A PRESENTATION
OF
SMART PARKING

PRESENTED BY:
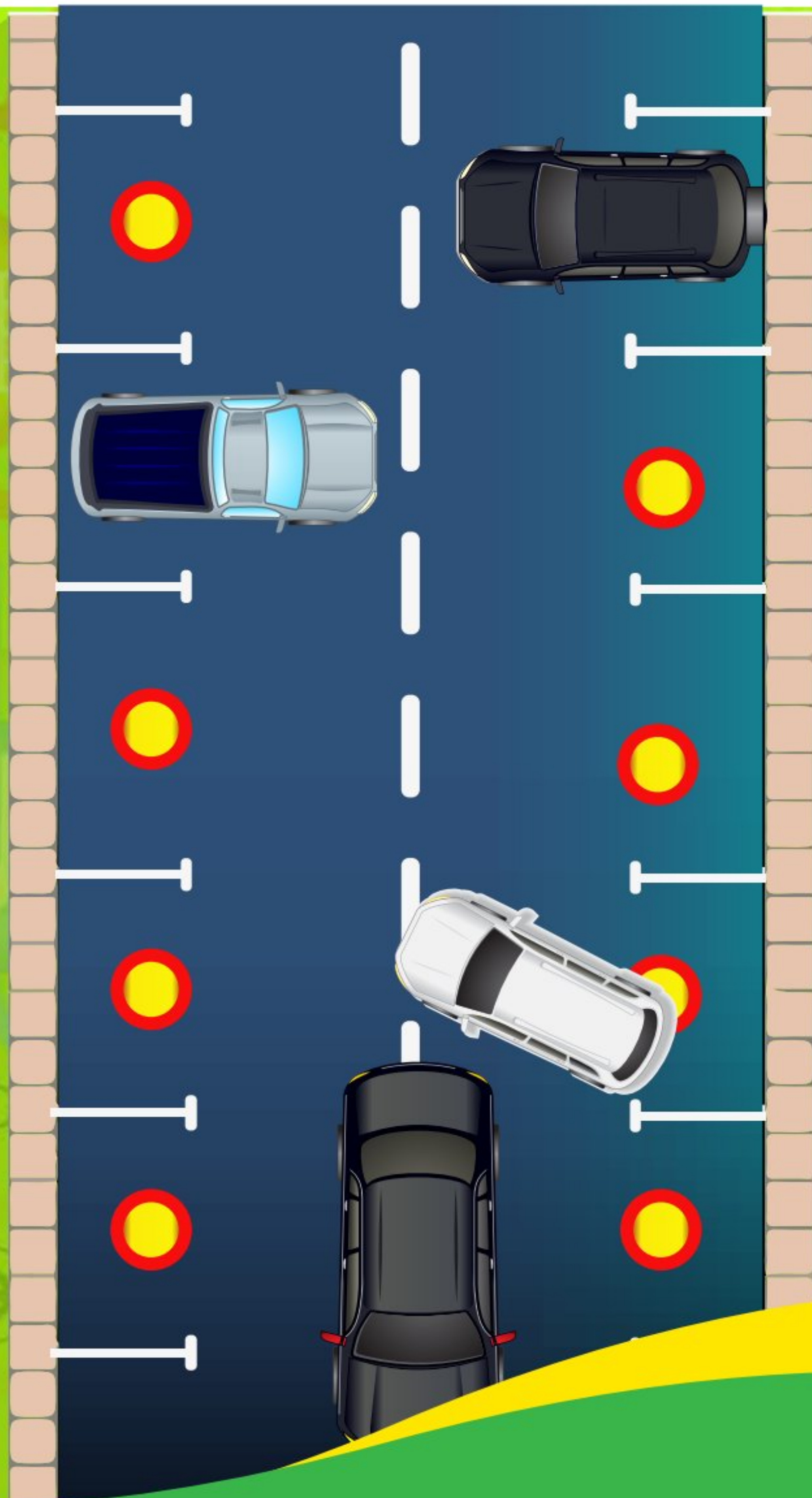
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SMART PARKING

Contents

Introduction.

Traffic congestion caused by vehicle is an alarming problem at a global scale and it has been growing exponentially. Car parking problem is a major contributor and has been, still a major problem with increasing vehicle size in the luxurious segment and confined parking spaces in urban cities. Searching for a parking space is a routine (and often frustrating) activity for many people in cities around the world. This search burns about one million barrels of the world's oil every day. As the global population continues to urbanize, without a well-planned, convenience-driven retreat from the car these problems will worsen.

According to a report, Smart Parking could result in 2,20,000 gallons of fuels saving till 2030 and approx. 3,00,000 gallons of fuels saved by 2050 , if implemented successfully .
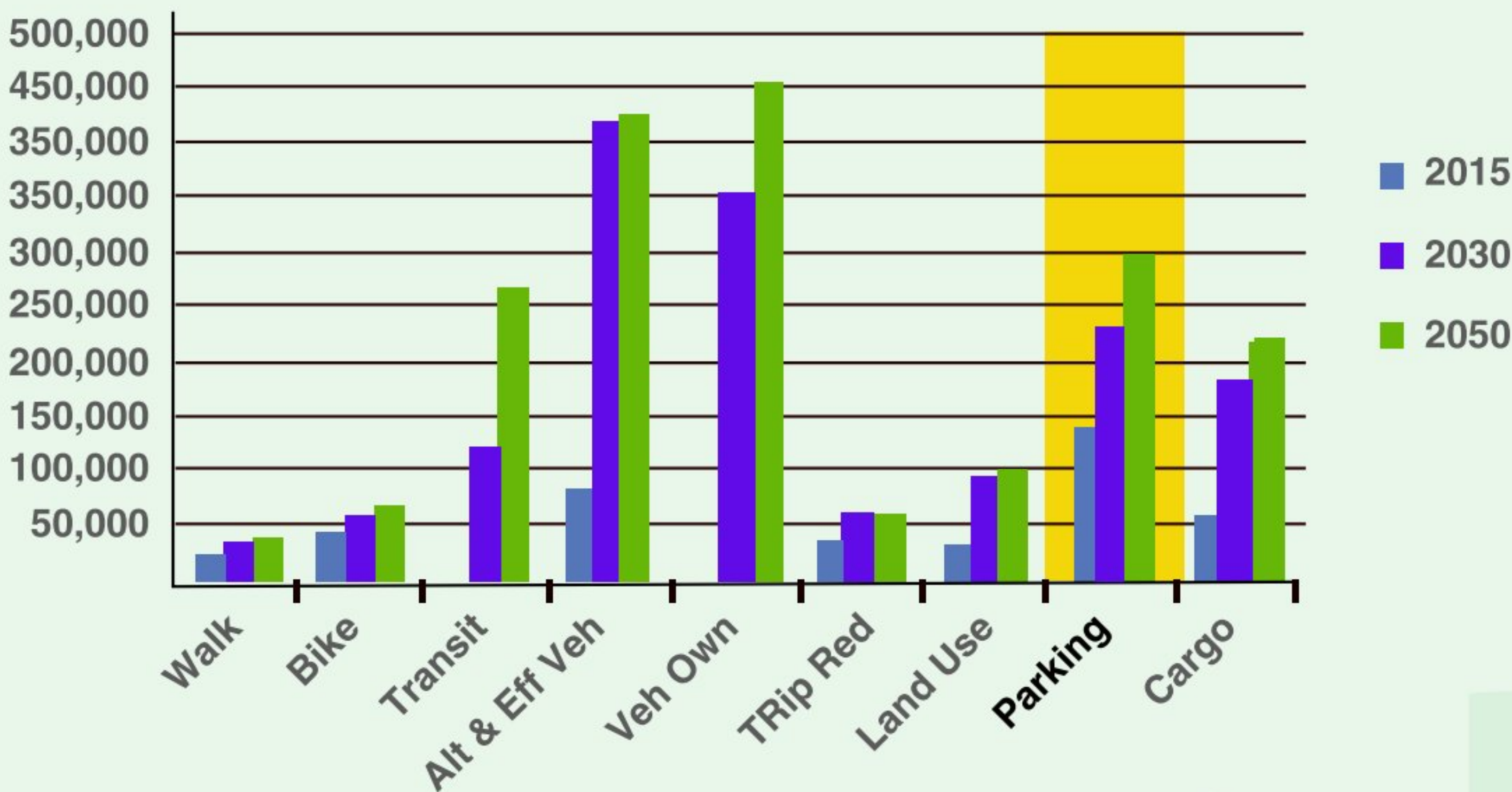
Smart Parking systems typically obtains information about available parking spaces in a particular geographic area and process is real-time to place vehicles at available positions .It involves using low-cost sensors, real-time data collection, and mobile-phone-enabled automated payment systems that allow people to reserve parking in advance or very accurately predict where they will likely find a spot. When deployed as a system, smart parking thus reduces car emissions in urban centers by reducing the need for people to needlessly circle city blocks searching for parking. It also permits cities to carefully manage their parking supply
Smart parking helps one of the biggest problems on driving in urban areas; finding empty parking spaces and controlling illegal parking. This implies M2M technologies aims rightness/safety as well as convenience.

Need and benefits analysis of smart parking

Smart Parking would enable the following

- Accurately predict and sense spot/vehicle occupancy in real-time.

- Guides residents and visitors to available parking.

- Optimize Parking Space Usage

- Simplifies the parking experience and adds value for parking stakeholders, such as drivers and merchants

- Help traffic in the city flow more freely leveraging IoT technology.

- Enables intelligent decisions using data, including real–time status applications and historical analytics reports

- Smart Parking plays a major role in creating better urban environment by reducing the emission of CO_2 and other pollutants

- Smart Parking enables better and real time monitoring and managing of available parking space , resulting in significant revenue generation

- Provides tools to optimize workforce management

Smart parking work flow analysis

1 square Km.

1 One single Gateway covers an area of about 1 square Km.

2 The gateway sends the information via the internet to the database in real time.

Internet

Data base

3 The occupancy is instantly reported to the users via apps and illuminated panels in the street.

4 The central control can get real time analytics about parking bays occupancy per areas and times of the day

5 When connected to the payment method system, the authority can identiíy non-paying cars and with the use of a tablet app, parking wardens can work more effectively.

6 When a car parks over the sensor, it is detected and the sensor relays that information- wirelessly- to the gateway.

Parking assistance system description

- The Parking Assistance System include three modules-Monitoring module, Control module and a displaying unit. Along with above three module it will also have centralized supervisory system to maintain a data base of parking space and will have a SMS gateway.
- The monitoring module includes ultrasonic sensors/ ambient light sensor which identifies the free parking spaces and transmits the Information to control unit through Zigbee.
- Apart from detecting the car the sensor also provides additional information like the stretch of time the car has been parked and also its health status.
- The control units processes the information and sends the information to Centralized supervisory system.
- Centralized supervisory system receives information of parking space from the controller through UDP. It then sends the information such as slot allotted, time parked, billing information and directional details to the user's mobile phone

SQL

Central
Supervisory
Station

Listen Tool

To SMS
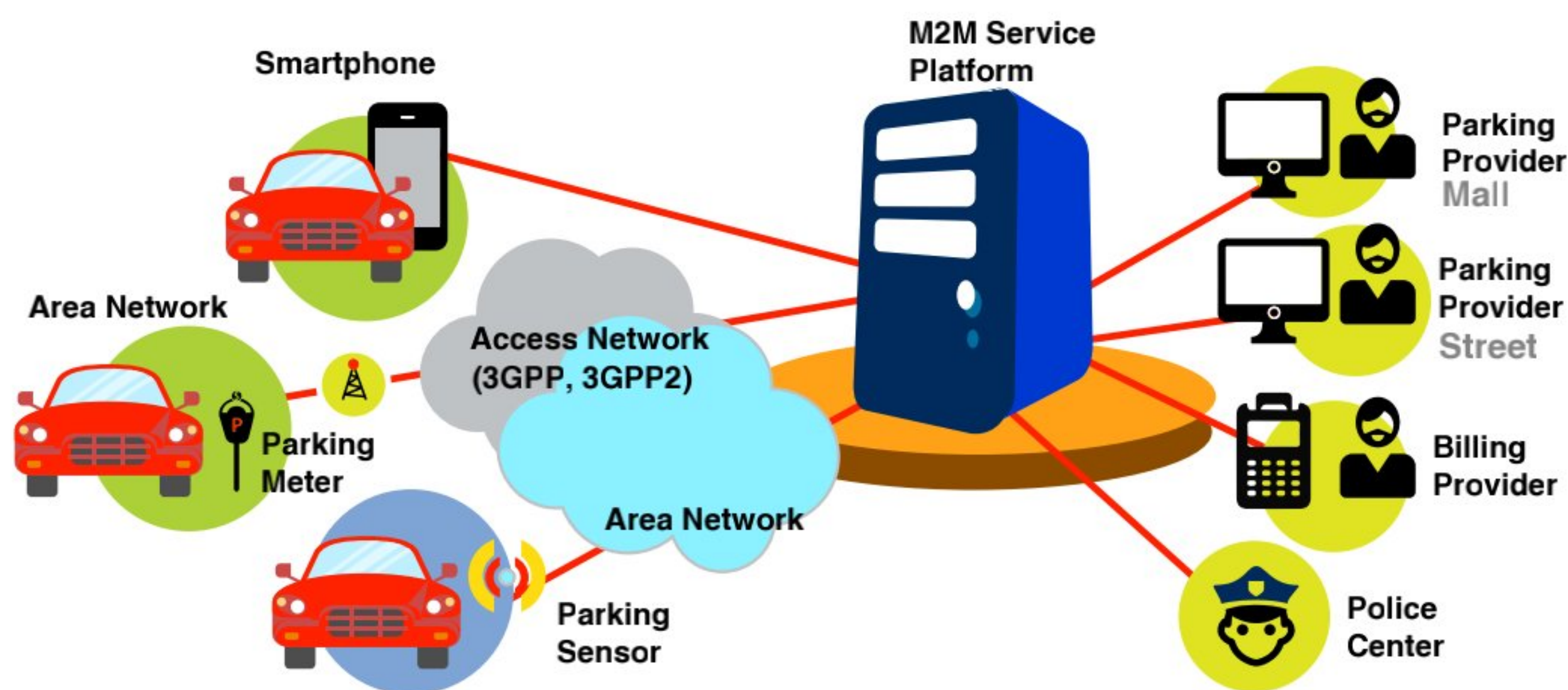Gateway

From
User
interface
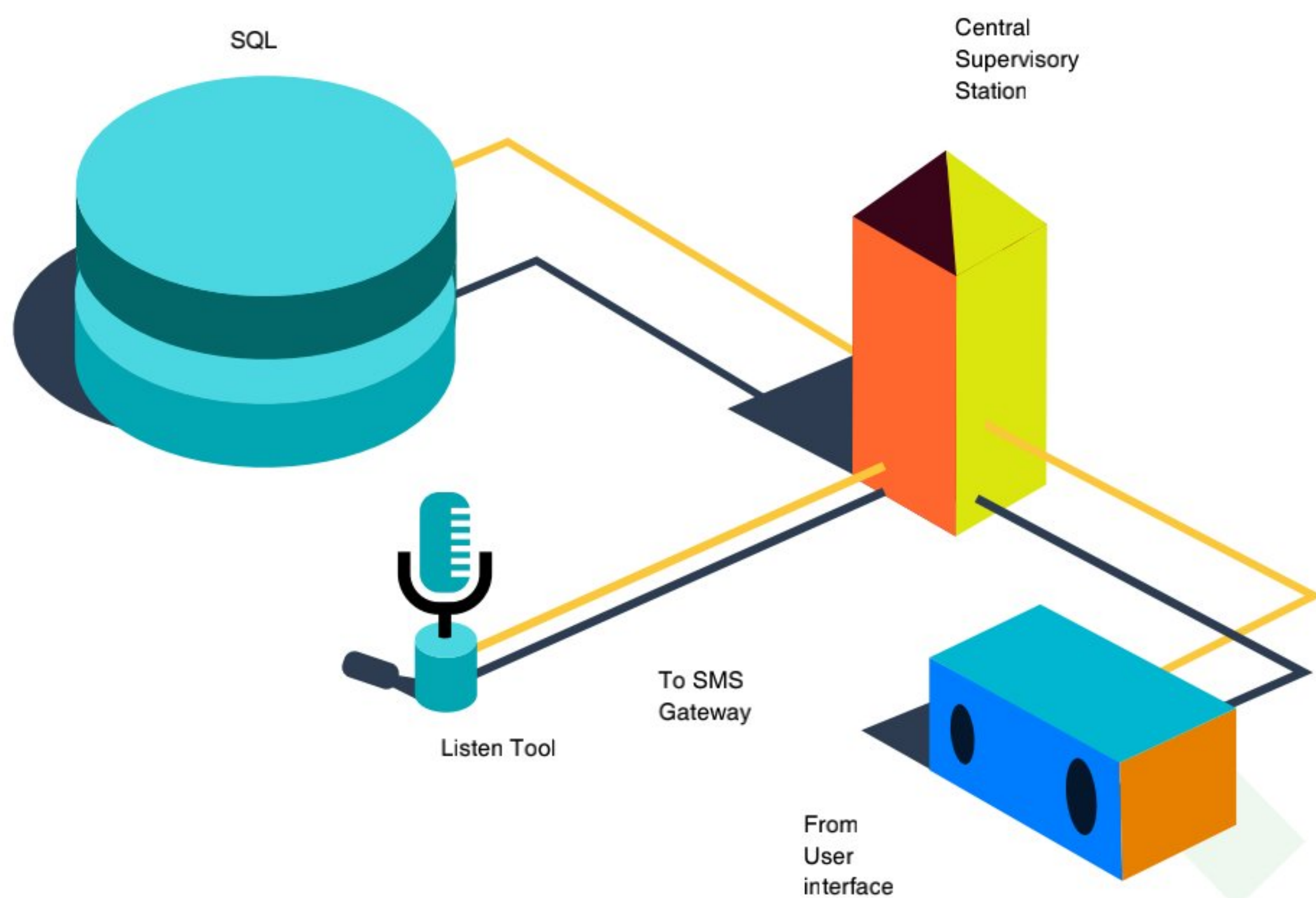
PRE-REQUISITES (ASSUMPTIONS):
- An infrastructure (person/service) is expected to route and receive the requests and acknowledge them.
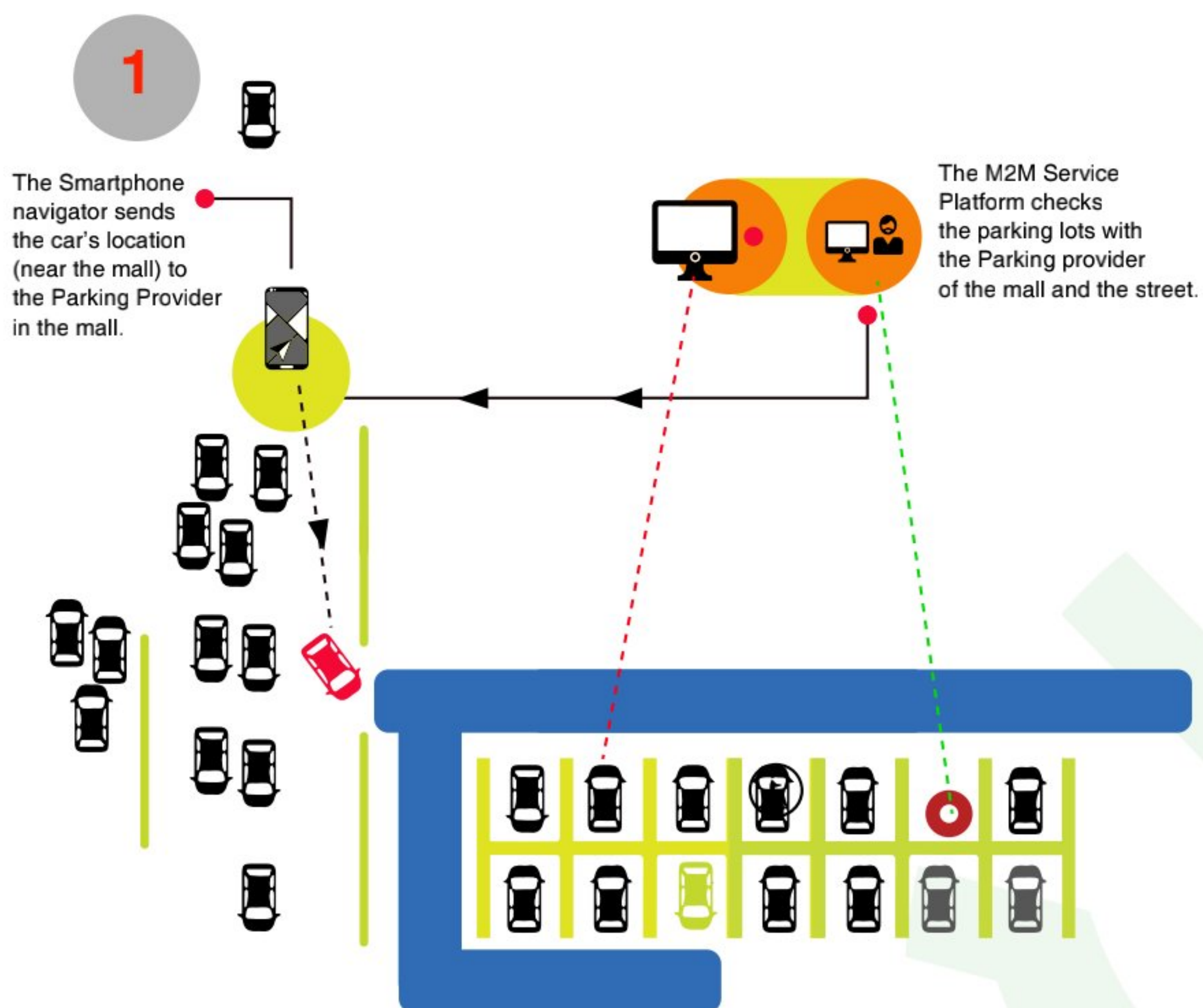- A system is expected to be in place to act.

Actors involved

Actor Name	Actor Type (person, organization, device, system)	Role Description
M2M Service Platform	System	This is a platform that interacts with M2M Gateways/ Devices and M2M Application Service Providers.
Smartphone	Device	This is a M2M Device acts as a car navigator and a wallet to pay parking fee by connecting parking meters.
On-street Parking Meter	Device	This is a M2M Device installed near parking slots to charge drivers parking fees
In-building Parking Sensor	Device	This is a M2M Device installed near parking slots to charge drivers parking fees
Parking Provider	System	This is a M2M Application Service Provider who owns parking lots, in this use case there are two parking providers; in the mall and on street.
Billing Provider	System	This is a M2M Application Service Provider (e.g. credit card company) who provides billing service to M2M Users such as parking fee. When it issues a bill, coupons from M2M Application Service Providers are used as tokens for compensation schemes. They also can charge fines issued by police center on their bills
Police Centre	Person	This is a law enforcement authority, one of M2M Application Service Providers, who charges fine to whom break laws
User	Person	This is a M2M service user who drives a car

Scenario Illustration

Smartphone

M2M Service Platform

Parking Provider Mall

Parking Provider Street

Area Network

Access Network (3GPP, 3GPP2)

Area Network

Parking Meter

Parking Sensor

Billing Provider

Police Center

normal call flow

1

The Smartphone navigator sends the car's location (near the mall) to the Parking Provider in the mall.

The M2M Service Platform checks the parking lots with the Parking provider of the mall and the street.

2

The Smartphone navigator sends the car's location (near the mall) to the Parking Provider in the mall.

The Parking provider

The M2M Service Platform checks the parking lots with the Parking provider of the mall and the street.

The Parking provider

3

The Parking provider would recommend parking space to the navigator.

The Smartphone navigator sends the car's location (near the mall) to the Parking Provider in the mall.

The M2M Service Platform checks the parking lots with the Parking provider of the mall and the street.

The On-Street Parking Meter would direct the vehicle and the parking provider to **"Start Parking "**

The Parking provider would offer parking discount (if any) on the go.

4

The On-Street Parking Meter would direct the vehicle and the parking provider to "Start Parking "

The Parking provider would offer parking discount (if any) on the go.

After the parking period is over, the provider would intimate the On-Street Parking meter.

Process flow diagram

M2M Application Service Domain

| On-street Parking Meter | Smartphone Navigator | M2M Service Platform | Parking Provider (mall) | Parking Provider (street) | Billing Provider |

1. Send car's location (near the mall

2. Send current parking avilability (fully occupied)

3. Check other parkin lots

4. Recommend parking space (on street)

5. Start parking

6. Offer parking fee discount

7. Finish parking

8. Bill parking fee (discounted)
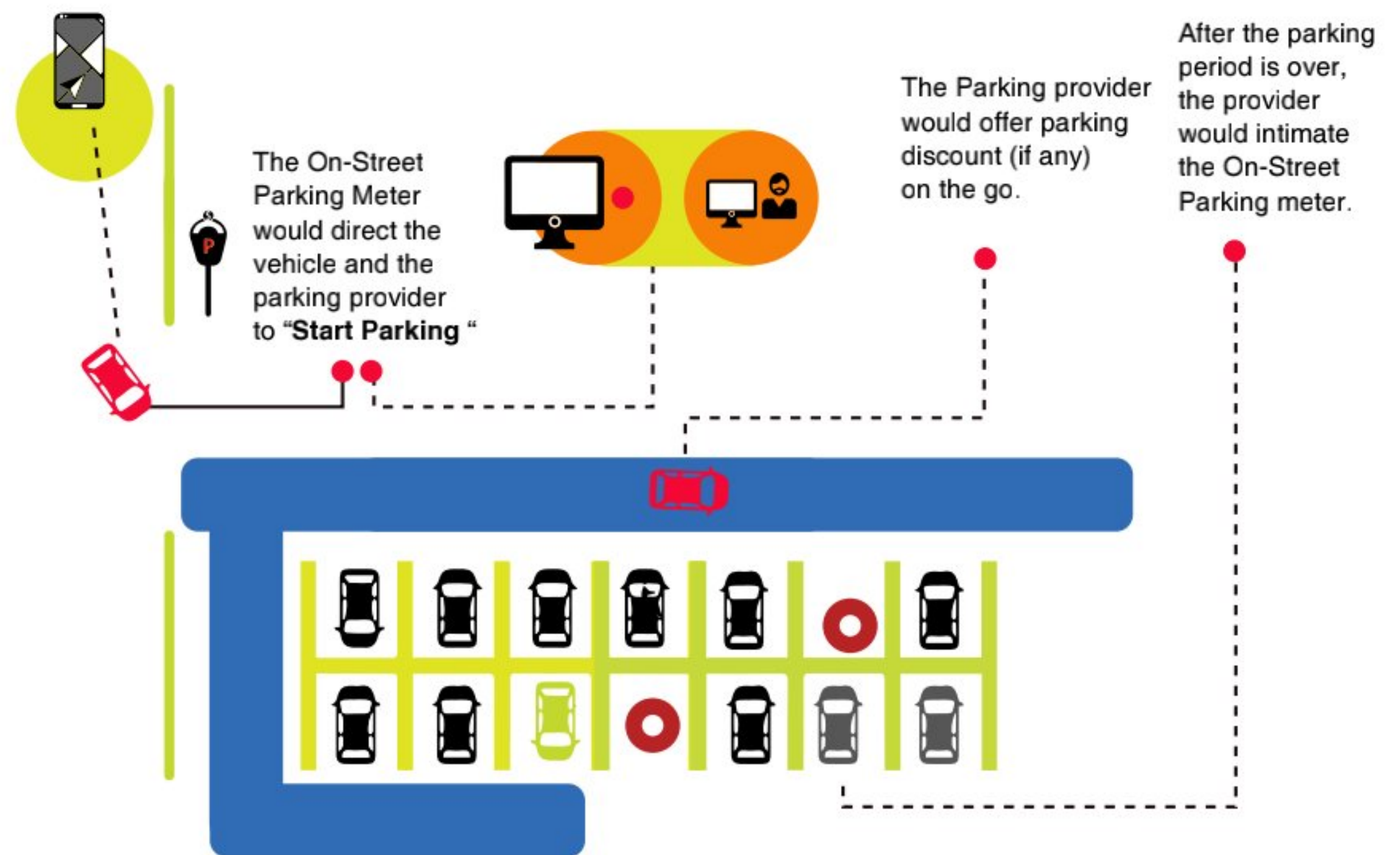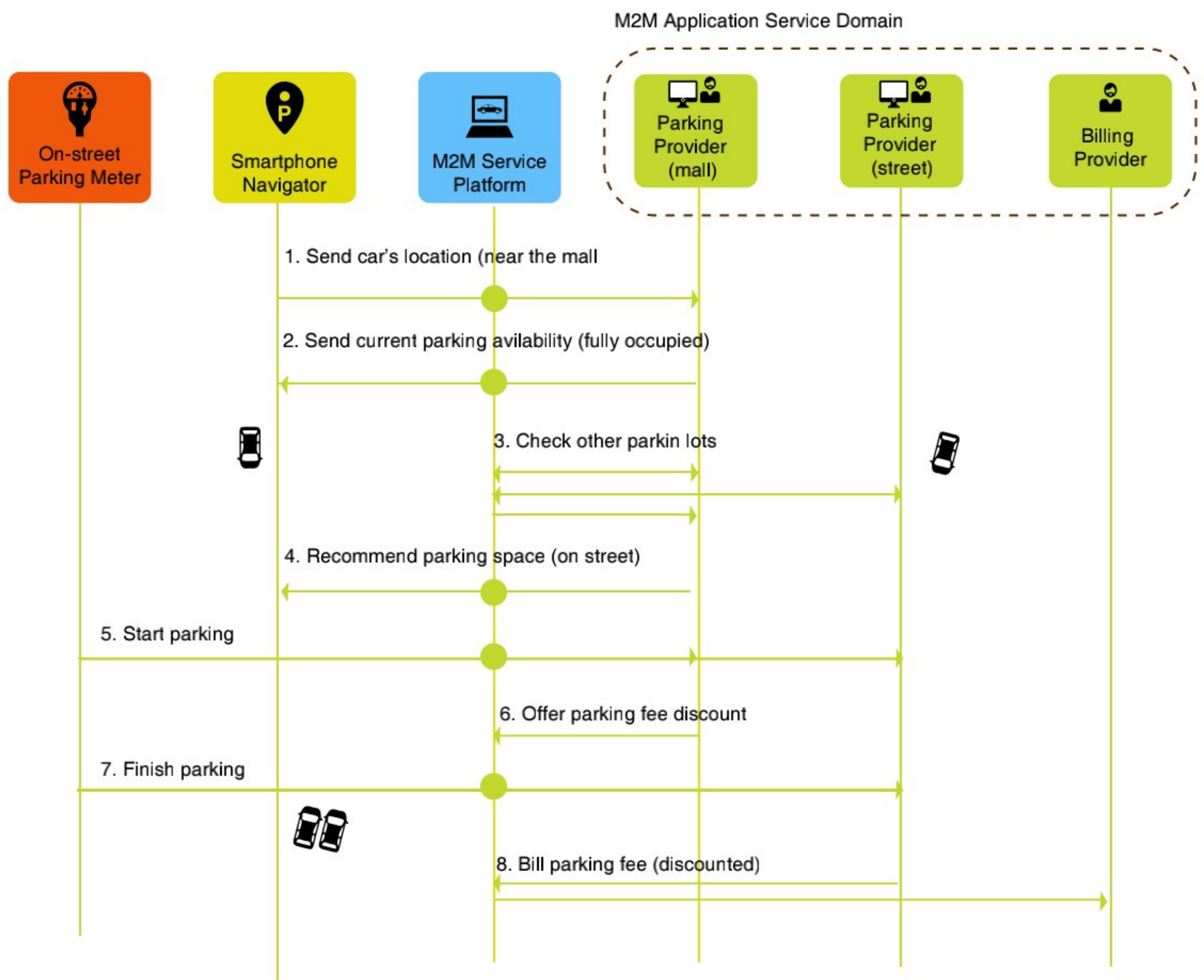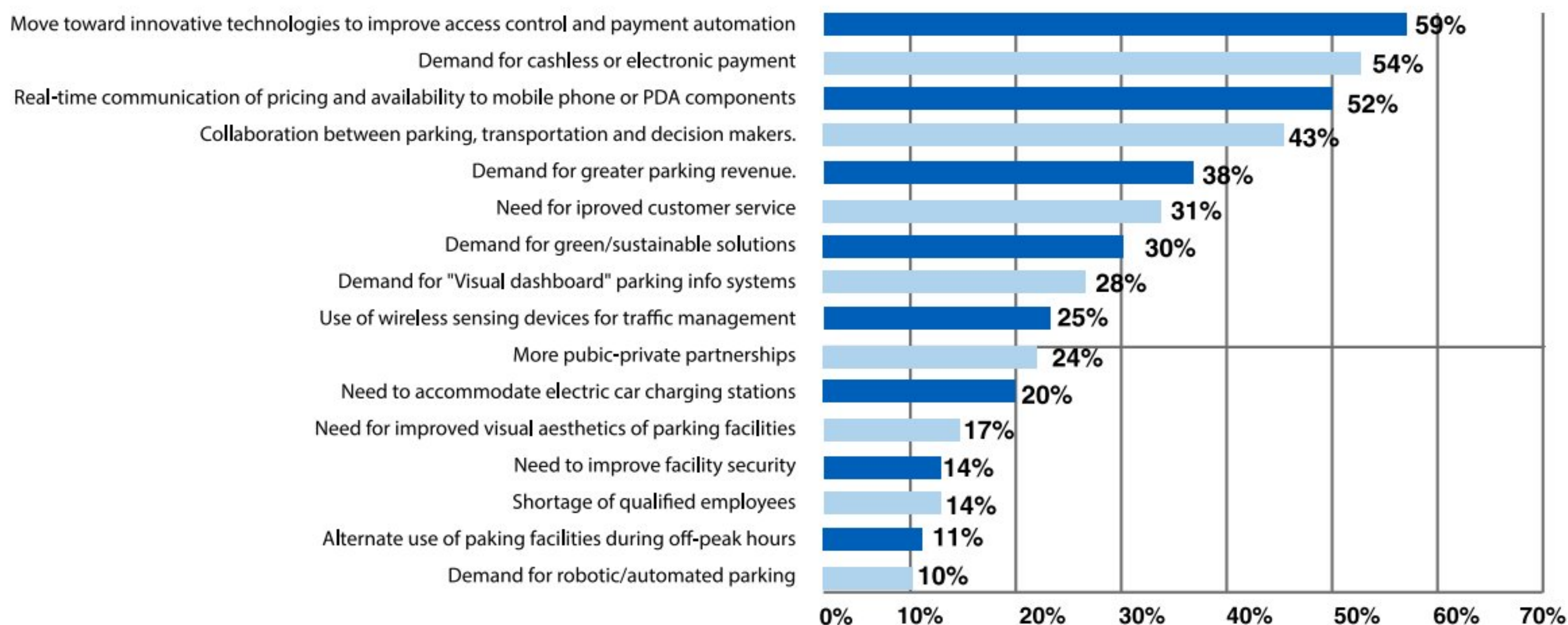
Potential market Landscape

The rapid growth in the number of vehicles worldwide is intensifying the problem of the scarcity of parking space. Again according to industry data, 30% of traffic congestion occurs due to vehicle drivers struggling to find parking space. These in turn are magnifying the necessity of smart and efficient parking systems. Today's intelligent parking management systems are capable of providing extreme level of convenience to the drivers, as well as simplifying and automating the business operation and administrative functions of the parking site owners.
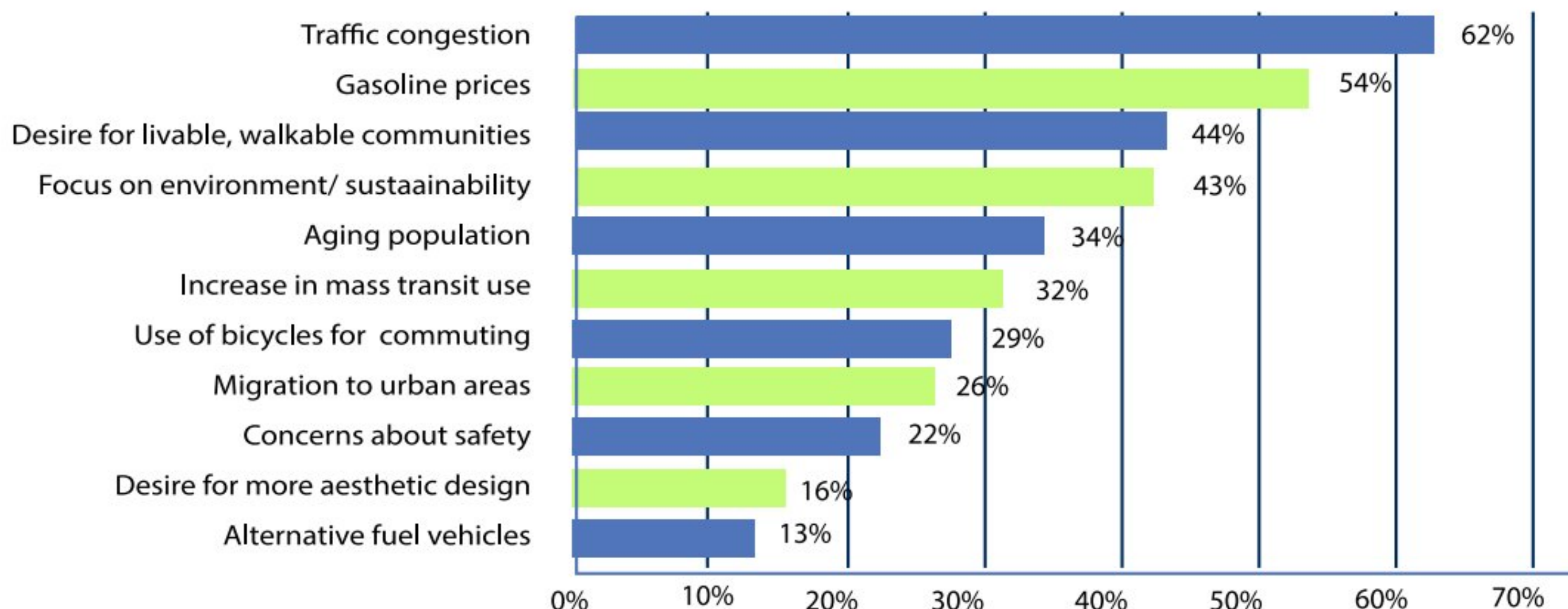
Emerging Trends in Parking

Following are the trends having the greatest effect on Parking Industry

Trend	Percentage
Move toward innovative technologies to improve access control and payment automation	59%
Demand for cashless or electronic payment	54%
Real-time communication of pricing and availability to mobile phone or PDA components	52%
Collaboration between parking, transportation and decision makers.	43%
Demand for greater parking revenue.	38%
Need for iproved customer service	31%
Demand for green/sustainable solutions	30%
Demand for "Visual dashboard" parking info systems	28%
Use of wireless sensing devices for traffic management	25%
More pubic-private partnerships	24%
Need to accommodate electric car charging stations	20%
Need for improved visual aesthetics of parking facilities	17%
Need to improve facility security	14%
Shortage of qualified employees	14%
Alternate use of paking facilities during off-peak hours	11%
Demand for robotic/automated parking	10%

The high growth rate in the registration of new cars worldwide, with major boom from regional economies such as Asia Pacific (APAC), will open the window of opportunities for parking management business. The ongoing and upcoming smart city projects worldwide will create room for the intelligent parking management systems. The global parking management industry is expected to grow at a Compound Annual Growth Rate (CAGR) of 11.4% from 2014 to 2019.

The parking management market is estimated to be at $5,025.9 million in 2014. The market is expected to grow in tandem with the growth in vehicle ownerships and parking facilities development. Need for smooth traffic flow, business benefits to the parking site operators, and decreasing hardware and connectivity costs are the key drivers for the parking management industry.

Traffic congestion and gasoline prices leads the list for the major societal changes having significant influence on parking.

Factor	Percentage
Traffic congestion	62%
Gasoline prices	54%
Desire for livable, walkable communities	44%
Focus on environment/ sustaainability	43%
Aging population	34%
Increase in mass transit use	32%
Use of bicycles for commuting	29%
Migration to urban areas	26%
Concerns about safety	22%
Desire for more aesthetic design	16%
Alternative fuel vehicles	13%

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Challenges and major pain points

The major challenge in Parking Systems is of system integration due to wide variety of hardware and software platforms involved and hence possess a great threat or concern to the system scalability.

The technology platform supporting P&E , PARC and PUCRS systems comprises of a myriad of hardware sensors, dynamic messaging systems and traffic control devices, wireless and wireline telecommunications systems, computer clients and servers and hardware drivers and application interfaces.

Enabling all these devices from thousands of different vendors to communicate and tying them together into one platform is the greatest challenge in reducing the cost and complexity of smart parking. The variety of infrastructure hardware and software systems that need to be integrated is enormous and add to it the conventional older hardware making investment in Smart Parking solution highly risky and fragmented.

Another major pain point comes from the electronic payment vendors. These payment processors provide permit based electronic payment, typically for a convenience fee. The key to many of these hosted solutions is scalability, the ability of the transaction processor to support over wide geographical, market and service areas, with minimal cost

Indian Specific Ecosystem Challenges

- Absence of a robust billing platform leading to possible revenue leakages

- Interoperability between devices/lack of standards.

- Although other countries have solutions deployed, Smart parking does not really provide much solution to two wheelers as yet in India.

- Various Security issues and threats to the installed on-site parking meter.

- The IoT enabled Parking System shall support mechanisms to correlate charging data/records from different IoT Application Service Providers.

- The IoT enabled Parking System shall support triggering M2M Devices to report on-demand information regarding collected data from other M2M Devices

- Smart parking providers will need to establish reliable application programming interfaces (APIs) that enable service partners to provide consumers with access to smart parking services on-line through a variety of channels, including the web, mobile phone apps, connected personal navigation devices and car telematics services
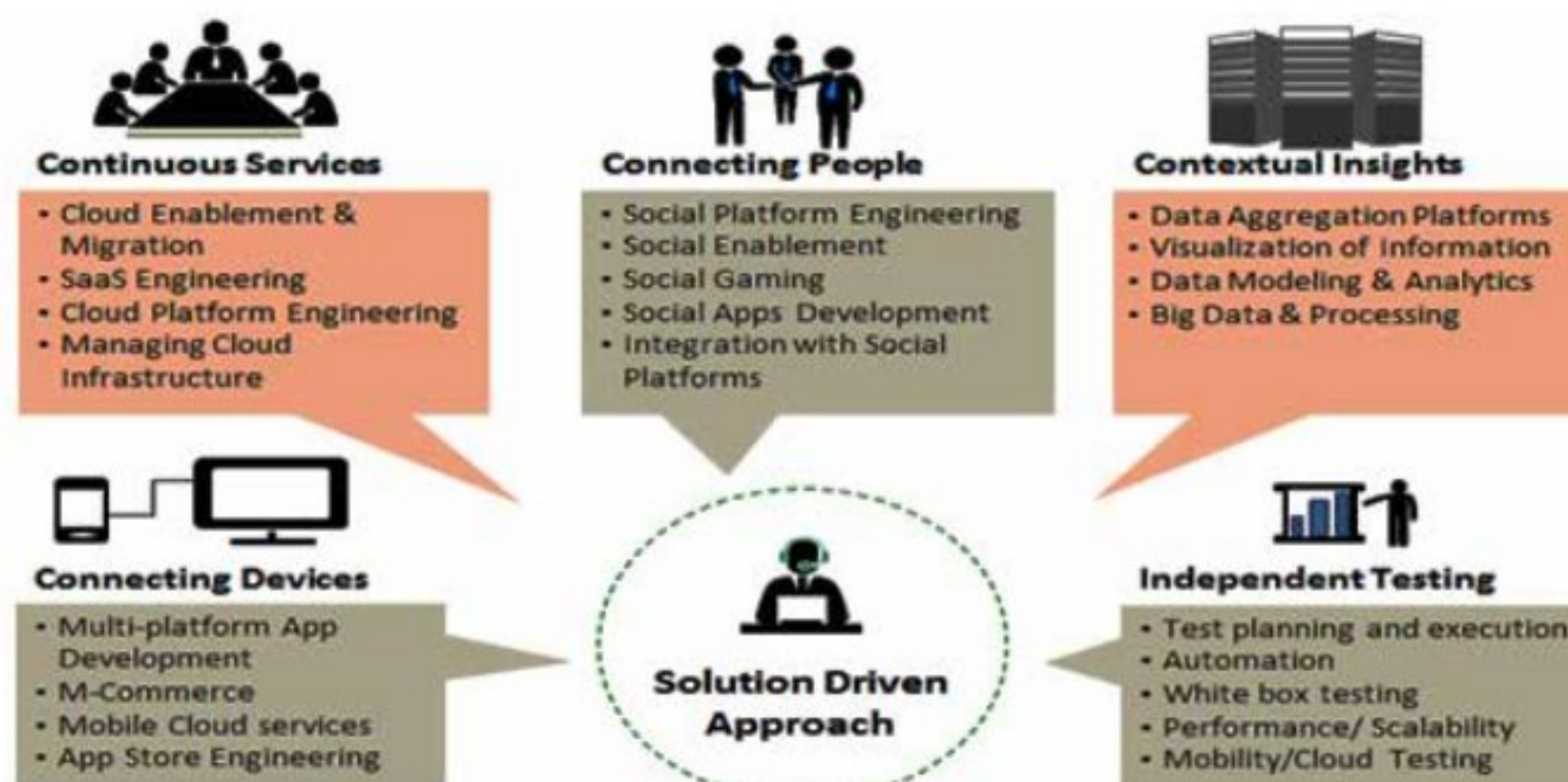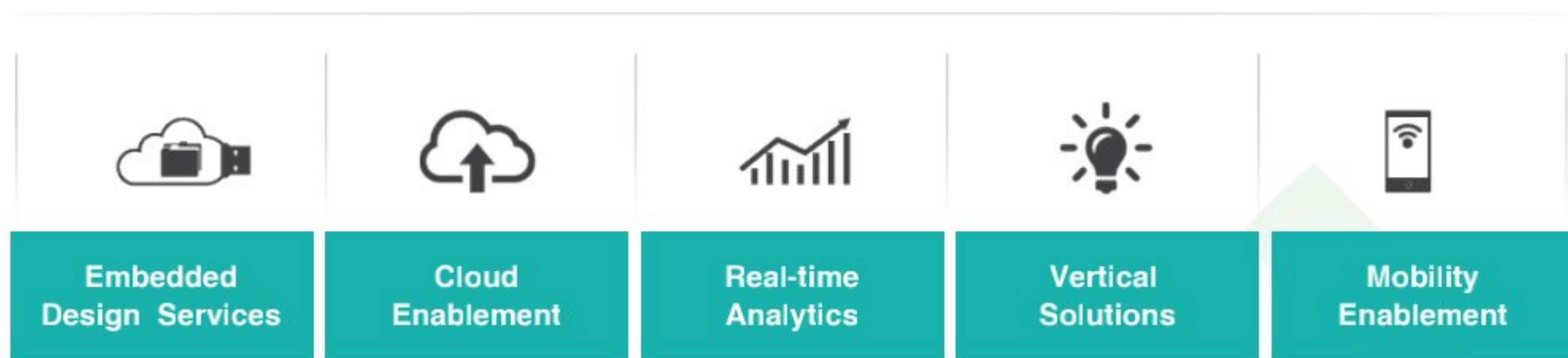
Happiest minds internet of things approach

Our brand commitment is to deliver a customer experience which is smart, connected and secure. With the advanced benefits of M2M technology, we focus on delivering services that would make enterprises, our environment and life smarter than in the future.

Smart Environment
- Homes and Buildings
- Cities

Smart Living
- Personal Device
- Consumer Electronics

Delivering Smart, Connected and Secure Customer Experience

Smart Transportation
- Fleet Management
- Logistics
- Telematics

Smart Enterprises
- Retail
- Manufacturing
- Healthcare
- Utilities

INDUSTRY PARTNERSHIPS

Microsoft Partner · ILS technology · Intel Intelligent Systems Alliance Partner · ARM CONNECTED · CEA

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Our IoT services range from designing hardware devices, cloud enablement, mobility enablement, engineering and real-time analytics, and consulting to create end-to-end solutions. Our IoT services encompass managed services via SOC/NOC that ensures smooth functioning of the M2M infrastructure for the business

| Embedded Design Services | Cloud Enablement | Real-time Analytics | Vertical Solutions | Mobility Enablement |

Continuous Services
- Cloud Enablement & Migration
- SaaS Engineering
- Cloud Platform Engineering
- Managing Cloud Infrastructure

Connecting People
- Social Platform Engineering
- Social Enablement
- Social Gaming
- Social Apps Development
- Integration with Social Platforms

Contextual Insights
- Data Aggregation Platforms
- Visualization of Information
- Data Modeling & Analytics
- Big Data & Processing

Connecting Devices
- Multi-platform App Development
- M-Commerce
- Mobile Cloud services
- App Store Engineering

Solution Driven Approach

Independent Testing
- Test planning and execution
- Automation
- White box testing
- Performance/ Scalability
- Mobility/Cloud Testing

About the Author

Aditya is a certified Business Analyst, ITIL v3, Business Continuity Management and Business Process Framework Professional. He has a rich experience in technology R&D, business development and Solu-tion Offerings with special focus on Internet of Things domain. Aditya holds a MBA degree from Symbio-sis International University with a Bachelors' degree in Computer Science Engineering. You can reach him at aditya.basu@happiestminds.com

Aditya Basu

About Happiest Minds Technologies

Happiest Minds, the Mindful IT Company, applies agile methodologies to enable digital transformation for enterprises and technology providers by delivering seamless customer experience, business efficiency and actionable insights. We leverage a spectrum of disruptive technologies such as: Big Data Analytics, AI & Cognitive Computing, Internet of Things, Cloud, Security, SDN-NFV, RPA, Blockchain, etc. Positioned as "Born Digital . Born Agile", our capabilities spans across product engineering, digital business solutions, infrastructure management and security services. We deliver these services across industry sectors such as retail, consumer packaged goods, edutech, e-commerce, banking, insurance, hi-tech, engineering R&D, manufacturing, automotive and travel/transportation/hospitality.

Headquartered in Bangalore, India; Happiest Minds has operations in USA, UK, The Netherlands, Australia and Middle East.

Conclusion

The major enablers or drivers for smart parking, essentially are the problems of urban livability, transportation mobility and environment sustainability. Primarily Smart Parking technology is about enhancing the productivity levels and the service levels in operations. Some of the underlying benefits could be lowering operating costs, while building value for customer to drive occupancy, revenues and facility value. We have evolved from traditional servicing channels like toll-booth and parking attendants to incorporate automated pay stations, meters and gates.

Parking is a $ 25 billion dollar industry which has seen minimalistic innovations and implementations. The majority of investments has always been in creating energy-efficient hybrid and electric vehicles, which in-turn still doesn't solve the problem of global gridlock causing the same burden on urban gridlock. Finally, in the long run, smart parking can actually transform the very makeup of our urban landscapes, making them more amenable to people rather than cars.

Street to Vehicle communication would be pivotal and crucial along with the Vehicle to Vehicle communication as the success and market readiness of Autonomous vehicle ecosystem lies in collecting and interpreting the data at the Street Level.

THANK YOU