

INTELLIGENT SYSTEMS BELONGING TO ROAD VEHICLES

(Prepared by the expert of Hungary)

1. There are at least three major categories of the intelligent systems belonging to road vehicles. Sometimes the border lines between these categories are not sharp enough, certain overlapping may be found, but generally these categories are useful tools to separate the different intelligent systems.
 - 1.1. **Intelligent Vehicle Systems (IVS)** are built and work in the vehicle itself using no active signals from outside. Their task is to provide a better (safer, more effective, more environment friendly, more comfortable, etc.) operation for the individual vehicles.
 - 1.2. **Intelligent Traffic Systems (ITS1)** are based on a one-sided or bilateral active communication between the individual vehicles and outside centres trying to provide a better (safer, more effective, more comfortable, etc.) traffic on the roads for all of the vehicles.
 - 1.3. **Intelligent Transport Systems (ITS2)** are based on the active communication between a certain group of the vehicles and centres organizing the better (more effective, more secure, etc.) work of this group of vehicles.

Fig.1. gives a very general scheme of the three intelligent systems and their possible relations.
2. Some examples (being in use or in the development stage) are given in Fig.2. to get a picture about the functions and task of the three systems.
3. The different systems have different relation and communication levels. Fig.3. gives a general scheme of these relations.
 - IVS systems have relations and communications only inside the vehicle, among each other, through the Central Database and Control Unit (CDCU) and to the driver through the interface.
 - ITS1 systems have relations and communications between the vehicle and the environment. (Active outside signals and information.) and also the driver (through the interface).
 - ITS2-s are trilateral systems: the relations and information flow are connecting the vehicle, the environment and the transport company, and the driver is again involved the game.
4. There are two interesting and basic questions in relation to the three systems:
 - 4.1. The relations of these systems to the driver. All the systems need certain interface to provide a bilateral communication with the driver. How many interfaces are acceptable in one vehicle, should they be unified, who is responsible for the interfaces, do they need approval, etc?
 - 4.2. The relations of these systems to each other. May they have direct connections or only through the driver, who is responsible for these connections, communications, do they need approval, etc?

5. All of these three intelligent systems may have the following capabilities and functions:
 - Observation, recognition, collecting information
 - Evaluation and decision making
 - Control of vehicle processes
 - Feedback about the control

It is a well-known and discussed question in the case of IVS-s, how to share functions between the driver and the systems, how to specify the driver's responsibility. This question becomes more complicated considering ITS1 and ITS2 systems, too. Could these two kinds of system have direct connection to IVS systems, if so, in which circumstances, conditions?

6. Fig.4. compares some further features of the three kinds of intelligent system, as we see them today: are their use obligatory or optional, where are they installed the vehicle, are they used by individual vehicles or by certain groups of vehicles, what is their main task, are they regulated under international control?
7. In the case of IVS-s the international control is already "in hand". WP.29 and its subsidiary bodies (WG-s) are working on international regulations dealing with IVS-s. The IVS-s generally belong to certain vehicle systems (braking, steering, lighting, suspension, air-conditioning, etc.) The problem to be answered and decided in the future:
 - a) The IVS-s should be regulated (and approved) in the frame of the system/performance regulations (braking, steering, lighting, etc.) which are using the IVS. We have already existing examples for this solution.
 - b) The IVS-s should have a special, general regulation and approval procedure.
 - c) A certain combination of these two solutions is required.

It is necessary to mention that the majority of the known IVS-s are directly related to the safety and security of the vehicles, their occupants and partners in the traffic. (ABS, ESP, rear- end crash warning, adaptive headlamps, protection against unauthorized use, etc.) but some of them are not (AC system, engine emission control, etc.) These kinds of systems could have indirect effect on safety through the CDCU unit or the interface (see Fig.1.)

8. The ITS1 and ITS2 systems generally are not directly related to the safety and security (counter example: speed limit information system) but indirectly – through the CDCU unit and the interface they may cause terrible situations (Think about crime, terrorism) The protection against these possibilities, when a signal, command, order can enter the IVS-s and disturb their normal operation is on zero level today. May be this danger, for the time being does not seem to be a realistic one. But the on-board computer technics in the vehicles and the ITS1 and ITS2 systems will be rapidly increased and developed in the future, and their connections will be closer and stronger.

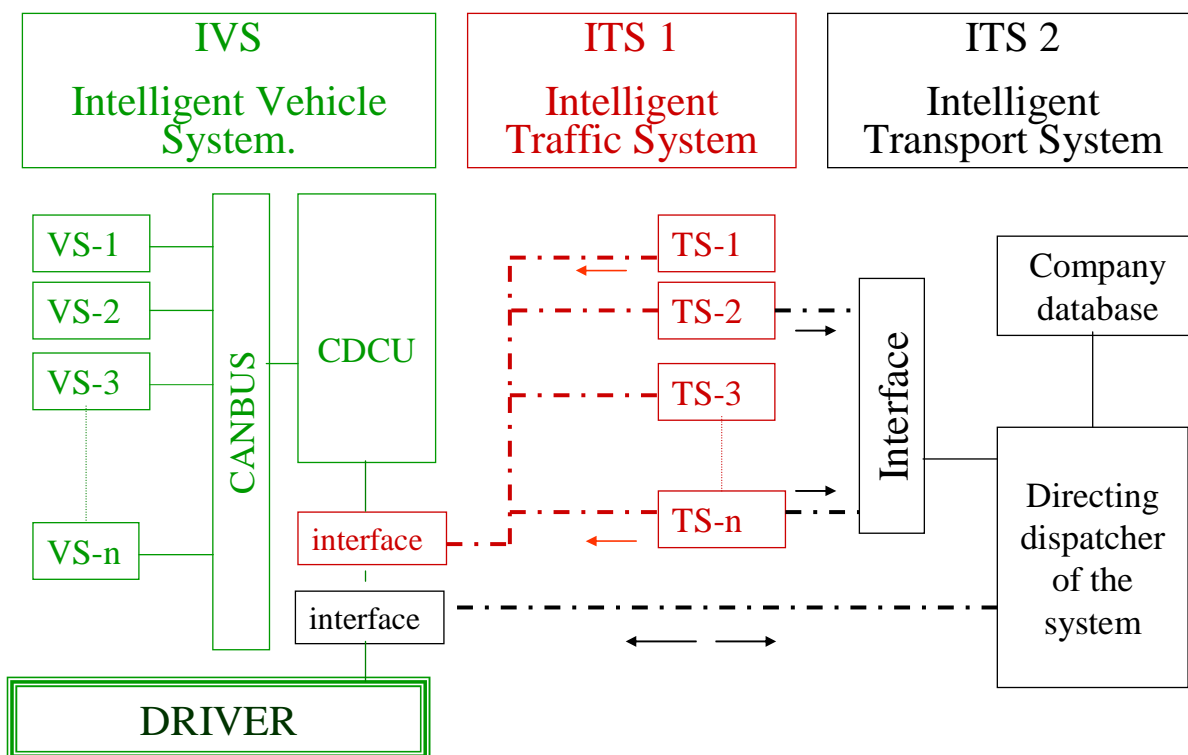


Figure 1.

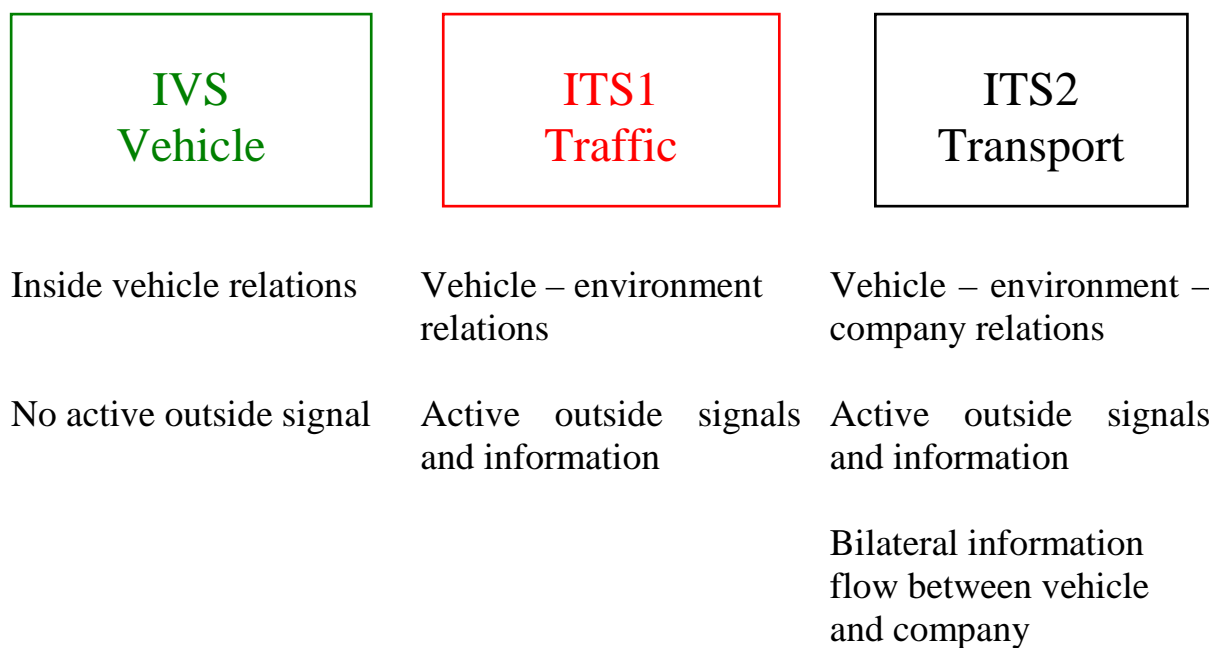


Figure 2.

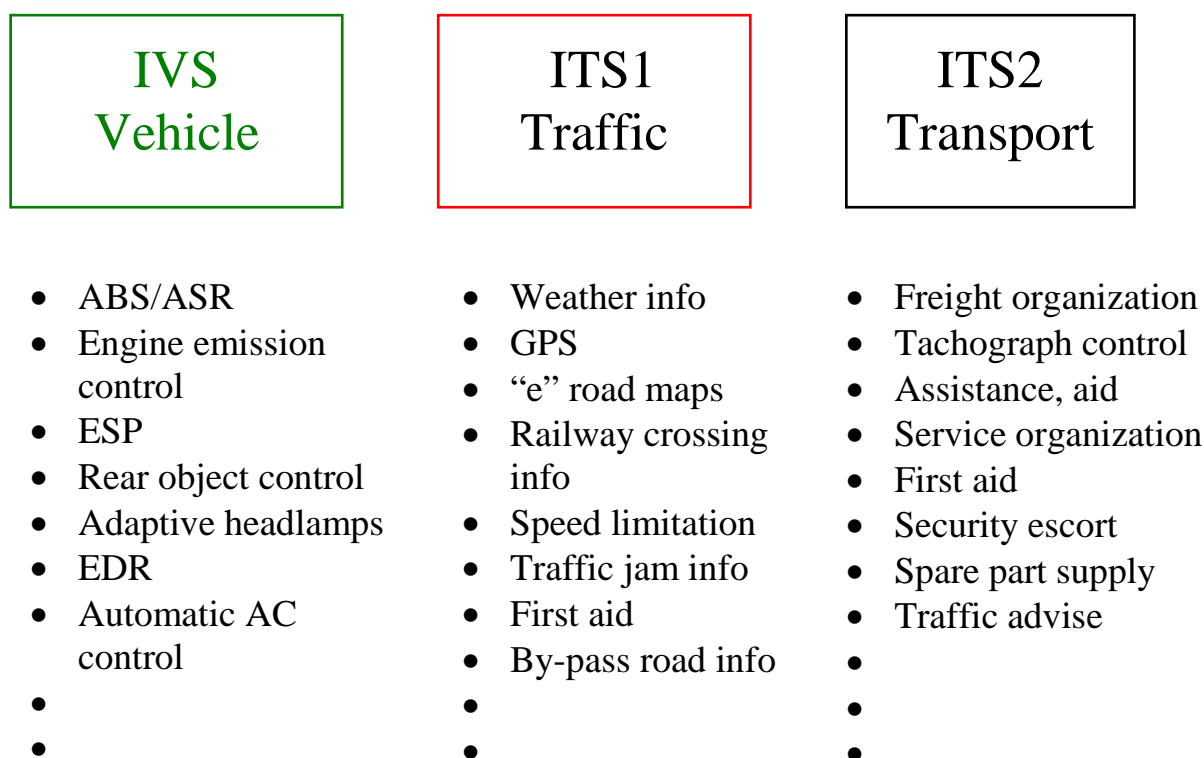


Figure 3.

IVS Vehicle	ITS1 Traffic	ITS2 Transport
Obligatory/optional	Optional (obligatory?)	Optional
Mainly factory installation	Mainly factory installation	Mainly after-sale installation
Individual vehicles	Voluntary vehicle groups	Organized vehicle groups
In all vehicle categories	In all vehicle categories	In certain vehicle categories (taxi,- truck,- bus companies)
Increase safety, security environment protection, comfort	Organize and/or control road traffic	Increase transport efficiency
WP.29 responsibility	WP.1.?	?

Figure 4.