



# **ITS Architecture in the Czech Republic and Overview of the Region**

Experiences learnt during ongoing projects  
supporting the promotion of ITS



# Content

- Why an ITS architecture
  - Objectives and Results
- Types of ITS architecture
- Brief description of ITS Architectures in a region
  - EU, FR, IT, FI, NO, NL, HU, AT, UK
- Synthesis and summary of reviewed ITS architectures
- Overview of Czech ITS Architecture
  - Past, Present and Future
- Recommendations and conclusions



# Why an ITS architecture? (1/3)

***The objective is the achievement of:***

- **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, transport related requirements ...)



## Why an ITS architecture? (2/3)

### ***Direct impact on the following factors:***

- Efficient building of telecommunication environment reduce their expenditures;
- Reduction of transmitted information reduce expenditures of transmission;
- Definition of organizations requirements reduce expenditures when building special telecommunication environments;



# Why an ITS architecture? (3/3)

## ***Direct impact on the following factors:***

- Economical convenience of new solutions of transmission information will lead to the increase of demand for new technologies of telecommunication networks;
- Possible modular development of telematic systems in single branches and organizations using the existing systems.



# Types of ITS architecture (1/4)

- The objectives and its impacts mentioned above can be guaranteed only if the ITS Architecture is implemented at all decision levels accordingly.
- The levels at which is the ITS architecture used, gives us three different representations (in level of detail):
  - Mission (political national, local) statement
  - Framework (high level) architecture
  - Reference (low level) architecture



## Types of ITS architecture (2/4)

### ***ITS national mission statement [MS]***

- a clearly structured, **overarching, long-term political vision** in regard to the use of traffic that serves the interests of the stakeholders and users and represent goals and benefits.
- the model is elaborated in a framework which meets the requirements, responsibilities, roles, and the policies and measures and **contains a rough implementation plan.**



# Types of ITS architecture (3/4)

## ***ITS Framework Architecture [FA]***

- provides the **abstract** implementation **framework** for the realization of the mission statement
- consists of **conceptual, functional, technical, physical** and **organizational** descriptions and agreements that need to exist
- should be as inclusive as possible and also provide for **future extensibility**



# Types of ITS architecture (4/4)

## ***Reference Architecture [RA]***

- **Specialization of the FA** for a general application, such as city traffic signal control.
- Includes the specification of the functions, their implementation into components, the specification of interfaces and communication between the various system components, the specification of used data types and their structure and the institutional description.
- It is so **detailed** that it can serve as a template for the implementation of concrete applications.



# ITS architectures in a region

From **proper** use ITS Architecture in development of telematics applications can **benefit all involved parties**.

So how it is implemented among the Europe?



# ITS architectures in a region





# ITS architectures in a region

## ***Brief information about ITS Architectures***

- Name and year, main “contractor” and source of inspiration for national ITS framework architecture.
- Liability / required use and continuous support, usage.
- Type of architectures (MS/FA/RA) used at national level
- Specialties of ITS Architectures and information how they are related to standards.

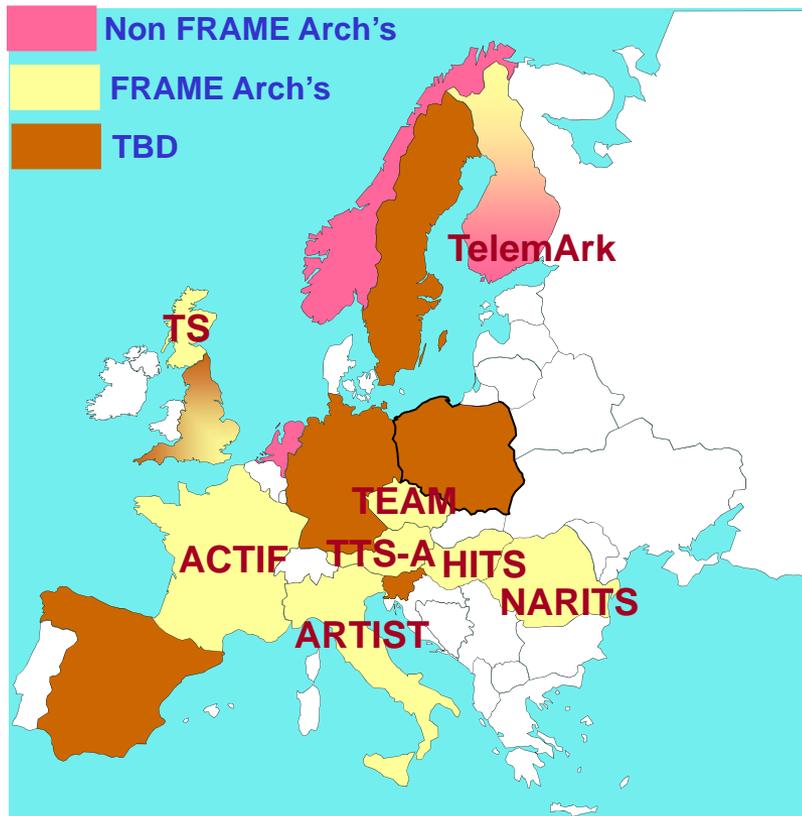


# European Union



- **FRAME**: European ITS framework architecture, 1<sup>st</sup> version published in 2000 (result of the KAREN project).
- Further updated by EU research projects (currently E-FRAME project, 4<sup>th</sup> version).
- Other EU research projects shall use it. Not mandatory for other European/national projects.
- The ITS Action plan (**KOM(2008) 886**) and the guideline for the implementation of ITS (**KOM(2008) 887**) contain measures for implementation of European framework architecture for ITS, forms European Mission statement.

- Current FRAME Deployment in Europe



Countries involved with FRAME



Projects using FRAME



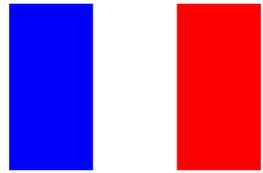
# European Union



- **COMeSafety** and **PRE-DRIVE C2X** developed European ITS architecture for cooperative systems that covers communication architecture.
- Created "ITS Station Architecture" is being used in the standards being developed by ETSI.
- *Type: MS (ITS Action plan), FA (FRAME, COMeSafety)*
- *SW tools are used for creation of ITS Architecture*
- *Standards are partially included (COMeSafety)*



# France



- **ACTIF:** architecture (first version) was produced in 2000, by French Ministry, based on a draft of the KAREN.
- Continuously supported by the public institutions (CERTU), provides training courses and seminars. Now in version 5, incorporates the results of case studies.
- The use of ACTIF isn't mandatory.
- *Type: MS (ITS Vision for France), FA (ACTIF), SW tools*
- *Standards are partially included in case studies*
- Uses case studies as a part of ITS Architecture



# Italy



- **ARTIST** architecture was created in 2003 based on the FRAME (3<sup>rd</sup> version) and ACTIF (2<sup>nd</sup> version), initiated by Ministry of Infrastructures and Transport.
- There isn't continuous government support of ARTIST.
- The use of ARTIST is mandatory in state funded ITS projects.
- *Type: MS (General Plan for Transport and Logistics), FA (ARTIST), SW Tools (SETA)*
- *Standards are not included*



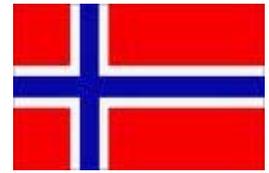
# Finland



- **TelemARK** architecture was produced in 2000, partially inspired by KAREN, initiated by Ministry of Transport.
- Since 2005, ITS Finland is the owner of the ITS architecture. Updates. TelemARK is compatible with FRAME and corresponds to national ITS strategy.
- The use of TelemARK is mandatory in state funded ITS projects.
- *Type: MS (ITS National Strategy), FA (TelemARK)*
- *Standards are included (no technologies are given)*



# Norway



- **ARKTRANS** architecture was produced in 2004 (inspiration taken from FRAME, NISTA), based on National ITS strategy, by Ministry of Transport
- Continuously updated (6<sup>th</sup> version) and supported by government. "National Transport Plan and "ITS Action Plan" serves as national mission statement.
- Use of ARKTRANS is not mandatory.
- *Type: MS (National ITS strategy), FA (ARKTRANS)*
- *Standards are not included*



# Netherlands



- **AVB** architecture was developed in 2000, based on FRAME, initiated by Ministry of Transport (RWS).
- RWS department was determined to be responsible for the national ITS architecture AVB. but no further government supported development.
- Use of AVB is not mandatory.
- *Type: MS (ITS Road Map), FA (AVB)*
- Standards: not included



# Hungary



- **HITS** architecture was developed in 2006, directly based on the FRAME. Initiated by Ministry of transport.
- HITS is still under development.
- Currently, it is not mandatory to use HITS. In future it is planned to make the usage of ITS architecture compulsory.
- *Type: MS ( ), FA (HITS)*
- Standards: not included



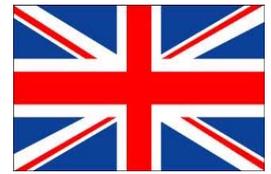
# Austria



- Austrian Telematics Master Plan (MS) was produced in 2004. Based on FRAME Architecture. Initiated by Ministry of Transport.
- Telematics Master Plan requires use of ITS architecture (for framework architecture uses FRAME).
- TMP was partially carried out. But there isn't continuous government support.
- *Type: MS (Masterplan), FA (FRAME)*
- *Standards are not included*



# The United Kingdom



- The "ITS Policy Framework for the Roads Sector" was published in 2005, by the Department of Transport. It was formulated together with the "National Technical Framework for ITS" (NTFI)
- Regional ITS architectures have been created using FRAME. But there isn't government support of ITS national framework architecture.
- Type: MS (ITS Policy ...), local FA (FRAME approach)
- Standards: not included



# Synthesis and summary of ITS architectures in a region





# Synthesis and summary of ITS architectures in a region (1/2)

- Framework architectures were developed as a result of one time research / ministry project.
- All European countries used KAREN / FRAME:
  - Some just as a starting point / inspiration.
  - Some adopted the methodology and database and extended them to incorporate national differences.
  - Few just adopted all FRAME as it is.
- ITS framework architectures have legal accountability / mandatory only for research or publicly funded projects.

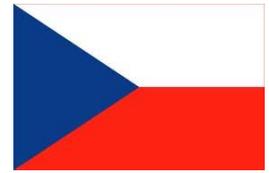


# Synthesis and summary of ITS architectures in a region (2/2)

- Maintenance of ITS architecture is in responsibility of government body or in some cases of ITS associations, however no special body exist to oversee also the integration and management of ITS initiatives.
- Maintaining of ITS framework architecture is ensured only in few countries (FR, NO, FI). Other countries does not have ensured further stable continuation or support.
- Standards, though important, are not dealt with in ITS Framework Architectures – too high level of abstraction.

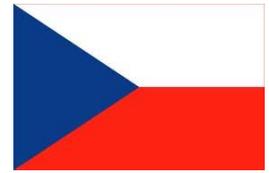


# Analysis of ITS Architecture in the Czech Republic





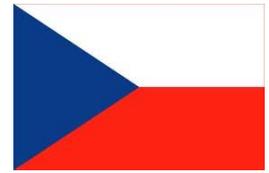
# Development of ITS architecture in the Czech Republic (1/5)



- ITS architecture of the Czech Republic was created within the project „*ITS in transport-telecommunication conditions of the Czech Republic*” (802-210-108) supported by Ministry of Transport
  - comes from KAREN, FRAME, ACTIF projects
  - time schedule 2001 – 2005



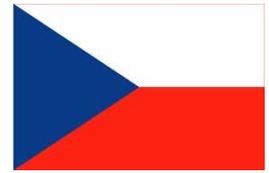
# Development of ITS architecture in the Czech Republic (2/5)



- Methodology of ITS Architecture creation studied independently on KAREN and ACTIF
  - Process analysis, requirements definition, synchronization issues and data registry definition
  - Principles of further system design based on architecture and actual usage of architecture
- Key findings used in modifying KAREN approach and ACTIF model into Czech ITS architecture

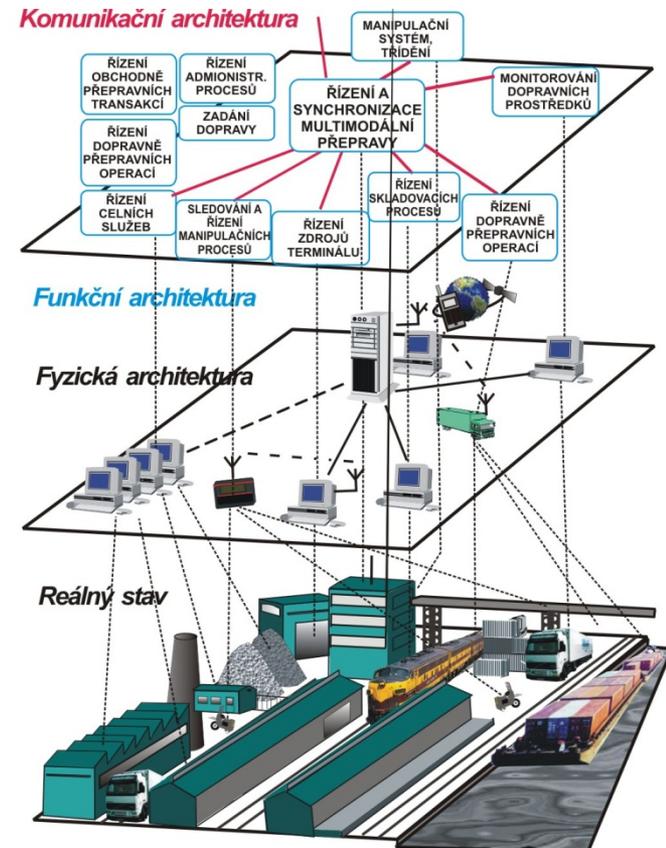


# Development of ITS architecture in the Czech Republic (3/5)



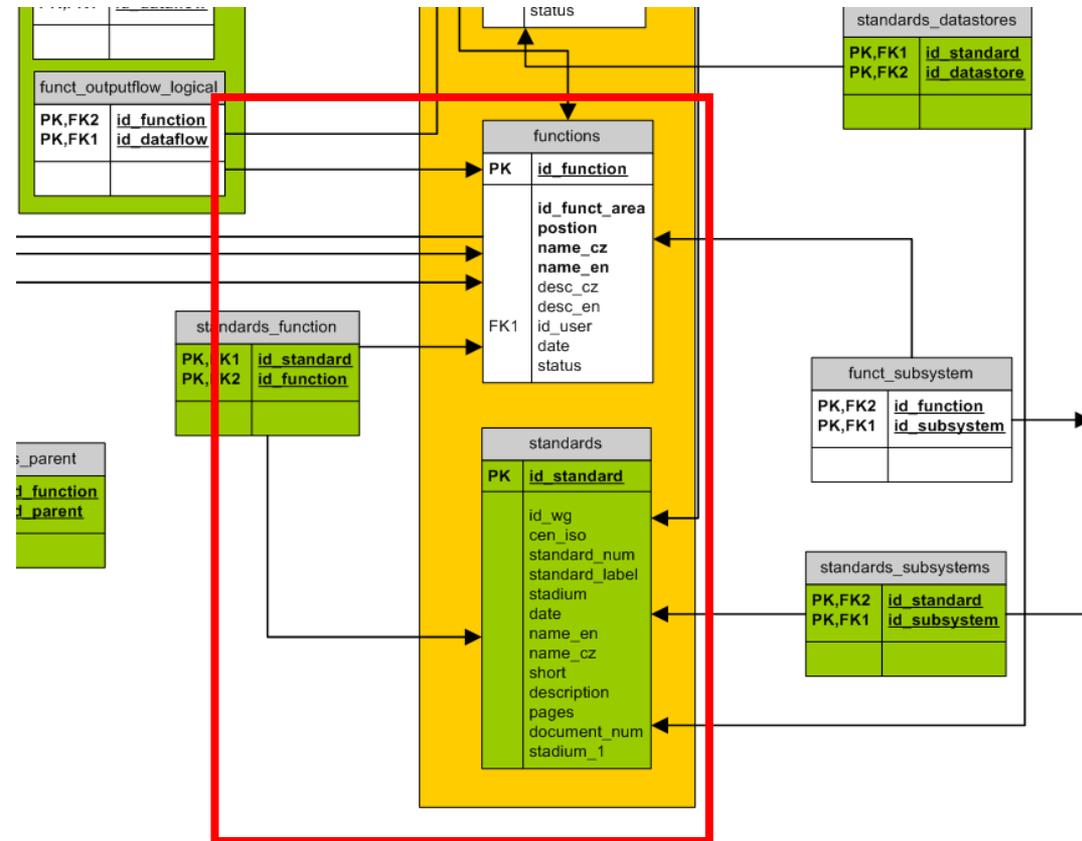
- Previous analysis led to definition of:
  - User needs
  - Functional architecture
  - Information architecture
  - Physical architecture
  - Communication architecture and
  - Use cases
- User interface for creation of simple use cases and browsing of architecture was developed.

- Based on analysis of KAREN and ACTIF example use cases were created to find out Czech environment aspects:
  - management of transportation in Hradec Králové city,
  - multimodal terminal in Ústí nad Labem city



## Standards in ITS Architecture:

- Total number of 62 standards linked to ITS architecture
- Relation realized through functional part of architecture





# Follow up of ITS architecture in the Czech Republic (1/2)



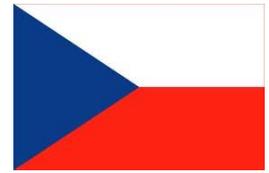
- Research project was successfully finalized in 2005
- A number of good quality methodical documents and recommendations were created
- First national ITS architecture was introduced

## **BUT**

- No political decision about its mandatory use was given
- No guidelines how to use the architecture were created
- No personal support was provided after 2005



# Follow up of ITS architecture in the Czech Republic (2/2)



- Some research telematics projects were done consistently with (used) the developed ITS architecture. i.e. Project for movement of hazardous goods and ITS action plan and concept for Prague

**BUT**

- Only few commercial project were done according to the developed ITS architecture – sometimes they “mentally” fit in but the ITS architecture itself was not used – was not required by an official body.



# New developments in ITS architecture in the CZ (1/2)



Recent activities promoting the use of ITS architecture:

- Methodical guidance for creation of ITS systems, which as a part of system development process takes into account ITS architecture - this document is mandatory for state funded projects.
- New research project which aims to bring the architecture to technical people and decision makers. (2009-2010) The logo for the research project "ITS ARCHITEKTURA" features the word "ITS" in white, a red and blue yin-yang symbol, and the word "ARCHITEKTURA" in white, all on a blue rectangular background.
- ITS Association is creating brief ITS mission statement documents and guidelines.



# New developments in ITS architecture in the CZ (2/2)



Other activities indirectly enabling ITS architecture:

- All standards adopted by Czech standards organization are available online for a fee (single lic.150 EUR / year)
- Creation of consolidated standards terminology dictionary (available online in near future)
- Creation of commented excerpts of standards (for each standard 1-5 pages, available online in near future)



# Synthesis of Czech ITS architecture development and recommendations





# Synthesis and summary of Czech ITS architecture (1/2)

- National ITS Framework Architecture was a result of a research project and it (FA) did not have ensured further continuation or support.
- No national body is appointed to take care of the National ITS framework architecture and for the integration and management of ITS initiatives.
- Even though framework ITS Architecture exist it is not widely used / accepted (research projects only).
- Standards are linked to ITS Architecture at functional level – but it is too generous.



# Synthesis and summary of Czech ITS architecture (2/2)

- Ongoing R&D project aims at upgrading and easier use of existing ITS Architecture.
- ITS Association is now active in creation of position “guidance” documents for the government use.
- New approved methodical guidance for creation of ITS systems requires use of ITS Architecture.
- New tools ensures easier development of ITS systems
  - Database of excerpts of standards
  - ITS terminology
  - Database of case studies.



# Recommendations based on previous synthesis and summary





# Recommendations based on previous synthesis and summary (1/3)

- Base National ITS Framework Architecture on FRAME
- Develop **case studies** based on national FA, containing elaborated architectural models and description of:
  - needed standards and guidelines, used terminology
  - involved equipment and known installations.
- Government officials shall use information from CS to clarify and simplify process of preparation of similar ITS installations.



# Recommendations based on previous synthesis and summary (2/3)

- Ensure awareness of ITS standards:
  - By their description in form of excerpts stored in a database, so it can be easily evaluated if they are needed for particular system or not.
- Ensure use of same ITS terminology:
  - By creating and maintaining terminological dictionary
- Ensure use of ITS framework architecture:
  - by making its use mandatory for government contracts (for easier comparison and interoperability)



# Recommendations based on previous synthesis and summary (3/3)

- Continuous support of development and procurement of
  - ITS national mission statement and
  - **National ITS framework architecture**

must be ensured by government (Ministry of transport) and by ITS board of experts.
- Form of support shall include:
  - Legal framework that enforces use of ITS architecture
  - Establishing a department for ITS at Ministry of transport, that shall take care of ITS architecture.
  - Continuous creation of Use Cases.



# Thank you

contact: Petr Bures [buress@fd.cvut.cz](mailto:buress@fd.cvut.cz)

*Czech Technical University in Prague*

*Faculty of Transportation Engineering*

*Department of Control and Telematics*