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The Encoding control notation

Encoding rules are used to define how messages travelling between the various parts of a telecoms system are represented along the cable or air interface that connects them. If the representation (or encoding) can be made smaller then clearly more messages can be sent in the same space. In mobile systems especially, this efficiency of encoding for the messages between the mobile station and the base station transmitter is vitally important since the available bandwidth is fixed, you can't just connect a thicker cable!
The techniques and notations are already available for specifying the required data structures in a machine (encoding) independent way, most notable Abstract Syntax Notation 1 (ASN.1). Such ASN.1 protocol descriptions can be used in combination with standardized encoding rules such as the Basic Encoding Rules (BER) and the Packed Encoding Rules (PER). In some of the new application areas however generalized encoding rules such as BER and PER are not efficient or flexible enough, what is needed is a unique application specific set of encoding rules. This has lead to some standards using informal non-standard solutions such as tables to specify these required new encoding rules. Such informal encoding solutions normally are not directly machine processable and this together with lack of tool support often makes them extremely error prone.
The goal of the ASN.1 Encoding Control Notation (ECN) is to replace these informal encoding schemes with a standardized machine processable solution which will be powerful enough and flexible enough to handle the encoding needs of present and future application areas.

The Encoding Control Notation (ECN) allows specifiers to define their own encoding rules by referencing standardized encoding rules and modifying some of their characteristics (for example, one may want to use the whole standardized PER set but for the boolean values that would remain encoded on octets), or even to set up completely new ones.

ECN will prove useful in application domains that require a particularly optimized transfer syntax (in terms of size or speed of encoding/decoding). All these standards describe data transfer as bit- or octet-fields in tables or (English) texts, sometimes without providing any ASN.1 modules. ASN.1's ability to model emerging protocols such as Bluetooth makes it ideal for working with protocols whose messages were originally defined without use of ASN.1.

A more systematic use of ASN.1 in the context of these protocols will make them more likely to be used in generic test-tools like those based on TTCN (Tree and Tabular Combined Notation) for example, and will prevent a plethora of informal encoding rules (unfit for validation), generally non-standardized, which may become the exclusive property of a single tool vendor.

ASN.1 can describe types, but for the time being there exists no formal notation that could define encoding rules. The encoding control will be modelled by a new category of modules called Encoding Definition Modules (EDM); they will contain the information (such as alignment, padding bits, computation of length field, etc) that defines the encoding to be associated with (some of) the generic ASN.1 standard types or specific types imported from another ASN.1 module.
In addition, a linkage module, called the Encoding Link Module (ELM), which is in principle very much similar to a makefile for Unix systems, will associate one or several modules with one or several encoding control modules (or with standardized encoding rules, like the PER aligned variant for example, together with an encoding control module in which some of these standardized rules are modified).

The encoding control standard is called ITU-T X.692 | ISO/IEC 8825-3 and has been approved in 2008.

APPLICATION DOMAINS

Some of the following standards have already been re-designed with ECN:

- Tutorial examples in the ECN standard
- UMTS (Universal Mobile Telecommunications System) Radio Access Network for third-generation mobile phones
- Bluetooth
- ISO/IEC 7816-4: Information technology -- Identification cards -- Integrated circuit(s) cards with contacts -- Part 4: Interindustry commands for interchange
- IEEE 802.15 (short distance wireless networks)
- HIPERLAN
- Terrestrial Trunked Radio (TETRA)
- Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Protocol specifications (EN 301 931-1)
- General Packet Radio Service (GPRS)
- European digital cellular communication system (Phase 1); Mobile radio interface; Layer 3 specification (GSM 04.08)
- Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 - Stage 2 (TS 123 078)
- Signalling System No. 7 - ISDN User Part of CCITT (ITU-T Q.763)
- Signalling Connection Control Part (SCCP, ITU-T Q.713)
- some standards for intelligent transportation systems management

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