Draft Paper for WG8 TF3

Proposal for Code Structure Reference Model and Dependent Sub-Models for Anti-collision Methods in the Multiple Identification of Grouped RFID Tags and Contactless Cards

by
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Introduction

Sales literature and published patent specifications provide a confusing mass of detail on the operating principles of anti-collision methods used in Contactless cards RFID tag products or designs for reading from or writing to grouped Transponders without physical singulation.

As a guide to understanding a hierarchy of reference models can be defined. These can describe the actions of the key components of the Interrogator and a group of Transponders operating within its sphere of influence (Activation Zone). Selective addressing is also covered.

The models operate conceptually at various layers in a simplification of the OSI 7 layer model for distributed computer communications systems. At its simplest a 3 layer model suffices for RFID tag and contactless card systems. Layer 3 covers the Applications Interface for batch collection of source data from, and dissemination to, the grouped Transponders.

Layer 2 is the Link Layer between the Transponders and the Interrogator sending messages (commands and data) to or receiving them from the local population (p) of Transponders in the Activation Zone.

Layer 1 deals with the connection medium (radio or induction).

In descending order layer-wise the reference models proposed as necessary and sufficient are:-
Code Structure Model for logical operations in controlling Batch Processing (i.e. Reading from and writing to the local population (p).
A Slot Timing Model (STM) to describe the Interrogator's protocol signalling and power transfer activities in a manner independent of operating frequency.
Channel Encoding Model (CEM) covering the Layer 2/1 interface.
Modulation/demodulation model covering Layer 1 activity.

The rest of this note concentrates on the Code Structure Model for multiple identification at the top of the hierarchy (a) above. The name proposed for the model is the acronym RAND.

The RAND Code Structure Model

RAND consists of three numbers R, AN and D. Their definitions are :-

R= Recognition Number i.e. the id code of a specific transponder. It is "unique" to that physical piece of hardware. It is normally permanently engraved in the transponder's memory chip. However, this is not necessarily the case. A temporary R value may be provided.

AN = Application Number i.e. the code number of the tagged object (sometimes a serial number but a category "Article Number" is also allowed). AN can be non-unique. Identifying "n" AN of the same value in a batch gives a direct count of the number of objects n in the category in a local population p.

D = All other Application Data used to describe the attributes of the tagged object AN.

Operation of the RAND Model

The Interrogator and the individual Transponders signal between one another for a period of time sufficient to enable the Interrogator to search the code space of R to determine which p transponders are present out of a possible population of P. Once a particular Transponder and the Interrogator are linked in one-to-one correspondence the AN Identity code of the tagged object is read and any source data exchange (transactions) between the Transponder and Interrogator can take place as required by the application.

Application Considerations

For most applications speed is required. There is a preference for anti-collision methods which offer very short average time to initiate and terminate the one-to-one link. Since power is always at a premium energy efficiency of anti-collision methods is also a valuable factor for consideration

Comments

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