

# NEW POSSIBILITIES OF CONSIGNMENTS LABELING IN THE POSTAL SERVICES

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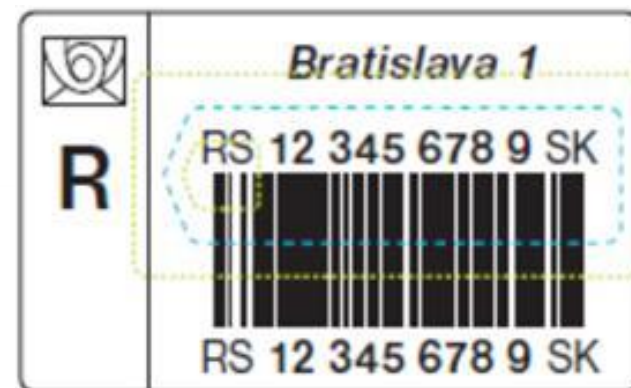
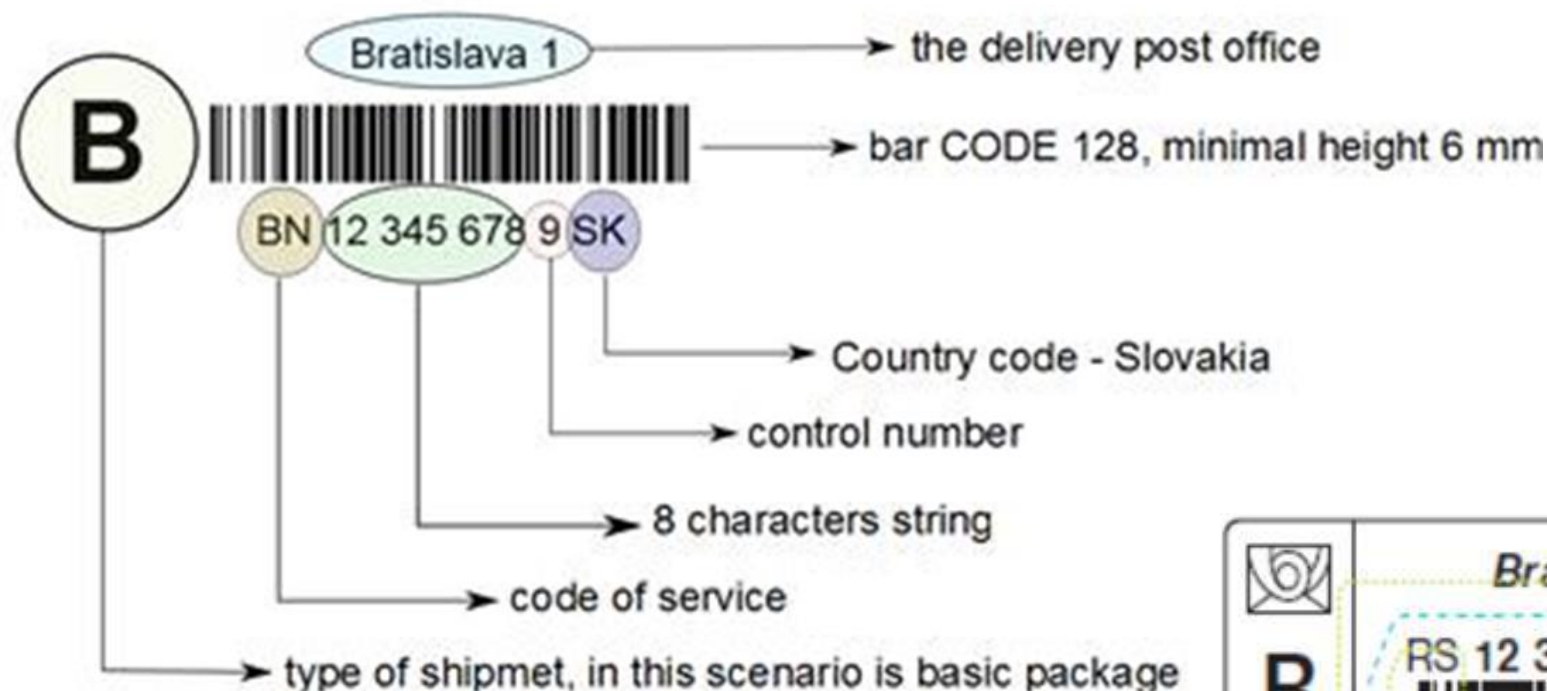
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# Introduction

- Information is currently still the best competitive tool and who controls it before gaining a big advantage.
- Radio Frequency Identification (RFID) and Electronic Product Code (EPC) are technologies, emerging after barcodes for automatic identification products and information sharing between trading partners.

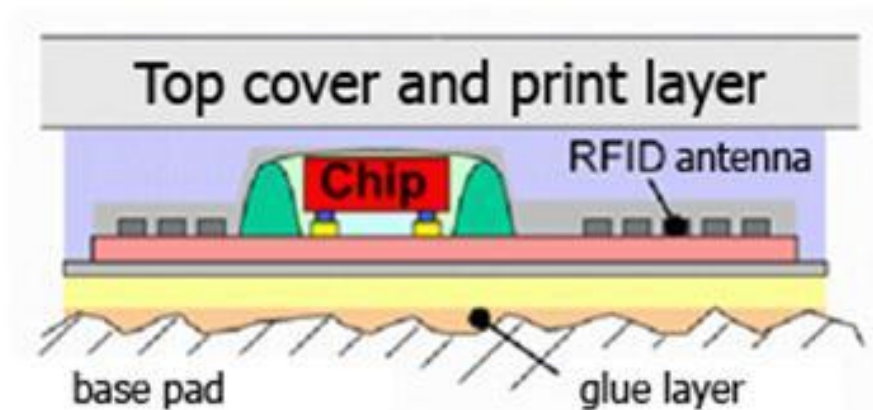
# Current status in Slovak post

- One dimensional bar CODE 128
- 12 alphanumeric characters + control number



# RFID Smart labels

- One of the options to replace current postal system based on one-dimensional bar code is the use of smart labels.
- This is elegant combination of the bar code and identification using RFID.
- The advantage could be the use of two-dimensional bar code with additional information readable for humans or optical readers on top layer.



# Electronic Product Code (EPC)

- EPC codes, created on the basis of existing standards may be used throughout the supply-demand chain, from producer to consumer.
- Mail can also be used such EPC codes in their activity.
- The data encoded in the tag memory will be scanned EPC sensors. EPC sensor will be placed at strategic points in the supply chains in order to track the movement of goods in the chain.

# Memory Organization of Gen 2 RFID Tags

RFID Tags, particularly Gen 2 RFID Tags, may carry data of **three** different kinds:

- **Business Data**
- **Control Information**
- **Tag Manufacture Information**

# Business Data

- Information that **describes** the **physical object** to which the tag is affixed.
- This information includes the Electronic Product Code (EPC) that **uniquely** identifies the physical **object**, and may also include other data elements carried on the tag
- This information is what business applications act upon, and so this data **is** commonly **transferred** between the data capture level and the business application level in a typical implementation architecture.
- Most standardized business data on an RFID tag is **equivalent** to business data that may be found in other data carriers, such as **bar codes**.

# Control Information

- Information that is used by data capture applications to help control the process of interacting with tags.
- Control Information includes data that **helps a capturing** application filter out tags from large populations to increase read efficiency, special **handling information** that affects the behavior of capturing application, information that **controls** tag **security** features, and so on.
- Control Information is typically ***not passed directly to business applications, though may influence how a capturing application presents business data to the business application level.***
- *Unlike Business Data, Control Information has **no equivalent in bar codes** or other data carriers.*



# Manufacture Information TID

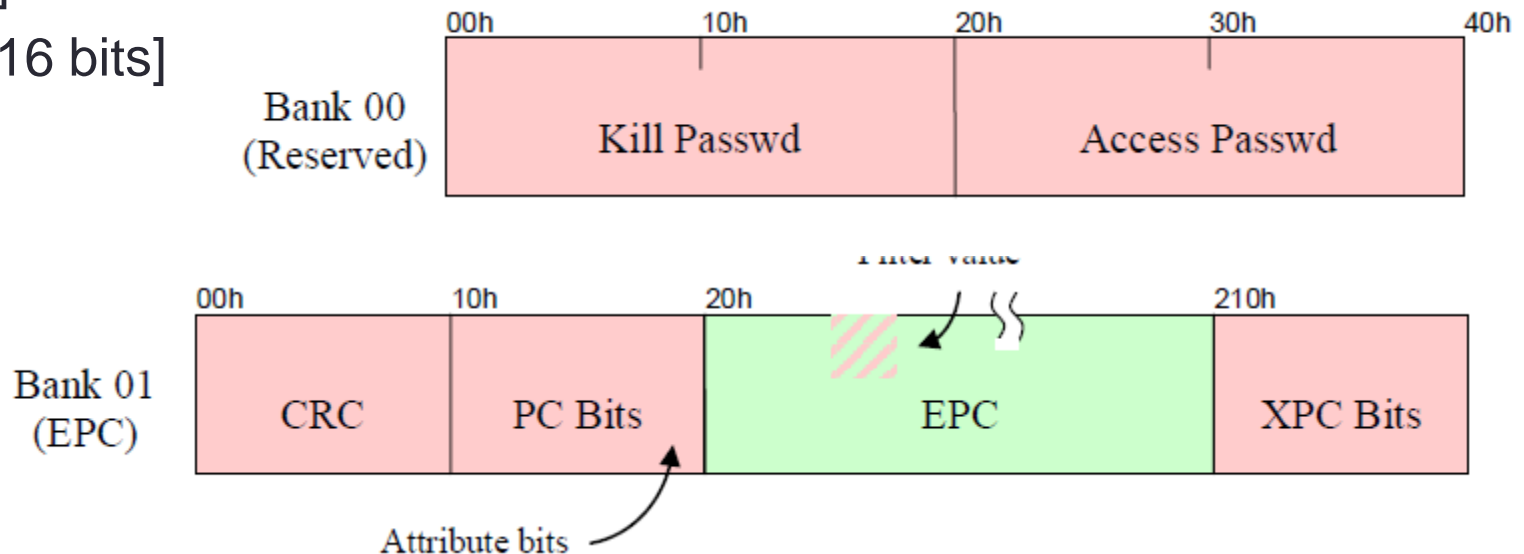
- Information that describes the **Tag itself**, as opposed to the physical object to which the tag is affixed.
- includes a **manufacturer ID** and a **code** that indicates the **tag model**.
- It **may also include** information that describes tag **capabilities**, as well as a **unique serial number** assigned at manufacture time.
- Usually is like Control Information in that it is used by capture applications but **not directly passed** to business applications.
- In some applications, the **unique serial number** that may be a part of Tag Manufacture Information is used in addition to the EPC, and so acts like Business Data.
- Like Control Information, has **no equivalent** in **bar codes** or other data carriers.

# Gen 2 Tag Memory Map

- Binary data structures defined in the Tag Data Standard are intended for use in RFID Tags, particularly in UHF Class 1 Gen 2 Tags
- Specifically, it **specifies** that memory in these tags consists of **four** separately addressable banks, numbered 00, 01, 10, and 11.

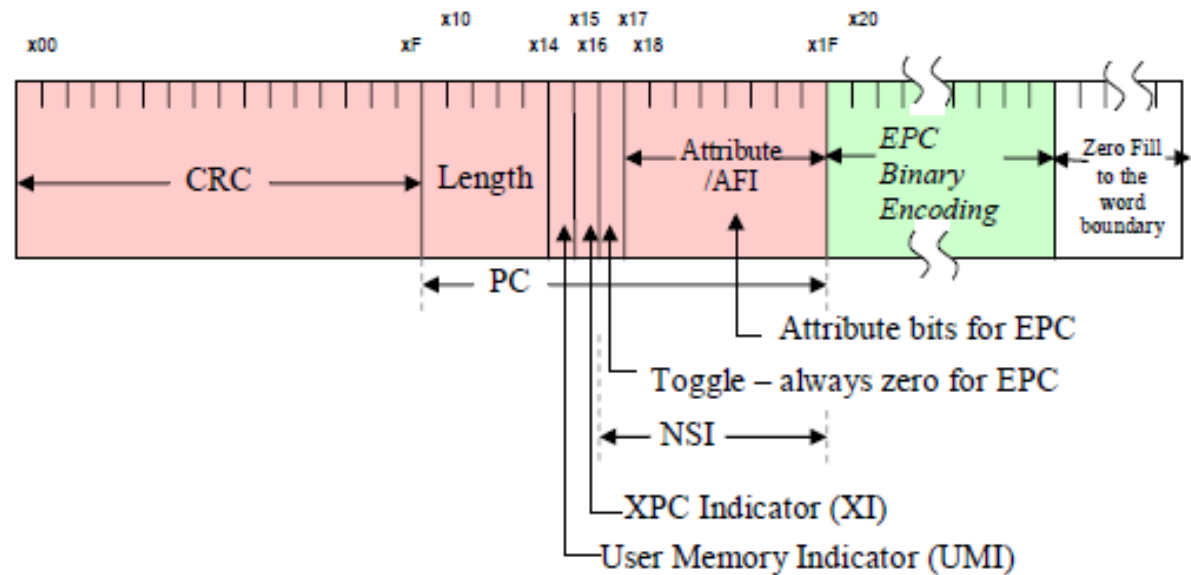
# Bank 00 and 01

- bank **00**
  - **access** password [32] , **kill** password [32]
- bank **01**
  - CRC [16 bits]
  - **PC bits** [32 bits]
  - EPC [] + filter
  - XPC [16 bits]



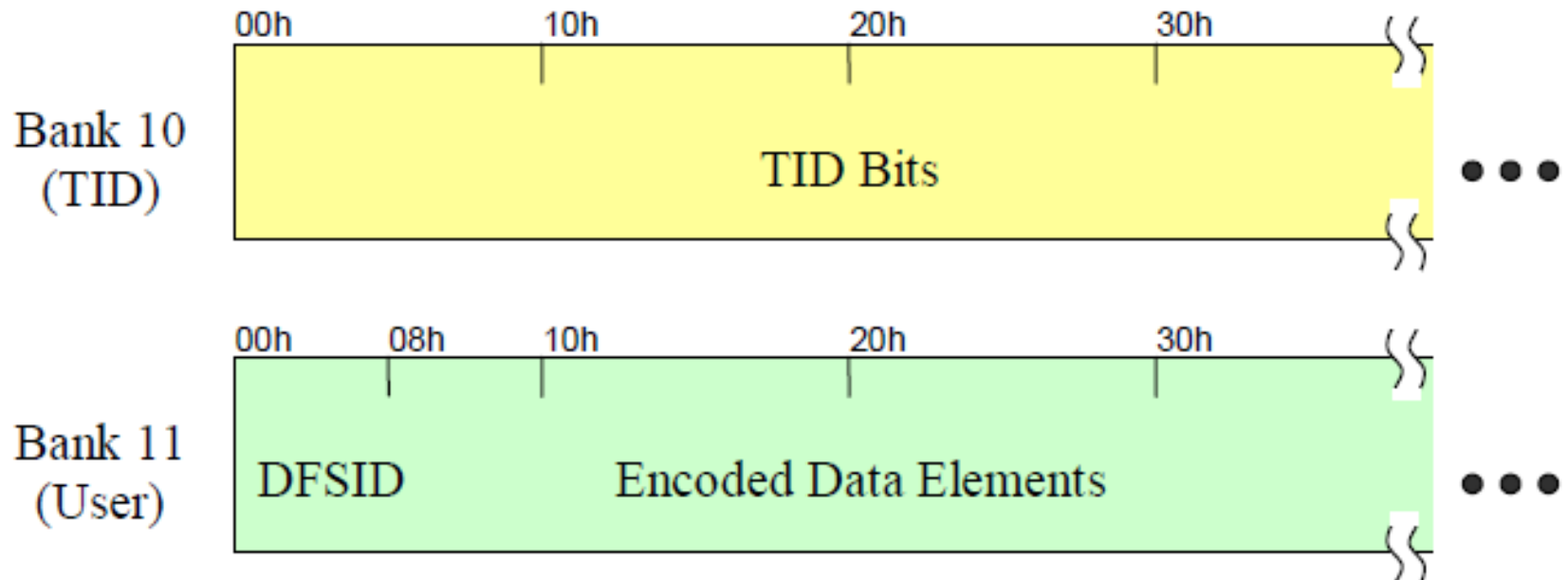
# PC bits

- length [5 bits]
- UMI – user mem indicator [1 bit **0/1**]
- XI XPC indicator [1 bit **0/1**]
- EPC toggle [1 bit **0**] if **1** -> **AFI**
- **AFI** application family indicator



# Bank 10 and 11

- bank **10 TID** (manufacturer ... )
- bank **11 USER**



# EPC headers

define

- 0000 0000 – 00h – unprogrammed tag
- 0000 1000 - 08h SSCC 64
- 0000 1001 - 09h SGLN 64
- 0000 101x - 0Ah, 0Bh - GRAI64
- 0010 1100 - 2Ch - GDTI 96
- 0010 1101 - 2Dh - GSRN 96
- **0011 0000 - 30h - SGTIN 96**
- 0011 1011 - 3Ah - ADI variable
-

# Binary headers

- The general structure of an EPC Binary Encoding as used on a tag is as a string of bits (i.e., a binary representation), consisting of a fixed length, 8 bit, header followed by a series of fields whose overall length, structure, and function are determined by the header value

# “Partition Table” Encoding

- The Partition Table encoding method is used for a segment that appears in the URI as a pair of variable-length numeric fields separated by a dot (“.”) character, and in the binary encoding as a 3-bit “partition” field followed by two variable length binary integers.
- The number of characters in the two URI fields always totals to a constant number of characters, and the number of bits in the binary encoding likewise totals to a constant number of bits
- usually define **company prefix** and **components prefix**
- **company.**



# SSCC coding

- 8 bit – **EPC Header** (00110001 30h, 31h)
- 3 bit – **filter**
- 3 bit – **partition**
- **company prefix** M
- **item references** L

partition define ratio between [length of] M and L

- 0 – M:40 L:18 -> digit M:12 L:5
- 1 – M:37 L:21 -> digit M:11 L:6
- 2 – M:34 L:24 -> digit M:10 L:7
- 3 – M:30 L:28 -> digit M:9 L:8
- 4 – M:27 L:31 -> digit M:8 L:9
- 5 – M:24 L:24 -> digit M:7 L:10
- 6 – M:20 L:38 -> digit M:6 L:11

# SGTIN Coding tables

<b>Scheme</b>	SGTIN-96					
<b>URI Template</b>	urn:epc:tag:sgtin-96: <i>F.C.I.S</i>					
<b>Total Bits</b>	96					
<b>Logical Segment</b>	EPC Header	Filter	Partition	GS1 Company Prefix (*)	Indicator (**) / Item Reference	Serial
<b>Logical Segment Bit Count</b>	8	3	3	20-40	24-4	38
<b>Coding Segment</b>	EPC Header	Filter	GTIN			Serial
<b>URI portion</b>		<i>F</i>	<i>C.I</i>			<i>S</i>
<b>Coding Segment Bit Count</b>	8	3	47			38
<b>Bit Position</b>	$b_{95}b_{94}...b_{88}$	$b_{87}b_{86}b_{85}$	$b_{84}b_{83}...b_{38}$			$b_{37}b_{36}...b_0$
<b>Coding Method</b>	00110000	Integer	Partition Table 17			Integer

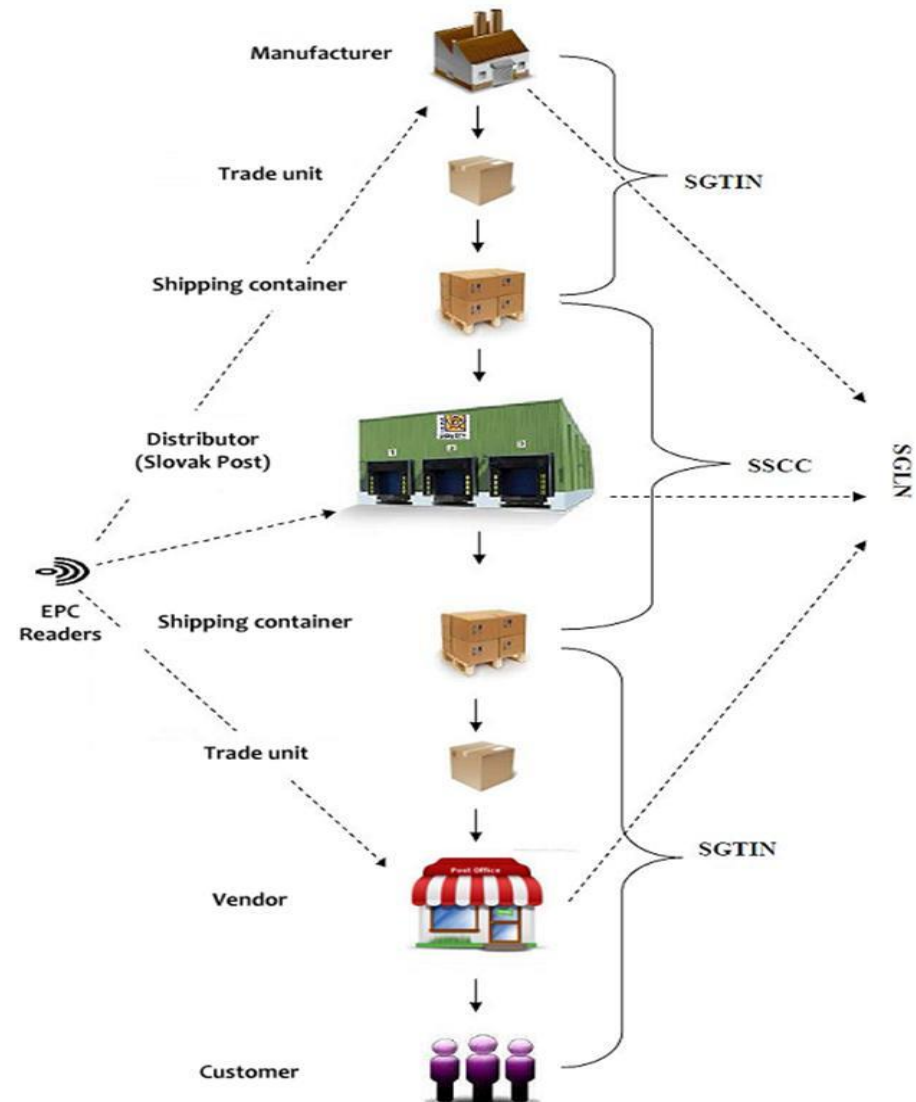
Partition Value ( <i>P</i> )	GS1 Company Prefix		Indicator/Pad Digit and Item Reference	
	Bits ( <i>M</i> )	Digits ( <i>L</i> )	Bits ( <i>N</i> )	Digits
0	40	12	4	1
1	37	11	7	2
2	34	10	10	3
3	30	9	14	4
4	27	8	17	5
5	24	7	20	6
6	20	6	24	7

00110000 010 001 1111000011110000111100001111000011110 1111001 10

EPC example binary form- 96 bits length

## Use of EPC codes in the mail and logistics

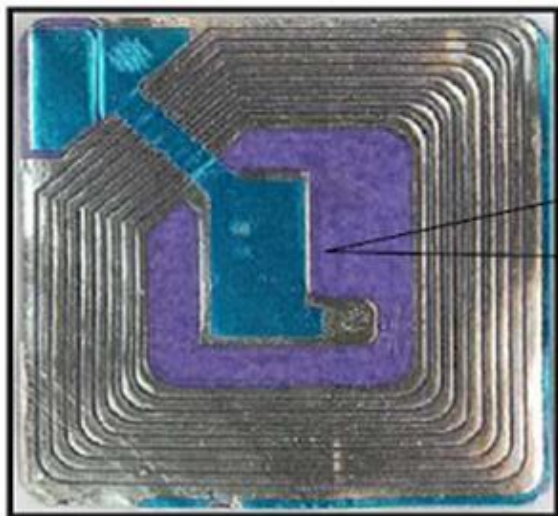
- EPC scheme used in this case:
  - ❖ SGLN to uniquely identify physical locations, specific place,
  - ❖ SGTIN to uniquely identify a specific type of product,
  - ❖ SSCC to uniquely identify logistic units.



# Possible data structure stored into RFID tag

- EPC structure:
- Head- defines type of EPC code. For each type of EPC is different 8 bit combination.
- EPC manager number. Prefix of company and assigned number from GS1 – GS1 company prefix
- Type of item- Type of product, not unique product but group of products (yogurt, milk or in our case shipment, package)
- Serial number- This number refers to certain product, you may find additional information about the product- final destination of package (country or information for final sorting), type of service, insurance of shipment etc

### Smart label



001100010101010101100  
 00010011010111100100001  
 01001010000101001011011  
 010000000000000000000000  
 0000

Adresné HSS:  
HSS Žilina 022

Date: 11.01.2013

weight: 25 kg  
number  
of units: 20

**FRAGILE**

(00)256385752340123787

(00)256385752340123787



### RFID middleware

### Analytical system

Information System

Id	EPC Uni	Hmotnosť v kg	Počet kusov	Adresné HSS
1	urn:epc:id:ssoc:111111.211111111111	36	12	HSS Žilina 022
2	urn:epc:id:ssoc:5638575.2234012378	25	20	HSS Žilina 022
3	urn:epc:id:ssoc:0718908562.0723189	44	80	HSS Košice 022

### database



Information System

Id uni	Hmotnosť v kg	Počet kusov	adresne_HSS
1	36	12	HSS Žilina 022
2	25	20	HSS Žilina 022
3	44	80	HSS Košice 022

# Conclusion

- The added value comes by the very RFID technology that allows you to capture traffic units without direct optical visibility
- EPC code can contain more information than current one dimensional bar code
- The problem with using EPC codes in the mail may be in the absence of headers for operators. At present, the header does not exist for operators.
- Mail would need to have a strong "lobbying" as if it were a difficult approval process and creating standard for operators.

Thank You