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National Information System Architecture of the Czech Republic, information system, Intelligent Transport System (ITS), ITS architecture, process analysis of ITS

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INCLUDING OF ITSS IN THE NATIONAL INFORMATION SYSTEM ARCHITECTURE OF THE CZECH REPUBLIC[3]

The goal of the first part of this paper is to present including of Intelligent Transportation Systems in global architecture of the National Information System of the Czech Republic. The goal of the second part of this one is to present some of results of the ITS architecture which is developed in the frame of the Czech national project.[4]

UJĘCIE ITSS W ARCHITEKTURZE KRAJOWEGO SYSTEMU INFORMATCZNEGO REPUBLIKI CZECH

Celem pierwszej części niniejszego referatu jest przedstawienie włączenia Inteligentnych Systemów Transportu w globalnej architekturze Krajowego Systemu Informatycznego w Republice Czech, Celem drugiej części jest przedstawienie pewnych wyników architektury ITS, która została opracowana w ramach czeskiego projektu narodowego.

1. INTRODUCTION

In the part one of this paper deals with including an architecture of Intelligent Transportation Systems (ITSs) in Global Architecture of the National Information System (GANIS) of the Czech Republic (CR).

The paper is based on Global Architecture of Information System (GAIS) concept. The GAIS concept is, in fact, general considered a stable framework a rational creation of information systems (IS) private firms and the state authorities and organisations.

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[4] Ass. Prof. Dr. Ing. M. Svítek is responsible manager of the project „ITS in the Transport Telecommunication Environment of the Czech Republic“ which is supported by the Czech Ministry of Transport.

The part two of this paper presents selected results created whithin the team project „ITS in transport telecommunication environment of the Czech Republic“, the goal of which is to develop the national ITS architecture and support the strategy for ITS development in the Czech Republic (e. g. in analogy with the U.S. methodology „Market Packages“[5] or the finnish guidelines[6] for evaluation of ITS projects).

PART ONE: ARCHITECTURE OF THE NATIONAL INFORMATION SYSTEM OF THE CZECH REPUBLIC (GANIS) AND INCLUDING OF THE ITSS

2. SHORT HISTORY OF THE GANIS OF THE CR CREATION

Since beginning 1990 were (in state representation) entrusted with coordination and management of a creation and a next development of information systems so-called the National (state) Information System (NIS) - or (since 1998) so-called information systems of public administration (ISPA) – series the Czech ministries or central state offices of the CR.

But in fact still absents a clear leading role of state (of the Czech authorities) both for coordinated managing and economic effective development of ISPA of the CR and for implementation modern IS/ICT technologies in the frame of different departments, state offices and branches of Czech economy.

3. NUMBER AND MEANING OF HIERARCHICAL LEVELS OF GANIS OF THE CR

Since 1 January 2003 exists in the CR five-level hierarchy of administration management of the Czech Republic (see Fig.1).

[5] The methodics (methodology) „Market Packages“ was developed by National ITS Architecture Development Team of the U.S.A., December 1999.

[6] The guidelines were developed as a part of the Finnish National R & D Programme on ITS Infrastructures and Services FITS, 1996 - 2002.

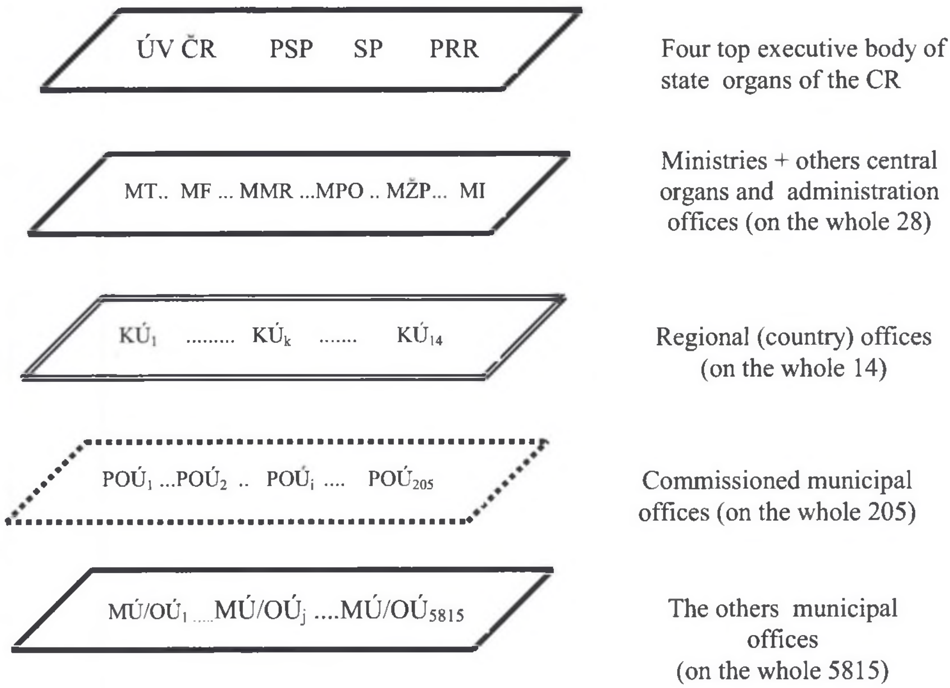


Fig.1. Five-level hierarchy of the top executive, national and regional public administration of the Czech Republic (since 1 January 2003)

This five-levels hierarchical structure is defined partly a set of all executive, national and regional public **authorities** of the Czech Republic[7], partly is given a very numerous (but us unknown) a set of all vertical and horizontal connections (relationships) among ones, also.

4. SCHEME OF GLOBAL ARCHITECTURE OF MANAGING AND INFORMATION SYSTEMS OF THE CZECH STATE AUTHORITIES

Originally (but working still) design five-level Global Architecture of Managing and Information Systems of the top executive, national (state) and regional public administration of the CR (GANIS) schematically presents Fig.2.

In the contemporary world becomes a conception of a creation of global architecture of information systems (GAIS) a rational base of system design and implementation complex, dynamic, vast and complicated information systems in present.

[7] Numerically is it 6066 state organs and offices of all authorities of the Czech Republic (as sum 4 + 28 + 14 + 205 + 5815 on Fig.1 mentioned organs and offices of all Czech authorities).

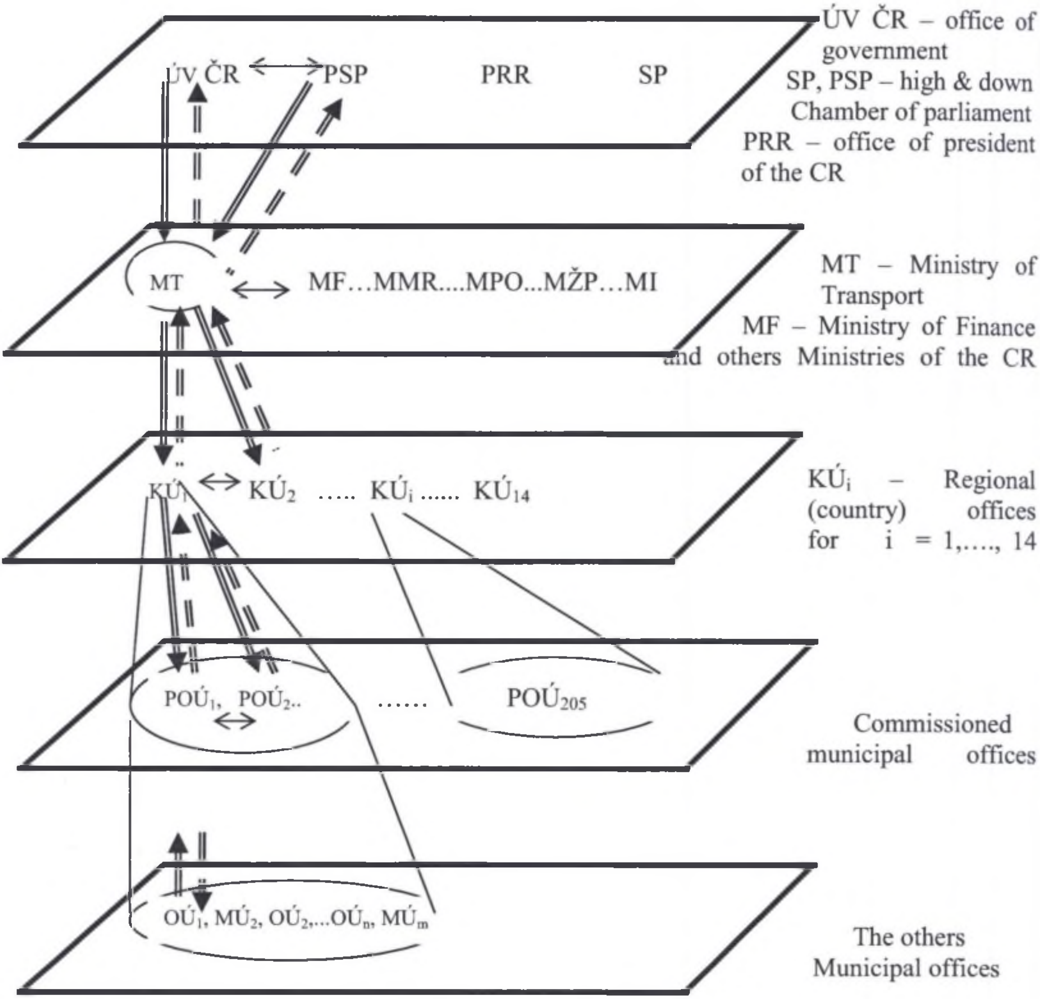


Fig.2. Scheme of the five-level global architecture of managing and information systems of the top executive, national and regional administration of the CR (GANIS)

5. CONCEPT OF GLOBAL ARCHITECTURE OF HIERARCHICAL INFORMATION SYSTEM OF TRANSPORT OF THE CR

Working idea of Global Architecture of Hierarchical Information System of the Czech transport (GAHISCT) and including of the ITSs to GAHISCT presents (schematically only) Fig.3.

On the first (non-detailed) distinguishing level (DL) can we recognize e. g. six kinds of information systems so-called the 1st order – hierarchical information systems of railway, road, aerial, ship, combinated and integrated transport (HISRW, HISR, HISAER, HISSHP, HISCOM, HISINTG).

On the second (more detailed) distinguishing level every of six hierarchical IS of the 1st order can be divided (decomposed) in to a set of systems of the 2nd order by conveniently choosed point of view (criterion, purpose) and so on.

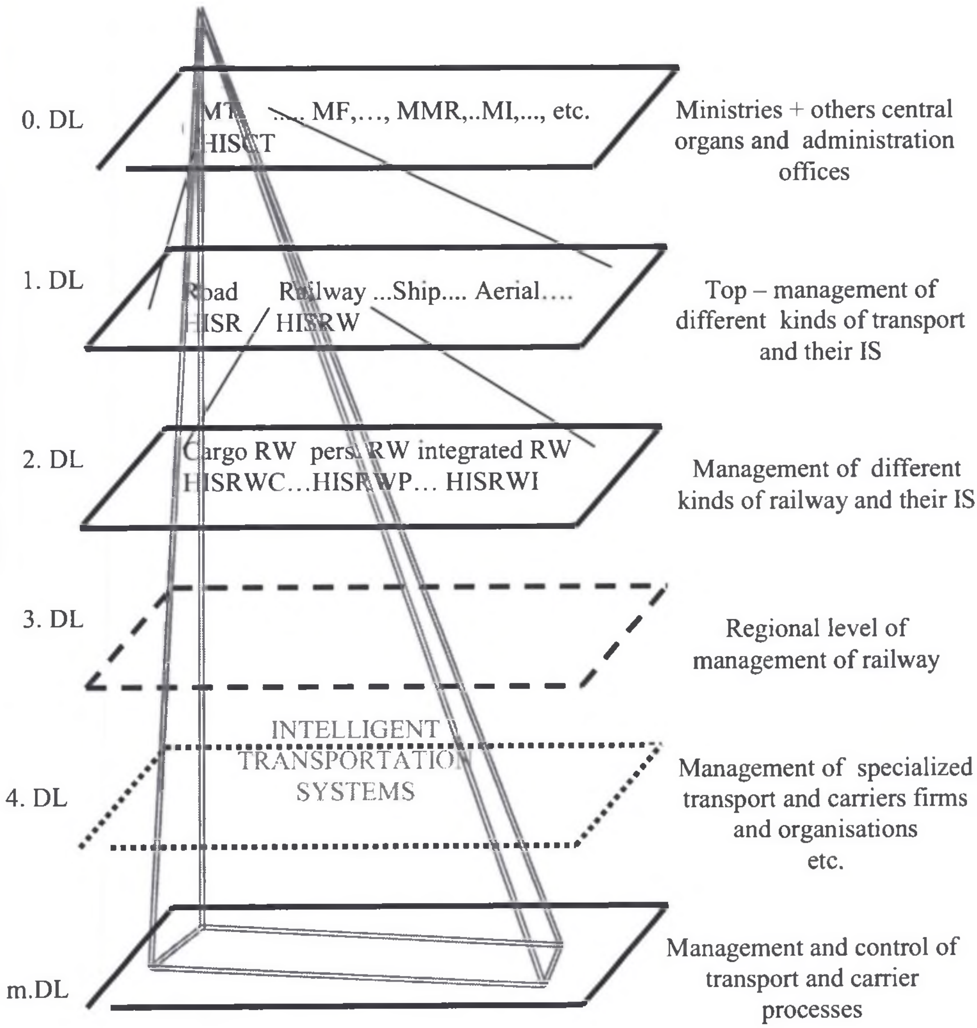


Fig.3. Scheme of the multi-level global architecture of the hierarchical information system of the Czech transport (GAHISCT)

For example HISRW could we devide to second systems of the 2nd order - HIS of cargo (HISRWC) and HIS personal transport (HISRWP), it´s to two systems of the 2nd order.

Or we can devide HISRW e. g. according to regional point of view management, administration and control transport and carrier processes to more systems of the 2nd order (see Fig.3).

PART TWO: DESIGN OF THE CZECH ITS ARCHITECTURE

6. SIX PART ARCHITECTURE OF ITS

The architecture reflects several different views of the examined system and can be divided into:

- *Reference architecture* - defines the main terminators of ITS system (the reference architecture yields to definition of boundary between ITS system and environment of ITS system).
- *Functional architecture* - defines the structure and hierarchy of ITS functions (the functional architecture yields to the definition of functionality of whole ITS system).
- *Information architecture* - defines information links between functions and terminators (the goal of information architecture is to provide the cohesion between different functions).
- *Physical architecture* - defines the physical subsystems and modules (the physical architecture could be adopted according to the user requirements, e.g. legislative rules, organisation structure, etc.).
- *Communication architecture* - defines the telecommunication links between physical devices (correctly selected communication architecture optimises telecommunication tools).
- *Organisation architecture* - specifies competencies of single management levels (correctly selected organisation architecture optimises management and competencies at all management levels).

The ITS architecture of the Czech Republic is conformable with the KAREN methodology, with ACTIF results and partly with COMETA recommendations. The main afford is put into the promotion of ITS architecture in real ITS practise and using it for solving the different ITS optimisation tasks.

7. PROCESS ANALYSIS OF ITS SYSTEMS

The instrument for creating ITS architecture is the process analysis shown on Fig.4. The processes are defined by chaining system components through the information links. The system component carries the implicit system function (F1, F2, F3, G1, G2, G3, etc.). The terminator (e.g. driver, consignee, emergency vehicle) is often the initiator and also the terminator of the selected process.

The chains of functions (processes) are mapped on physical subsystems or modules (first process is defined with help of functions F1, F2 and F3 on Fig.4, second process is defined by chaining the functions G1, G2 and G3) and the information flows between functions that specify the communication links between subsystems or modules. If the time, performance, etc. constrains are assigned to different functions and information links, the result of the presented analysis is the table of different, often contradictory, system requirements assigned to each physical subsystem (module) and physical communication link between subsystems.

From the point of view the construction of the selected subsystem it is possible to consider a single universal subsystem fulfilling the most exacting system parameters, the creation of several subsystem classes according to a set of system parameters, creation of a modular subsystem where the addition of another module entails the increase of system parameters, etc.

The same principle may be applied while designing the telecommunication environment between selected subsystems (unified radio band frequency for all transport telematic applications, combination of individual transmission systems, combination of fixed and radio networks, etc.). In analogy with the subsystem design, the design of the telecommunication environment may be divided into several classes or, as the case may be, the transmission environment may be designed in a modular way when higher system parameters on the information transmission may be achieved by adding additional modules.

Similar situation applies to the other part of ITS system, or between ITS systems of different transport modes, e.g. road and railway transport. It is necessary to consider whether each transport mode has to have the selected subsystem alone available or whether there is an opportunity for sharing such subsystems, etc.

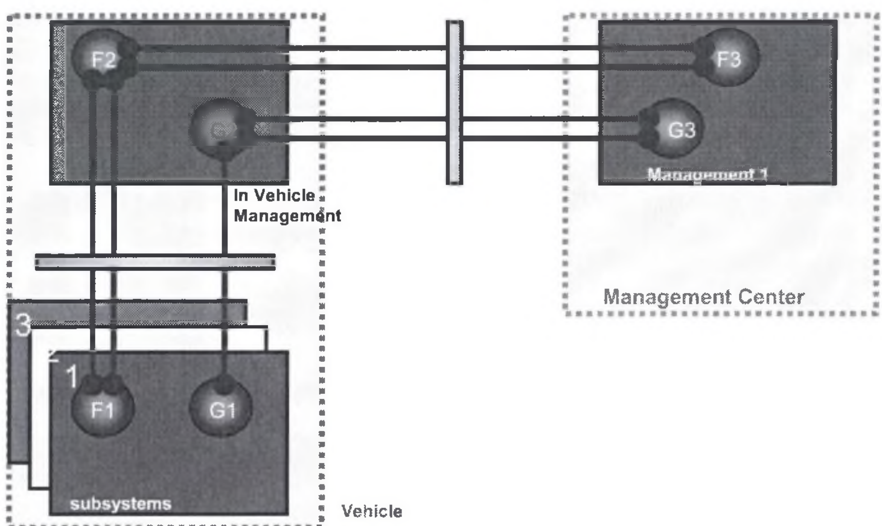


Fig.4. The principle of process analysis

8. RESULTS OF THE CZECH ITS ARCHITECTURE

The current state of functional and information ITS architecture is shown on below scheme. This scheme presents the macro-functions (9 basic macro-functions) and information link between them. The information links in white box represents the linkage between functions and the information links in shadow box represents the information linkage between functions and terminators.

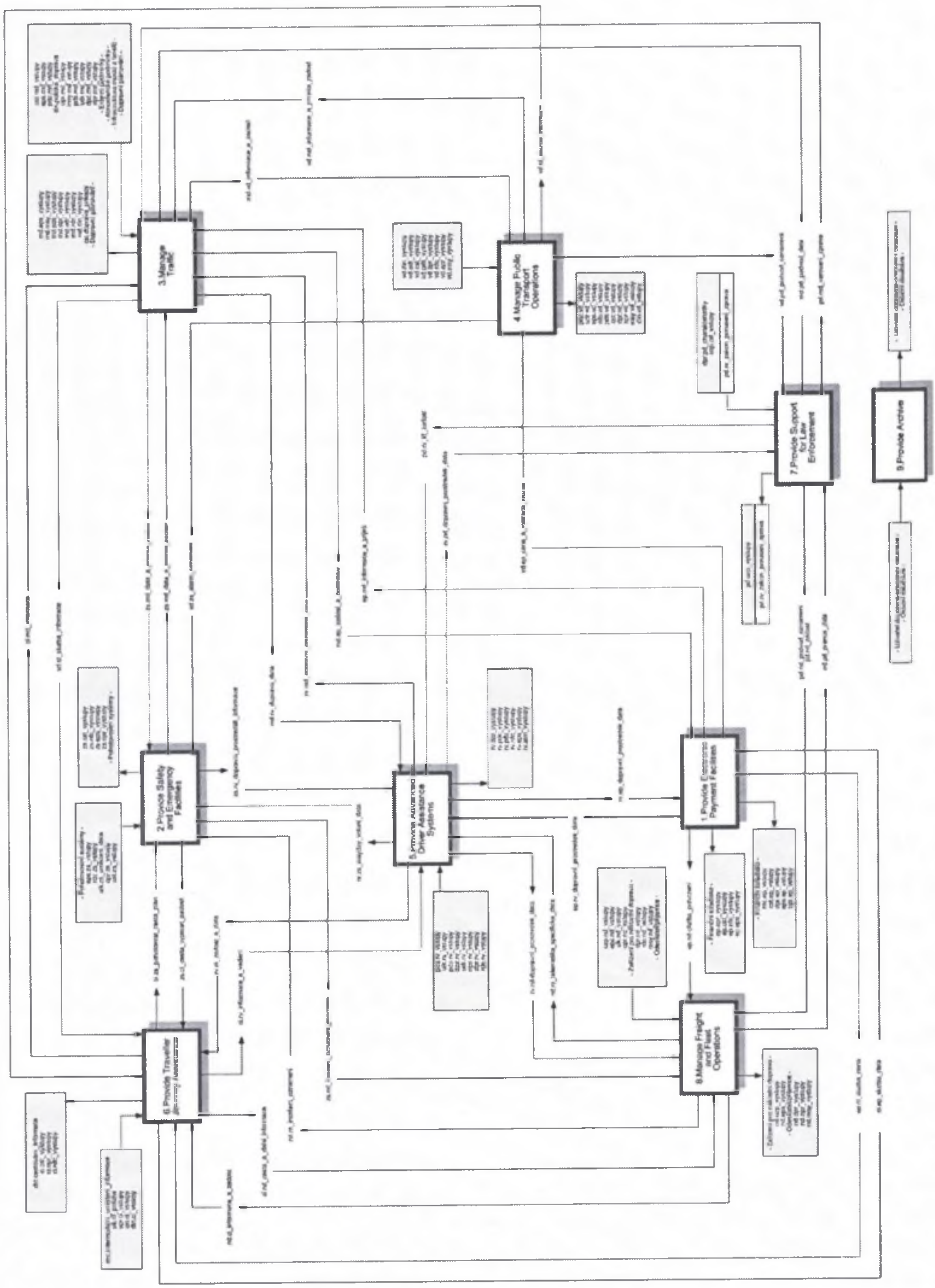
9. CONCLUSIONS

The paper is outlined the GANIS in five-level hierarchy of managing and information systems of the top executive, national and regional public administration in the CR, with effect from 1 January 2003. Global architecture of hierarchical information system of transport CR (GAHISCT) is outlined and shortly described.

The ITSs and/or the ITS architecture are declared like an explicit integral part of the GAHISCT. The hierarchical information system of transport of the CR is one of explicit part of the National Information System (NIS or ISPA) of the Czech Republic. It means that the ITSs and/or the Czech ITS architecture are an implicit inseparable part of the National Information System of the CR.

Basic objective of the creation of the national (Czech) ITS architecture is the achievement of the interoperability between individual telematic applications, including maximum use of available infrastructure by all telematic applications while keeping system requirements in individual telematic applications (technical requirements: safety, reliability, availability, integrity, etc.; transport related requirements: transport comfort, minimisation of external requirements of the transport related process, maintaining transport policy objectives at national and European level, etc.).

The result of the ITS architecture should be a design of individual subsystems and functional blocks, including the definition of their system parameters for OBU (On-Board Unit), telecommunication environment and processing centres for all kinds of transport telematic applications.


1.Provide Electronic Payment Facilities
2.Provide Safety and Emergency Facilities
3.Manage Traffic
4.Manage Public Transport Operations
5.Provide Advanced Driver Assistance Systems
6.Provide Traveller Journey Assistance
7.Provide Support for Law Enforcement
8.Manage Freight and Fleet Operations
9.Provide Archive

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