Setra service d'études techniques des routes et autoroutes

INFORMATION NOTICE

France's Road Command Language and Normalisation

CNEVT 08 normalisation commission
Author: CETE Méditerranée

June 2001
Revised: december 2007

France's Road Transport Master Plan has been deployed and operational for a number of years, leading France's Road Traffic and Safety Department to finance numerous projects involving dynamic road safety and monitoring systems and computer systems.
In order to ensure the long-term viability of the money being spent as well as the interoperability of the systems being ordered and installed, a functional standardisation had to take place.
It is this thinking that gave rise to the development of the Road Command Language (LCR).
The French Ministry of Transportation chose to propose this language to the "Road Management and Information" normalisation commission (CN08) in order to focus the outcome of the work of the normalisation commission and capitalise on the consensual nature of its decisions.
The resulting standards must be applied by all commissioners of public works.

The benefits of the LCR

The LCR was invented in the 80s in order to meet the functional requirements of collecting traffic data. The studies that were carried out in order to define this language analysed all the functions of automatic data collection systems, from road sensors to computerised archiving systems, data collection nodes and computer communication front-ends. The LCR was first applied to dynamic road systems within the scope of the SIREDO Master Plan: the SOL2 stations and the Communication Interchange Modules (MI[1]).

The LCR language goes beyond mere syntax and actually provides a means of modelling the functionality of Traffic Management Systems (TMS). Thus the development of an LCR standard always begins with a detailed functional analysis that takes into consideration the stated requirements of the users and the technical and economic constraints formulated by the manufacturers.
As a result, each LCR standard applicable to a specific system constitutes **a comprehensive functional specification** of that system.

The publication of an LCR standard applicable to a given system yields many benefits:

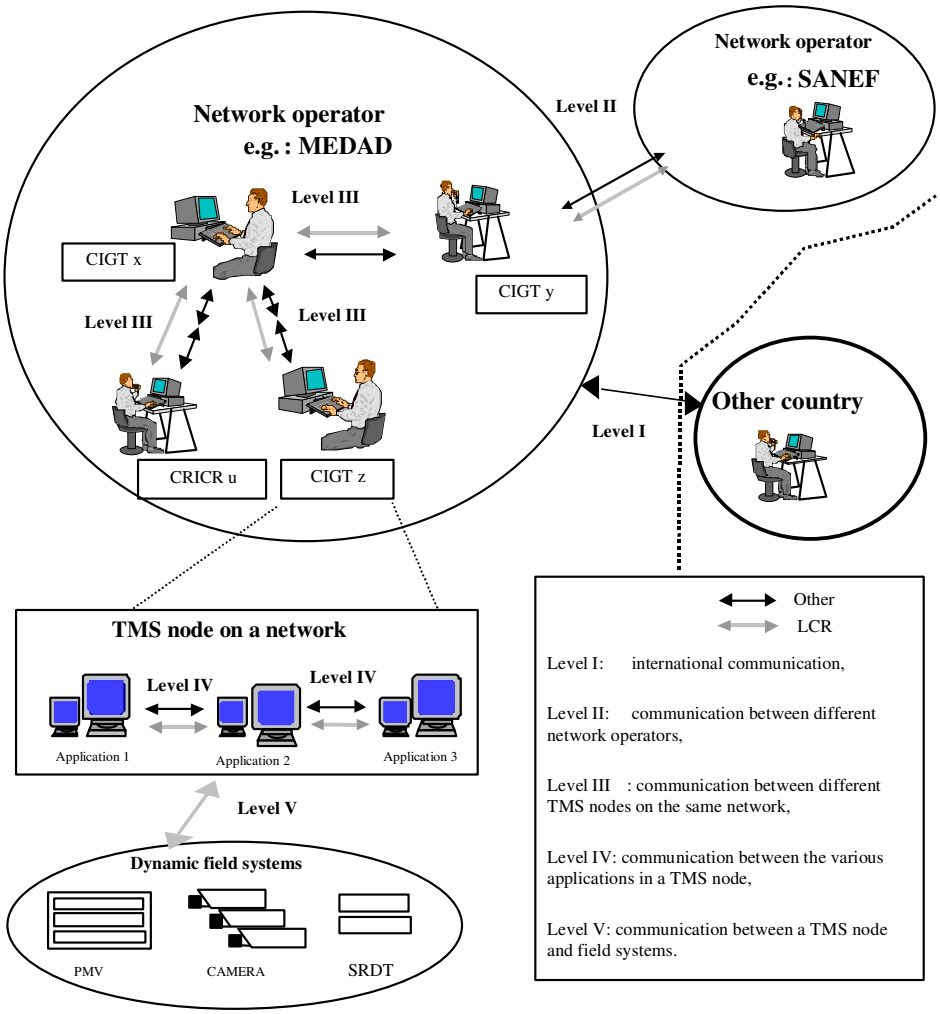
- "Off-the-shelf" **uniformity of products** enabling different suppliers to be compared like-for-like and making products from different origins interchangeable,
- **simplification of the prescription** process, which need only relates to standards,
- **reduction of investment costs** thanks to economies of scale,
- **reduction of maintenance costs**, thanks to the uniformity of the products, their increased reliability and economies of scale,
- **uniformity of inspection processes** for acceptance, certification or qualification,
- **interoperability** of equipment from different origins, simplifying the design of systems. The relevance of the LCR to current systems.

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
ministère de l'Écologie du Développement et de l'Aménagement durables

The relevance of the LCR to current systems

Traffic management systems (TMS) are becoming increasingly complex and efficient. They make use of a variety of communication networks enabling rapid communication between software applications and between TMS nodes. These communications are vital to enable proper decision-making. It is therefore crucial to break them down into simple elements in order to determine in what way the LCR may apply.

Without purporting to presume the architecture of all road traffic management systems, the diagram below symbolises by means of arrows all the transmissions and exchanges of data that take place as part of a road traffic management application: between the software applications of a single node, between the various operating nodes of a single network, between different networks and even between different countries.
Five levels of communication are identified in the diagram shown below:



The LCR's standards for dynamic systems apply throughout **level V**. They apply to the transmission of data acquired in the field, to CCTV monitoring and to the automatic detection of incidents, as well as to the remote control of "active" systems such as variable message signs.
At **level IV**, the LCR mainly applies to transmissions of traffic data and to communication between acquisition front-ends and software applications (e.g. CIM concentrator and synoptic application), but other classes of systems may also be involved: CCTV systems, for instance. Some operators have also chosen to extend the LCR to all applications managed by their traffic management node (e.g. the MARIUS system in Marseille).
The DATEX II [2] specifications defined at the European level cope with the needs of the **levels I to III**. They deal with exchanges of event data, measured data (traffic measurement or weather data) as well as of elaborated data (level of service or travel times). They should be turned into European standards.

Now**, levels II and III** use the LCR solely for the transmission of traffic data.
.

In urban and suburban settings where the traffic at intersections is controlled mainly by traffic light systems, other standards apply at level V, namely the NF P 99-071 standard and its extensions, referred to collectively as DIASER[3].

State of progress of the standardisation work

The work that has been under way for over a decade has led to the development of**:**
- **Methodological standards** (nature and accuracy of measurements, codification, etc.),
- **Functional standards** (configuration of systems, self-monitoring, multiple user support, etc.),
- **Hardware standards** (standardised sensors, DUs[4], physical interfaces, etc.),
- **Communication and interfacing standards** (TEDI [5], LCR, formats of measurements, etc.).

The following table sets out the standards developed over the past fifteen years, and those that are currently being developed.

Standards	Groups of experts						Status	Date	Description
	DU	MPU	Weather	VMS	CCTV	Radar			
P 99-301	x						Experimental	11/94	Induction loop sensors
NF P 99-300	x	x				x	Adopted	20/11/97	Nature and accuracy of traffic data
NF P 99-302	x	x	x	x	x	x	Adopted	05/06/93	Protocol for the transmission of traffic data
NF P 99-304	x	x				x	Adopted	20/12/01	LCR - formats of transmitted measurements
NP P 99-305	x						Adopted	05/09/03	DUs and induction loop sensors
NF P 99-306-1	x					x	Adopted	20/10/06	RADAR DUs
NF P 99-313	x	x		x	x		Adopted	08/2003	Terminology to MPUs, DUs, VMSs and cameras
NF P 99-320			x				Adopted	05/04/98	Terminology applicable to road weather data
NF P 99-321-1			x				Adopted	20/06/06	Weather data gathering systems -specifications
NF P 99-324			x				Adopted	05/10/06	Weather stations and the LCR – formats of transmitted measurements
NF P 99-330	x	x				x	Adopted	20/04/01	Trials of NF P 99-300 – methodology
NF P 99-332	x	x	x	x	x	x	Adopted	05/05/06	Trials of NF P 99-302 – transmission protocol
NF P 99-334		x					Adopted	20/06/06	Trials of NF P 99-344 – MPUs
NF P 99-340	x	x	x	x	x	x	Adopted	20/12/98	Road Command Language
NF P 99-341				x			Adopted	20/06/01	Application of the LCR to VMSs
NF P 99-341-1				x			Adopted	Feb. 2008	Application of the LCR to embedded VMSs
NF P 99-342					x		Adopted	05/06/01	Application of the LCR to cameras
NF P 99-344		x					Adopted	20/12/01	Application of the LCR to MPUs
NF P 99-346			x				Adopted	20/10/06	Application of the LCR to road weather stations
P 99-340-1	x	x	x	x	x	x	Under way	2008	Road Command Language – IP extension
P 99-331				x			Under way	2008	Trials of NF P 99-341 – VMSs
P 99-345	x	x				x	Under way	2008	Application of the LCR to DUs
P 99-344-2	x	x					Under way	2008	Application of the LCR to MPUs – serial DU option

Standards	Groups of experts						Status	Date	Description
	DU	MPU	Weather	VMS	CCTV	Radar			
P 99-344-1		x							Application of the LCR to MPUs – multiple-user option
P99-345-1						x			Application of the LCR to Radar DUs
P 99-335	x								Trials of NF P 99-305 – sensor units
P 99-321-2			x					.	Systems for gathering weather data – trials
P 99-3…	x								Trials of NF P 99-300 – electromagnetic sensors
P 99-3…	x								Trials of NF P 99-301 – electromagnetic sensors
P 99-3…	x	x							Trials of NF P 99-304 - formats of measurements
P 99-3…						x			Trials of RADAR detection units
P 99-3…						x			Trials of RADAR sensors
P 99-3…					x				Trials of NF P 99-342 – cameras
P 99-3…	x								Trials of NF P 99-345 – DUs

Internet links:
http://equidyn.fr/: this site is designed for users of the LCR, TEDI and SIREDO.

Prospects

Given the ever-increasing interconnection of traffic management applications and TMS nodes, the standardisation of languages and communication protocols must be pursued at all levels.
The LCR standardisation process is purely French. However, it may be considered as very well advanced in this field. Its spreading should be continued during the next years yet.
In turn the European standardisation should progress to handle all the exchange requirements at level I, II or III.

Glossary

[1] **MI**, Communication Interchange Module: a central station featuring a computer and software designed to acquire, consolidate and transmit in real time to other applications data supplied by several MPUs.

[2] **DATEX II**, (for traffic and traveller DATa EXchange) name given to the specifications defied and published by the DATEX Technical Committee on behalf of European Commission (www.datex2.eu).

[3] **DIASER**, *DIAlogue SERie* [serial communication] for road traffic management systems involving traffic lights: the name commonly used to refer to the NF P 99-071 standard governing the transmission of data between a controller and an external system.

[4] **DU**, Detection Unit: an element comprising hardware and software that is designed to acquire individual traffic measurements and transmit them towards an MPU (the simplest incarnation of this is a remote traffic sensor).

[5] **TEDI**, *Transmission et Echange de Données Informatiques* [transmission and exchange of computer data]: the name commonly used to refer to the NF P 99-302 standard governing the protocol for transmission of alphanumeric traffic data.

[6] **MPU**, Measurement and Processing Unit: an element comprising hardware and software designed to consolidate data provided by several DUs (or sensors) and to transmit the raw or processed data to a central station.