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Extending the EPC Network – The Potential of RFID in Anti-Counterfeiting

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Public Safety User Requirements & Technology Solutions Workshop
Sophia Antipolis 24-Feb-2005

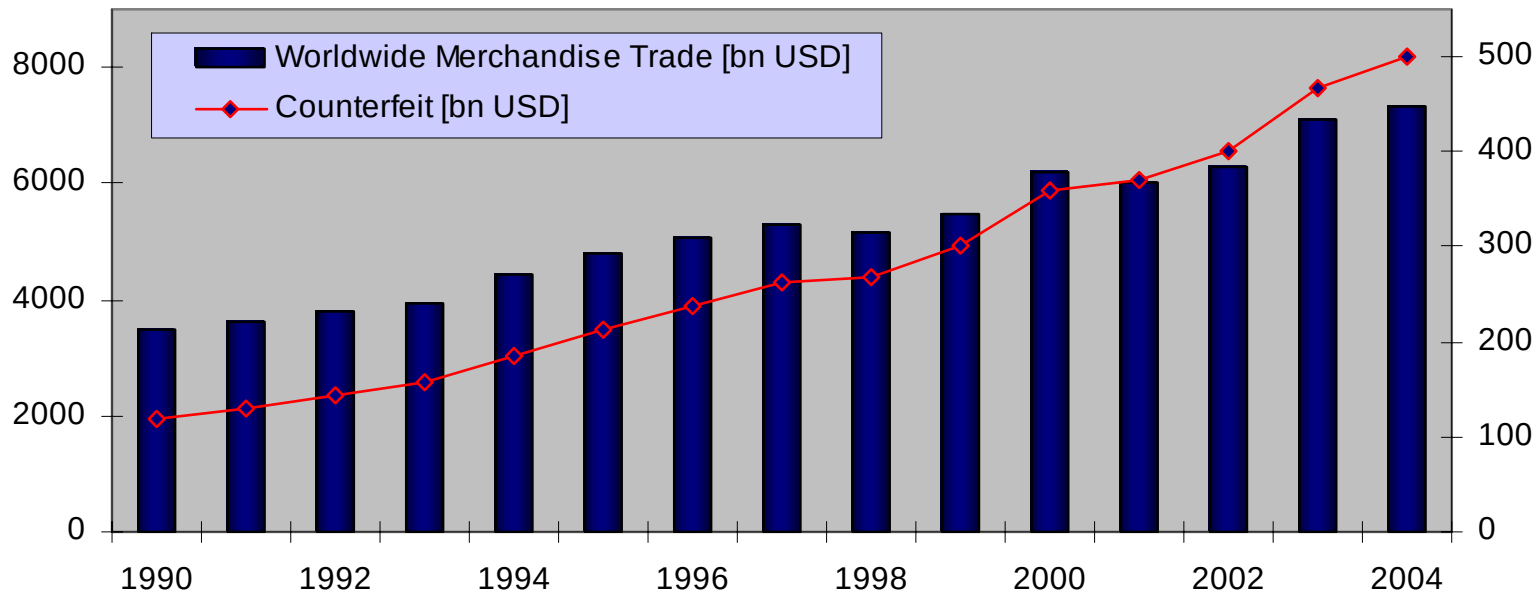
Agenda

Problem:

- Extend of Counterfeiting and Product Piracy
- Reasons for the Development
- Illicit Trade and Public Safety
- Impact on Affected Parties
- Links to Organized Crime

The Extend of Counterfeiting and Product Piracy (i)

- **Up to seven percent** of world trade is in counterfeit goods
- The music-, software- and luxury goods industry suffer enormous losses due to counterfeit. However, other sectors are also heavily affected:
  - 5 to 10 percent of all **car parts** are counterfeits
  - 5 to 8 percent of **pharmaceuticals** are fakes
  - Up to 12 percent of all **toys** sold in Europe are plagiarism



Source: Green book EU, WTO, ICC

Reasons for the Development

- Increase in international trade
- Outsourcing to Eastern Europe / Asia
- More complex supply chains
- New markets in Eastern Europe / Asia
- Extended free trade associations

- **Advances in technology**

Illicit Trade and Public Safety (ii)

- 192,000 People died in China in 2001 because of **fake drugs**
- **Fake baby formula** has caused infants to develop rashes and seizures
- 1 Million **counterfeit birth control pills** have caused unwanted pregnancies
- Indian hospital patients die from **counterfeit glycerin**
- **Counterfeit bolts** blamed for Norwegian plane crash that kills 55 passengers
- Malfunctioning **counterfeit parts** discovered in $7 million worth of open heart surgery pumps
- 7 Children died when their bus crashed because of **fake brake pads**
- **Counterfeit shampoo** found to contain harmful bacteria
- Risk of explosion is high in **counterfeit batteries**
- **.... and so on ....**

Product Counterfeiting – Impact on Affected Parties

Consequences for users:

- Physical injuries
- Financial losses
- A less secure environment
- But also a possible financial bargain!

Consequences for the economy:

- Impact on foreign investment
- Impact on employment
- Loss of tax
- But some countries “live” from illicit trade!

Consequences for companies:

- Unjustified liability claims
- Quality perception
- Negative impact on the brand / loss of goodwill
- Loss of revenue
- Negative impact on the ROI of R&D

Drivers towards a solution:

- Laws & Regulations
- Quality Management
- Brand Protection
- Risk Reduction

➔ Business Case

Links to Organized Crime

- Profits from counterfeiting match and often exceed those from drug trafficking
  - One kilo of pirated CDs is worth more than a kilo of cannabis resin
  - A counterfeit computer game costs €0.20 to produce and sells at €25...
  - Cannabis cost €1 to €2 to produce and sells at €12
- The penalties for selling within these two areas are also different...

Links to Organized Crime (ii)

- In most countries of the EU, selling counterfeit goods could cost you a 2-year prison term and a €150,000 fine...
- Selling drugs could land you in prison for 10-years and a costs you up to €7,500,000

Little wonder organized crime is turning to counterfeiting…

The rewards are higher and the risks lower

More Information: http://www.treas.gov/rewards/pdfs/Green_Quest_Brochure.pdf
http://www.iacc.org/teampublish/uploads/Testimony8.pdf

To sum up

Counterfeiting and product piracy

- is a large-scale problem
- imposes a security risk on the costumer
- causes high cost to an economy
- causes high cost to companies
- fosters organized crime

➔ These are strong drives towards a solution

What can be done?

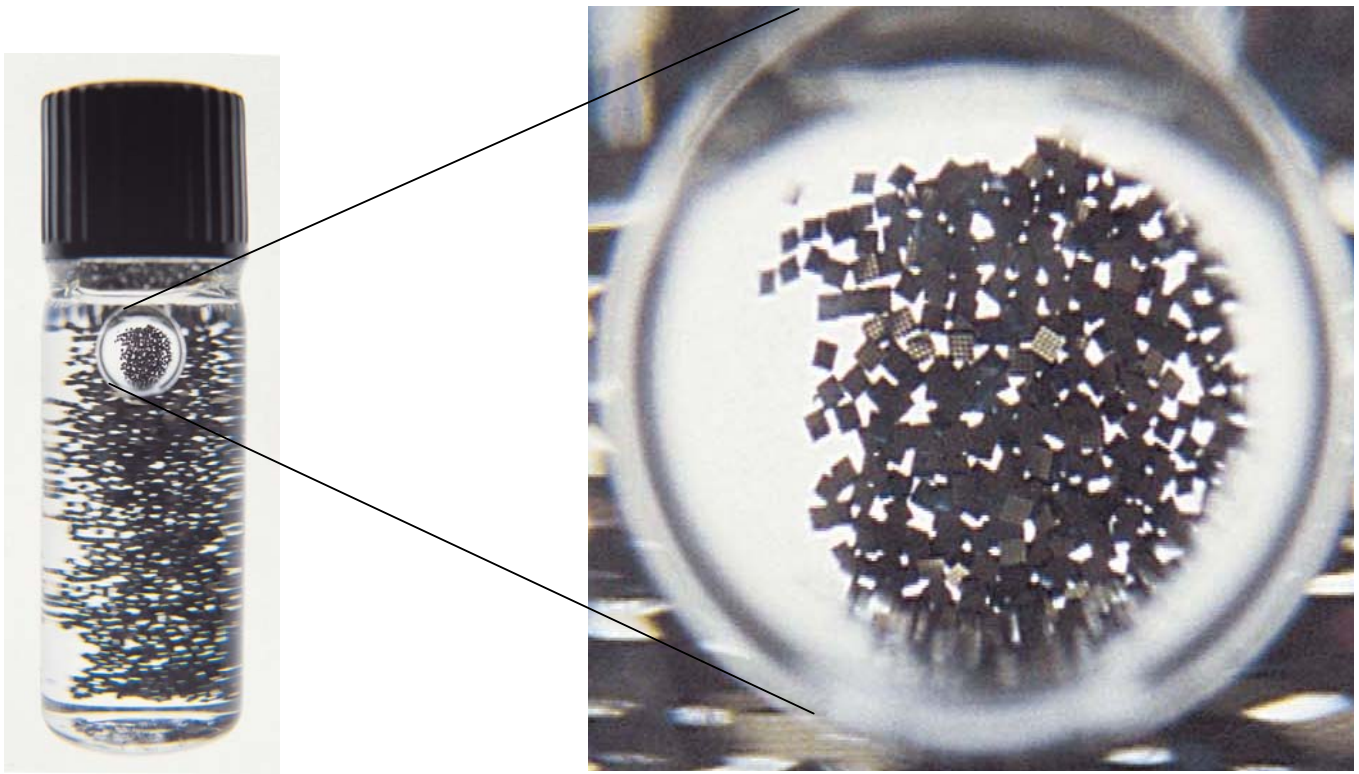
- laws and regulations
- enforcement agencies
- consumer information
- Technology measures

Agenda

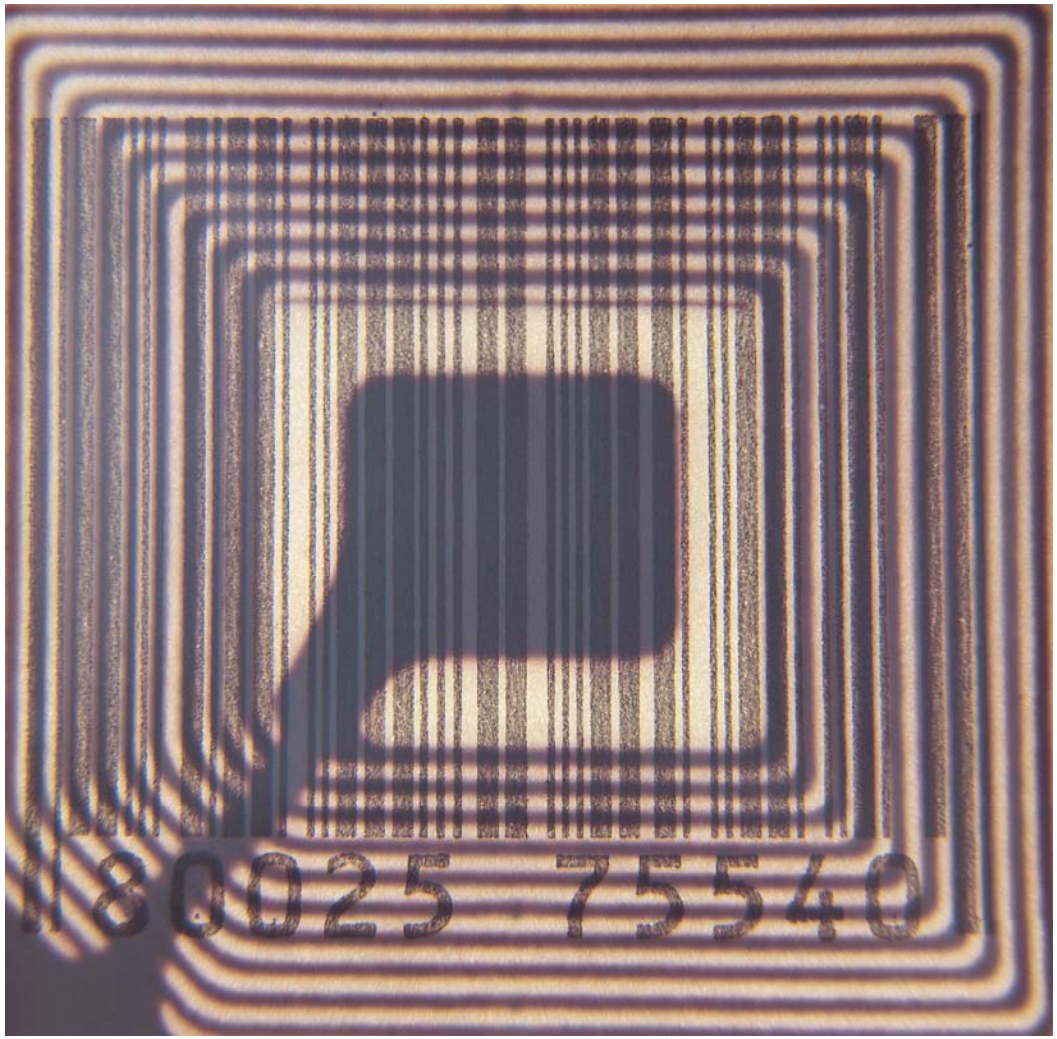
Approach:

- The Vision of Ubiquitous Computing
- The Electronic Product Code
- A Plausibility Check: Track & Trace
- The Goal: Secure Product Authentication

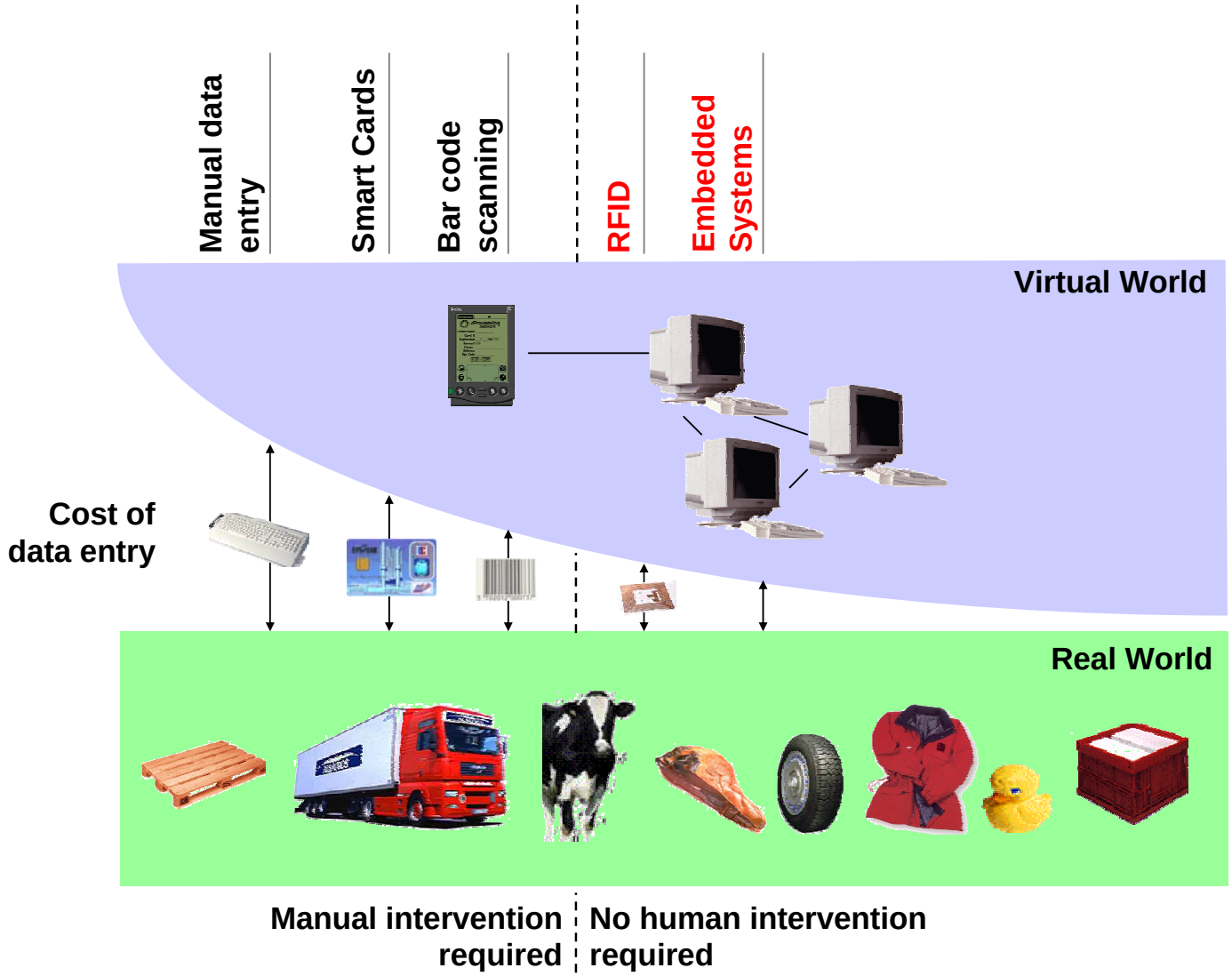
Ubiquitous Computing: Low cost minicomputers ...



... with mobile communication capabilities...



… finally close the media gap.



The lack of integration between the real and the virtual world is responsible for many problems

- Out-of-stock
  - Average OOS level in retail industry: 8.3%
  - Average OOS level in direct store delivery product categories in US: 7.4%
- Shrinkage
  - Average shrinkage rate for supermarkets/grocery in US: 1.5% of sales
- Unsaleable products
  - Cost of unsaleable food and grocery products in US: 1% of sales
- Counterfeiting and illicit trade
  - Up to 7 % of world trade is in counterfeit goods
- Data inaccuracy
  - Mean difference between physical and book inventory in a single case study: 6.8 units per SKU or on average 35% of target inventory

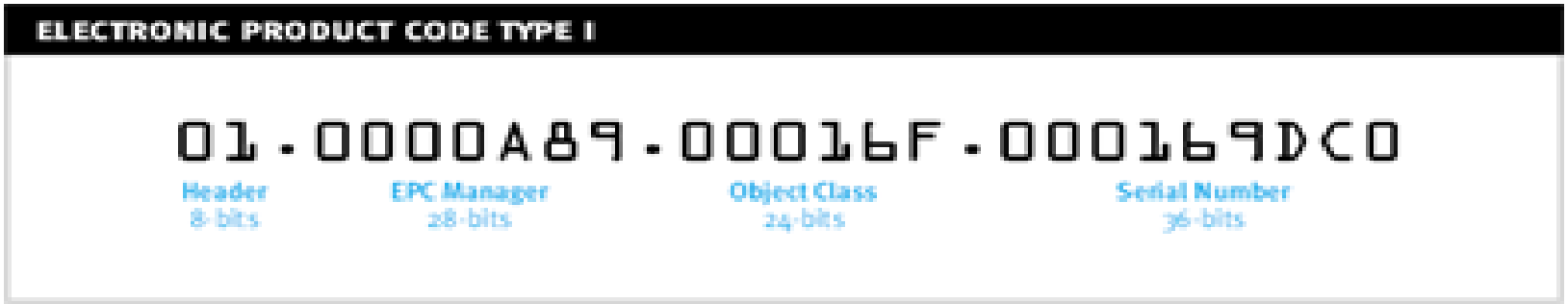
Source: C. Tellkamp, E. Fleisch, Auto-ID Lab St. Gallen

Automatically connecting objects around the world is a vision of many powerful player.

- Gillette
- Wal-Mart
- P&G
- Unilever
- Kraft
- Philip Morris
- Nestle
- Best Buy
- DoD
- Tesco
- Home Depot
- CVS
- Sun
- Philips
- Intel
- ST Micro
- Canon
- Alien
- BT
- NTT
- Metro
- Mitsui
- Pfizer
- Sara Lee
- USPS
- UPS
- DoD
- UCC/EAN
- Accenture
- IBM
- Coca-Cola
- Pepsi
- Kodak
- NCR
- SAP
- Symbol

Over 100 in total!

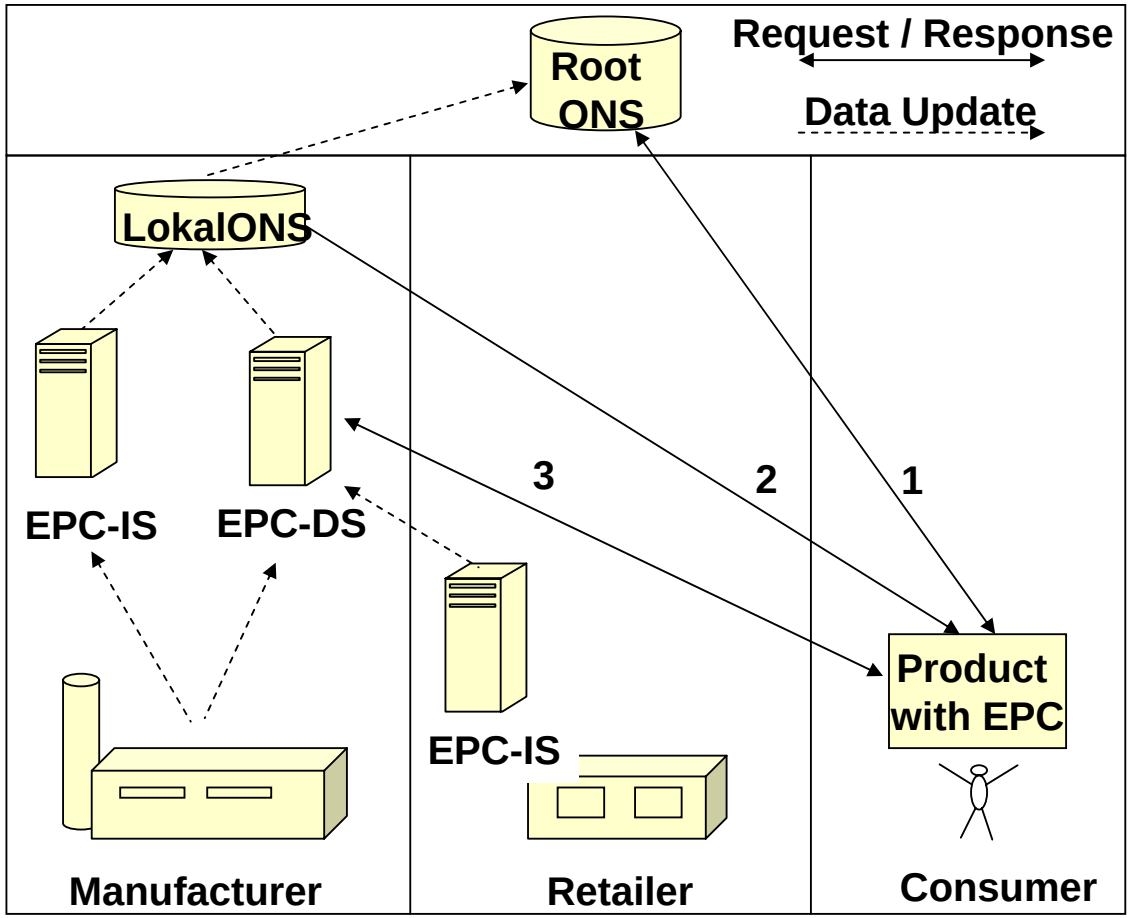
The Electronic Product Code:
So, we started to number the world …



- RFID and the EPC make efficient track & trace possible
- Track & trace information allows to assemble a products' history
- Automated tests lead to low costs
- Plausibility checks can be performed frequently
  - by the state authorities
  - by companies
  - by customers
- Higher visibility of products reduces theft and smuggle
- More efficient product recalls become possible
- It becomes easier to spot where illicit goods enter a supply chain

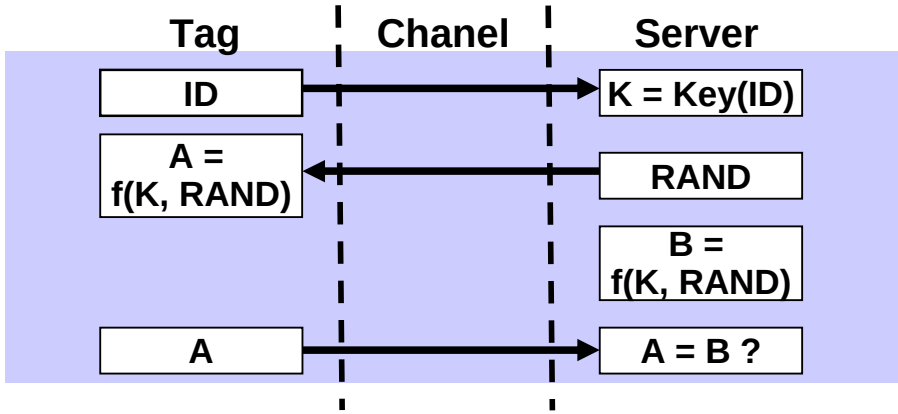
RFID for Track & Trace – IT Overview

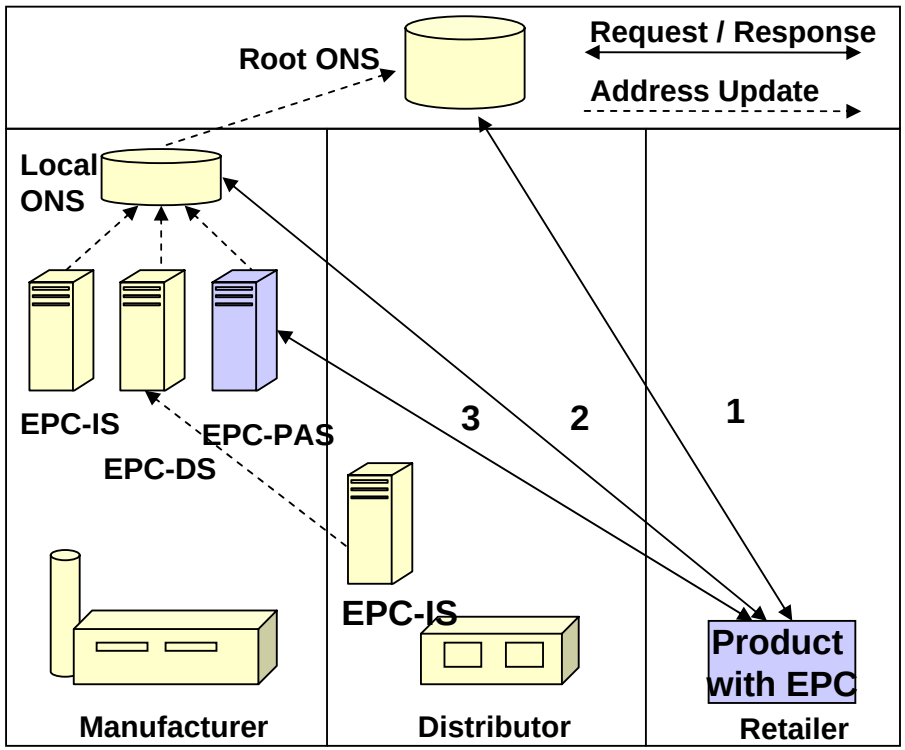
- Companies record e.g. time of purchase / sale in a central database
- The EPC Tag references this database
- Infrastructure to resolve the database address works similar to the internet
- Standardization becomes necessary
- Problems occur when simple RFID Tags are duplicated



RFID Tags with Secure Authentication

- Challenge-response authentication is well established today
- The channel does not need to be secure
- The EPC Network forms the IT infrastructure
- The EPC Network only has to be extended by an authentication server (EPC-PAS)
- The communication infrastructure does not have to be updated





The Two Solutions Based on RFID

Cost to break a feature >> Financial gain or possible harm due to a counterfeit within the products lifetime

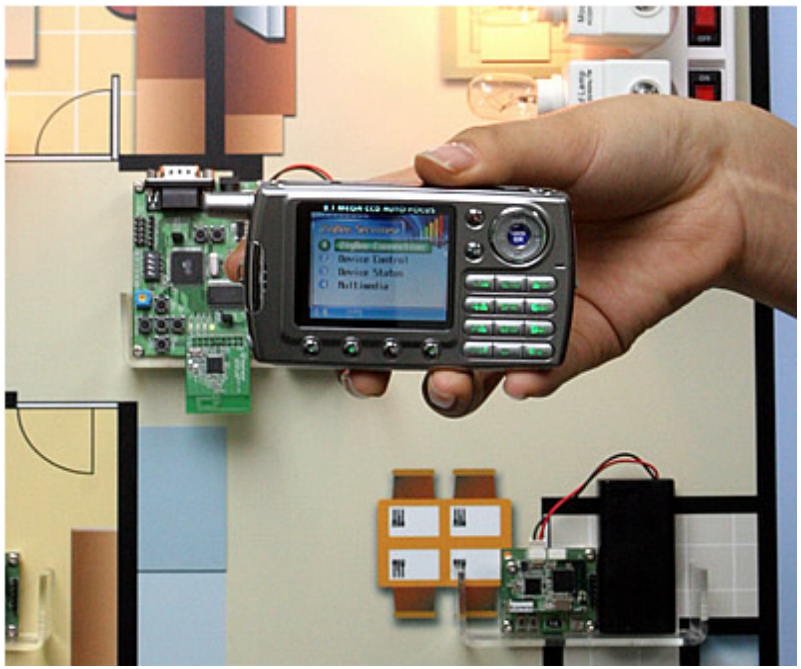
1. **Simple EPC tags**
   - Fine grained track & trace information allows to assemble a products' history
   - Plausibility checks via track & trace
   - Automated tests at low costs
   - Higher visibility of products reduces theft
   - Cloning simple EPC tags is possible
   - Track & trace databases have to be updated by all owners

2. **RFID tags with secure authentication**
   - Prevent cloning attacks
   - Higher cost per tag
   - Provide efficient measures against counterfeiting and piracy
   - Also works when intermediate parties do not update a track & trace database
   - The technology is established in many contactless smart cards
   - Required for highly security goods such as aircraft parts

One infrastructure for various levels of security!

Integrating the User

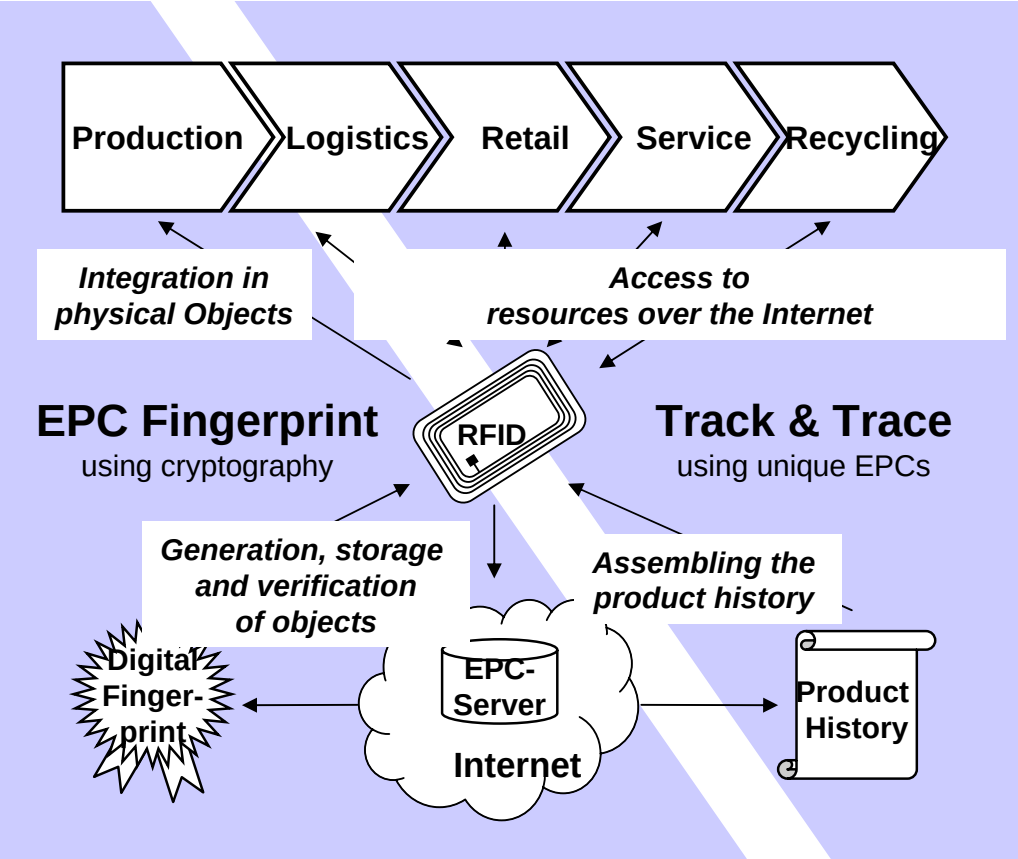
- Near field communication devices and RFID readers are currently implemented in mobile phones
- The consumer may want to check the products himself
- We developed a very rudimentary demonstrator to show some key functionalities



Summary – Ubiquitous Computing and Illicit Trade

- UbiComp technologies and RFID connects the real and the virtual world
- The EPC and the EPC-Infrastructure make the supply chain more transparent and secure
- Powerful organizations drive the adoption of the EPC
- In the future, products can authenticate themselves to the user, helping to fight counterfeits, product piracy, and smuggle

EPC Fingerprint and Tack & Trace



Thank You very much.

Contact:

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Identify Any Object Anywhere Automatically

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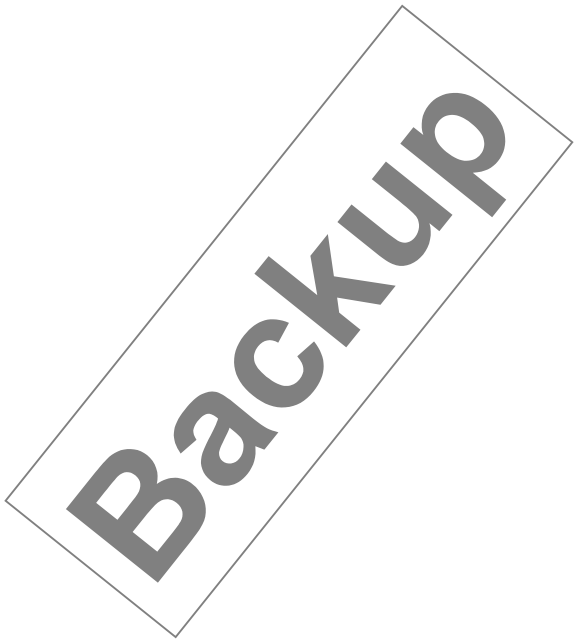
Backup



Research Questions

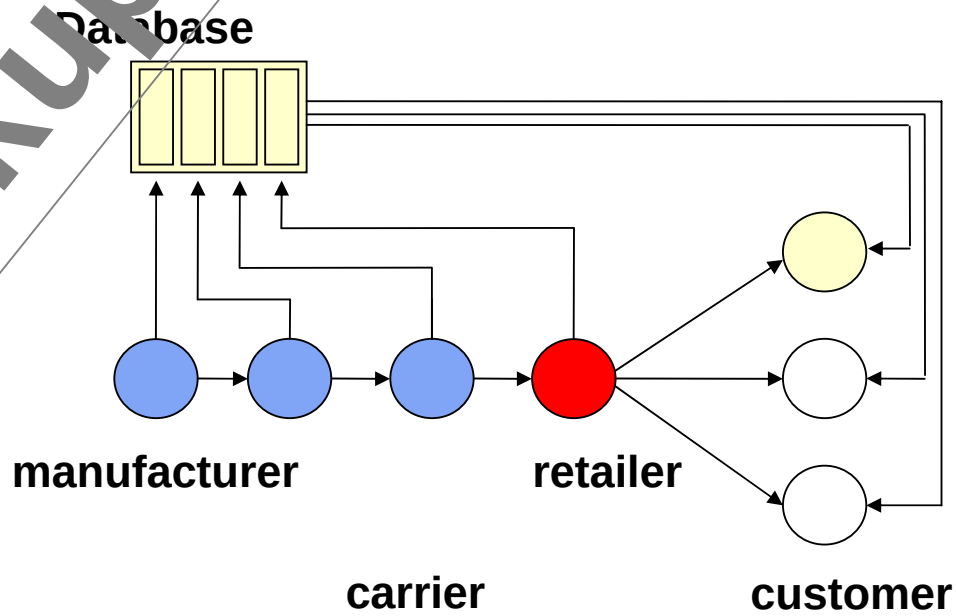
- Business related questions
  - Determine the cost due to a single counterfeit
  - Quantification of the impact of counterfeits on goodwill / brand name
  - Analyze user demand
  - Impact on trust
  - Impact on processes
- Hardware
  - Low-cost tags with security features
  - Scalability
- Software
  - Database access rights in a non-predetermined supply chain
  - Heuristics to transform the product history in a counterfeit test
  - Analyze attack scenarios of a track & trace infrastructure
  - Key-management
  - Scalability

Backup

Problems with Track &Trace

➔ Cloning of simple RFID Tags is possible!

1. A manufacturer registers the sale of a product
2. A carrier looks up if the product history is plausible, buys the product and updates the database
3. A retailer buys the product and registers the purchase
4. The retailer duplicates the tag and attaches it to counterfeits
5. A consumer who wants to buy the product performs a plausibility check, and finds that the product history is plausible.
6. The retailer does not register the sale
7. The retailer can sell counterfeits as long as the consumer does not update the database

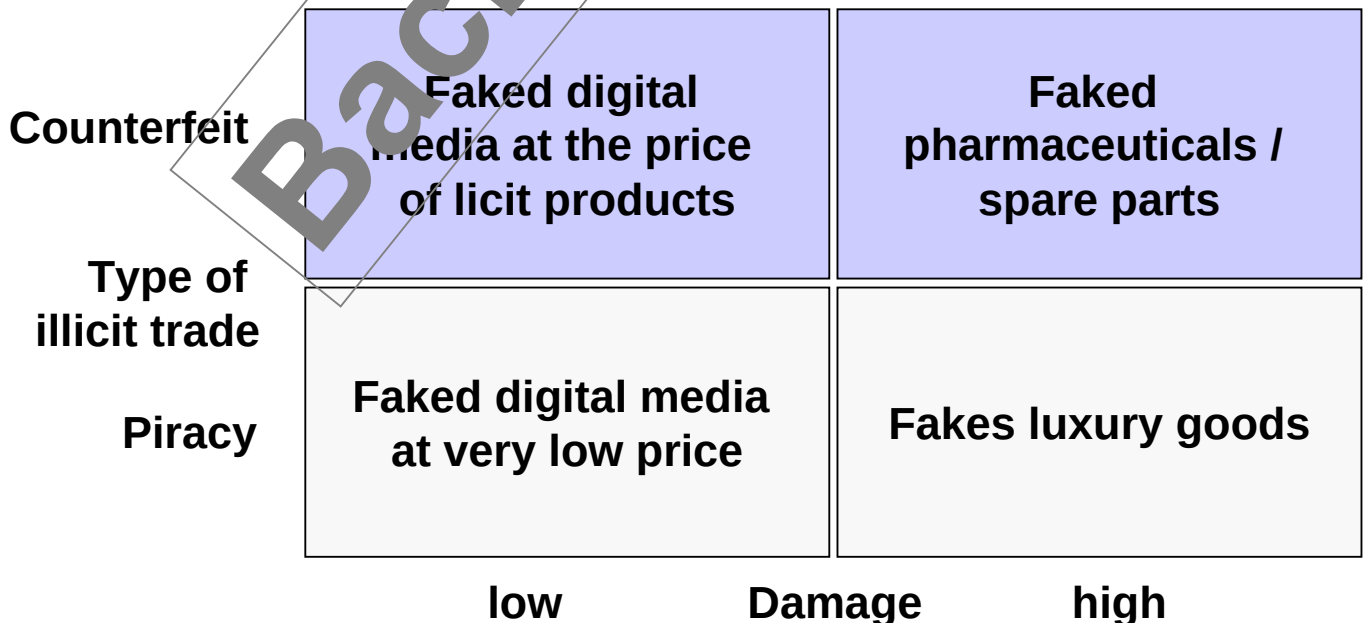


Illicit Trade – Role of the Costumer

- **What roles do consumers have?**
  - Some costumers by goods not knowing that these are counterfeits
  - But: Some costumers accept illicit products!

➔ **Counterfeiting is the production of faked or forged goods, while piracy is the infringement of copyright.**

Apparentness - Damage Matrix



More on the attitude of costumer is available under
http://www.a-cg.com/docs/Why_you_should_care.pdf

The Extend of Counterfeiting and Product Piracy (ii)

- **Care must be taken when using the above mentioned statistics**
  - Who has been asked? Companies? Governments?
  - What numbers do these statistics include? Only counterfeits? Grey markets? Stolen Goods?

- **Determining the financial loss due to illicit trade is difficult**
  - How to determine / estimate the volume of pirated or counterfeited products?
  - How to express this in terms of money?
  - In which way do counterfeits substitute licit products?

Backup

One may question absolute numbers, but the tendency is clear.