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Container Tracking In Multimodal Transport Using Intelligent Transportation Systems

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Multimodal transport defined

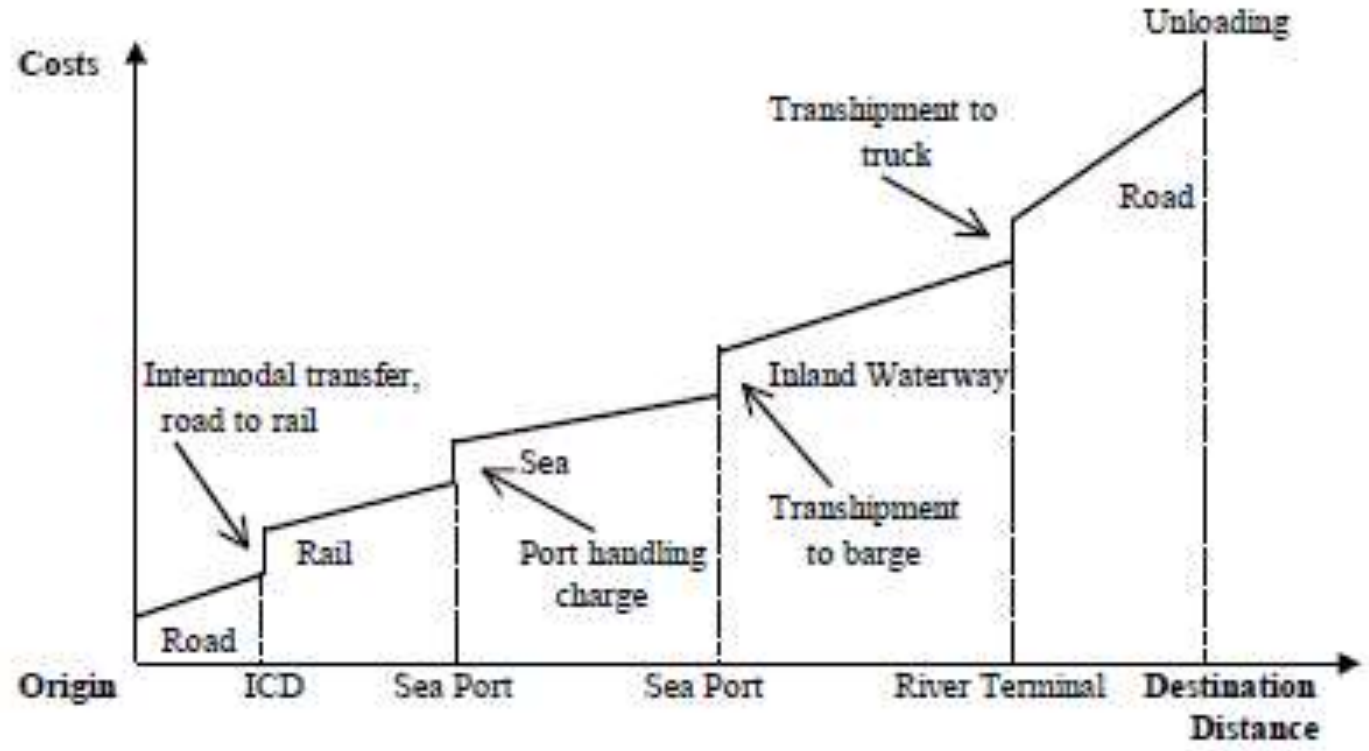
Multimodal transport, as understood by many, refers to a transport system usually operated by one carrier with more than one mode of transport under the control or ownership of one operator. It involves the use of more than one means of transport such as a combination of truck, railcar, airplane or ship in succession to each other e.g. a container line which operates both a ship and a rail system of double stack trains.

Source : Multimodal Transport Operations - UNESCAP -Transport & Tourism Division

Advantages of multimodal transport

- Minimizes time loss at trans-shipment points
- Provides faster transit of goods
- Reduces burden of documentation and formalities
- Saves cost
- Establishes only one agency to deal with
- Reduces cost of exports

Cost-model for multimodal transport



Source : Modelling Freight Logistics: The Vientiane-Singapore Corridor - Banomyong, R.

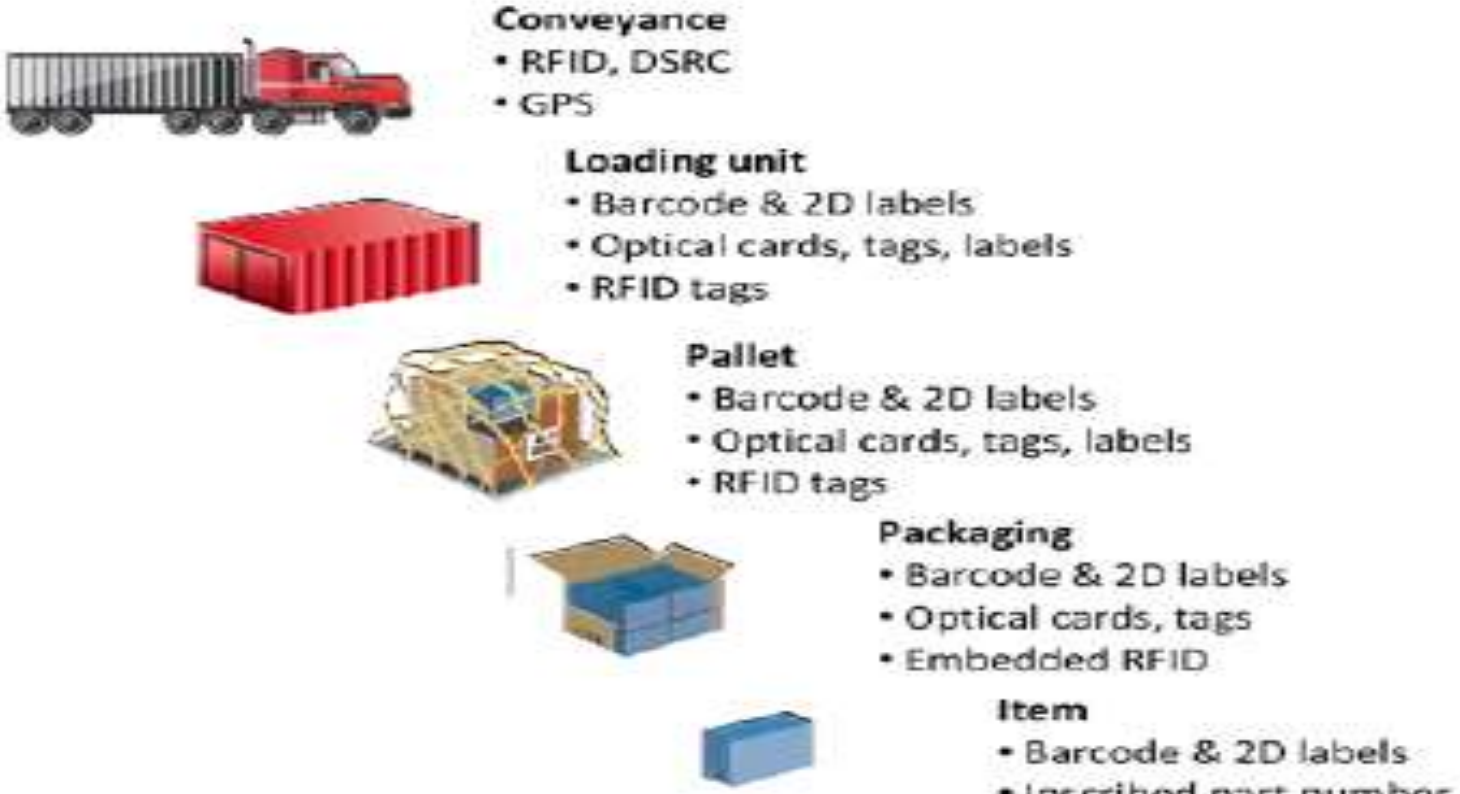
Container “revolution”

Containers are loaded with products at the shipper’s premises and sealed, and then they are carried over to the consignee’s premises intact, without the content being taken out or re-packed en route.

Containerization benefits:

- door-to-door delivery
- speedy intermodal transfers
- low handling costs
- reduced breakage and pilferage
- lower insurance cost

Identifying objects in the multimodal transport



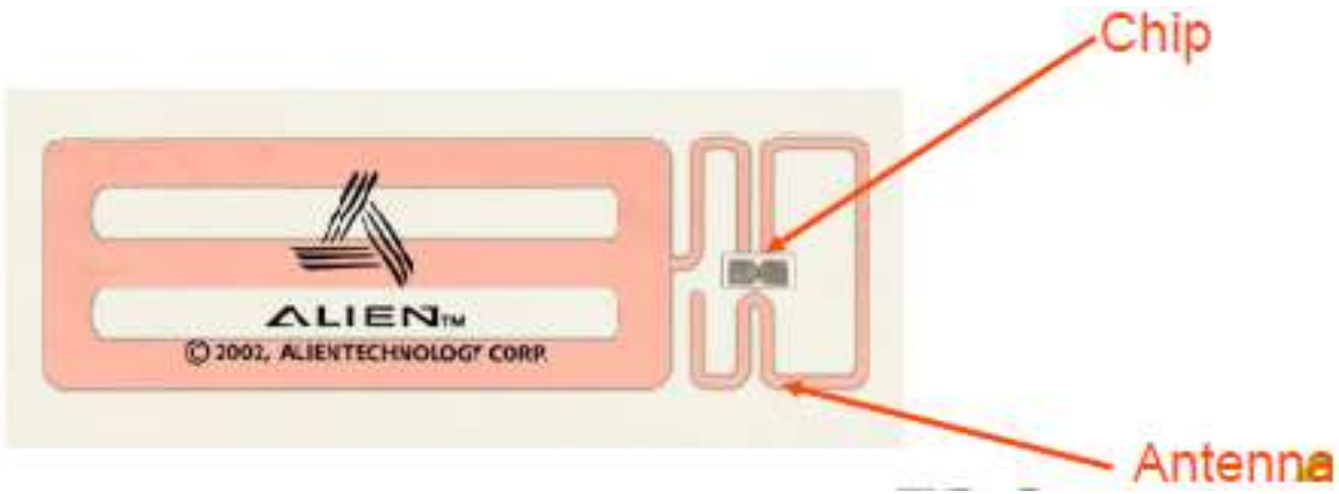
Source: INTERSYS WP1: State-of-the-art RFID

RFID solutions to increase the profitability

- Real-time, supply chain-wide inventory visibility by reading the RFID tags that are incorporated in the merchandise at the manufacturer, supply chain and store levels
- A barrier to the sale and distribution of counterfeit merchandise
- An in-store customer service platform and a high-value, in-store selling tool
- A barrier to the return of stolen merchandise for cash
- An item-level quality control tool to provide enhanced control over suppliers

Radio Frequency Identification – RFID

- Chip + antenna + packaging substrate =Tag
- Readers use radio waves — non line-of- sight technology



Source: RFID & EPC Essentials - Version 01 EPC global

RFID frequency range

Band	Range	Examples of applications	Typical read range
LF	120 – 135 kHz	Animal identification Production monitoring Automation Access control (pallets) Car engine immobilizer	Up to 2m
HF	13.56 MHz	Retail goods Mail and baggage logistics Smart cards Smart labels Access control and security (theft surveillance) Automation	Up to 1m
UHF	433 MHz (active tags) 860-960 MHz	Animal tracking Goods tracking and identification (Item level tracking in factory, Pallet and carton identification)	Up to tens m Up to 5m
Microwave	2.45 - 5.8 GHz	Moving car electronic toll collection Fleet management Tracking/identification of goods Train and carriage identification Container/Package identification Electronic seals	Up to 10m

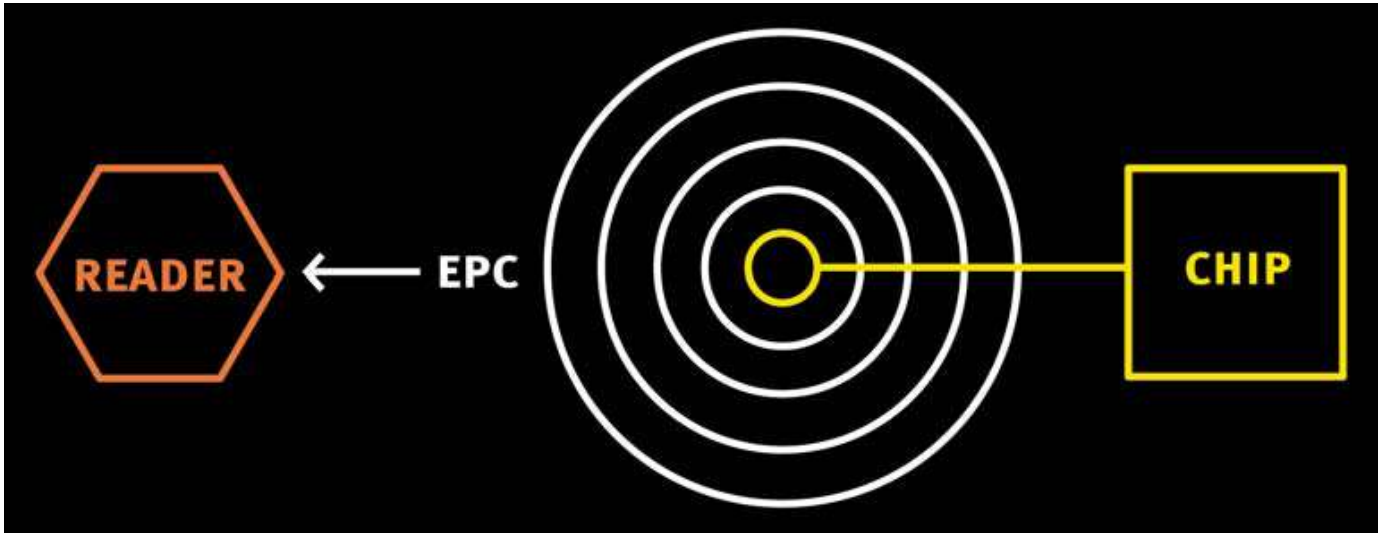
Sorce: INTERSYS WP1: State-of-the-art RFID

RFID/EPC Tags and Readers

The reader ‘zaps’ the chip with a radio wave, the chip replies with its EPC

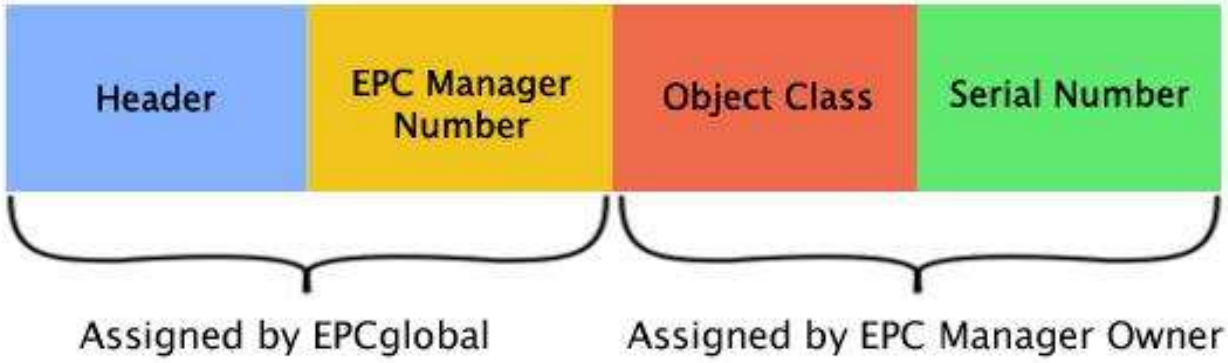
– EPC is the only thing stored on the chip

– The chip is passive (no power)



Source: RFID & EPC Essentials - Version 01 EPC global

EPC Basic Format



Source: http://www.epc-rfid.info/

- Header
  – identifies the length, type, structure, version, and generation of the EPC
- EPC Manager Number
  – entity responsible for maintaining the subsequent partitions
- Object Class
  – identifies a class of objects
- Serial Number
  – identifies the instance

EPC benefits

Improved Product Availability

- EPC helps stores keep better track of inventory so items can be restocked faster
- Products are on the shelf when you want them

Faster Service

- EPC can help you easily find products in the store
- In the future, EPC can help speed check out
- In the future, EPC can allow for faster returns

Quality Assurance

- EPC can help protect you against counterfeit products including medicines, clothing, toys and electronics
- EPC can help make it easier to check how and when products move from manufacture to retail shelf.
- EPC can be used to monitor the freshness of goods with expiration dates
- EPC can provide a faster way to recall defective products.

Tagging in logistics

Tagging:
–Bar code label
–RFID tagging
–Combined

Source: Freight and Logistics Services. Tracking of vehicles and freight based on RFID - Bojan Merlin - EasyWay Annual Forum 2009

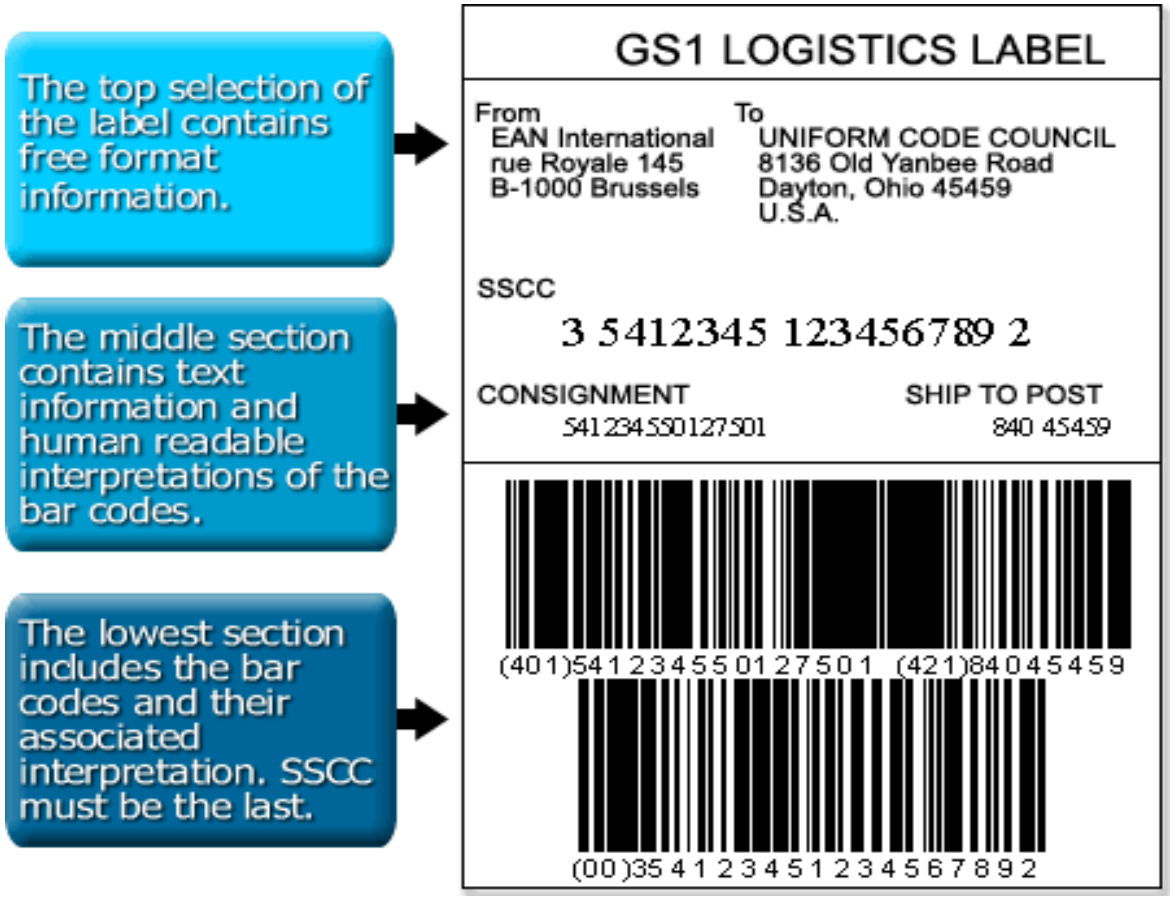
Standard
–GS1 EPC Global

GS1 Identification Keys (ID Keys)

Key Concepts

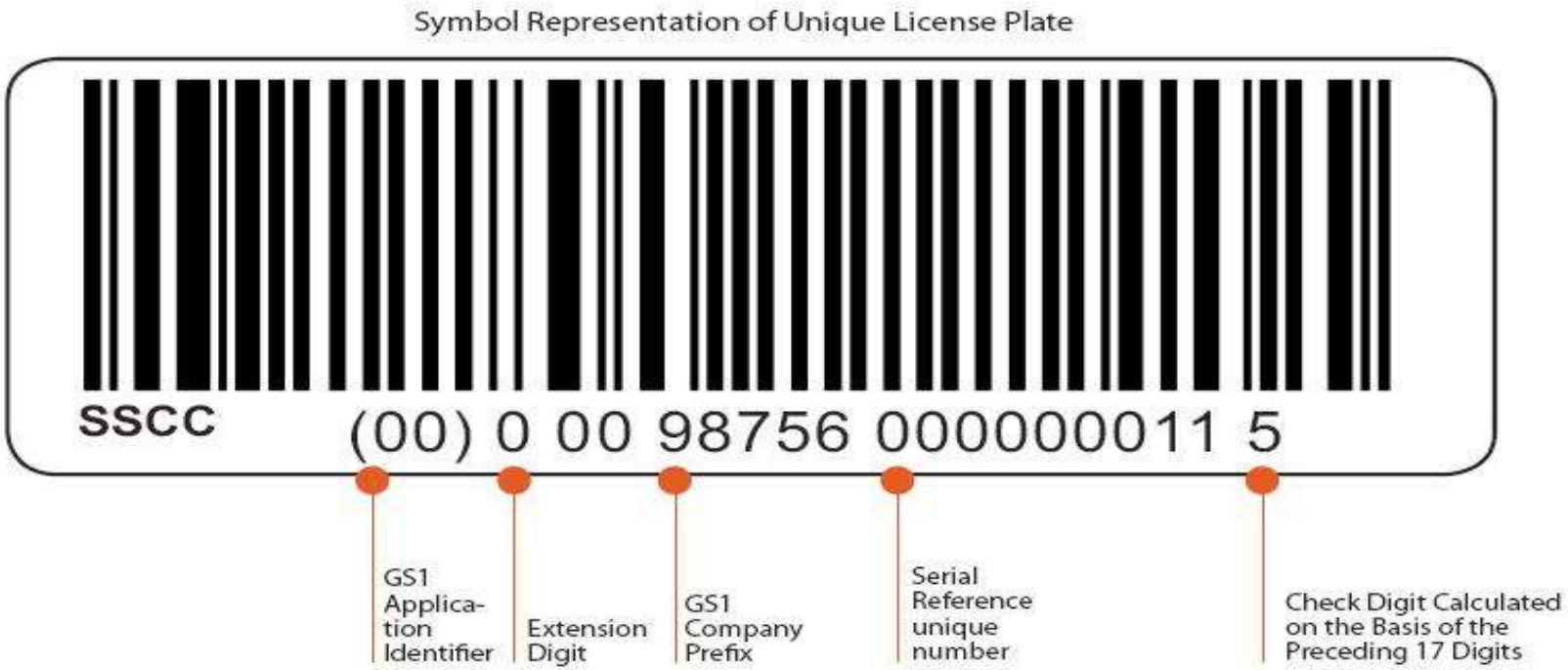
GTIN - Global Trade Item Number
GLN - Global Location Number
SSCC – Serial Shipping Container Code
GRAI – Global Returnable Asset Identifier
GIAI – Global Individual Asset Identifier
GSRN – Global Service Relation Number
GDTI – Global Document Type Identifier

Serial Shipping Container Code (SSCC)



Source: http://dc-mgt.blogspot.ro/

SSCC structure



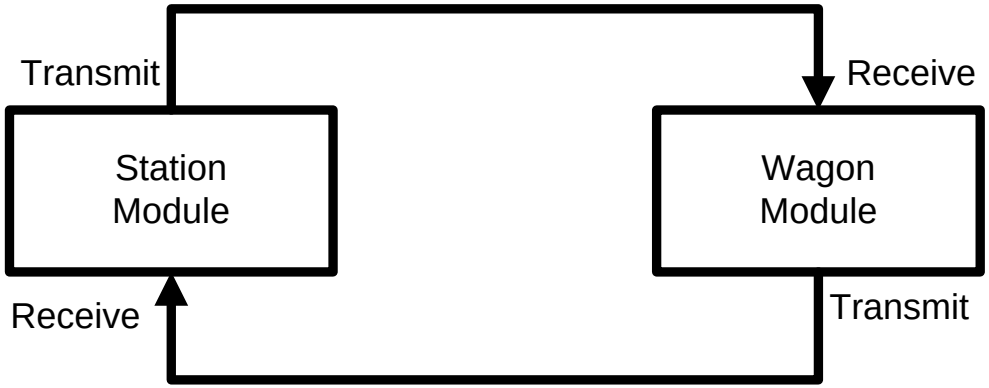
Source: GS1 - Standard International Logistic Label - STILL

System monitoring and management of multimodal freight transport. Case Study

It is a modern, integrated, interactive and intelligent system, being dedicated to the provision of electronic services for multimodal transport of containerized goods at European level and to the monitoring of the container position and integrity.

The most difficult issue was to find a remote automatic identification of vehicles and cargo units, a system that is simultaneously cheap, reliable and requiring minimal monitoring activities on the objects.

Block diagram for the radio monitoring equipment



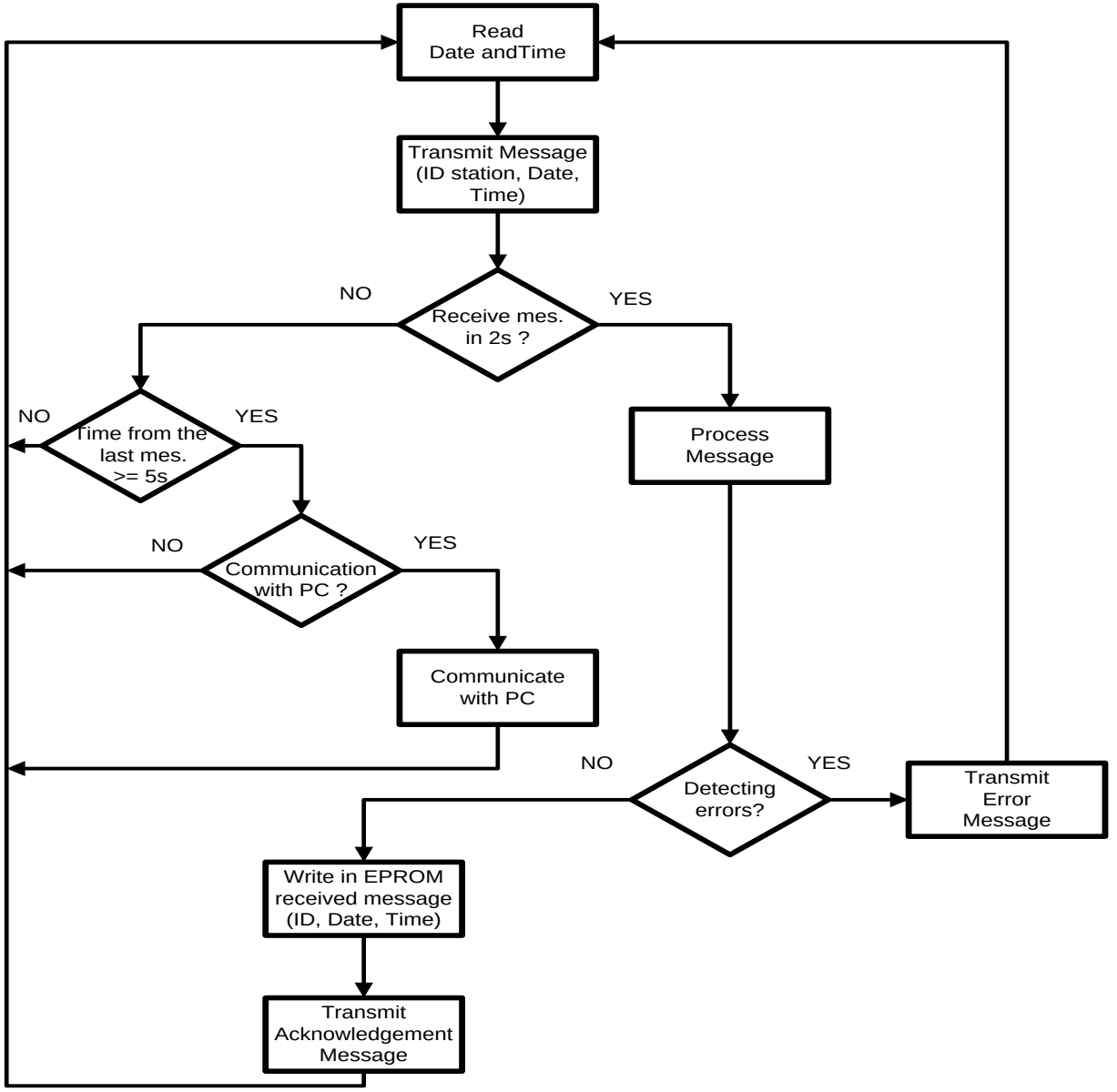
Messages sent by the station are:

- station identifier with date and time
- acknowledgment message sent as a response to those which had been sent by the wagon

The message sent by the wagon is

- wagon identifier

The functional algorithm of the station module



Conclusions

Using the tag gives a total visibility of goods throughout the supply chain, from producer to buyer or user, which would not have been possible using other technologies such as barcodes.

This leads to better management of goods, their situation may be known in real time, it improves security by detecting counterfeit goods and preventing fraud. It can also be prevented congestion and loss or goods created by all the error which exists in the supply chain and also it increases data acquisition speed and quality. All these advantages lead to lower costs and great productivity.

cont . Conclusions

RFID is a very adaptable technology which is easily compatible with other technologies, especially for data transmission using RS232 and TCP-IP interfaces. Nowadays RFID and GSM technologies are working using mobile readers and data transmissions via GSM network.

All of these represent just the beginning of exploiting RFID technologies, not getting at his full potential and its future reveals great and interesting opportunities for economical and logistic fields of science.