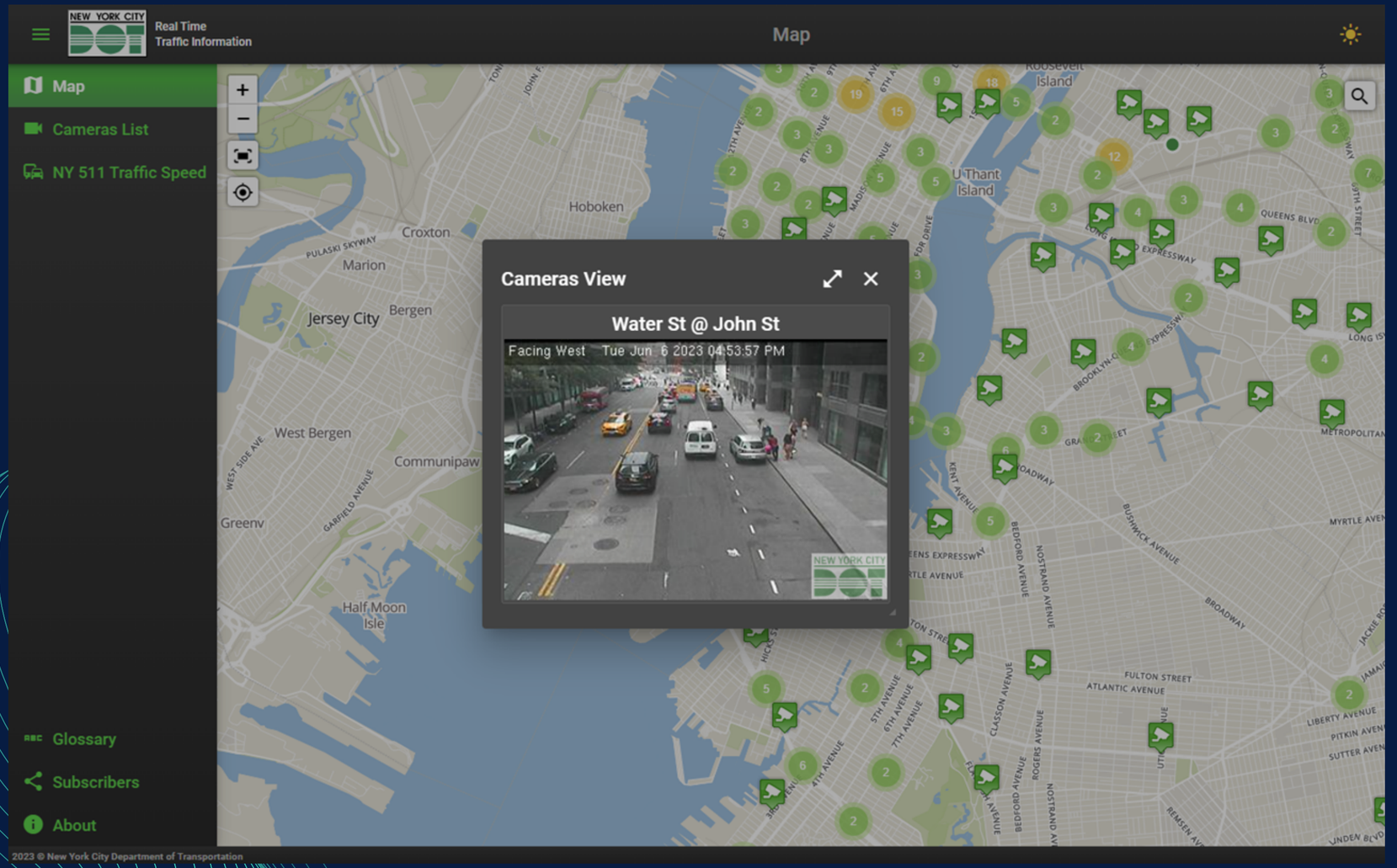
- Allows agencies the ability to operate proactively while reducing downtime and increasing operating efficiency.

- Provides tools for the real-time connection with communications service provider (CSP).

- Consolidates and displays repair statuses on one unified geo-coded map.

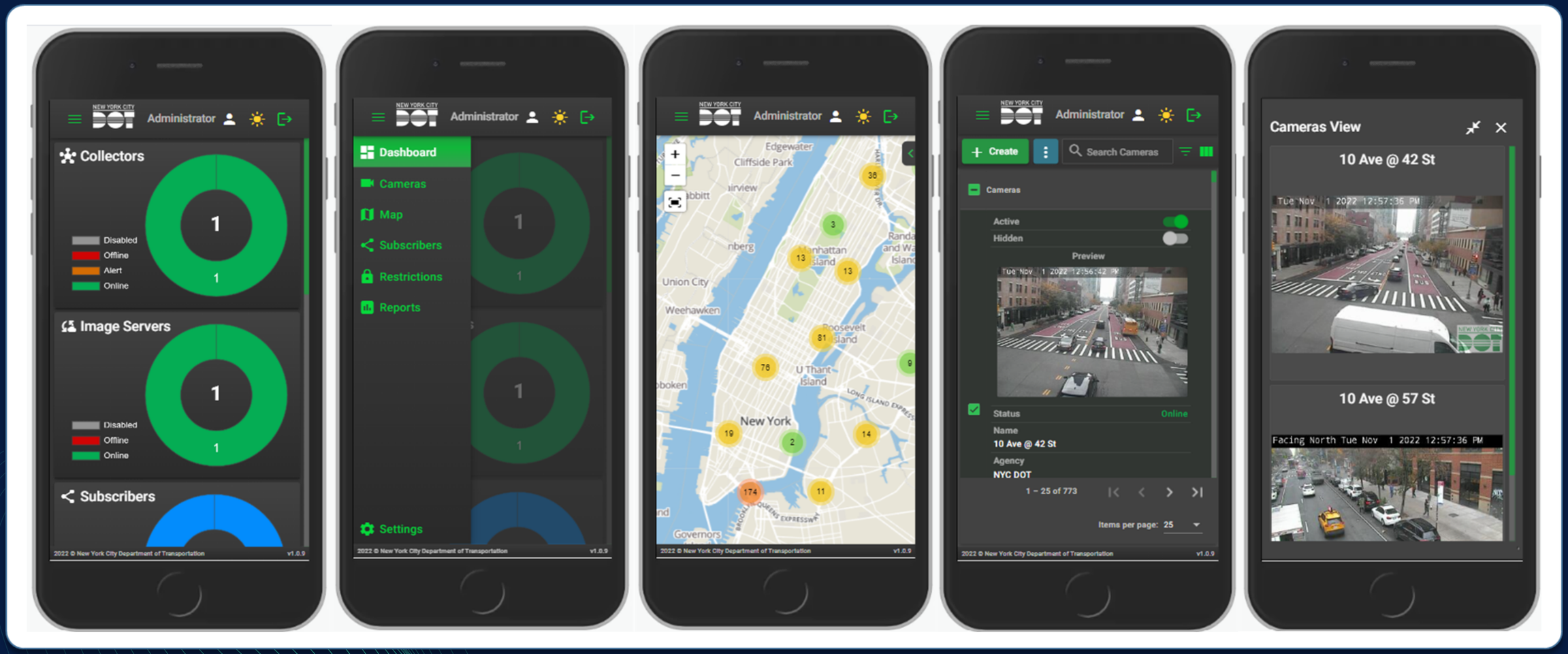
- Implements and adapts any extracted personalized client data-source.

Real Time Traffic Information (RTTI)



www.nyctmc.org

Real Time Traffic Information (RTTI)



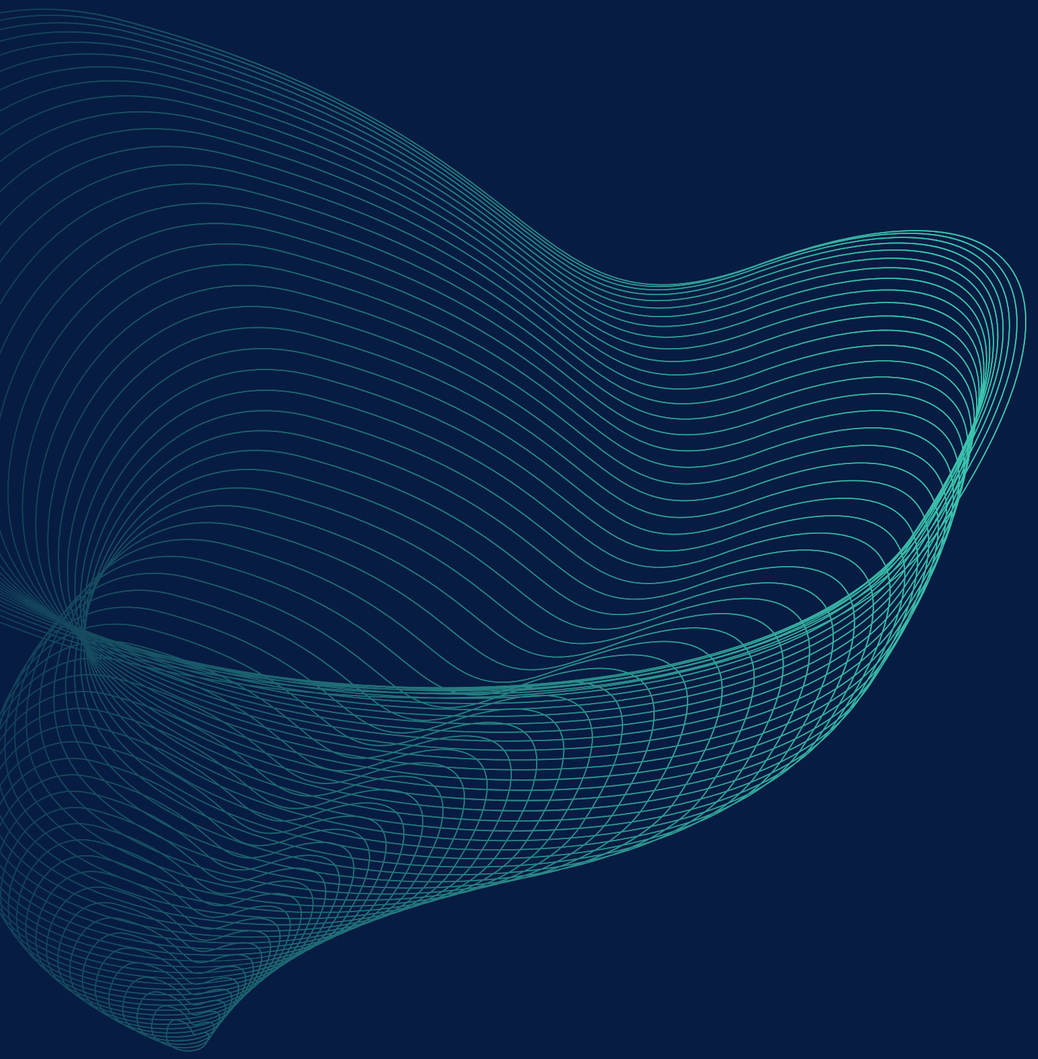
www.nyctmc.org

AI & IoT Assets Management

- Boosting Operation Efficiency
- Allow rapid, real-time decision-making
- Minimize operation, inspection and maintenance cost
- Provide high availability systems with 99.999 rating
- Reliable interchangeable Smart Devices
- Provide AI-powered IoT Traffic Management
- Eliminates Human Error

Conclusion

Interconnected infrastructure allows minimize day-to-day maintenance efforts, providing real-time information about devices (things), allow better assets utilization and optimization, enhance monitoring and assets tracking, and cybersecurity. IoT assets management system enables full-fledged Asset Lifecycle Management (ALM) process of optimization of asset's reliability and operational performance during its lifespan. IoT assets management system allows to manage and minimize energy consumption, manage power infrastructure, and increase efficiency of the assets usage, improve energy management with minimal human intervention, similar approach apply to the environmental management technique. Implementation of the IoT Assets Management System should be a strategic priority for the any ITS organization or agency.



Q & A