



RFID SYSTEM

RFID Payments and Identification System



RFID-What it is?

- Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders.
- RFID (radio frequency identification) is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person.
- An alternative to bar code.
- RFID is also called dedicated short range communication (DSRC).

Uses of RFID

- Used where unique identification is needed.
- Gaming Zone
- Large Retail companies – Product Tracking.
- Hospitals & Nursing Homes – Patient Tagging .
- Airports – Baggage Tracking.
- Security Applications – Contactless Smart Cards.
- RFID Readers could also WRITE onto Tags.
- RFID Sensors to sense temperature, movement, radiation, food quality.
- Passports-UK, Australia, Finland, Ireland.
- RFID is used in Libraries.
- Replacing Barcodes.



The Elements of an RFID System

RFID systems fundamentally consist of four elements: the RFID tags themselves, the RFID readers, the antennas and choice of radio characteristics, and the computer network (if any) that is used to connect the readers



RFID Tags

The tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory, and a power system. The power system can be completely powered by the incoming RF signal, in which case the tag is known as a *passive tag*. *An RFID tag that does not contain a power source. The reader is transmitting RF signals. This electromagnetic field - generated by the reader - powers the tag and enables it to send back information stored on the chip. Alternatively, the tag's power system can have a battery, in which case the tag is known as an active tag.*

RFID Tags cont...

The primary advantages of active tags are their reading range and reliability. The tags also tend to be more reliable because they do not need a continuous radio signal to power their electronics.

Passive tags, on the other hand, can be much smaller and cheaper than active ones because they don't have batteries. Another advantage is their longer shelf life: Whereas an active tag's batteries may last only a few years, a passive tag could in principle be read many decades after the chip was manufactured.

Between the active and the passive tags are the *semi-passive tags*. These tags have a battery, like active tags, but still use the reader's power to transmit a message back to the RFID reader using a technique known as backscatter. These tags thus have the read reliability of an active tag but the read range of a passive tag. They also have a longer shelf life than a tag that is fully active.

Tags come in all shapes and sizes. It can be in the form of a Key Chain, A Plastic Card, etc. The shapes of the Tag can be designed as needed.



A few RFID Tags Designs



The Tags can be designed as per choice.

Readers

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well.

In simple RFID systems, the reader's pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even passwords.

Readers cont...

RFID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation. However, for some applications, this is unnecessary and could be undesirable in battery-powered devices that need to conserve energy. Thus, it is possible to configure an RFID reader so that it sends the radio pulse only in response to an external event. For example, most electronic toll collection systems have the reader constantly powered up so that every passing car will be recorded. On the other hand, RFID scanners used in veterinarian's offices are frequently equipped with triggers and power up the only when the trigger is pulled.

Antennas and Radio

The RFID physical layer consists of the actual radios and antennas used to couple the reader to the tag so that information can be transferred between the two.

Radio energy is measured by two fundamental characteristics: the *frequencies at which it oscillates* and the strength or *power of those oscillations*.

Most RFID systems use the so-called *unlicensed spectrum*, which is a *specific* part of the spectrum set aside for use without a radio license. Popular bands are the low-frequency (LF) band at 125–134.2KHz, the high-frequency band at 13.56MHz, the ultrahigh-frequency (UHF) band at 915MHz (in North America; varies in other regions), and the industrial, scientific, and medical (ISM) band at 2.4GHz.

Building proximity cards, automobile immobilizer chips, and implantable RFID ampoules tend to operate in the LF band. The FDA has adopted the HF band for RFID systems used for prescription drugs. The EPC system operates in the HF and UHF bands, although early deployments are favoring the UHF band.



Antennas and Radio cont...

As with most radio systems, the larger the antenna on the reader and the tag, the better an RFID system will work because large antennas are generally more efficient at transmitting and receiving radio power than are small antennas. Thus, a large antenna on the reader means that more power can be sent to the RFID tag and more of the tag's emitted energy can be collected and analyzed. A large antenna on the tag means that more of the power can be collected and used to power the chip. Likewise, a large antenna on the chip means that more power can be transmitted back to the reader.

The Network

Most RFID tags transmit a number and nothing more. So what does a typical reader do with a typical 96-bit number like 79,228,162,514,264,337,593,543,950,335?6 In most cases, the reader sends it to a computer.

What the computer does with the RFID code depends on the application. With an access-control system, the computer might look to see if the RFID number is present on a list of numbers that's allowed access to a particular door or location. If the number is present, the computer might energize a solenoid that would unlock the door. In the case of the Gaming Zone payment system, the tag's serial number and the stored amount value authorizes a gaming system with the amount value stored and also update the stored value of the RFID Tag.

Now, customers do not even need a wallet because they can use special keychain to pay. Contactless technology is also enabling businesses to learn more about their customers through the collection and storage of vital information of buying patterns. This same type of technology can be used for personnel access, ticketing, payTV, gaming, and payphone applications.



THANK YOU

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