

**LOOP DETECTORS, VMS, DIGITAL MAPS, AND SENSORS**

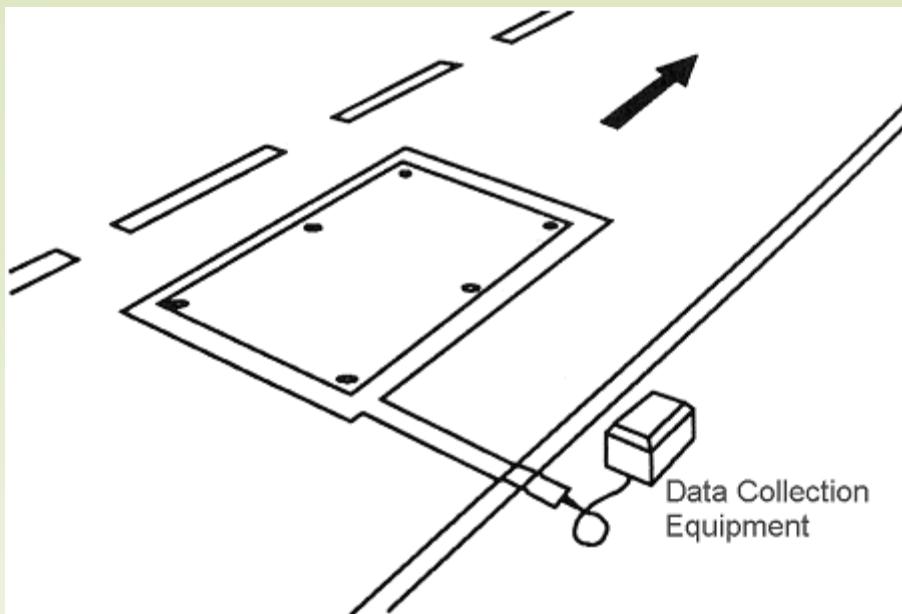
# Detectors

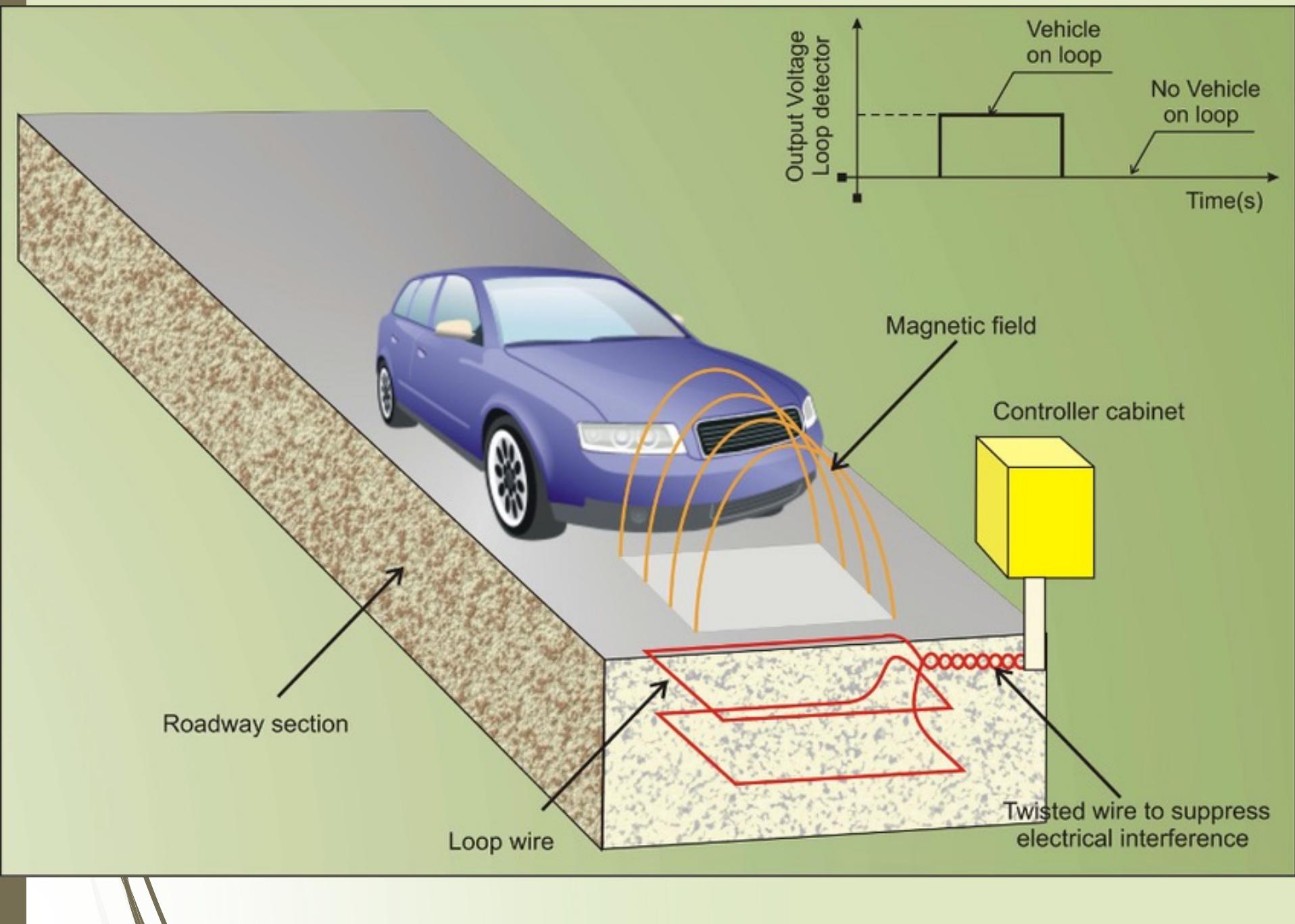
Detectors are used to identify the presence of a vehicle, so that the controller knows how to adjust the amount of green time to provide. There are many types of detectors. One type is known as the loop detector. The square black lines you may see in the roadway as you approach an intersection are the visible part of the loop detector, which is a thin wire buried in the roadway. When a vehicle drives over the loop, it sends a message to the signal controller. The signal controller's software evaluates the messages from all the loops at the intersection and changes the signal timing appropriately. Small TV cameras can also be used to detect vehicles.

# Detectors

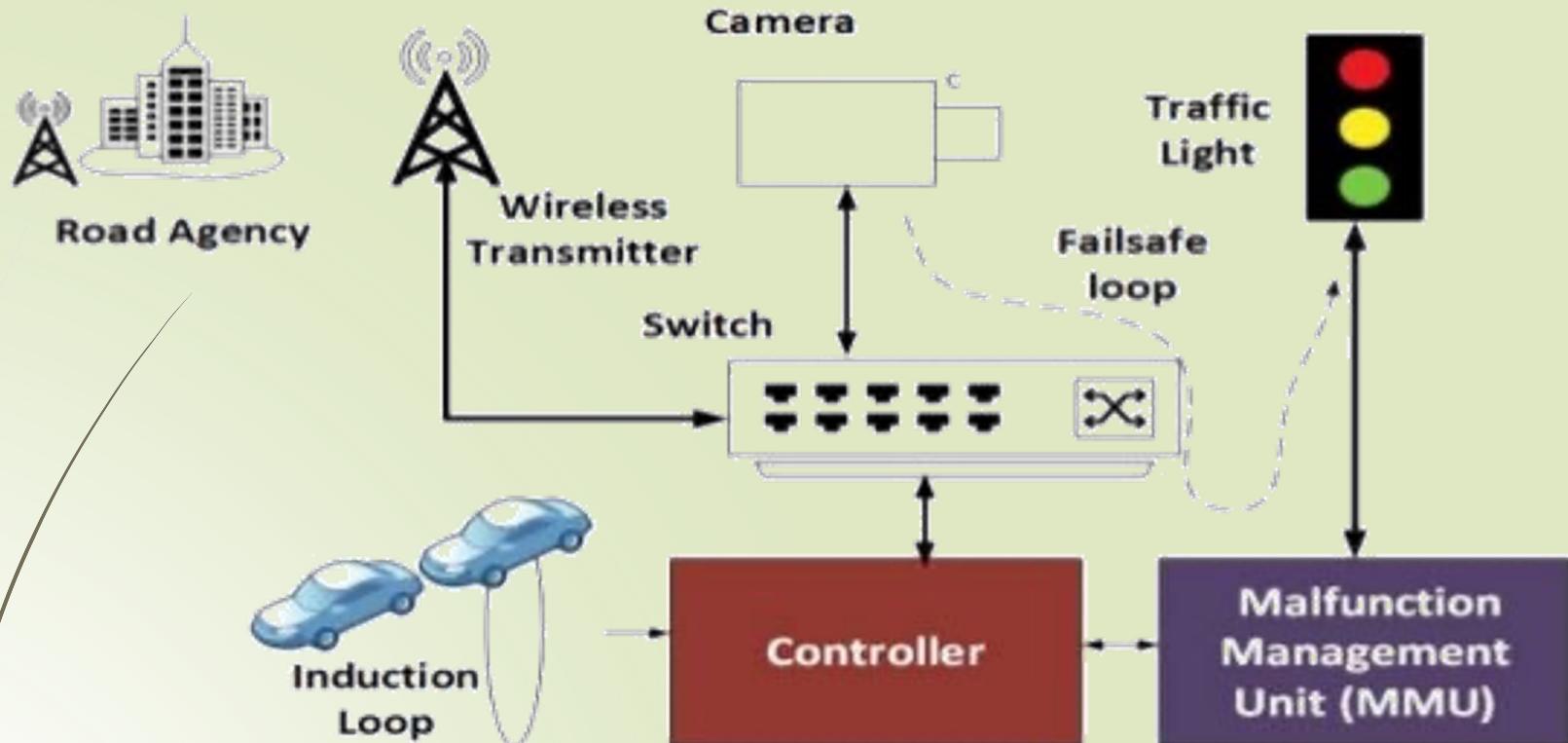
**Loop Detectors** are commonly used in roads for various traffic management purposes, such as vehicle detection, traffic signal control, and traffic data collection.

- Installation: A loop detector consists of one or more loops of wire embedded in the pavement.
- Inductive sensing: Loop detectors utilize the principle of inductive sensing. When an electrical current flows through a wire, it generates a magnetic field around it.
- Vehicle detection: When a vehicle passes over or near the wire loops, it disrupts the magnetic field. This disturbance is detected by the loop detector as a change in the electrical properties of the wire loops.
- Signal processing: The loop detector analyzes the changes in the electrical properties of the wire loops caused by the presence or absence of a vehicle. It processes this information to determine the presence, speed, and sometimes the size or classification of the vehicle.
- Output and control: Based on the information, it can provide outputs to traffic signal controllers or other systems. For example, it can trigger a traffic signal change to accommodate the detected vehicle or provide traffic data for analysis.



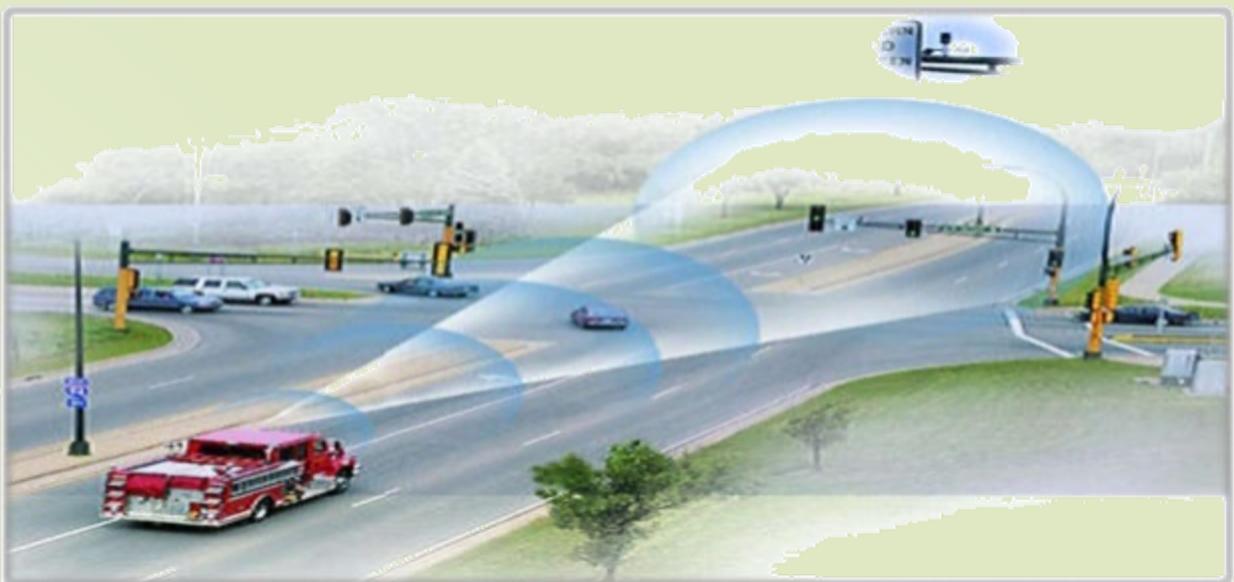


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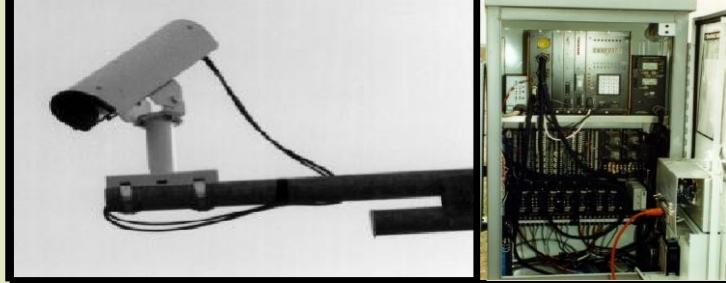


# Examples of Detectors in Lahore

- Mall Road
- Metro Bus



# CCTV cameras

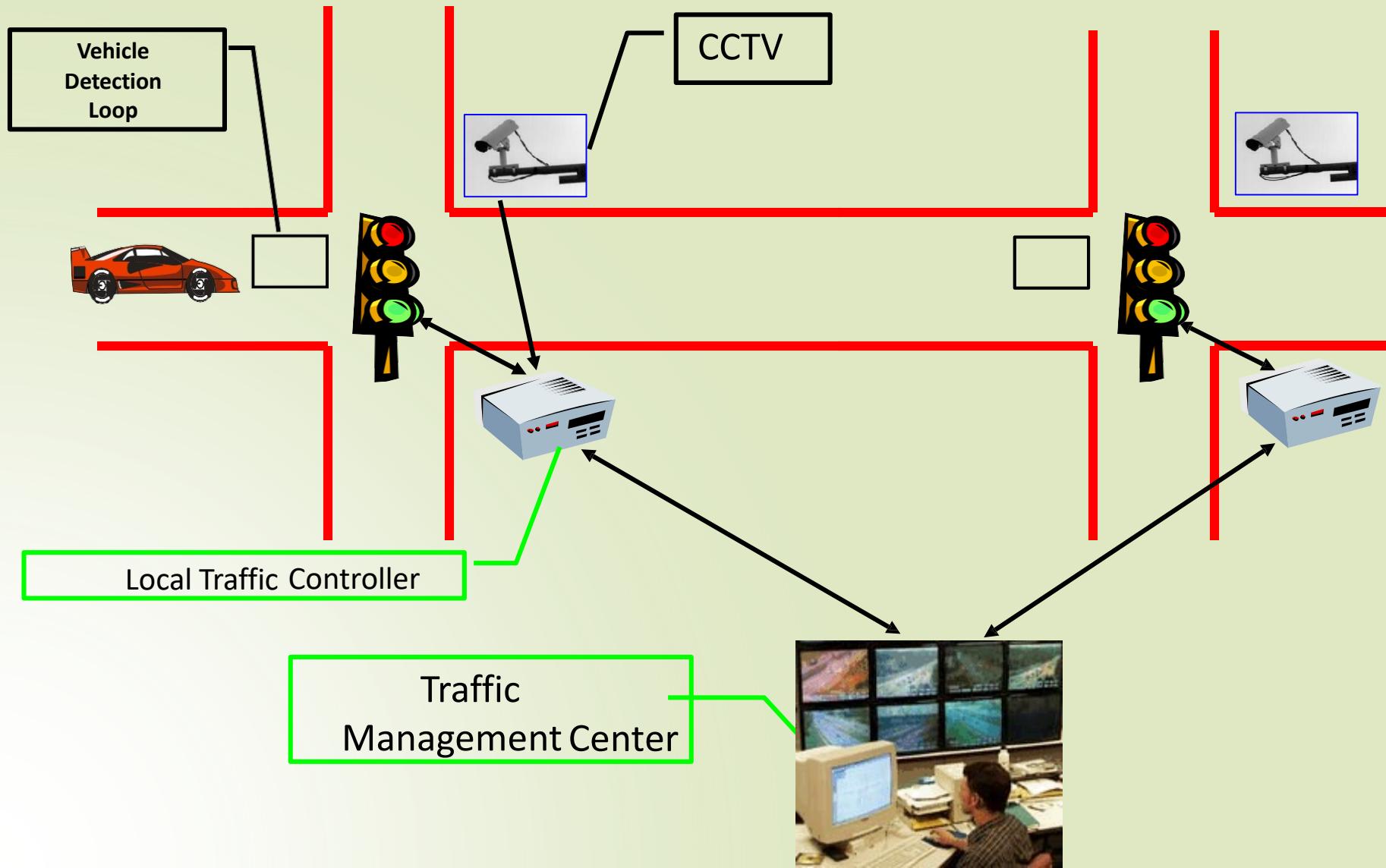


CCTV cameras will carry out the following functions:

- Traffic Signal Operations Monitoring
- Traffic Signal Functional Monitoring of Equipment
- Special Event Management
- Emergency Management/ Disaster operations



# CONCEPTUAL OPERATION OF ADVANCED TRAFFIC MANAGEMENT SYSTEM (ATMS)



# Variable Message Signs (VMS)

Variable Message Signs (VMS) are **digital road signs used to inform car drivers about specific temporary events and real-time traffic conditions**. The signs are often linked to a manned control center via a local network or a radio link.



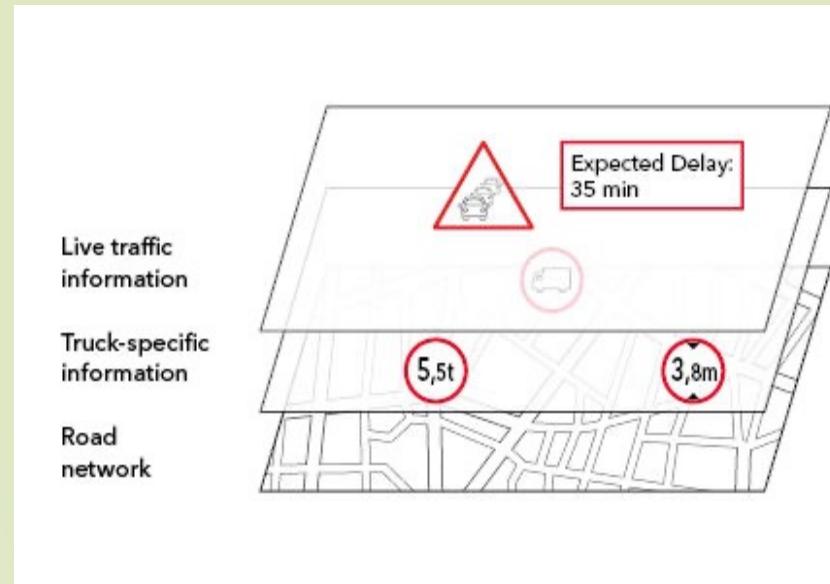
## Digital Mapping

Digital mapping services have emerged as one of the most powerful growth areas in information technology.



# Digital mapping

- ❑ Digital mapping (also called digital cartography) is the process by which a **collection of data is compiled and formatted into a virtual image.**
- ❑ The primary function of this technology is to produce maps that give **accurate representations** of a particular area, detailing major road arteries and other points of interest.
- ❑ The technology also allows the calculation of distances from once place to another.



# Digital mapping

- Though digital mapping can be found in a variety of computer applications, such as **Google Earth**, the main use of these maps is with the **Global Positioning System, or GPS satellite network**, used in standard automotive navigation systems.
- The roots of digital mapping lie within traditional paper maps.
- As digital maps have grown with the expansion of GPS technology in the past decade, live traffic updates, points of interest and service locations have been added to enhance digital maps to be more “user conscious.

# Digital mapping

- Users can now choose between virtual maps, satellite (aerial views), and hybrid (a combination of virtual map and aerial views) views.
- With the ability to update and expand digital mapping devices, newly constructed roads and places can be added to appear on maps.
- Digital maps heavily rely upon a vast amount of data collected over time. Most of the information is the culmination of satellite imagery as well as street level information.
- Maps must be updated frequently to provide users with the most accurate reflection of a location. While there is a wide spectrum of companies that specialize in digital mapping, the basic premise is that digital maps will accurately portray roads as they actually appear to give "life-like experiences."

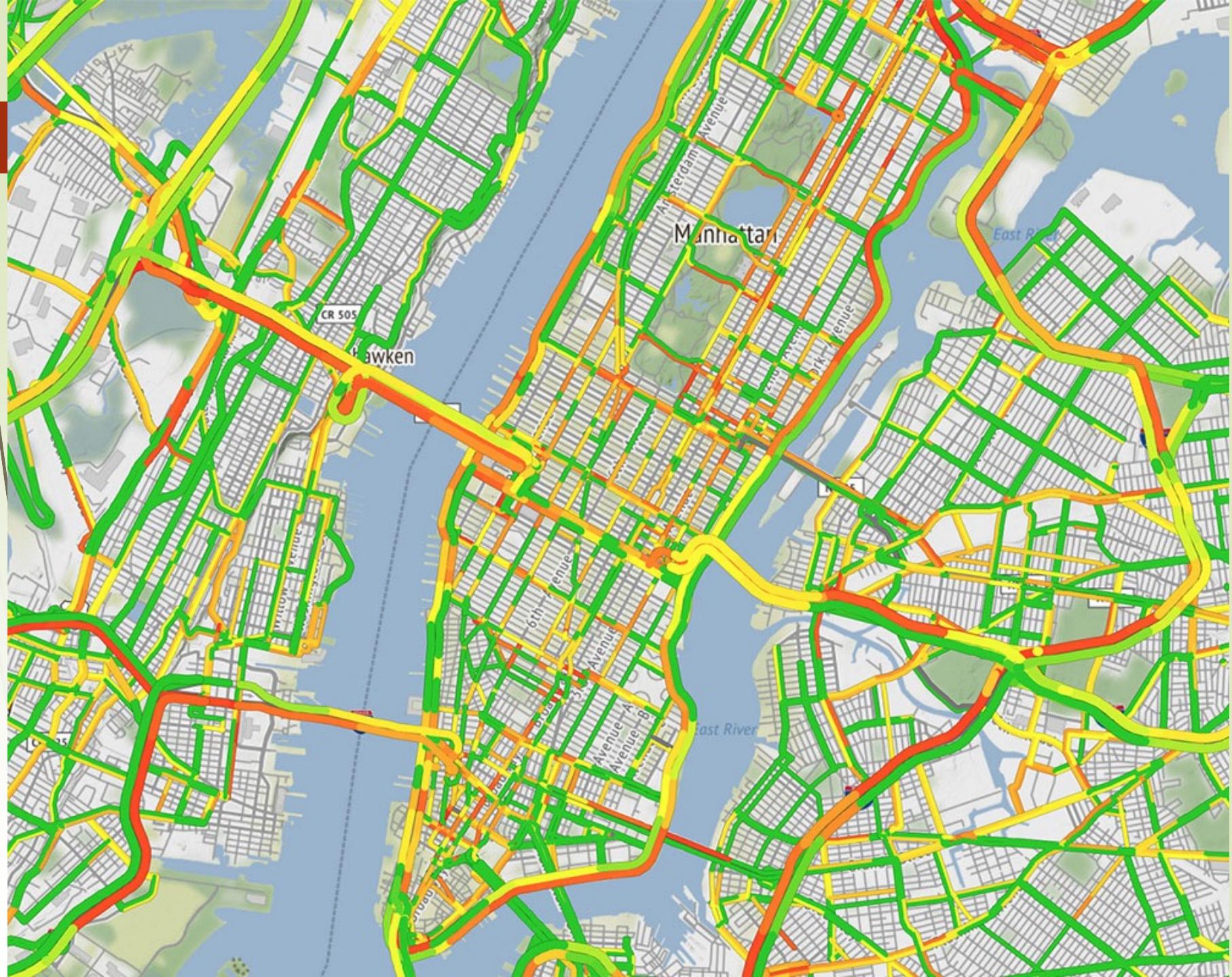
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- GPS is the foundation behind digital mapping navigation systems.
  - The coordinates and position as well as atomic time obtained by a terrestrial GPS receiver from GPS satellites orbiting Earth interact together to provide the digital mapping programming with points of origin in addition to the destination points needed to calculate distance.
  - This information is then analyzed and compiled to create a map that provides the easiest and most efficient way to reach a destination.



More technically speaking, the device operates in the following manner:

- GPS receivers collect data from at least **four GPS** satellites orbiting the Earth, calculating position **in three dimensions**.
- The GPS receiver then utilizes position to provide GPS coordinates, or **exact points of latitudinal and longitudinal direction from GPS satellites**.
- The points, or coordinates, output an accurate range between approximately "**10-20 meters**" of the actual location.

- 
- The beginning point, entered via GPS coordinates, and the ending point, (address or coordinates) input by the user, are then entered into the digital map.
  - The map outputs a real-time visual representation of the route. The map then moves along the path of the driver.
  - If the driver drifts from the designated route, the navigation system will use the current coordinates to recalculate a route to the destination location.



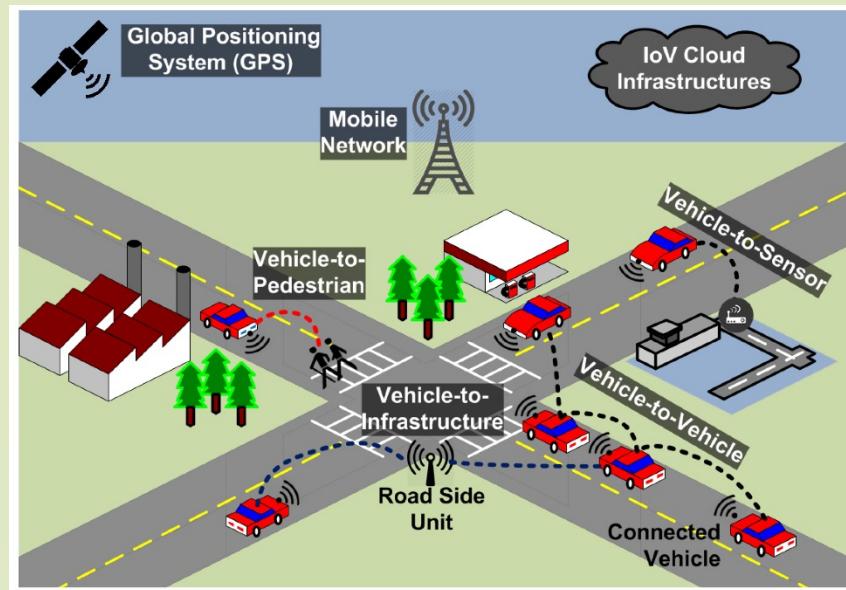
# Sensors and Platform

## Sensor:

A device that records electromagnetic Energy for example, camera, scanner.

## Platform:

Carrier bed used to carry a sensor for example, airborne, space borne, ground etc.





# Sensors

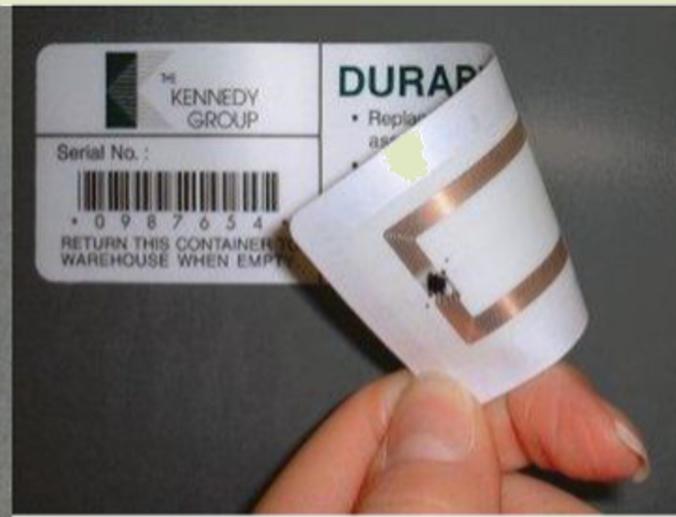
RFID

NFC

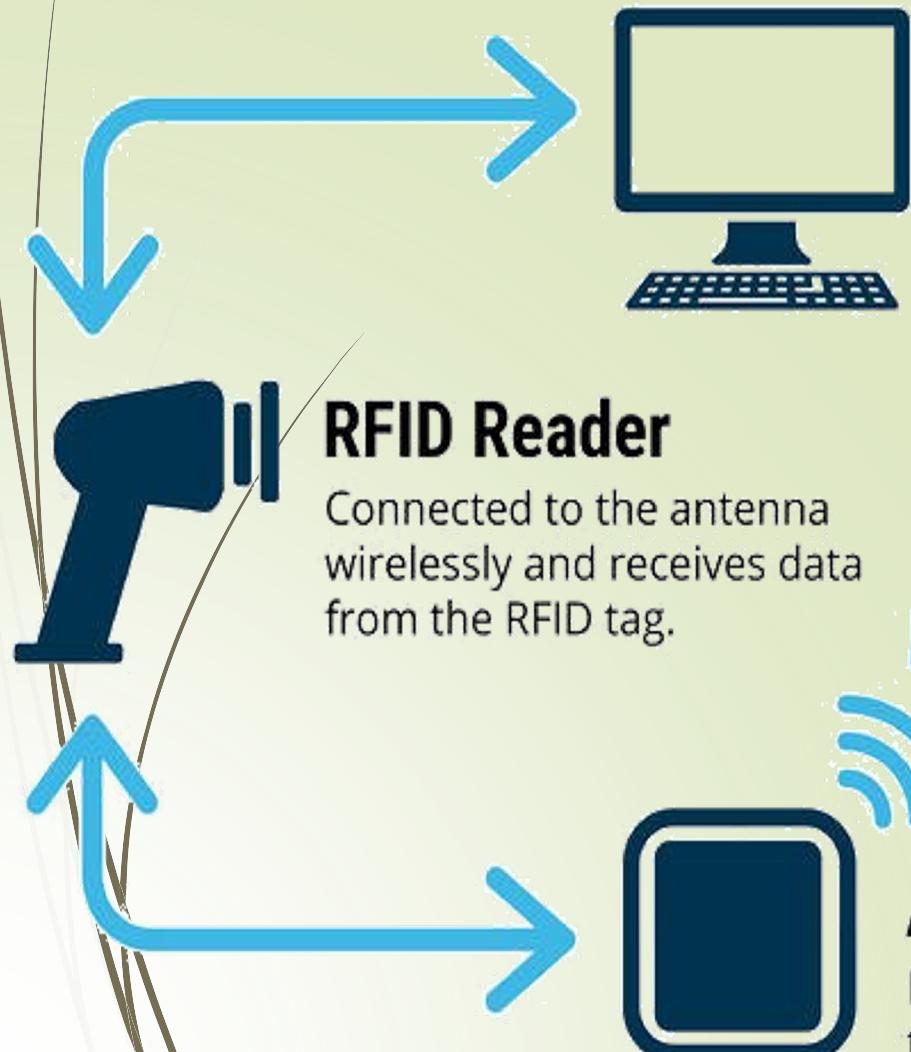
QR Code

# RFID

Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects.



# Basic RFID System



## Computer Database

Data is transmitted into the RFID database where it can be stored and evaluated.

## RFID Tag

Attached to assets to transmit stored data to the antenna.



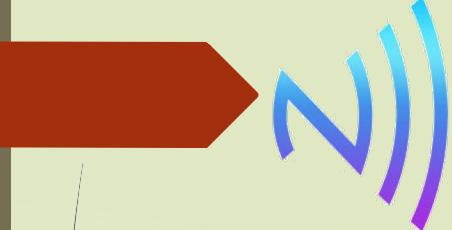
## Antenna

Receives the stored data from the tag and transmits that data to an RFID reader.

# NFC

Near field communication (NFC) is a set of standards for Smartphone and similar devices to establish **radio communication** with each other by touching them together or bringing them into proximity, usually no more than a few centimeters.





# Purpose of NFC



Transfer Contacts



Send Documents



App / Online Content



Contactless Payment



Read NFC Tag

# QR Code

The QR (Quick Response) Code is a two-dimensional (2-D) matrix code that belongs to a larger set of machine-readable codes, all of which are often referred to as barcodes, regardless of whether they are made up of bars, squares or other-shaped elements.

