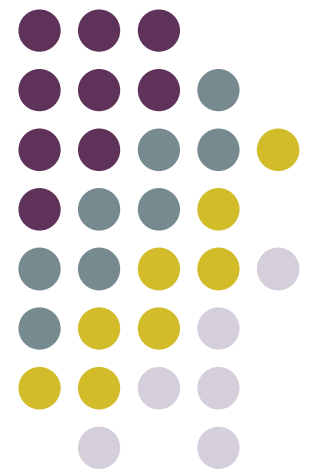


RFID – An Introduction

Murari Raghavan
UNC-Charlotte



Overview



- 1 What is RFID?
- 1 History
- 1 RFID basics
- 1 Applications & Advantages
- 1 RFID future
- 1 Conclusion

What is RFID?



- 1 Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies.

History



- 1 First RFID during World War II by German AIRFORCE
- 1 The planes approaching the base rolled twice to change the radio signals detected by the RADAR, and thus identifying themselves as German planes. This crude method was the first Passive RFID system.

Current identification techniques



- 1 BAR codes
- 1 Optical character readers
- 1 Biometric techniques
- 1 Magnetic strips



RFID Tag

Header: identifies the EPC (Electronic product Code) version number – allows for different lengths

EPC Manager: the manufacturer of the product the EPC is attached to: ex. **Coca Cola**

Object Class: exact type of product, most often the SKU (Stock Keeping Unit): ex. **Diet Coke US Version**

Serial Number: unique to the item tells **exactly which Diet Coke**





Types of RFID

1 Active RFID

An internal power source (battery) is employed within the tag to continuously power the tag and its RF communication circuitry

1 Passive RFID

RF energy transferred from the reader to the tag to power the tag

RFID - Working



- 1 RFID systems consist of tags, reading devices that convey information from the tags to computer
- 1 An unpowered tag is powered intermittently from a distance by a reader device that broadcasts energy to it
- 1 Tags consist of a plain antenna bonded to a silicon chip and encapsulated inside a glass or plastic module.

Contd....

RFID - Working



- 1 Tags operate differently depending on several factors, especially the frequency they function
- 1 Tags which work at frequency bands of 13.56 MHz or lower are still the most widely used
- 1 Typically, tags need to be less than 1m away from the reader

HIGH-FREQUENCY SYSTEM

1 An integrated circuit sends a digital signal to a transceiver, which generates a radio-frequency signal that is transmitted by a dipole antenna.

READER

Integrated circuit

Tag identifier code
02321000112501

Digital signal

Transceiver

Dipole antenna

2 The electric field of the propagating signal gives rise to a potential difference across the tag's dipole antenna, which causes current to flow into the capacitor; the resulting charge is trapped there by the diode.

3 The voltage across the capacitor turns on the integrated circuit, which sends out its unique identifier code as a series of digital high- and low-voltage levels, corresponding to ones and zeros. The signal moves to the transistor.

TAG

Current

Diode

Capacitor

Transistor

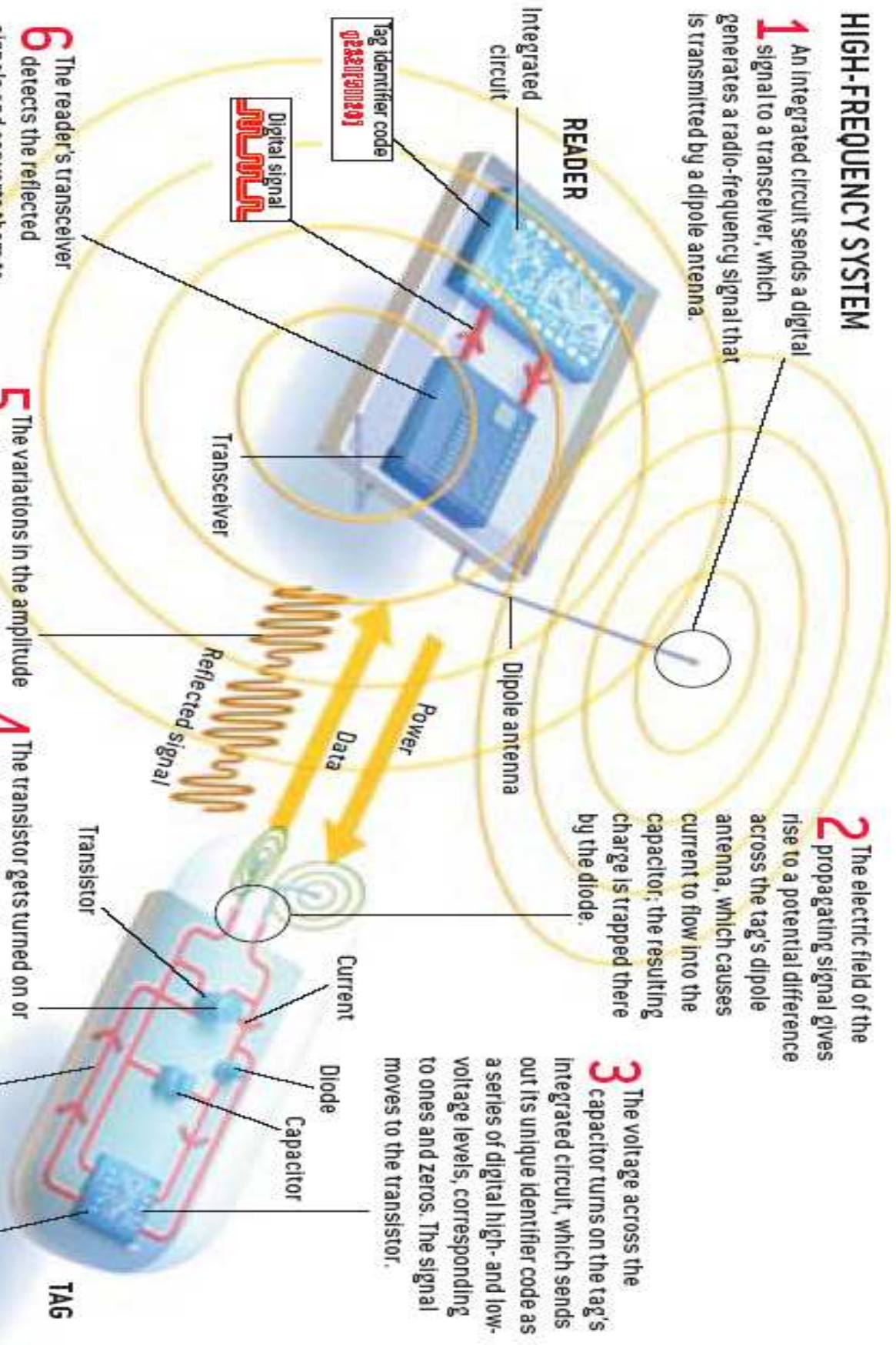
Digital signal

Tag identifier code
12321000112501

6 The reader's transceiver detects the reflected signals and converts them to a digital signal that is relayed to the integrated circuit, where the tag's unique identifier is determined.

5 The variations in the amplitude of the reflected signal, in what is called backscatter modulation, correspond to the pattern of the transistor turning on and off.

4 The transistor gets turned on or off by the highs and lows of the digital signal, alternately causing the antenna to reflect back or absorb some of the incident radio-frequency energy from the reader.





Current trend

- 1 RFID devices are beginning to replace magnetic-stripe security cards.
- 1 RFID makes it more convenient when scanning tags attached to the windshields of passing cars à drivers don't have to stop or slow down while zipping through toll plazas.
- 1 Some RFID tags permit readers to write new data to their onboard memories for later retrieval.

Advantages



- 1 No line of sight requirement
- 1 The tag can stand a harsh environment
- 1 Long read range Portable database Multiple tag read/write
- 1 Tracking people, items, and equipment in real-time

Application



- 1 Fully automated shipping and receiving
- 1 Real time inventory
- 1 Real time to generate receiving documents
- 1 Real time to generate shipping documents
- 1 Automatically order products that are low in inventory

RFID future



- 1 RFID tracking technology is starting to be used to follow merchandise as it travels from factory to stores
- 1 RFID equipped Warehouse systems
à Wal-Mart in-store-test
- 1 The U.S. Department of Defense has called on its suppliers to adopt high-frequency RFID inventory labeling by 2005

Challenges



- 1 Tags must be positioned properly relative to readers so that the antenna coils can exchange signals
- 1 RFID signals are easily blocked
- 1 At an average cost of around 20~30 cents apiece, RFID tags are still too costly
- 1 Competing technical standard for RFID readers and tags prevent their universal adoption

Conclusion



- 1 Important technical challenges remain
- 1 If efficiently implemented, RFID has the power to make computing an unobtrusive, intuitive part of everyday life

Further reading



1 RFID journal

<http://www.rfidjournal.com>

1 Circuit Cellar : The One dollar wireless interface

Q u e s t i o n s



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