Conscious Objects

The impact of RFID

Curt Carrender

Overview

- What is RFID and How does it work?
- RFID Applications by maturity
- The direction RFID is moving
- New Applications in their infancy
- Demonstration

RFID – Radio Frequency Identification

- A wireless communication technology for tracking items
- Non-Line-of-Sight
- Components
  - Tags
  - Readers
  - Antennas
  - Software
- Range depends on frequency used

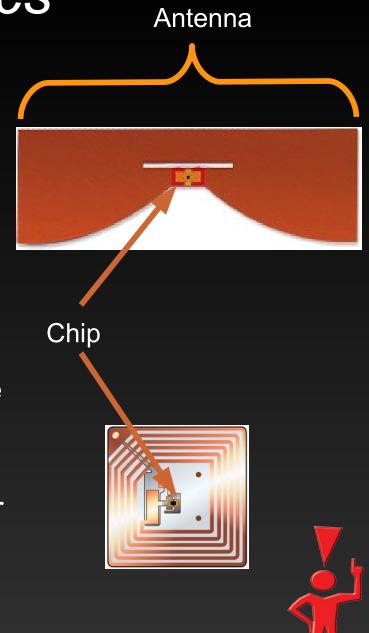|	Freq	Distance	Example Application
LF	125khz	Few cm	Auto-Immobilizer
HF	13.56Mhz	1m	Building Access
UHF	900Mhz	0-10m	Supply Chain
μwave	2.4Ghz	10m	Traffic Toll

RFID Basics

Antenna

A passive RFID tag is made up of a single chip and a conductor for an antenna.

Powered from energy beamed to them "over the air" by the Reader. (No battery)

They do not transmit.

They communicate by changing how they reflect the RF energy back to the Reader, sending "1"s and "0"s based upon the data in internal memory.

Chip

Range can be over 8 meters, cost under 8 cents, contain up to 10 kBs, and sized under 10 cm.

Types of Tags
Active v. Passive

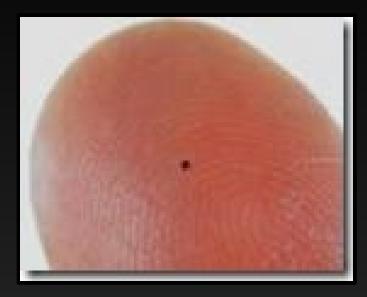|	Active	Passive
Battery	Yes	No
Signal strength	Stronger	Weaker
Signal availability	Always on	Responds when read
Size	Larger	Smaller
Initial cost	Higher	Lower
Maintenance	Replace every 2-3 years	Indefinite lifetime
Environment	Available for all environments	Available for all environments

They are cheap and reliable.

They are becoming ubiquitous and smarter.
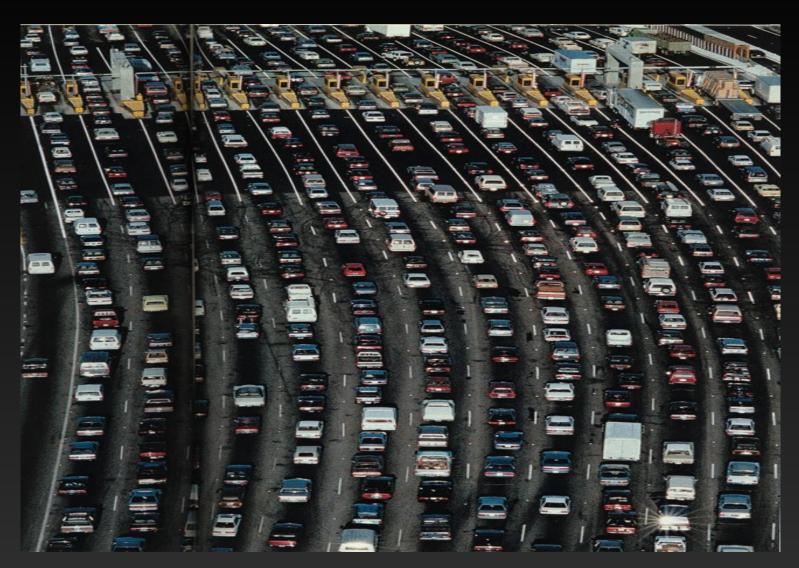
Transportation

RFID Tag for Rail

RFID Enabled train SNCF

15 year old Flat Car Tag

RFID and Toll

Why should you be interested?

This is the most environmentally positive thing RFID can do.

Example; the Bay Bridge here has 190,000 users per day.
Each has to wait about 10 minutes to pay their toll.
       190,000 people waste over:
      7 man years per day!

190,000 vehicles going from 0 to 60 mph uses over
       8,000 gallons of gas per day!

Newer Toll Roads Designed for RFID
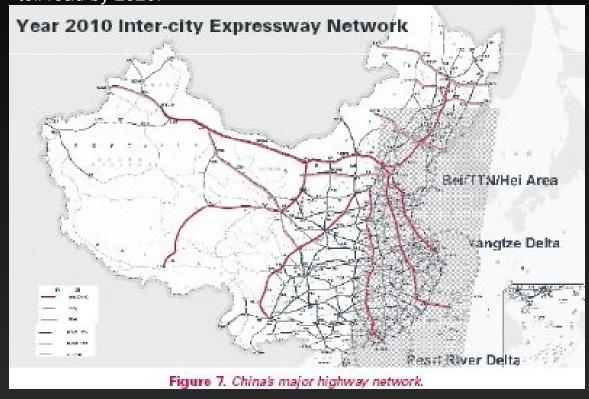
Recent Project in the Bay Area

Asian Market

Why should you be interested?

There are currently 53,600 km of toll road in China,
the second longest in the world behind the United States,
which has 89,000 km. And China plans to have 85,000 km of
toll road by 2020.

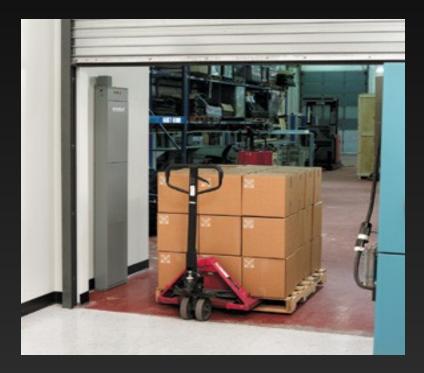Figure 7. *China's major highway network.*

Retail

Early adopters in
RFID in retail

Current Common Uses

Retail Examples Electronics

Automated Stores

What she gets and where is known until it leaves the area.

Tagged item to be purchased

Allows verification, Added security, and inventory 24 - 7.

Expansion is easy.
Application does not require 100% tagging for success.

Retail Directions Apparel

Grocery RFID?

Over **2 Billion square meters** of retail shelf space.

RFID on everything? Is it possible?

Retail Directions

Not yet. The nature of retail does not easily lend itself to RFID

Limited applications work

Automatic notification of out of stock saves supermarkets up to 4%!

The computer says I'm out of Ham . . . . .

A System Example that does work.

Set down a system, cover one brand or product and walk away!
No total store system is needed. Multiple customers.
Expansion is easy. No big infrastructure needed.

Documents

"Has anyone seen the Jones file?"

I know
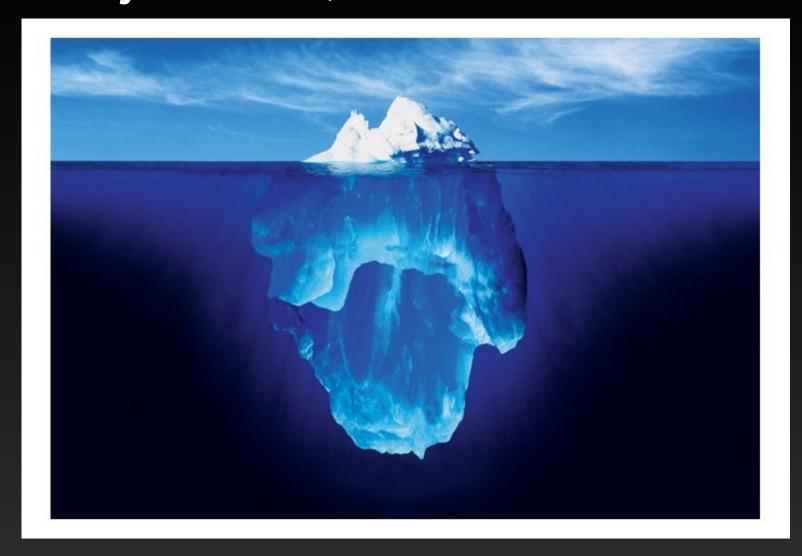Ask me!

Original Problem/Opportunity

- The *"paperless office"*[1] hasn't materialized.
- People still lose documents at a huge cost.
-

[1] "The Office of the Future". Business Week (2387): pp 48–70. 30 June 1975.

It's not just data, it's about saved time!
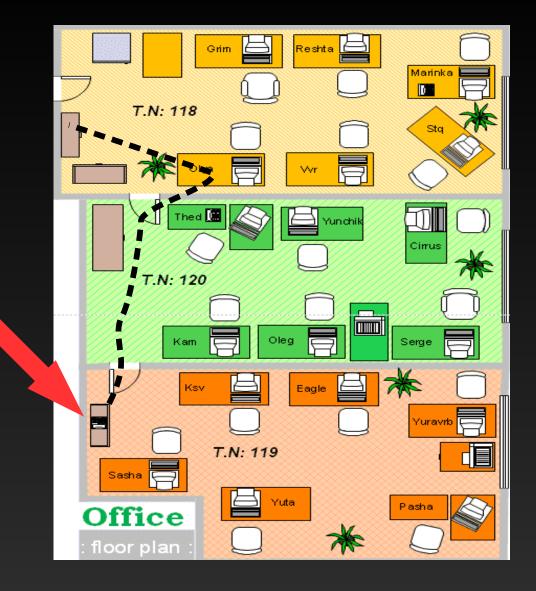

Brr!

Problem/Opportunity – SIZE

- Annual loses at a Fortune 500 co. = $5 million dollars
- Office workers waste 62.5 days per year

- 7.5% of these assets are lost forever,
- Again, it's not the file
It's the time!

Thinknet

Jones file
Created 2-13-09
Last location T.N. 118

Directions Document tracking

Tool Tracking

RxID

An RFID-enabled crash cart for emergencies.
It knows where it is
It knows its contents are complete

You know that it is ready for use

Disaster Assistance

Where's my wife?

I need insulin now!

Did Billy get out OK?

Hand held readers don't work here

Enablers

A full function UHF G2 Reader

Battery Powered
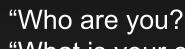
TINY

Networked Solution

3 meter read range

Mobile Crisis Logistics

The *USER* can attach their own ID bracelet.

Identification updates are made anytime a bracelet is within 2 to 3 meters of a reader. Cost is less than $2.00.

USERS can enter their own information.

"Who are you?
"What is your condition?"
"Where did you live?"
"Who do you want us to contact?
"Can we upload your data to the net?"

Mobile Crisis Logistics

Readers on duty 24-7 constantly tracking victim position.
The entire system takes minutes to deploy.

Ski Resorts

Ski resorts waste millions each year on counterfeiting, fraud and unnecessary labor .

Long lift lines are self regulating,

(customers may be somewhere else tomorrow.)

"Has anyone seen John?"

I know
Ask me!

Solution

Visible Mountain is a total system solution that combines lift control, ticketing, real time visibility, and access control to your resort

John is here

Solution

Visible Mountain is a total system solution that combines lift control, ticketing, real time visibility, and access control to your resort

John's trail since 2 pm

Fee based information

Cell phone communicates friends and family positioning for a fee.
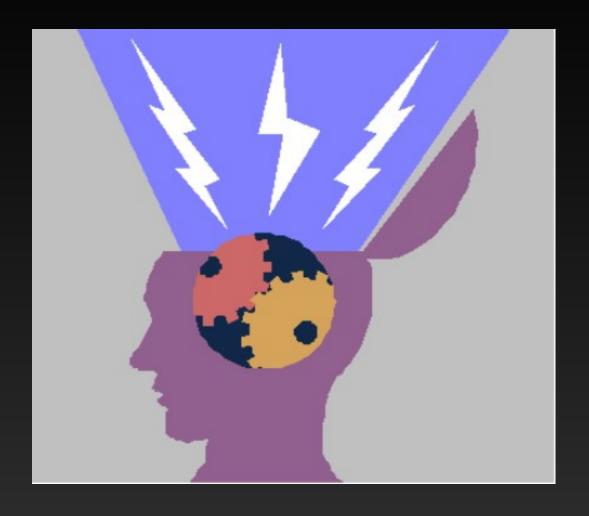

Wow! He's way over there?

NFC plus

The Amplified Human

Overview

Imagine that you could know everything there was to know about every object you looked at.

Imaging that you had the ability to "Google" every object you saw while you saw them, *even if you didn't know what it was.*

Imagine that you had the world wide webs information available to you in real time in a hands free manner.

Imagine the entire knowledge base on the web available to you in real time for your use.

This development is called:

The Amplified Human
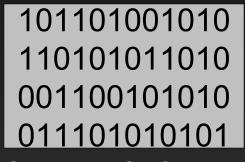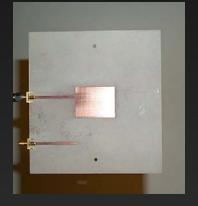
Functional Portions

RFID Module

Tags

Display, and headset

Patch Antenna

High Speed Modem

101101001010
110101011010
001100101010
011101010101

System Software

How Does It Work?

Objects have tags
Small readers read and send ID to a modem
The modem links the ID to the web or dedicated data base
Information is displayed
Speech recognition allows vectoring
Everyone an expert
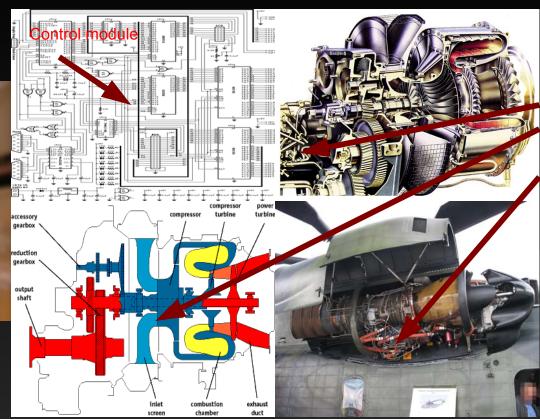Instant data but not knowledge

How Does It Work?

Each part has a link using an RFID tag
The tags are linked to instructions or allow vectoring
Works as if an expert was available.

Thinkify, LLC 18450 Technology Dr. Suite E, Morgan Hill, CA 95037
PH: 408.782.7111, Web: www.thinkifyit.com

How Does It Work?

Control module

Part 26-sd4

Remove plate labeled "Shield 21-1"
Plug in connector C 45 and hit "Status" on the Diagnostic computer.

The link is based upon the RFID tag's unique data.
The part of interest is shown in a variety of windows.
The operator can window down through a web of options.
The display provides instructions.

Other Uses

Training: Walk through complicated work with a virtual expert

Test: Get field feedback and training in real time

Emergency: Have this as back up to the "real" expert personnel

Monitoring: Use of a two way camera allows remote assistance

Improved instructions: The latest manual is always available

Not Just for Military

automatic real time information on anything based on user define rules or preferences

Demonstration