Radio Frequency Identification (RFID)
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Radio Frequency identification is a technology which uses tags as a component in an integrated supply chain solution set that will evolve over the next several years.
RFID tags contain a chip which holds an electronic product code (EPC) number that points to additional data detailing the contents of the package.

Readers identify the EPC numbers at a distance, without line-of-sight scanning or involving physical contact. Middleware can perform initial filtering on data from the readers.

Applications are evolving to comply with shipping products to automatically processing transactions based on RFID technology.
An RFID system consists of a tag made up of a microchip with an antenna, and an interrogator or reader with an antenna. The reader sends out electromagnetic waves. The tag antenna is tuned to receive these waves. A passive RFID tag draws power from the field created by the reader and uses it to power the microchip's circuits. The chip then modulates the waves that the tag sends back to the reader, which converts the new waves into digital data. In its minimalist configuration the micro-topology requires just four sub-systems, as follows:

Tag

Reader

Air Interface

Computer Communication and Control
RFID TOPOLOGY

EPC Network

Enterprise Systems

Tag

Reader

Middleware
A Tag is a transponder which receives a radio signal and in response to it sends out a radio signal.

- Tag contains an antenna, and a small chip that stores a small amount of data
- Tag can be programmed at manufacture or on installation
- Tag is powered by the high power electromagnetic field generated by the antennas - usually in doorways
- The field allows the chip/antenna to reflect back an Extremely weak signal containing the data
An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data.

The reader has two basic components -

A scanning antenna.

A transceiver with a decoder to interpret the data.
RFID systems are also distinguished by their frequency ranges. Low-frequency (30 KHz to 500 KHz) systems have short reading ranges and lower system costs. They are most commonly used in security access, asset tracking, and animal identification applications. High-frequency (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) systems, offering long read ranges (greater than 90 feet) and high reading speeds, are used for such applications as railroad car tracking and automated toll collection. However, the higher performance of high-frequency RFID systems incurs higher system costs.
RFID antenna

Connected to the RFID reader, can be of various size and structure, depending on the communication distance required for a given system’s performance. The antenna activates the RFID tag and transfers data by emitting wireless pulses.

RFID STATION

Made up of an RFID reader and an antenna. It can read information stored into the RFID tag and also update this RFID tag with new information. It generally holds application software specifically designed for the required task. RFID stations may be mounted in arrays around transfer points in industrial processes to automatically track assets as they are moving through the process.
Advantage of RFID

Long read range. Larger area of coverage. Up to several feet.

Portable database

Tracking people, items, and equipment in realtime. Non-line of sight identification of tags

Unattended operations are possible, minimizing human errors and high cost.

Ability to identify moving elements that have tags embedded.

Can be used in diverse environments, including livestock, military, and scientific areas.

RFID can be used in addition to Bar Code. These two technologies can be complementing each other.

Automatic integration with back end software solutions provide end to end integration of data in real time.

Enhanced visibility and forecasting

Improved inventory management.

Simultaneous automatic reading.
Disadvantage of RFID

Bulkier, due to embedding of electronic components in the tag

Prone to physical/electrical damage due to environmental conditions

Dead areas and orientation problems

Security

Ghost tags

Proximity issues

High cost

Unread tags

Vulnerable to damage
RFID technology is already replacing bar codes in niche applications. Pundits have high hopes for this technology to be a universal replacement for the barcode. Just like photocopiers that replaced carbon paper, RFID provides greater options and is rich with value add possibilities. Since RFID uses digital electronics the cost is dropping dramatically while benefits improve. As a result, RFID is creating new processes, markets and opportunities.