

「亞洲·矽谷 x 智慧航空城」高峰論壇：

5G 趨勢下物聯網機會與挑戰

IoT Opportunities and Challenges, IoT Access Connectivity, IoT Application Connectivity, Cisco IOT Framework

錢小山

首席技術顧問

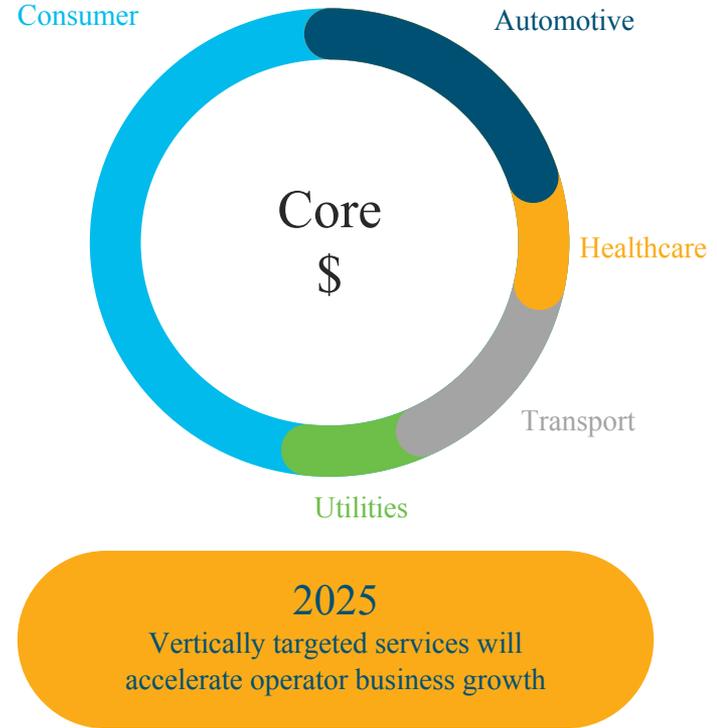
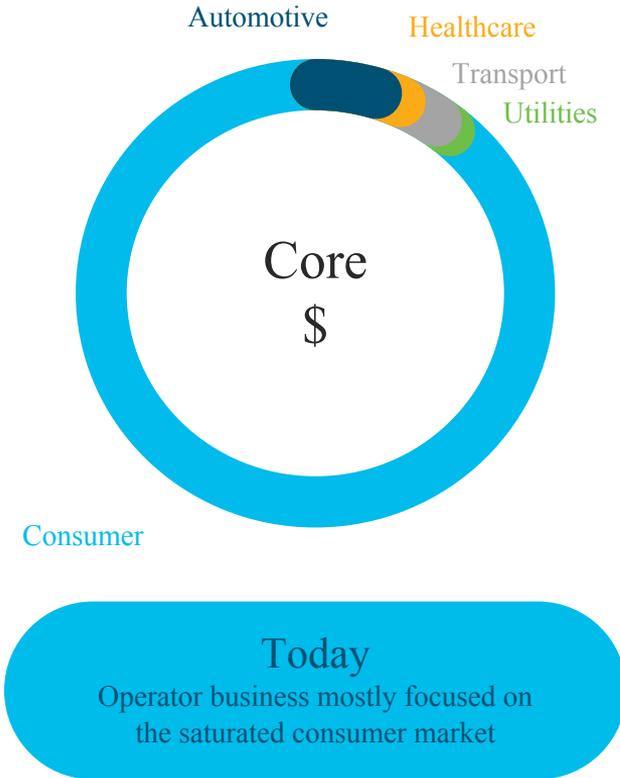
思科大中華區數據中心架構事業部

二〇一八年十二月

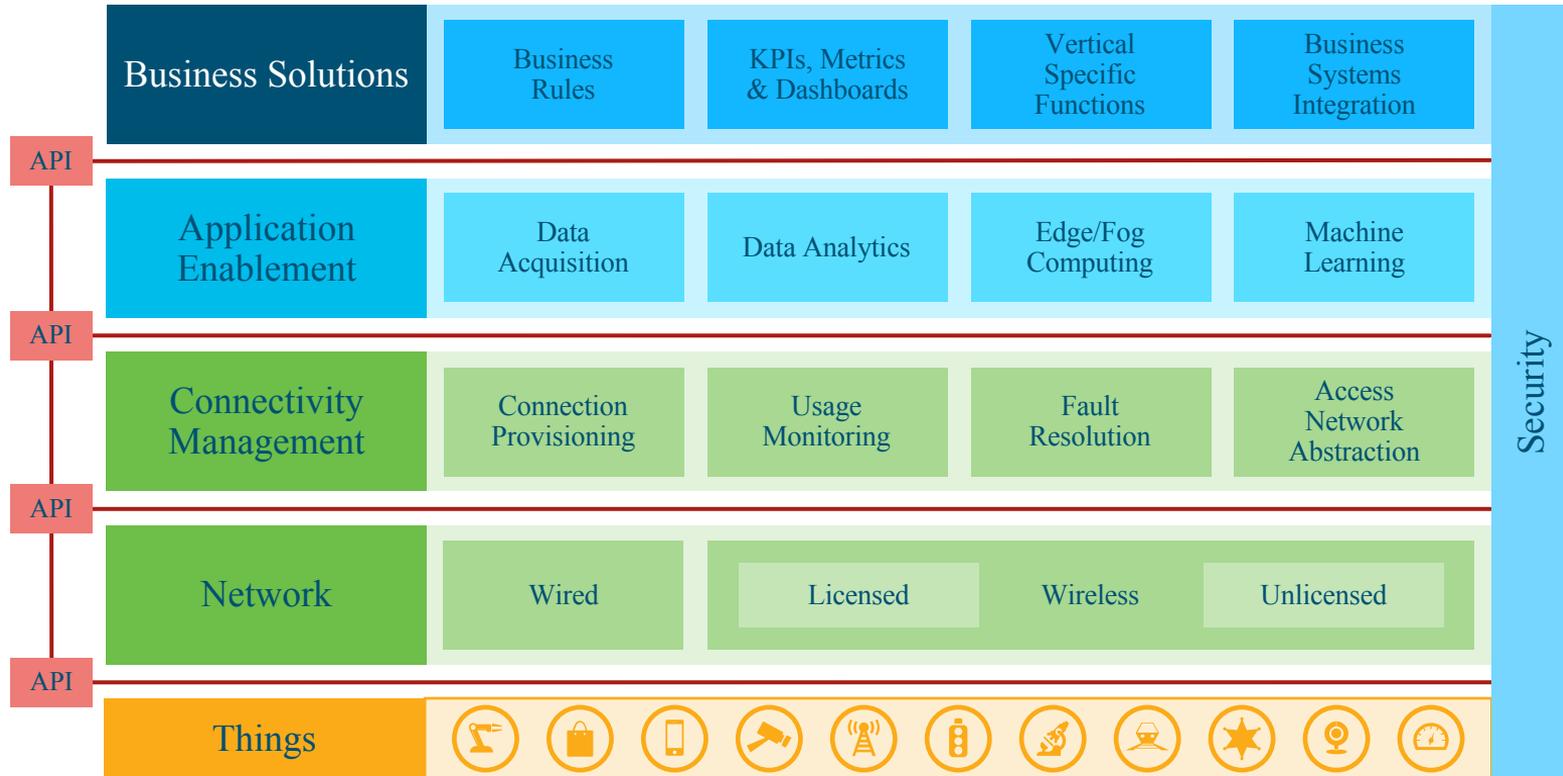


IoT Opportunities and Challenges

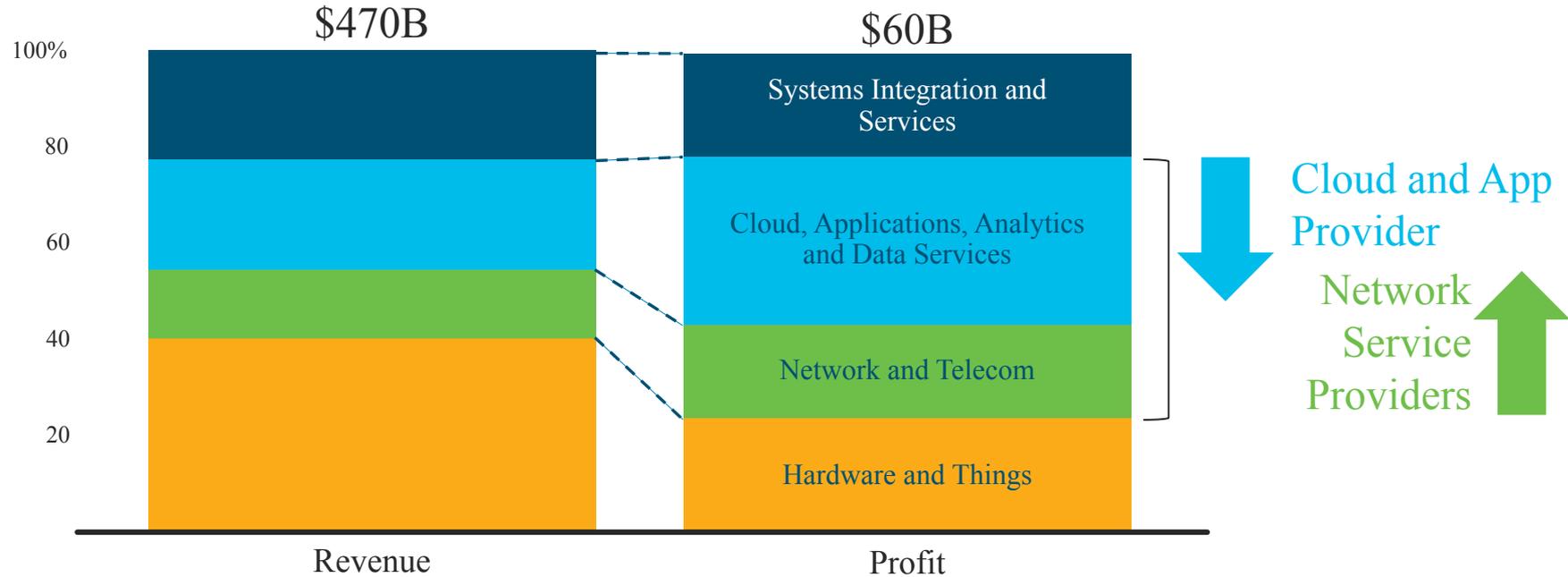
5G Revenue Growth Opportunities



An IoT Project Will Generally Have Multiple Integrated Technology Layers



What about the IoT Revenue ?



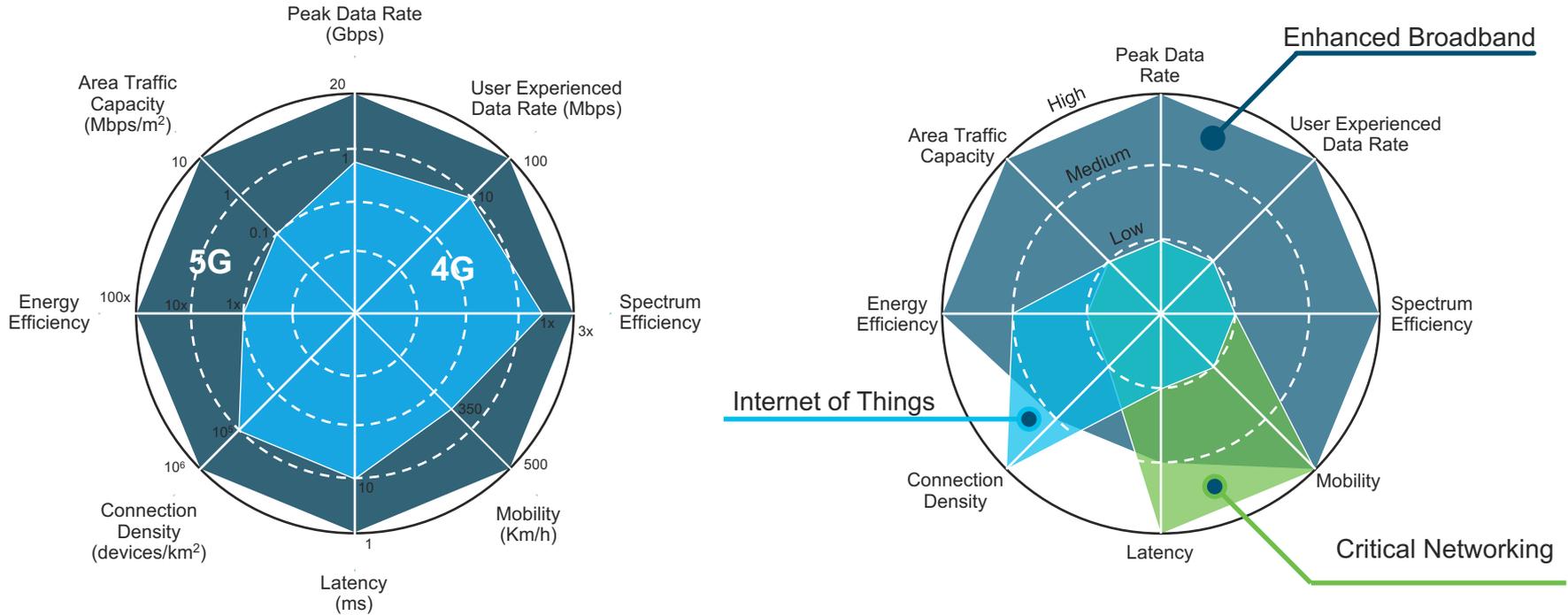


IoT Access Connectivity

Nov. 2018



IoT is one of 5G key Use Cases



No enhanced to radio access technology planned for IOT in 3GPP R16

Many Use Cases with Many Different Requirements



Automation & Monitoring

 50 – 500kbps  High
 Fixed  10 Years



Security & Surveillance

 0.5 – 8Mbps  Low
 Fixed  Connected



Fleet Management

 100s of Kbps  Low
 10 – 150Km/h  ~3 months



Smart Cities

 50 – 500Kbps  Low
 Fixed  10 Years



Automotive / Telematics

 10s of Mbps  Low
 10 – 150Km/h  Vehicle



Wearables

 10s of Mbps  Low
 ~5Km/h  ~1 week

5G Use Case examples: V2X requirements

Use Case	V2X Mode	Latency	Reliability	Data Rate per vehicle (kbps)	Range
Cooperative Awareness	V2V/V2I	100ms-1sec	90-95%	5-96	Short to medium
Cooperative Sensing	V2V/V2I	3ms-1sec	> 95%	5-25000	Short
Autonomous Driving	V2V/V2I	<3ms-100ms	> 99%	10-5000	Short to medium
Traffic Efficiency	V2I	> 1sec	< 90%	10-2000	Long
Teleoperated Driving (Drone)	V2I	5-20ms	> 99%	> 25000	Long

Related use cases actually requiring different network capabilities

SP Wireless IoT Connectivity Options

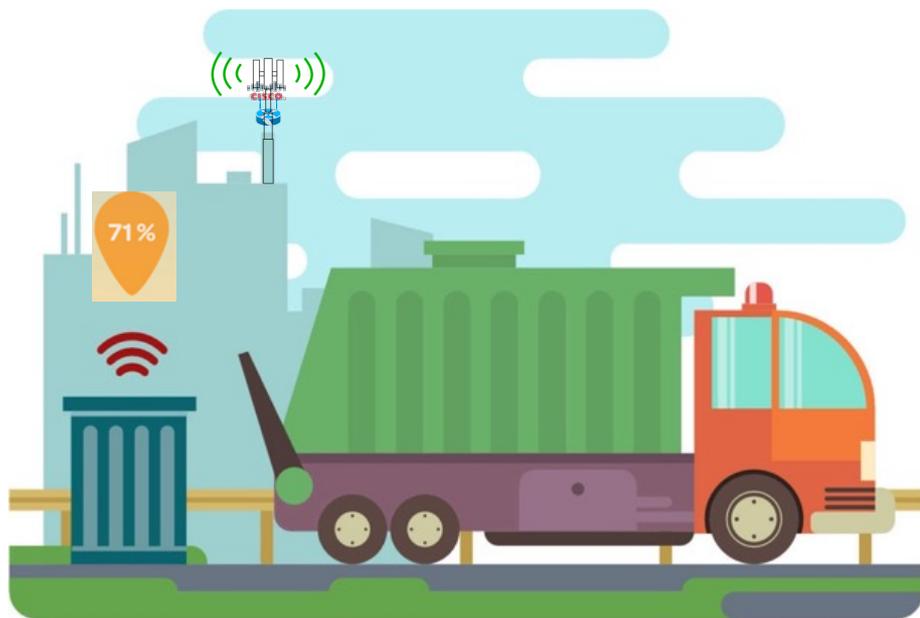
Traditional Cellular/WiFi

LPWA

Feature	2G	3G	LTE	WiFi	LTE-M (Cat M)	LPWA (LoRa)	EC-GSM	NB-IOT (Cat M2)	SIGFOX
Range	Long	Long	Long	Limited	Very Long	Long	Very Long	Very Long	Very Long
Operating Life	Hours/Day	Hours/Day	Hours/Day	Hours/Day	Days/Months	Years	Months/Years	Months/Years	Years
Spectrum	Lic.	Unlic.	Lic.	Unlic.	Lic.	Unlic.	Lic.	Lic.	Unlic.
Throughput	384kbps	40Mbps	100Mbps+	300Mbps	10Mbps	300-50kbps	<140kbps	<170kbps (DL) <250kbps (UL)	100-600bps
Module Cost (est.)	\$8-10	\$35-\$50	\$40-\$80	\$5-\$8	NC	\$5	NC	\$10-15	NC
Use Case Example	ATM	ATM	Connected Cars	Industrial	Alarm System	Metering Tracking	N/A	Smart parking Metering	Tracking
SP Offering	All	All	All	Variable	ATT, Verizon, Telus, Orange, KDDI, etc.	Orange, Swisscom, Proximus, Comcast	None	Vodafone, DT, KT	Telefonica, SFR

LPWA example

Waste management



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Key challenge :

Optimize the waste management operations

Solution :

- LoRaWAN technology enabled waste containers that monitor the filling level of the container

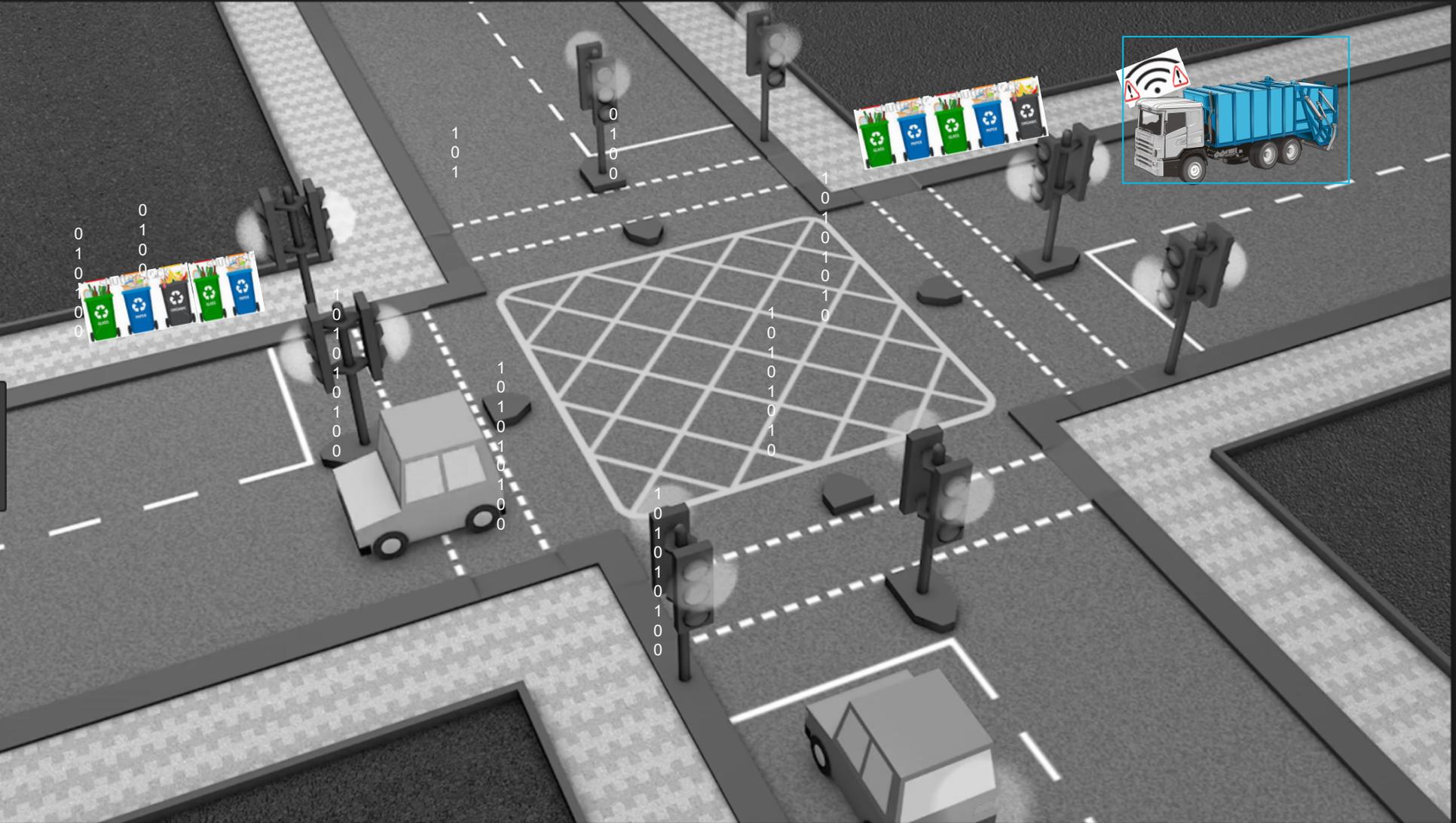
Key benefits :

- Real-time location and monitoring of waste containers
- Containers are emptied only if detected as full
- Waste vehicle operations are adapted and directed in real-time towards 100% full waste containers

Device partners :



enevo



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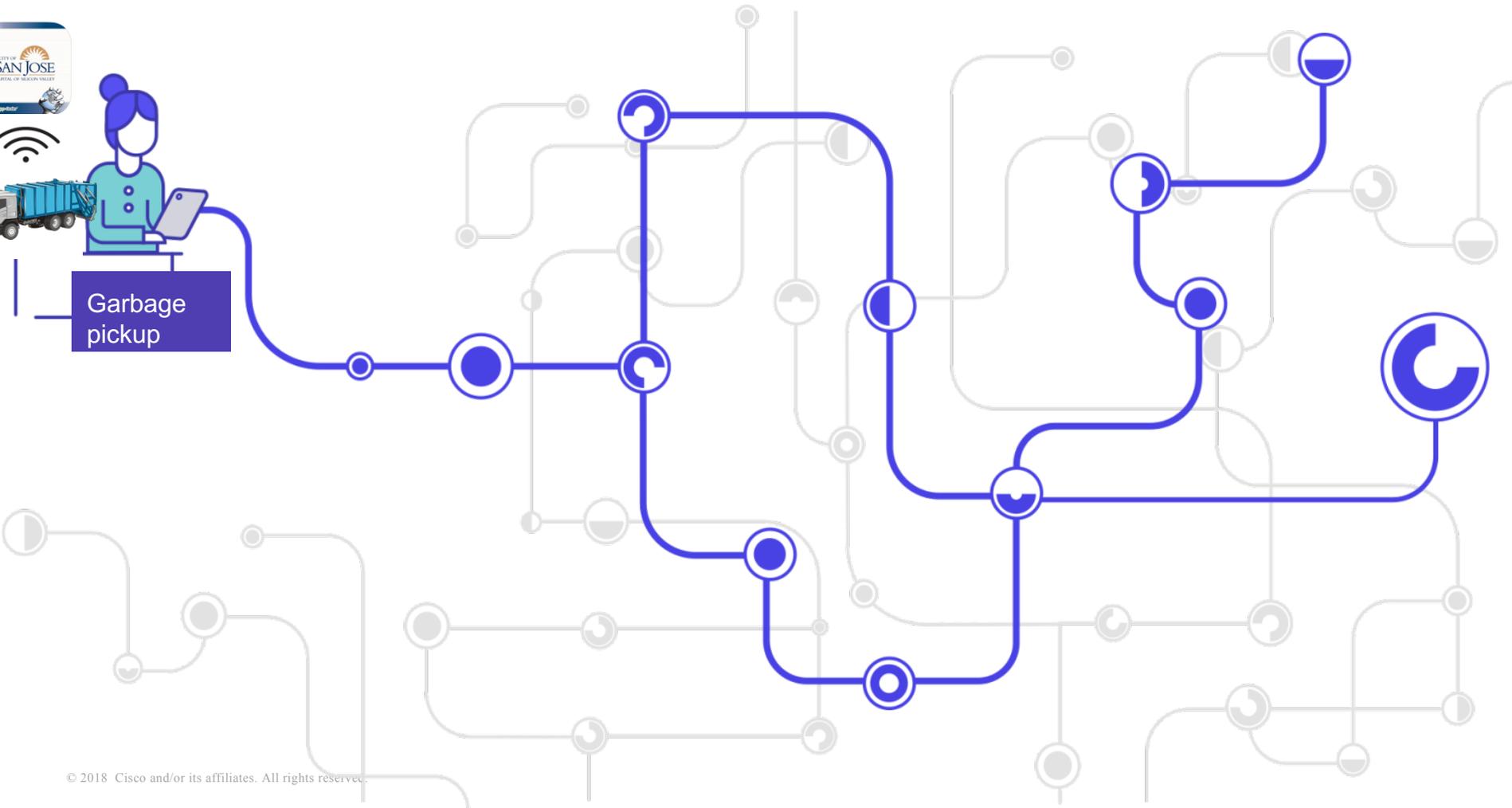
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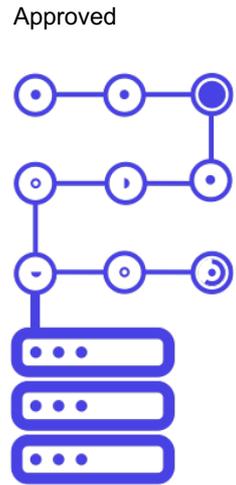
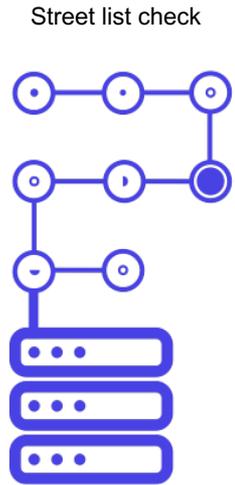
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Garbage pickup





LoRa and NB-IoT networks will co-exist

Cases Where NB-IoT is Preferred to LoRa

- High accuracy and QoS required, even at higher costs (licensed spectrum)
- Country-wide network needed for real time data (e.g. Location tracking across states based on GPS)
- High density areas with noise interference and a 4G cellular network available
- Consumer applications in home and health as SPs have strong GTM coverage
- Electricity available (Otherwise limited battery life limits duration of usage)

SP announced dual technology Strategy

- Orange
- BT

 LoRa relevant use case

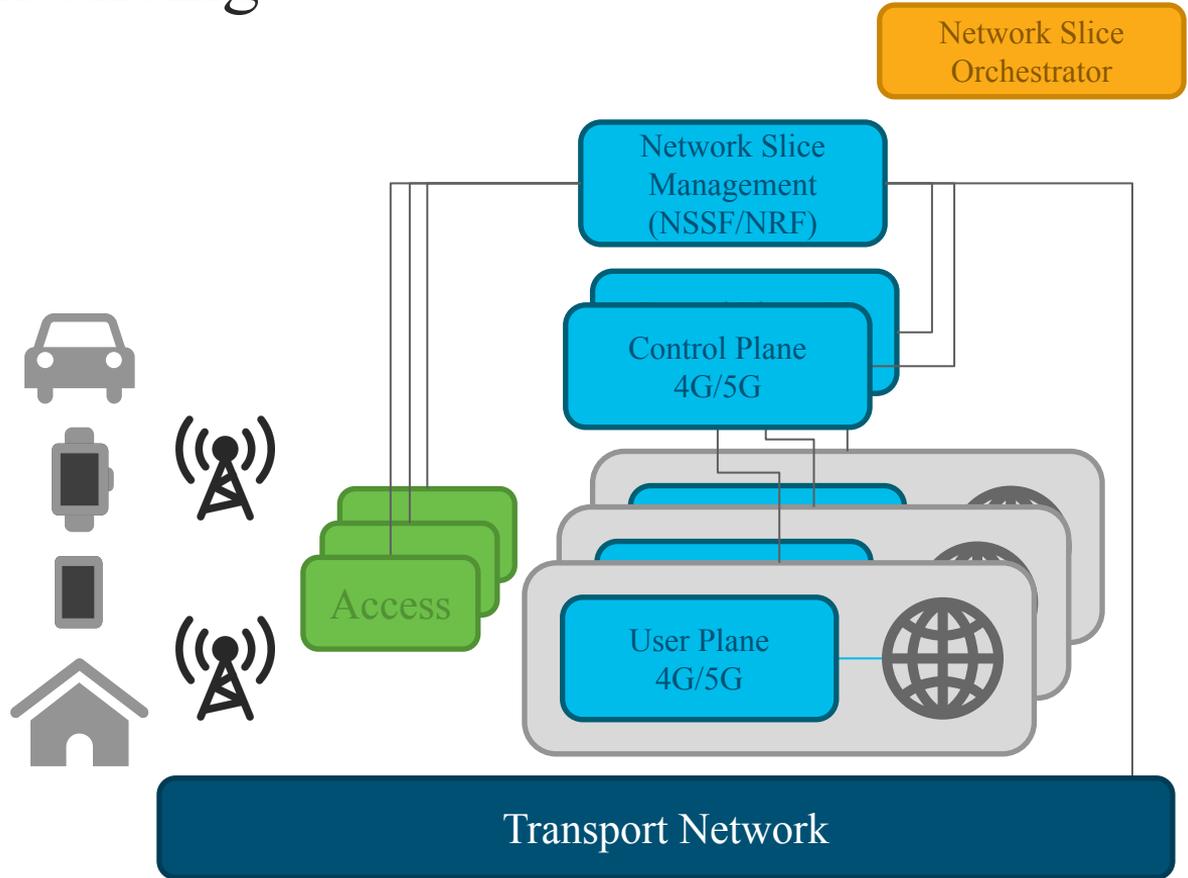
 NB-IoT relevant use case



(1) Cisco Corporate Strategy and Expert Interviews

4G and 5G Network Slicing

- Separate business purposes
 - Unique service assurance characteristics
 - Alternate policy and charging structure
 - Increased service security
 - Slice allocation through device identity
- Slice selection mechanisms
 - APN
 - PLMN Id (MOCN)
 - DECOR/eDECOR
 - NSSF/NRF (5G)





IoT Application Connectivity

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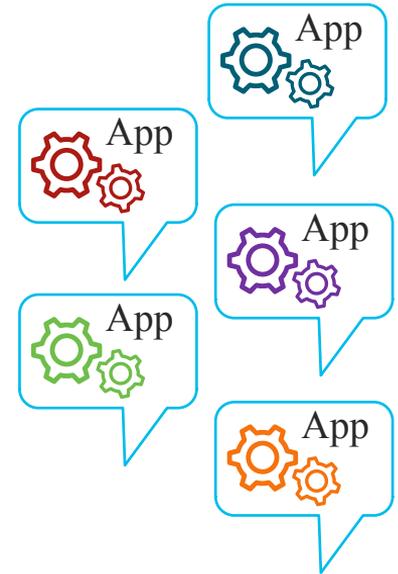
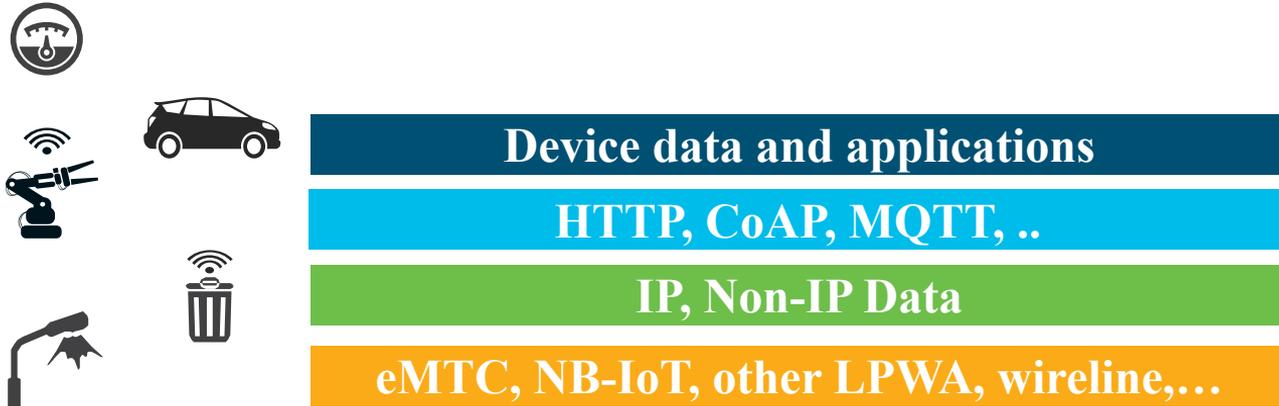
What are APIs

What are APIs

APIs transfer data as an interface



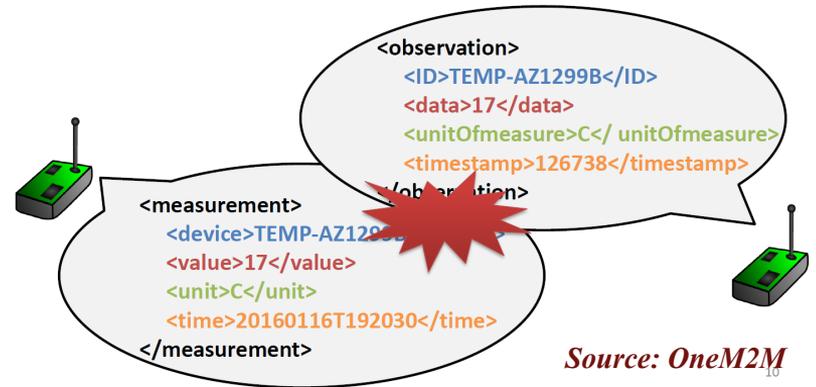
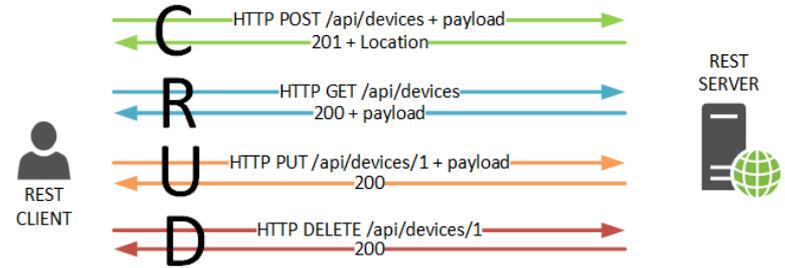
Moving Up The IoT Stack



- Many protocols and standards to choose
- How to enable and manage communication between IoT devices and apps?

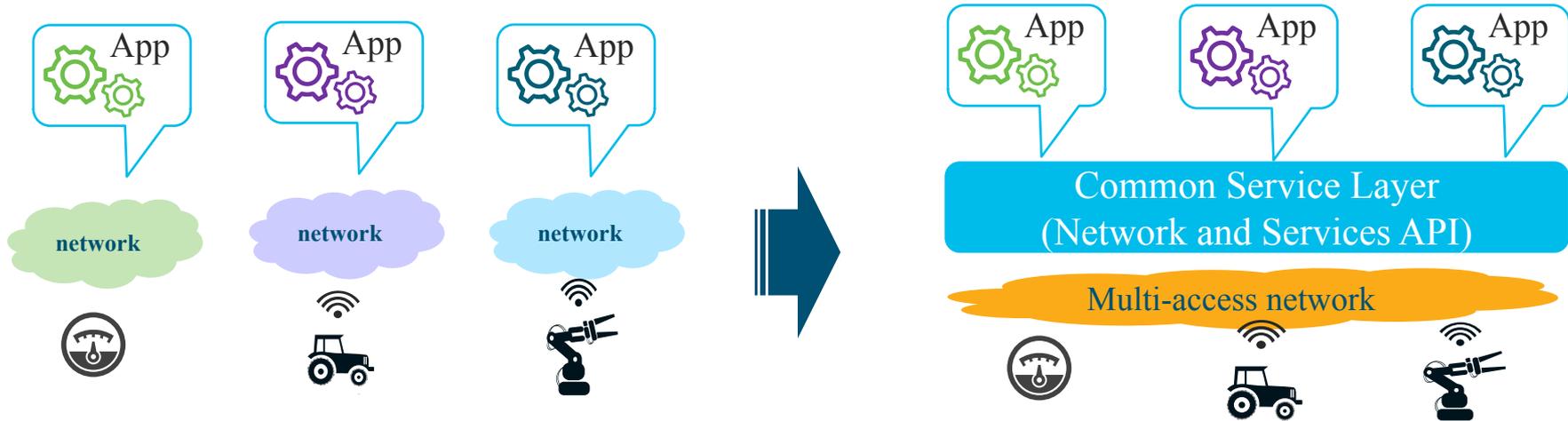
Service API and Data Modeling for IoT

- REST API to manage device data
- Stateless interfaces
- No need of many functions : just read/write/change/delete
- A common vocabulary is required to define IoT data and concepts
- Need a data model and semantics to represent device data
- Built-in Security



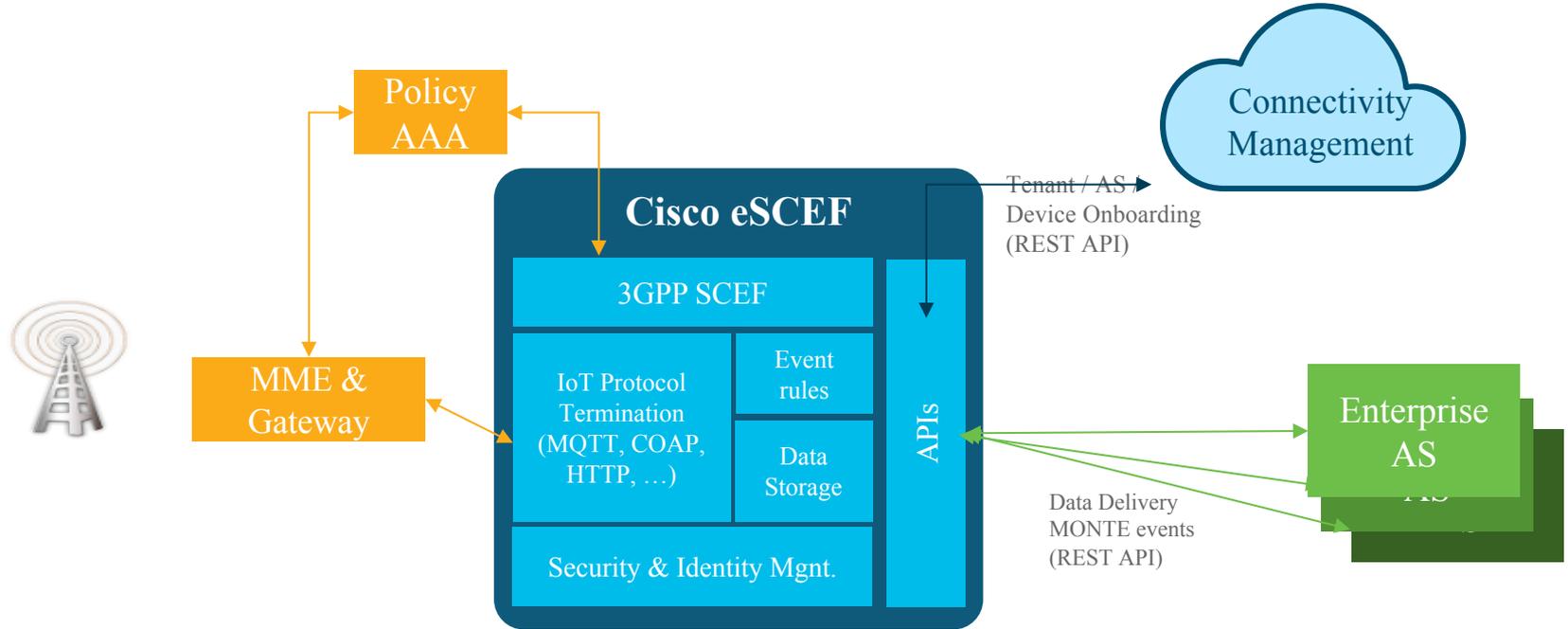
Source: OneM2M₁₀

From IoT Verticals to Horizontal Platform



- Many “vertical” IoT deployments today each of which with their own requirements and protocols/APIs
- Requirement to harmonize to enable easier deployment of IoT services in a cost efficient way
- Exposing open Network and Services API

Cisco eSCEF – a Mobile IOT API Enabler



1. Terminating IOT protocol and exposing data through API
2. On-boarding Device/Application/Tenant
3. Monitoring UE events in 3GPP network and make it available to authorized external world
4. Session with on-demand QOS
5. Non IP Data Delivery



Cisco IOT Framework

Nov. 2018



5G Opportunities - Enabling Digital Transformation

Business Opportunities

AR/VR Collaboration



Smart Cities



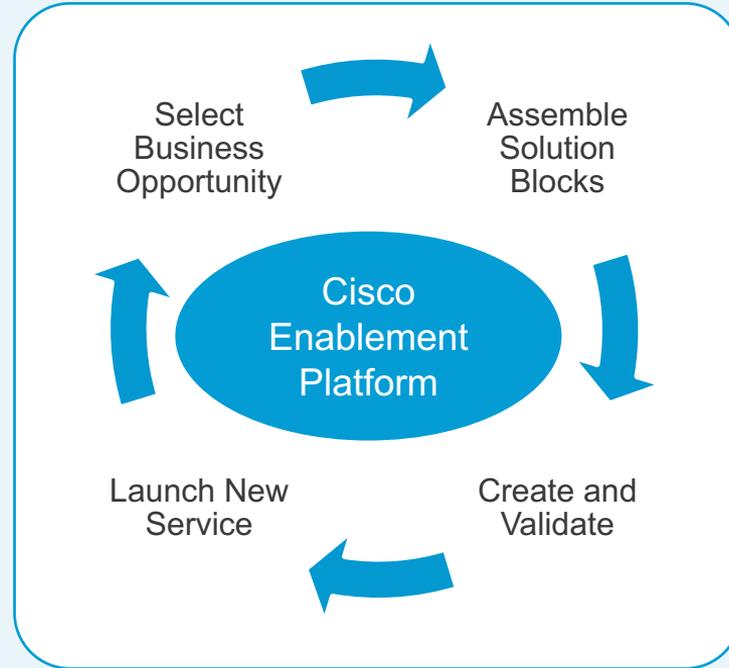
Connected Car



Mobile Gaming



Consumer Video



Services Building Blocks



Edge Computing



Low Latency



Connection Density



Massive Capacity



Network Slicing

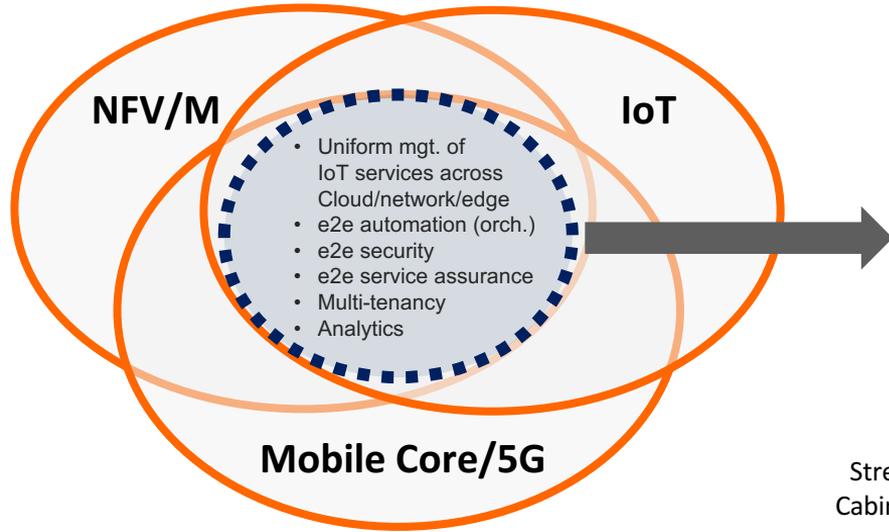


High Reliability

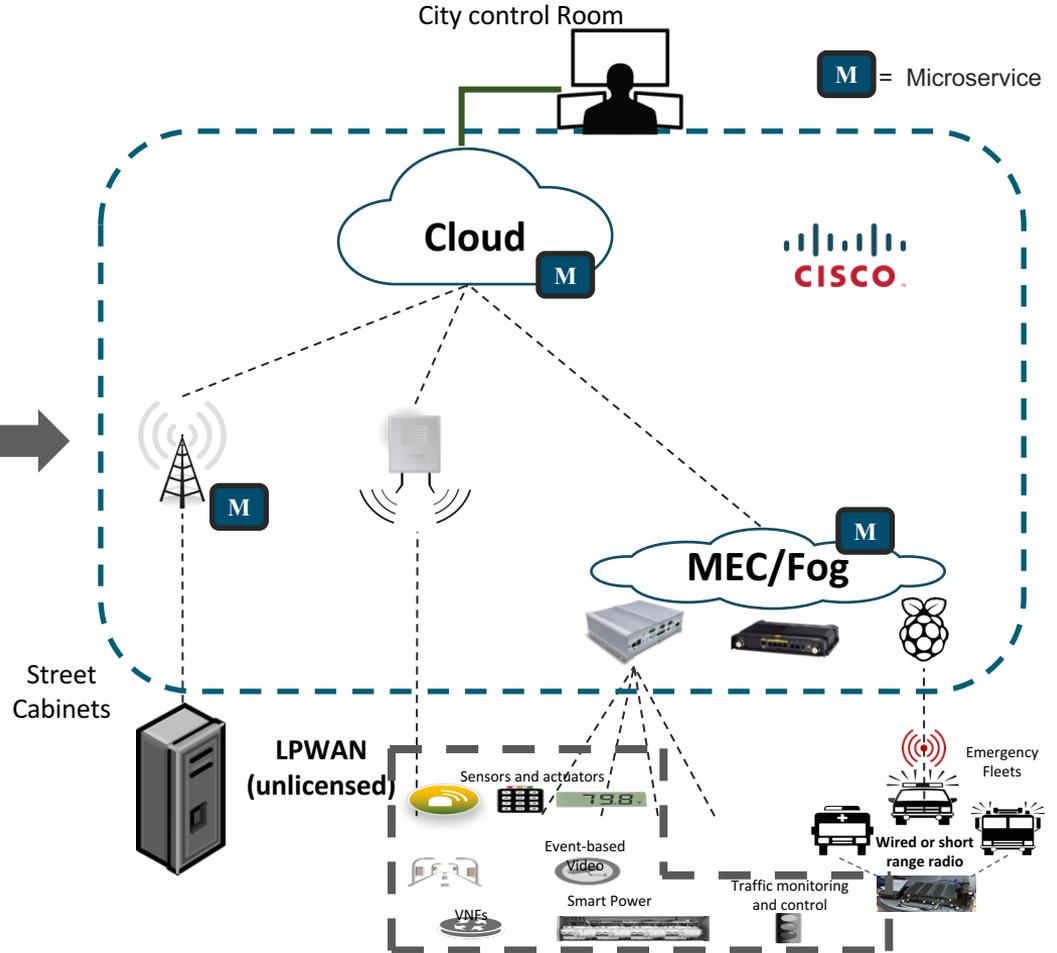


High Data Rate

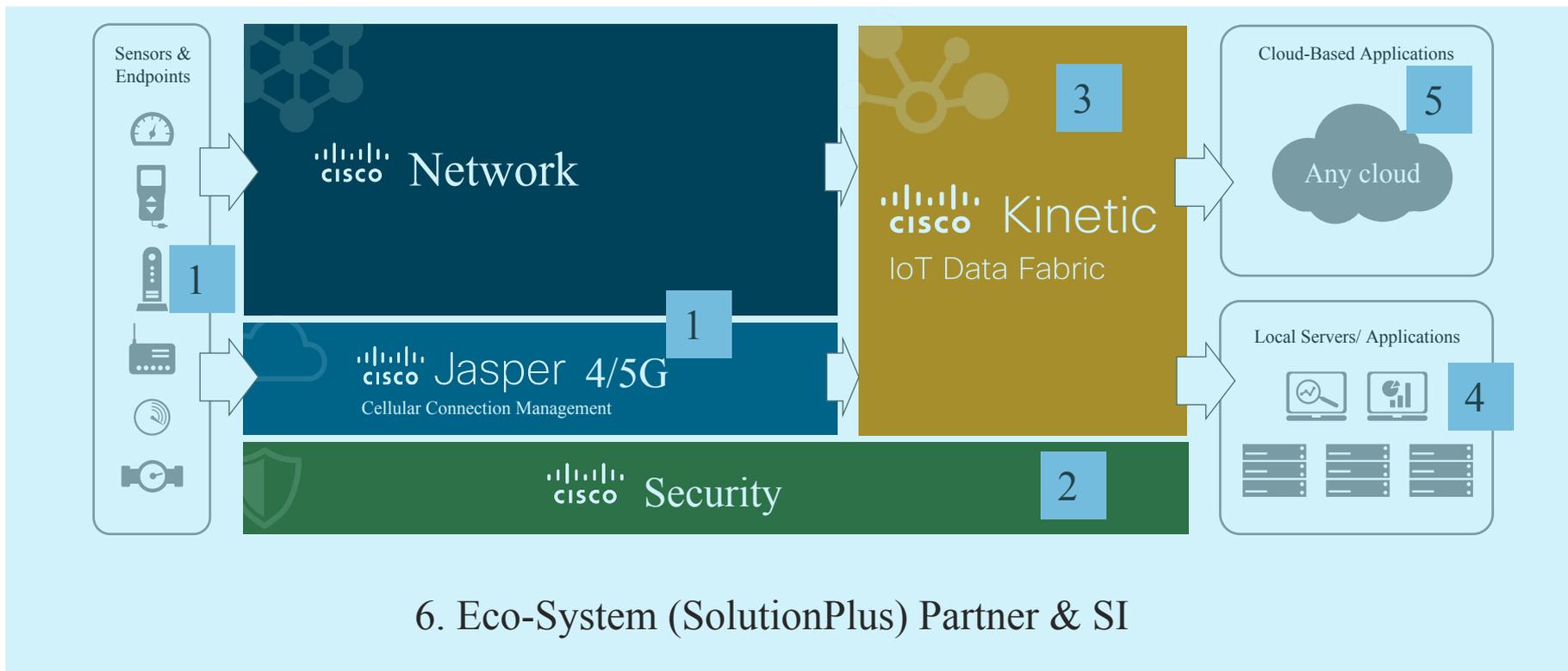
Cloud Service Model



**Same Core Components
(kill 3 birds w/1 stone)**

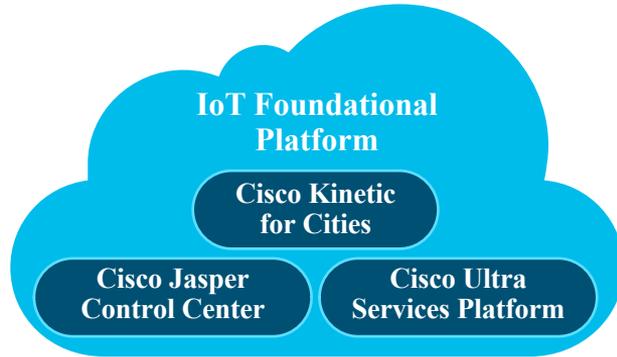


數位化的旅程與思科的定位



6. Eco-System (SolutionPlus) Partner & SI

Future 5G Smart City



Service Provider

5G New Radio

NB-IoT

Fixed Wireless



Easy for customers to adopt & deploy



- Repeatable, pre-packaged connectors/templates
- Deployed in cities around the world

Easy to sell



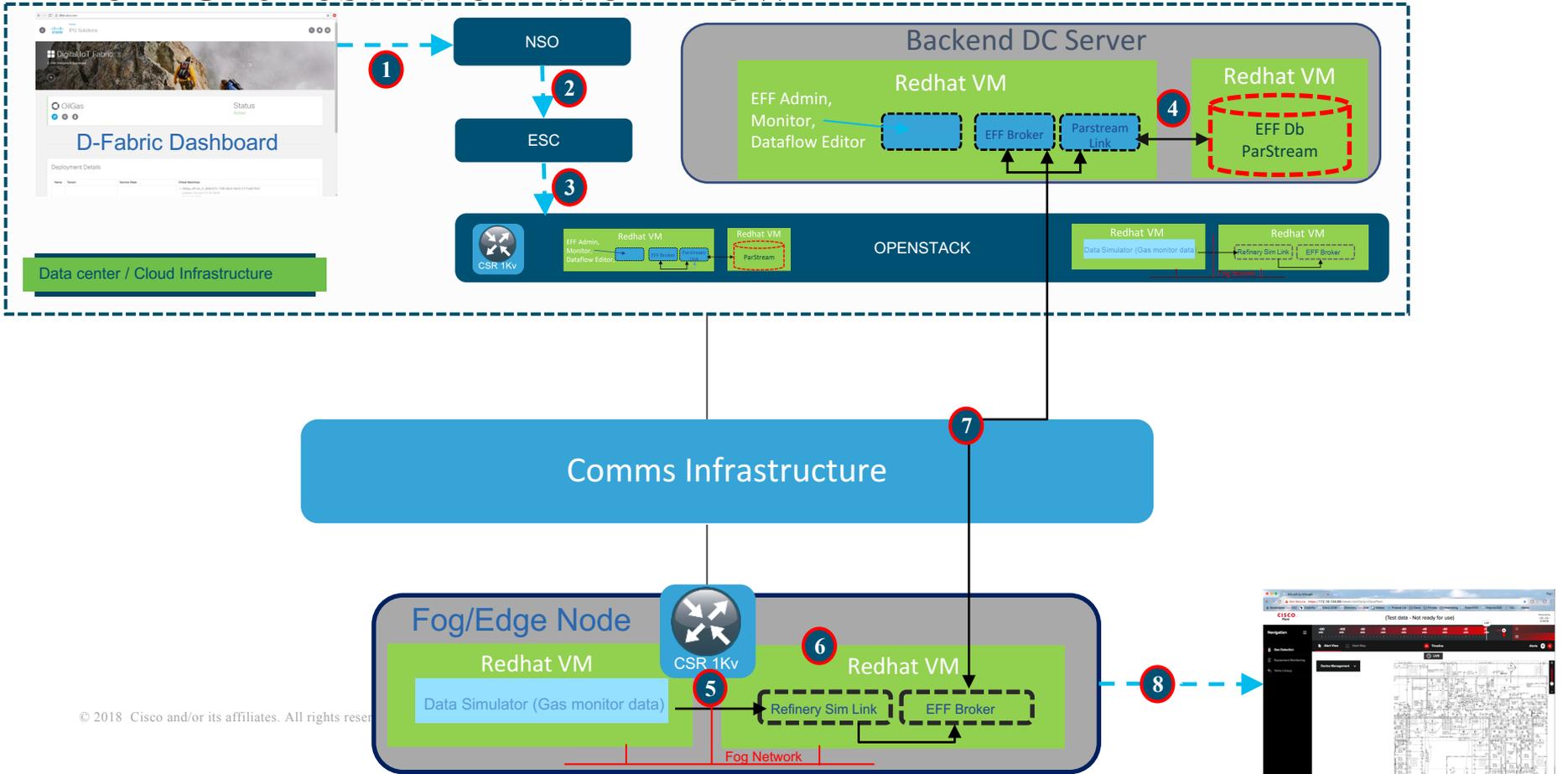
- Bundles/Starter solutions
- Certified partners

New revenue through new buying centers



- Sell the network
- Sell the Kinetic for Cities platform and solutions

IoT Orchestration Workflow

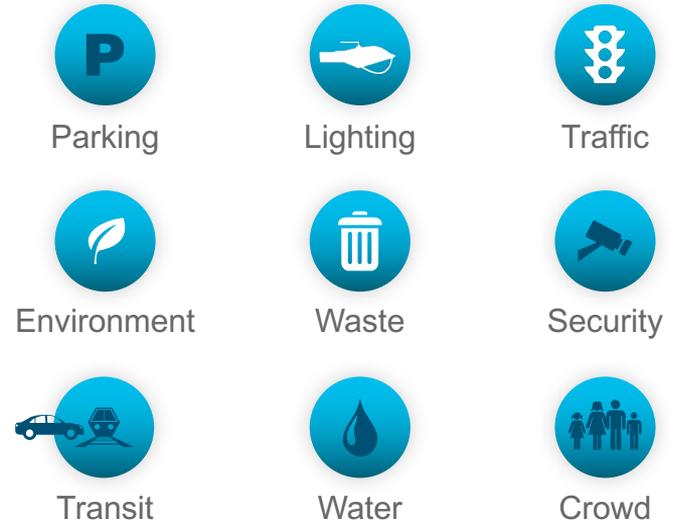


25 Global deployments

Global Deployments



Domains



Smart City Barcelona – Since 2012

目標

- 提高市民的生活質量，激發新的智能城市經濟

策略

- 用新的ICT技術並且跨越筒倉組織結構來改造城市

解決方案

- 佈建全市傳感器網絡並捕捉重要信息，實現12個領域下的智慧城市項目，包括：環保，信息通信技術，移動，水，能源，垃圾，自然資源，商務大樓，公共空間，政務公開，信息流共享和服務共享。

結果

- 每年節省\$ 5800萬的水資源費用
- 增加\$ 5000萬的停車費收入
- 增加47000個新職位

Thank You

