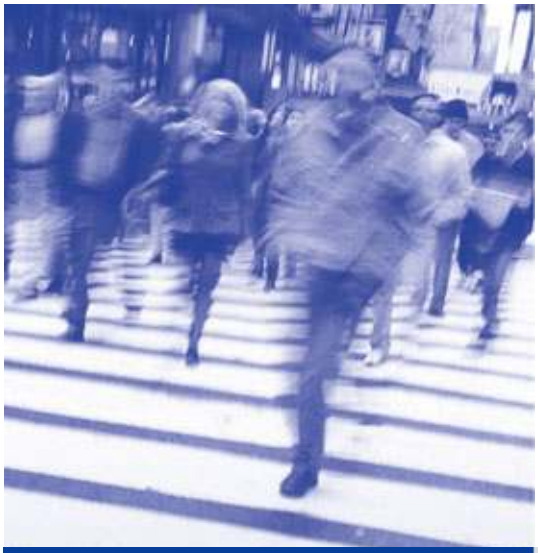

CiViTAS
Cleaner and better transport in cities

ÚSTÍ NAD LABEM

Ústí nad Labem

T26.1 Strategic Traffic Management Scheme in Ústí nad Labem

January 2012

THE CIVITAS INITIATIVE
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1 Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe are funded by the European Commission.

Objectives:

to promote and implement sustainable, clean and (energy) efficient urban transport measures
to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by:

Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
The organisation of the annual meeting of CIVITAS Forum members
Providing the Secretariat for the Political Advisory Committee (PAC)
Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS:

CIVITAS is coordinated by cities: it is a programme “of cities for cities”
Cities are in the heart of local public private partnerships
Political commitment is a basic requirement
Cities are living ‘Laboratories' for learning and evaluating

1.2 Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3 Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the ARCHIMEDES corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighbouring administrations.

The two Learning cities, to which experience and best-practice will be transferred, are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1 Leading City Innovation Areas

The four Leading cities in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport (PT) company features as a partner in the proposed project.

2 Ústí nad Labem

Ústí nad Labem is situated in the north of the Czech Republic, about 20 km from the German border. Thanks to its location in the beautiful valley of the largest Czech river Labe (Elbe) and the surrounding Central Bohemian Massive, it is sometimes called 'the Gateway to Bohemia'. Ústí is an industrial, business and cultural centre of the Ústí region.

Ústí nad Labem is an important industrial centre of north-west Bohemia. The city's population is 93859 living in an area of 93.95 km^2. The city is also home to the Jan Evangelista Purkyně University with eight faculties and large student population. The city used to be a base for a large range of heavy industry, causing damage to the natural environment. This is now a major focus for improvement and care.

The Transport Master Plan, initiated in 2007, will be the basic transport document for the development of a new urban plan in 2011. This document will characterise the development of transport in the city for the next 15 years. Therefore, the opportunity to integrate Sustainable Urban Transport Planning best practices into the Master Plan of Ústí nad Labem within the project represents an ideal match between city policy framework and the ARCHIMEDES project.

The project's main objective is to propose transport organisation of the city, depending on the urban form, transport intensity, development of public transport, and access needs.

3 Background to the Deliverable

Currently, traffic on local roads in the city of Ústí nad Labem has reached such a level that it is necessary to address issues of sustainable development and seek complex transport solutions for the city. The possibilities offered by construction of the new transport infrastructure are limited and the trend in the development of motor transport requires application of regulatory measures. Moreover, specific suitable alternatives and new opportunities must be developed. One objective of the city is aimed at regulation and segregation of motor transport in order to avoid safety risks for the population and to limit emission of harmful gases, noise and vibrations. It furthermore deals with priority for public transport (PT) and support of walking and cycling modes and also promotion for quality and cleaner life in the city.

The City of Ústí nad Labem has a target to develop a strategic traffic management strategy and implement measures to restrict traffic in the city centre. The goal is to improve traffic flow in the city and reduce the environmental impact of traffic. Within ARCHIMEDES task 11.3.4 Strategic Traffic Management, research has been conducted to analyse the conditions and structure of the existing traffic management in the current state, application of intelligent transport systems and transfer of traffic data in the city. The detailed results of this analysis are presented in the document R26.1 Strategic Traffic Management Study in Ústí nad Labem.

3.1 Summary Description of the Task

On the basis of the previous study the results were used to develop the optimal solution for strategic traffic management in the city designed within CITVITAS task 3.8, Strategic Traffic Management in Ústí nad Labem. In the framework of the task, a detailed traffic management scheme was designed for the city, including integration of elements of the Intelligent Transport System (ITS).

This task defines the conditions and basic structure of strategic traffic management suitable for Ústí nad Labem, which would increase opportunities for introducing measures to reduce motor traffic in the city centre, to limit negative effects of transport on the city environment and to increase fluency of traffic. It is aimed at improving effectiveness and quality of local transport in a complex way. Possibilities offered by constructing new transport infrastructure are limited and the prevailing trend of motor transport development requires comprehensive approach in implementing regulatory measures.

It is also appropriate to seek alternatives to restrictive measures and to create suitable opportunities. One of the tools for better organisation of transport in the city is traffic management in relation to modern information and telecommunication transport technologies. Transport telematics improves quality of management and increases possibilities for traffic regulations. It also improves quality of services provided by other means of transport. It enables more efficient implementation of city transport policy, including preference of PT usage, improving safety of pedestrians and cyclists, increasing awareness of all traffic participants and creating better opportunities for residents in the city environment.

Furthermore, the use of transport telematics also has potential as a suitable tool for implementing city transport policy. It enables road administrators to fulfil tasks related to maintenance and repair works more effectively and ensures more favourable conditions for units of the Integrated Rescue System (IRS).

The wide range of applications, however, demands creation of a comprehensive system utilising the potential offered by available technologies. Proposing a consistent, systematic architecture is one of the conditions, which must be met to reach the goal.

This task thus defines basic objectives and functions, which should be satisfied or improved by the telematics system of the city of Ústí nad Labem. The starting point is the analysis of the current state of traffic management system in the city and knowledge of foreseen needs of the territory (see task 11.3.4). The output is the proposal of a systematic architecture fulfilling defined requirements and, at the same time, allowing gradual implementation of its parts in order to establish a functioning complex solution.

Application of transport telematics is proposed in the following functional areas:

- Management and organisation of traffic on roads in the city
- Traffic data and information
- Parking of vehicles
- Public transport
- Freight transport
- Transport surveillance systems
- Emergency systems
- Traffic payments
- Management and maintenance of road infrastructure

The above listed division into functional areas is based on already developed proposals and practical realisations of systems for intelligent traffic management implemented in the Czech Republic and abroad. Based on the best practice, traffic management is designed in the city of Ústí nad Labem.

4 Proposal for Strategic Traffic Management in Ústí nad Labem

The following sections summarise design of the architecture of specific subsystems of traffic management in the city of Ústí nad Labem in the individual, above identified, functional areas.

In order to ensure correct functioning of the transport chain, individual physical subsystems are divided into four basic classes:

- Dispatching centres and headquarters
- Devices for communication and equipment of subsystems
- In-vehicle systems
- Users, drivers and passengers.

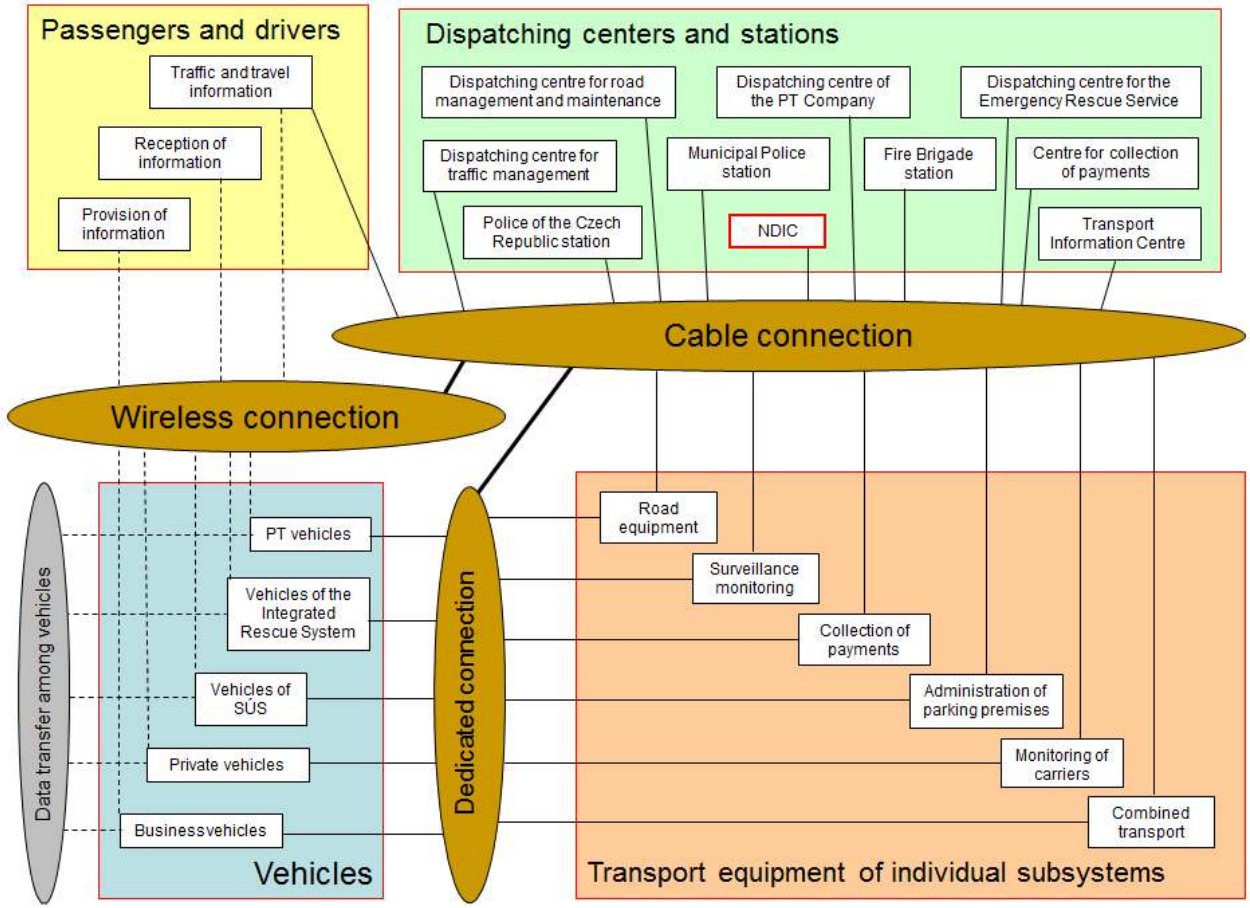
The dispatch centres provide management, evaluation and other functions of the transport system. Individual centres communicate with each other. They gather information via communication devices and in-vehicle systems in order to carry out required tasks.

Communication devices provide a direct connection between the road infrastructure and vehicles. The devices ensure that data is collected and monitored, and commands are executed. Outputs are subsequently distributed to the communication network, e.g. information tables. Each of these devices is bound to at least one of the traffic centres.

In-vehicle systems, such as navigation systems or higher forms of security functions and control functions, share traffic information. They provide data for communication devices, which communicate with drivers or passengers of personal vehicles as well as PT vehicles and vehicles of the IRS.

Users, drivers and passengers enable provision of travel and traffic data to individual users and to the public.

Figure 1 - Proposed physical architecture for Intelligent Telematics System (ITS) in Ústí nad Labem



4.1 Management and Organisation of Traffic on City Roads

The most important objective of the city's road traffic management system is to directly influence local transport, including regulation of traffic, PT priority, handling non-standard and emergency events, and establishing an extensive database. This database can be utilised for other subsystems in order to provide information to drivers and passengers, to manage transport infrastructure, to ensure priority for PT and to enable strategic decision-making at the level of city transport policy.

It is necessary to establish the **Transport Management Centre of Ústí nad Labem**. The Centre will contain selected data and information from the system of traffic management, organisation of surveillance systems, maintenance of transport infrastructure, security and rescue systems and other related subsystems. Selected traffic data used in the management system may provide information about the current transport situation to the users of the transport infrastructure, for example by presenting maps of levels of traffic in the territory.

Since several road tunnels are proposed in the territorial planning documentation on designing transport infrastructure on the city territory, it is necessary to complement the Transport Management Centre of UNL with a control station for operation of tunnels.

The potential of the existing transport facilities and technologies will be utilised. The core of the system is the first phase (medium-term level) management of traffic light signals and the related system of surveillance cameras. In terms of management, the proposal prefers automatic system responses to the current traffic situation in order to minimise the need for interventions in the control system by dispatchers. Any manual interventions should be limited to emergencies, for which relevant management algorithms are designed and which require local traffic management.

The process of standardisation of equipment, transmission protocols and technologies for telematics systems is ongoing. In order to ensure the required level of compatibility, it is necessary to choose technology fulfilling valid European and national standards. At the level of the Ministry of Transport, the knowledge system ZNALSYS and the database of abstracted standards STANDARD are being created in order to enable effective use and orientation of the applicable European standards relating to transport telematics. These valid standards must be met in planning and implementation of telematics systems in the city territory.

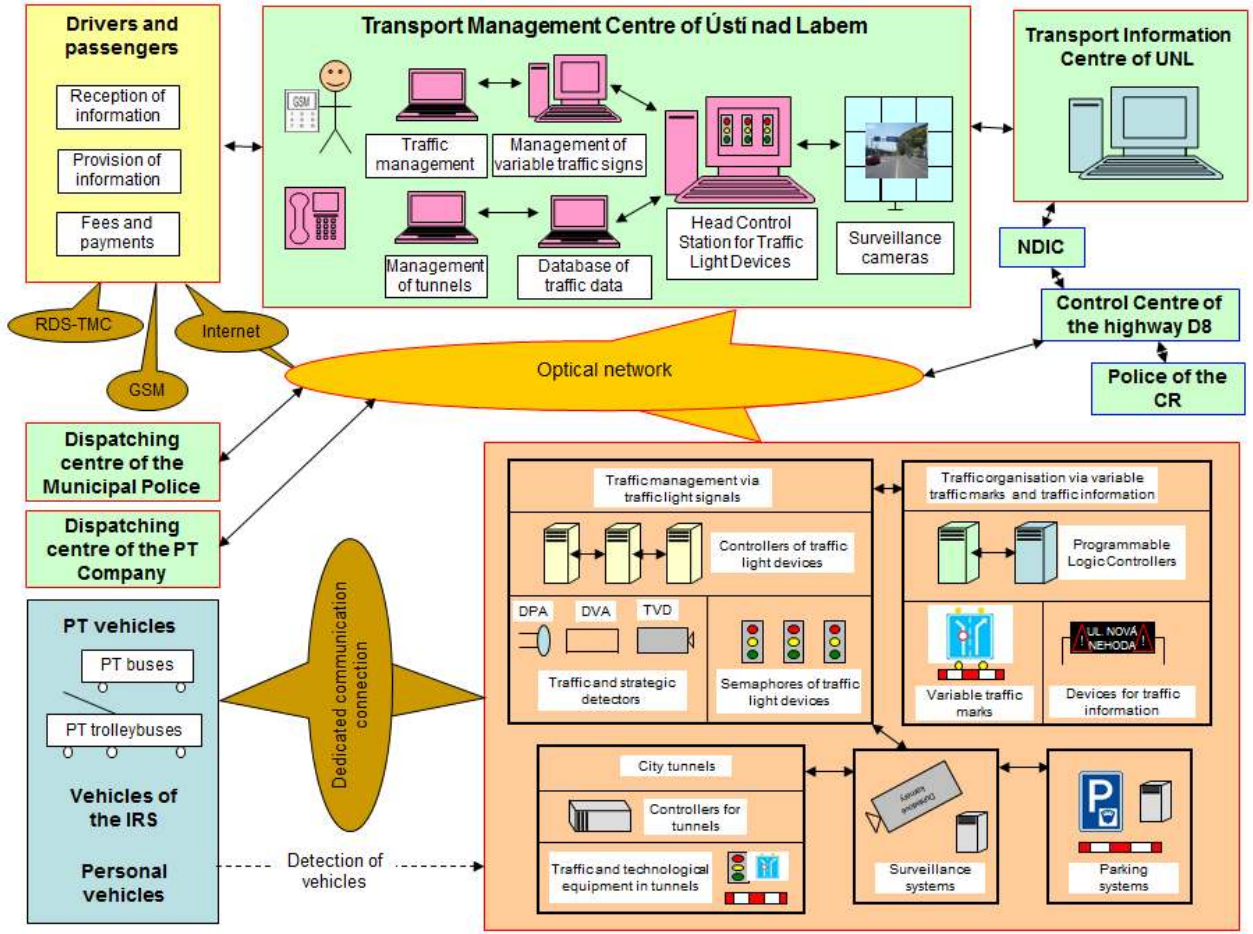
For basic elements and transport equipment used in the city territory, a standard should be established in order to ensure compatibility and compliance with required properties of transport facilities when purchasing new equipment. This standard should be set for the controllers of traffic light devices, traffic detectors, CCTV systems and variable traffic signs. In terms of telecommunication links, preferred transfer protocols and formats of traffic data for individual subsystems should be defined.

Furthermore, the proposed system of traffic management will have the following structure, based on the analysis of the existing functional architecture:

- Management of transport in the city
- Traffic management via variable traffic marks and traffic light signals
- Traffic management in emergencies

Closures of sections of highway D8 may have immediate effect on the urban transport situation. Therefore the city's traffic management should include information links, design strategies and traffic measures for non-standard situations such as these closures and subsequent diversions of traffic on the road network. The proposed solution for the management system and organisation of traffic on the local road network is presented in the following figure.

Figure 2 - Proposal for the architecture of the management system and organisation of traffic in Ústí nad Labem



Individual units of the management system and traffic organisation are defined as follows.

4.1.1 Traffic management via traffic light signals

The existing traffic light devices only manage traffic at local level or they are interconnected into coordinated groups. The proposed solution requires establishment of a transport control station (please see the next paragraph) containing a central computer linked with controllers of intersections with traffic lights. Given the expected number of traffic light devices in the city, it is sufficient to create a single transport area covering the whole territory. This transport control station will supervise functioning and failures of the management system realised via traffic light devices. It will also enable operation of control logics and transmission of transport data and management parameters. As mentioned above, operational interventions by dispatchers will occur only in emergencies, during which local manual control is usually carried out by an officer of the Czech Republic Police, directly at an intersection. Possible operational changes in the setting of traffic light signals can be carried out continuously, based on decisions at the level of transport management of the city. These interventions, consisting of modifications of management parameters without interfering with control logics, should be carried out by a designated transport engineer. The aim is continuous optimisation and regulation of traffic in the city.

Transport control station

The transport control station will be part of the Transport Management Centre of UNL, although it may be physically located elsewhere. The dispatcher for traffic management will be provided with information about the status of management realised by traffic light devices, and information from the system of surveillance cameras and will thus evaluate effectiveness of management. In case of non-standard traffic situations, the dispatcher will ensure the standard situation is reinstated. Since the Transport Management Centre of UNL will collect inputs of other subsystems, the dispatcher will also perform recordings and distribution of traffic information within the Transport Information Centre (for more details on the Transport Information Centre, please see the chapter 4.2 Transport Data and Information)

Dynamic traffic management via traffic light devices

Based on the proposed management logics, the controllers of traffic light devices respond to impulses from traffic detectors and adapt the order, sequence and duration of each traffic phase to suit the current traffic situation. Traffic management procedures are performed automatically. Limitations for adaptation (e.g., length of phases) are defined within the control logics.

Strategic traffic management via traffic light devices

In addition to operational and strategic interventions, the Transport Management Centre of UNL will allow local management logics of controllers of traffic light devices to be influenced by algorithms defined at a superior level. At complex transport locations, it is possible to integrate management of individual traffic light devices to ensure traffic management throughout the area. To enable such management, it is necessary to install strategic traffic detectors located in between intersections, where characteristics of traffic flow (i.e. intensity, speed) are measured. Based on data from these strategic detectors, management

parameters at local level are then adapted. This will enable refined, strategic management of traffic light devices and it is appropriate to utilise it in the future.

Strategic traffic detectors should be deployed at local collective roads (major local roads in the city with transport and serving function) or at selected areas in the city centre.

Public transport priority at traffic light-controlled intersections

Another field suitable for incorporation into the Transport Control Centre is priority for PT vehicles at traffic light-controlled intersections. PT vehicles are equipped with a GPS system, which allows identification of the location of individual PT vehicles at the dispatching centre of the PT Company of Ústí nad Labem. It is proposed to establish conditional priority for PT vehicles at traffic light-controlled intersections, based on the principle of detection of delayed PT vehicles and initiation of the relevant phase of traffic light control, giving priority to passage of PT vehicles. Detection of delayed PT vehicles will be realised wirelessly by sending relevant impulses from the in-vehicle transmitters to the controller.

It is also possible to apply preferences to improve transport performance or reduce the number of vehicles operating on individual lines. Lowering the number of operating vehicles can result in quicker passage of vehicles through the route.

For this type of preference, it is necessary to equip controllers with receivers of signals from PT vehicles. Entry to the control logics of controllers is carried out in a similar manner to intervention from a regular traffic detector. The control logics respond to the detection of a PT vehicle in a predefined manner. After the passage of the PT vehicle through the intersection and its logoff, the predefined algorithm ends.

In case of trolleybuses, detection can be realised via trolley contact. It is appropriate to replace installed mechanical detectors with optical detectors due to their higher reliability. The system is simpler than preferences realised via GPS, but it cannot take into account the current position of the vehicle compared to the schedule and thus vehicles ahead of their time schedules are also given priority on the intersection.

Utilisation of traffic data from the traffic light device management system

Control parameters and data from detectors of traffic light devices and strategic detectors are used to display the current transport situation in the area. Measurement of intensity at each detector of traffic light devices allows transformation of traffic intensity data into graphical information about stages of traffic in the area, such as viewing a load map of the related locality. If the system is supplemented by strategic detectors allowing detection of congestion and speed measurement, it is possible to obtain significant data sources for the traffic information system provided to the public. It is necessary to transfer data from selected transport detectors to a superior level and subsequently use an algorithm for determining degree of traffic based on data on traffic intensity.

4.1.2 Traffic organisation via variable traffic marks and light signals

This method of traffic control will be used on selected sections of the city's road network, specifically arteries in the city centre, local collective roads and through-roads.

The first road section currently equipped with a system of variable traffic marks is part of the road I/30, where flood barriers are implemented.

Other road sections with variable traffic marks will be tunnel sections, design of which is proposed in the documentation for territorial planning of the city. To comply with safety standards, it is necessary (unless it is a short tunnel) to use variable traffic marks and light signals. Control station for tunnels on local roads will be included within the Transport Management Centre of UNL. In case of tunnel closures, the adequate response of other management systems will be ensured, in particular traffic management by traffic light signals. For specific elements of a control system for tunnels, algorithms of automatic responses will be designed to detect transport events and react to non-standard conditions of technological equipment of the tunnel.

4.1.3 Traffic management in emergencies

Extraordinary situations may occur in the city territory and its surroundings, and influence the local transport situation.

For situations which can be expected, transport scenarios should be prepared. In Ústí nad Labem, traffic can be particularly affected by closures of tunnels in highway D8 (construction of which is not yet completed); the nearest alternative route leads through I and II class roads in the city. After completion of highway D8, traffic on existing through-roads in the city will be significantly lower, mainly in terms of freight transport. It will be then possible to carry out measures for traffic calming and transport regulation at selected locations of the existing transit sections. In case of redirecting traffic from highway D8 to an alternative route, it will be necessary to respond to the increase of traffic intensity and share of freight transport in the city traffic flow. For transit sections, it would be thus appropriate to propose programmes for traffic light devices, corresponding with changes of intensities on intersections and highlighting changes in the traffic situation by distributing information to the public, organised within the regional and national Transport Information Centre (for more detail on the Transport and Information Centre, please see the chapter 4.2 Transport Data and Information).

Another potentially significant impact on city traffic is the water level and possible resulting floods of waterways in the city territory. In Ústí nad Labem, this situation applies in particular to the street Přístavní. Flood barriers implemented on this street increase resistance and reliability of this street when the water level of Elbe River is significantly increased. In case of torrential rains, this street must be closed. Subsequently, transport issues at roundabouts and provision of information to drivers and passengers should be addressed.

Similarly, it is necessary to deal with changes in the transport situation in case of closures of local roads caused by incidents in the local chemical factory Spolchemie. It may be desirable to provide transport information about such events in the wider territory.

4.1.4 City traffic management

The workplace of the city's transport management will be based in the Transport Management Centre of UNL. Here it will be possible to browse and control management parameters for traffic devices connected to the centre and to monitor the current traffic situation. The workplace itself will not require permanent monitoring or manual operation and will be primarily used for analysis and subsequent design of measures to improve deficiencies in traffic safety and fluency. However, responsible transport engineers will

perform supervision of the ongoing management and will carry out continuous optimisation of functions of the control system. This workplace may also serve for supplementing data and parameters for management of traffic light devices in the city.

4.2 Transport Data and Information

The timely provision of transport information to road users may greatly reduce travel time and thereby increase travel comfort. Currently, collection of traffic data in the city territory is carried out via local systems, which are not interconnected. For this reason, it is essential to establish a regional Transport Information Centre, which would process data obtained from individual subsystems in order to provide information to drivers and passengers, the media, Ústí nad Labem Municipality, dispatching centres and other relevant institutions.

4.2.1 Reception, processing and provision of transport information

The input entering the newly established Transport Information Centre would include:

- Verbal information from various sources: drivers, passenger, service organisations, city institutions, etc.
- Information from database systems: management of roads, weather data, parking systems, etc.
- Traffic data: filtered and modified, mostly from strategic detectors, surveillance cameras, etc.

The information will be further processed in a uniform manner and subsequently distributed to the travelling public in the form of traffic information via telephone, radio broadcasting - Radio Data System/Traffic Message Channel (RDC/TMC), Internet or SMS. However, communication should be realised in both directions, i.e. the public will be able to inform dispatchers about extraordinary events via the public telephone network. It is suitable to utilise a free telephone connection (0800 number). Furthermore, it is appropriate to verify obtained information from multiple sources, including email and internet. A specialised web page will be established for the Transport Information Centre. The verified information will be further distributed to other subsystems.

Other bodies, which will contribute to collection of traffic data, will be the Police of the Czech Republic, Municipal Police, Ústí nad Labem Municipality, PT Company of Ústí nad Labem, the Authority for Management and Maintenance of Roads of the Ústí region (SÚS), AVE Ústí nad Labem (a private company responsible for maintenance of roads – for more details on maintenance of roads in the city, please see section 4.9), NTD Group (administrator of traffic light devices) and individual dispatching centres of the IRS. Additionally, current local weather forecasts will be obtained from the Hydro-meteorological Institute of the Czech Republic, preferably from the regional office located in Ústí nad Labem - Kočkov.

Obtained traffic data should be automatically forwarded to the United System of Traffic Information (JSDI) and the event should be recorded at the National Traffic Information Centre (NDIC). Transport data and information will thus be shared with other relevant traffic information entities.

The JSDI is a complex system environment for collection, processing, sharing, distribution and publication of traffic data and information on the current traffic situation. It provides information on roads in the Czech Republic, their components and equipment. The system was established by joined efforts of the Ministry of Transport of the Czech Republic, Ministry of Interior of the Czech Republic, Directorate of Roads and Highways of the Czech Republic and other institutions, both public and private, cooperating on the project. The NDIC is the central technical, operational and organisational workplace of the JSDI operating non-stop, performing collection, assessment, evaluation, verification and authorization of traffic data and information according to the Law of the Czech Republic.

4.2.2 Physical architecture of the Transport Information Centre

The basic unit of the Transport Information Centre will be the operator's workplace equipped by a computer terminal, phone and CCTV monitors, on which it will be possible to verify obtained information by switching between different cameras.

Functions of the computer terminal will include:

- Organising phone calls via a touch screen and pre-set connection schemes
- Control of CCTV cameras, including rotation and zoom
- Automatic reception of SMS messages and e-mails from the public
- Updates of the internet and WAP pages for public relations
- Monitoring system failures
- Manual data input on road closures, restrictions and emergency situations
- Displaying traffic load maps and values from strategic detectors, including TMC information, the status of variable information boards (see section 4.2.3 Provision of transport information via variable information boards), conditions of parking systems, infrastructure and other facilities in the city
- Overview of accidents in standardised format: date, time, description, elimination of consequences - available for relevant organisations and media;
- Transfer, completion and adjustment of reports proposed by the system for media, transport dispatchers and other institutions
- Creating custom reports and their transfer to appropriate destinations
- Setting parameters to control form and frequency of transmission to media
- Recording all performed operations into a journal of events
- Managing the text information and unified messages for media and the public
- Editors for handling screens from CCTV monitors and information databases
- Statistical functions for analysis of events.

The basis for communication with the external environment and centralisation of information from the public and institutions is presented by the informational server collecting information relating to:

- Traffic management (e.g. traffic data, load maps, classification and prediction of transport)
- Parking systems (e.g. data on occupancy/vacancy of parking places, prediction of available places)
- PT information
- Security systems (information from the centre of the IRS)

- Management of the infrastructure (e.g. information on the physical conditions of roads, closures).

4.2.3 Provision of transport information via variable information boards

Variable information boards may inform, for example, about occurrence of traffic accidents, congestion, maintenance works, time of arrival to a destination or occupancy of parking places.

Variable information boards should be installed on major access routes to the city, in particular on the road I/30 (Pražská street) in the direction from Prague, on the road I/62 (Přístavní and Opletalova streets) in the direction from Děčín and on the exits from the highway D8, i.e. on the road II/613 (Žižkova street). Other boards could be installed on major roads in the city centre.

Variable information boards will work automatically, although in some cases it is necessary to utilise manual control. The computer used for communication with the variable information boards will be equipped with software that allows generation of accurate, pre-set notices. Manual control of the boards can be realised in two ways, either by choosing from an established database of notices or by creating individual notices with the control function of the computer reviewing the syntax and the length of each sign.

Automatic control is utilised, for example, during floods, which can occur relatively often. The system would start at a given time, together with relevant variable traffic signs. Selected boards would present notices, such as: "THE STREET PŘÍSTAVNÍ IS CLOSED, DETOUR THROUGH THE STREET MALÁ HRADEBNÍ". The variable traffic boards may also be accompanied by variable traffic signs, typically the sign A15 (roadwork), A27 (accident), A23 (congestion), or A8 (danger of slippage).

4.2.4 Provision of transport information via radio

All radio and television stations will have access to information about traffic on the information server, containing following data:

- Load map with the predictions of traffic values
- Selected overviews from cameras
- The GIS map layer with the current road closures and restrictions
- Database of accidents and other traffic events with descriptions and possible filtering.

Access to the server will be authorised by the Department of Transport of the Ústí nad Labem Municipality.

4.2.5 Provision of transport information via internet

Information provided by the internet is available to both private individuals and institutions. It may be used before a journey to identify the current traffic situation. Therefore, a specialised web page will be established on a separate security server. This will be managed by an administrator. The web page will contain the following information:

- Load map with predictions of traffic values
- Overview of parking spaces with the current state of occupancy
- Road closures and restrictions
- Current accidents and extraordinary events relating to transport
- Selected overview from CCTV cameras;
- Information on PT interconnected with the web page of the PT Company of Ústí nad Labem
- Links to the web pages of the moto-clubs ABA and ÚAMK, and to the United System of Traffic Information, which will also display information about local transport related events.

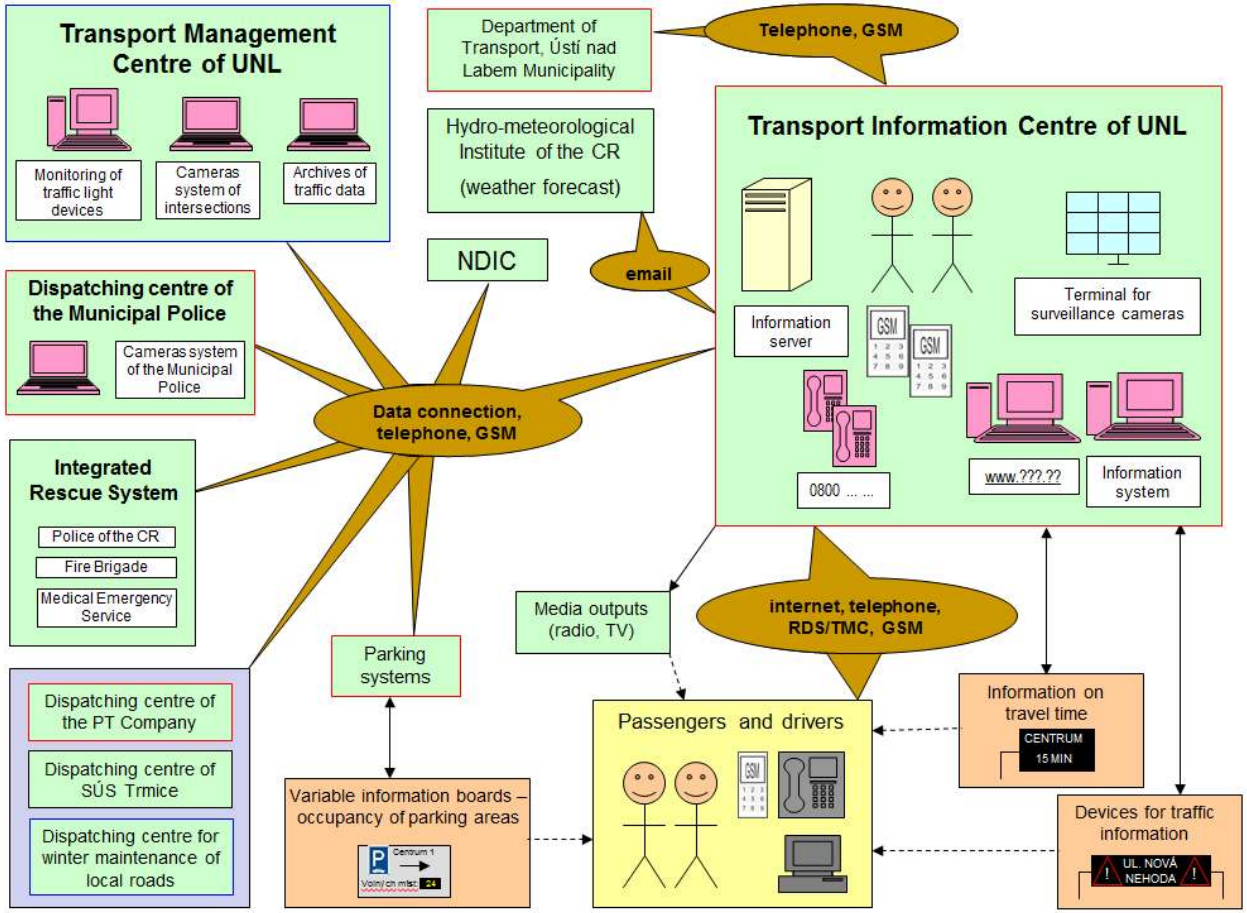
4.2.6 Provision of transport information via SMS

Road users may be informed also by the GSM mobile network, either before or during the journey. The system works in the following ways:

- Driver/passenger requests information using a mobile phone, with a description of the current position and intended destination
- Driver/passenger receives SMS message informing about relevant accidents, restrictions, congestions, etc. near his/her current position automatically, based on detection of the mobile network operator
- Driver/passenger defines a route and time of his/her journey on the website and relevant information is sent before or during the journey.

Diver/passenger may also receive information about current parking conditions in the city and identification of free parking spaces in his/her vicinity.

Figure 3 – Proposal for architecture of the Transport Information Centre in Ústí nad Labem



4.3 Parking of Vehicles

Similar to other major cities, Ústí nad Labem has a shortage of parking spaces, mainly in the city centre. The Short Term Parking Scheme study conducted within ARCHIMEDES task 3.7 showed that implementation of a Park and Ride (P&R) system is not suitable for the city. The main reason is that the PT network does not cover the entire urban area and outskirts are typically served only by one PT line operating with long intervals. In general, a smaller number of PT lines demands frequent transfers among the lines, which lowers comfort of passengers and considerably prolongs journey time, and thus a P&R system cannot offer advantages over individual motor transport in the city (see ARCHIMEDES deliverable T25.1 for more detail).

However, a solution suitable for addressing lack of parking places in the city centre is the Park and Go system (P&G), i.e. establishment of large parking premises on the boundary of the central area, from where the city is accessible on foot or comfortably by PT. The city centre is densely served by PT lines and PT vehicles operate here with short intervals. Therefore, the journey is short and fast. For efficient functionality of such a system, it is necessary to ensure a sufficient number of parking spaces, which requires implementation of collective public garages.

P&G parking premises are intended primarily for long-term parking suitable, for example, for drivers commuting to work or visitors to the city. This solution offers less comfort to drivers than parking in the immediate city centre, but on the other hand, vehicles parking in the city centre are causing a greater burden to the city.

To support the P&G scheme, it is necessary to implement paid parking zones in the city (for more details on parking payments, please see the chapter 4.8 Payments and Fees in the Transport Sector). Given the considerable deficit of parking spaces, it is appropriate to limit parking primarily to residents and only for short-term parking (the standard is set to 2 hours of parking). Long-term parking (from 2 to 24 hours) would be realised at collective parking premises. To avoid transition of the parking problem from the city centre to neighbouring outside areas, it is necessary to introduce parking zones also in these adjacent areas, limiting parking mainly to residents.

Furthermore, it is desirable to adjust price policy to ensure that parking in the city centre is advantageous only for a short period of time (such as 2-3 hours) and, long-term parking is convenient in large, collective parking premises. Tariffs and operating conditions would be unified for all P&G premises and parking zones.

Parking premises identified as suitable for the P&G system in the city are either existing underground collective garages and parking houses, or areas suitable for construction of new collective garages according to the Master Plan of Ústí nad Labem. Parking premises proposed for the P&G system are following:

- Existing parking areas:
    - Underground parking area by the Ústí nad Labem Municipality building
    - Underground parking area by the Mariánský bridge
    - Parking house by the bridge of E. Beneš
    - Parking area by the hotel Vladimír

- Parking premises currently in development:
  - Parking house by the main train station (designed for 200 vehicles)
- Newly proposed collective garages:
  - Underground garage by the Lidické square (foreseen parking of 270 vehicles)
  - Parking house in the streets U Chemičky and Tovární (foreseen parking of 600 vehicles)
  - Parking house by the Špitálské square (foreseen parking of 870 places)
  - Parking house in the streets Revoluční and U Trati (foreseen parking of 290 vehicles).

The premises will be utilised for other purposes, such as small shops and other services. The parking house by the main train station and could aid multimodal transport (car-train). Capacities of individual, proposed collective garages are listed as estimations.

Access routes to these parking premises lead through the city periphery and therefore will not cause additional burden to the city centre. As parking in the city centre is paid for, and construction and operation of collective garages is financially demanding, parking in collective garages must also be charged, although the payment should be adjusted to suit long-term parking and to be advantageous for residents. The parking charges in P&G premises should also offer possibility of prepaid parking, for example by quarterly and annual parking cards compatible with all P&G areas in Ústí nad Labem.

4.3.1 System of navigation to parking lots

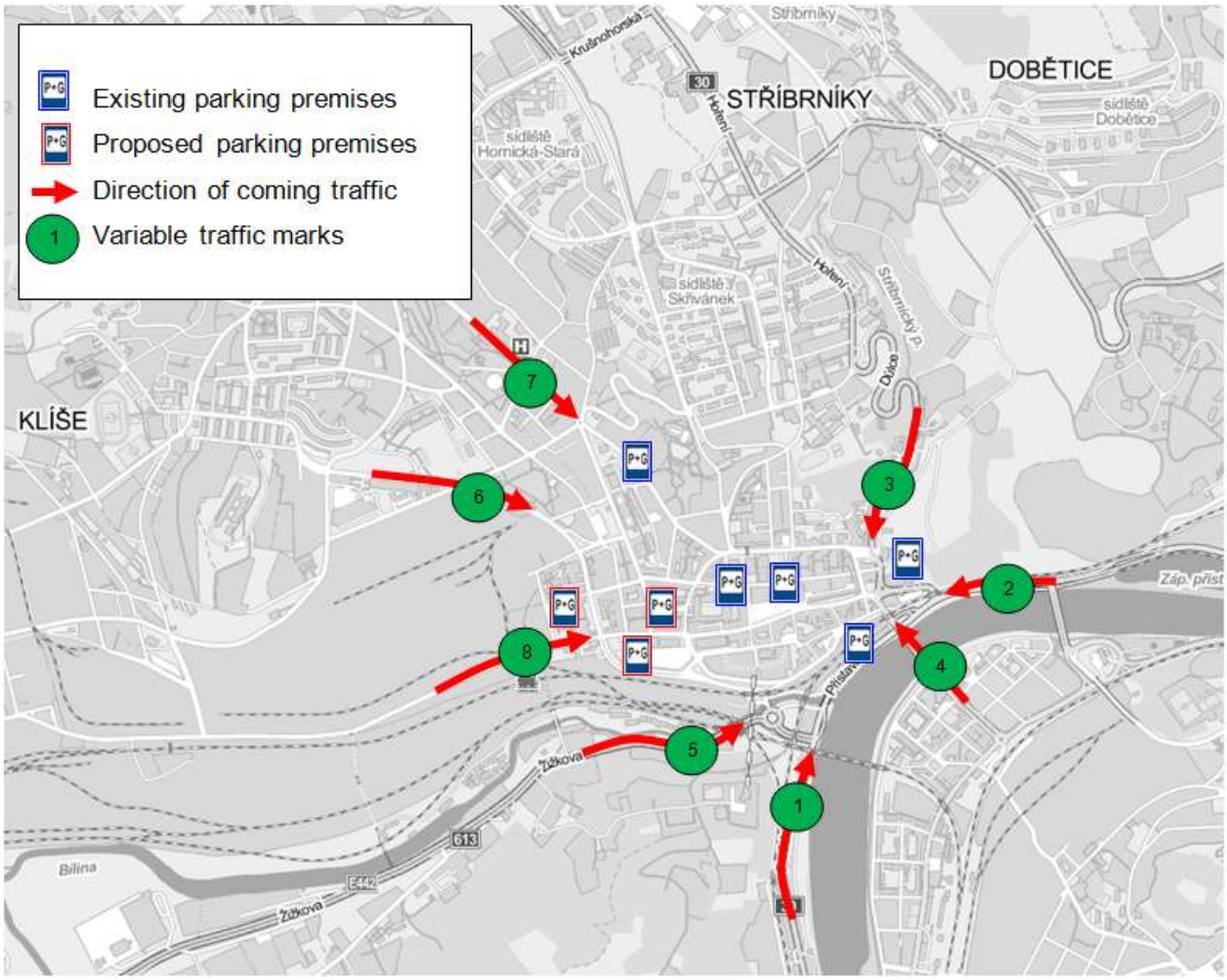
To ensure efficient functionality of the system of collective parking areas, it must be adequately and clearly presented to the public. Areas suitable for implementation of collective parking premises for the city centre should be equipped with a navigating system. Traffic signs must be well visible and easily understandable also for city visitors, enabling fast orientation. Variable information boards are recommended for significant improvement of efficiency of traffic marks. The boards will be located on all access roads to the city centre and will show the number of available parking lots at the nearest P&G area, or at other easily accessible P&G areas where appropriate, and will also show directions to the parking premises. If the capacity is reached at the nearest parking area, traffic marks will guide drivers to the next nearest available P&G area. The variable marks must therefore be managed centrally, preferably from the proposed Transport Management Centre of UNL collecting information about occupancy of all parking areas in the city.

Variable information boards should be located at the following strategically important entrances to the city centre (please see their location on the map on the Figure 4):

1. The street Pražská (I/30) in the direction from Prague – before the intersection with the street Žižkova
2. The street Přístavní (I/62) in the direction from Děčín – before the intersection with the street Hrnčířská
3. The street Důlce (I/30) in the direction from the road I/13 – before the intersection with the street Hrnčířská
4. The bridge of E. Beneš in the direction from Střekov and the road II/261 – before the ramp to the street Přístavní
5. The street Žižkova (II/613) in the direction from the road D8 – before the roundabout

6. The street Klíšská in the direction from Klíše – before the Špitálské square
7. The street Masarykova in the direction from Bukov - before the roundabout on the street Roosveltova
8. The street Revoluční in the direction from the industrial area – before the intersection with the street Panská.

Figure 4 – Scheme of P&G premises in the city centre and location of proposed variable traffic marks



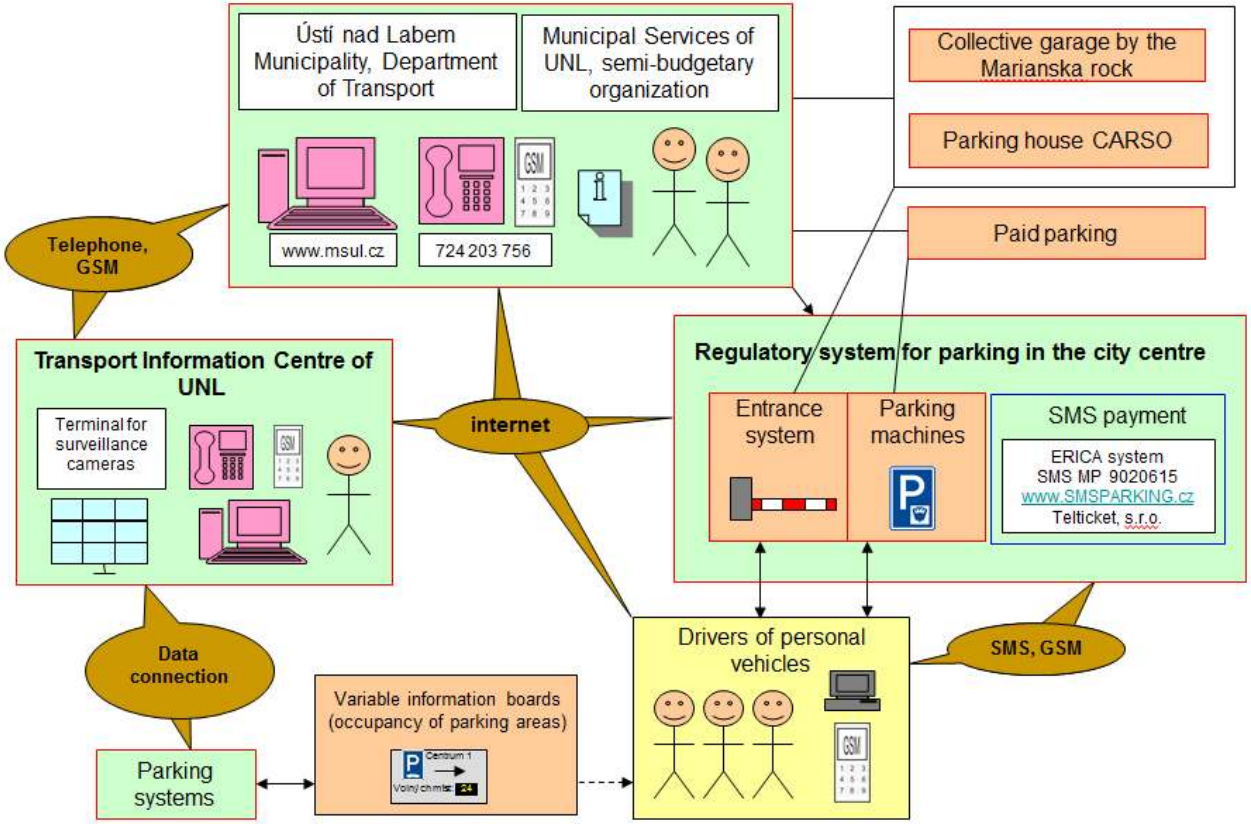
Source: http://mapy.cz

Each of these collective parking premises will monitor vehicles entering and leaving the area, and thus provide information on current occupancy. This should be available via variable traffic marks, the website application incorporating all the essential information on local transport as mentioned above, and the telephone line of the Transport Information Centre of Ústí nad Labem.

Other valuable information for drivers is the number of remaining available places at all the parking premises in the city centre. This will be determined from the number of parking tickets sold at each parking machines and the SMS messages sent for each parking place. However, such information would be only indicative due to the fact, that vehicles can leave

the parking lot before the end of ticket validity. Nonetheless, it is appropriate to process data on occupancy of parking areas, and to provide this data to road users and administrators, especially in case of renovation or upgrading of the parking system.

Figure 5 – Scheme of proposed parking in the city



4.4 Public Transport

Ensuring quality of PT services in the area is one of the essential conditions for traffic calming. In particular in the city centre, availability of PT services offers an alternative to individual motor transport. Quality of PT services may be significantly improved by developing telematics applications for PT. (For details on PT payments, please see the chapter 4.8 Payments and Fees in the Transport Sector).

4.4.1 Preferential measures for public transport at intersections controlled by traffic light devices

Due to gradually increasing delay of PT vehicles caused by traffic congestions during peak hours, it is desirable to increase reliability and quality of PT services by establishing PT priority at intersections controlled by traffic light devices. Currently, priority is applied only for trolleybuses, at the intersections Sociální Péče x Mezní (priority for left turn Sociální Péče → Mezní), where overhead trolley detectors are installed on traffic light devices. Buses do not have priority on any intersection in the city.

All traffic light devices in Ústí nad Labem enable dynamic traffic management depending on the traffic situation and therefore, it is possible to apply priority for PT vehicles. Another condition is the technological equipment of vehicles. Trolleybuses can utilise overhead trolley detectors activated by contact with a collector, which triggers the appropriate phase for passage of a trolleybus. Such detectors, however, do not address priority for buses on the same route and do not allow conditional priority.

PT vehicles can utilise a detection system using specific sensors located in front of intersections beside the road. A transmitting device in the vehicle sends a signal for passage, which is received by the sensor, which sends an impulse to the controller. This system requires equipping most of the PT vehicles with transmitters.

A similar solution is based on the GPS system. The controller enables passage of the vehicle through the intersection based on its detected position. This solution requires equipping PT vehicles with GPS modules, equipping controllers with GPS receivers and changing program settings of the controllers. The system is capable of distinguishing individual PT lines based on time schedules and of deciding about adequate priority at intersections according to detected delays and current traffic situation.

In terms of traffic management at intersections, conditional priority is more suitable than absolute priority. For conditional priority, relevant phases are extended within a limited time period, where the limit for PT is longer than for individual transport. If the vehicle with the priority of passage does not enter the intersection within the limit, it must wait for the next cycle and the relevant phase is again initiated earlier than in case of no priority. Other phases are shortened. The majority of these traffic light controlled intersections are heavily loaded with traffic at all entrances and priority implemented only in selected directions would increase congestion. In case of implementing conditional priority, the impact on the overall capacity of the intersection is not so significant.

In order to optimise signalling plans and establish priority in Ústí nad Labem, it is necessary to examine each intersection separately. Adjustment of the signal plan for priority of PT

vehicles will be problematic at those intersections where PT routes lead in a direction intensively utilised by individual transport, such as the intersection Masarykova x Štefánikova, which is heavily congested by traffic during peak periods and through which 3 PT routes lead. If a controller received an impulse from a bus far away before the intersection and extended the phase for passage, it would considerably delay vehicles on the street Masarykova, through which 2 trolleybus lines also go. If a bus detector was installed close before the intersection, buses would be delayed by other waiting vehicles. Duration time for transit of PT vehicles through the intersection should be shorter. It is therefore necessary to identify properly specific distances for sending registration signals for passage through the intersection. This distance is different for each individual intersection. Similarly, an excessively increased passage time for PT vehicles on the intersection in the direction on the street Masarykova would result in congestions on the street Štefánikova.

A different solution is appropriate for the intersection Malátova x Hoření, where the entrance to the intersection from the street Malátova is in a steep hill and reducing the amount of necessary stops of PT vehicles and subsequent accelerations will shorten operating time and reduce operating costs.

An example of an intersection, where establishing priority for PT vehicles is not appropriate and could have negative impact on the overall capacity, is the intersection Předmostí. Essentially, all the entrances of this intersection are utilised by PT and traffic intensity on all the entrances reaches maximum capacity. Eventual extension of transit time in one direction would significantly limit the capacity at another entrance, and thus increase congestion even at neighbouring intersections. The importance of PT priority on this intersection may be apparent during off-peak periods on working days, when intersection capacity is higher than traffic intensity and, therefore, extension of passage in the priority direction is possible within the capacity reserve.

Based on PT routes (in particular trolleybus lines) and the number of connections, such intersections were identified, where PT priority will not significantly influence the overall capacity or where PT routes lead in the direction of the most intensive traffic. Those intersections are: Přístavní with Hrnčířská, Přístavní with Drážďanská, U Trati with Spojka and Malá Hradební, Bělehradská with Krušnohorská, Sociální Péče with Mezní, Masaykova with Sadová and Masarykova with Štefánikova.

The above listed intersections are provided with capacity reserve, which is sufficient for establishment of PT priority. The lowest capacity reserve during peak periods is at the intersections Přístavní with Hrnčířská, Přístavní with Drážďanská and Masarykova with Štefánikova, which are located on the major city arteries and where congestion occurs daily.

4.4.2 Processing and provision of information to passengers

Technical support for PT, dealing with non-standard and emergency situations, and monitoring and recording the position of PT vehicles is currently provided by the dispatching centre of the PT Company. It is equipped with the supervisory and control system for monitoring routes of PT vehicles and information about individual vehicles. It also allows radio connection with PT drivers via the KONEKTEL network. Dispatchers are able to provide information about PT to passengers; there is a specialised office established for this purpose - the Information Centre of the PT Company, which, however, does not operate non-stop. Information to passengers is usually provided via telephone upon request. In most

cases, the requested information is on current changes to PT services, timetables and fares. There is also an internet search engine for PT connections available to the public.

For enhanced passenger awareness, the Station Information System (ZIS) should be established to provide dynamic information about current arrival times of trolleybuses and buses. ZIS is an integral part of the system providing transport information, making use of the subsystems for monitoring of a vehicle's position on its route. Stations will be equipped with a display panel with following information:

- The top line will display the PT connection leaving first, i.e. the number of the line, its destination and departure time in minutes;
- The other rows will display departures in the order that they leave the station;
- Moving text will inform about emergencies (great delays, cancelled connections).

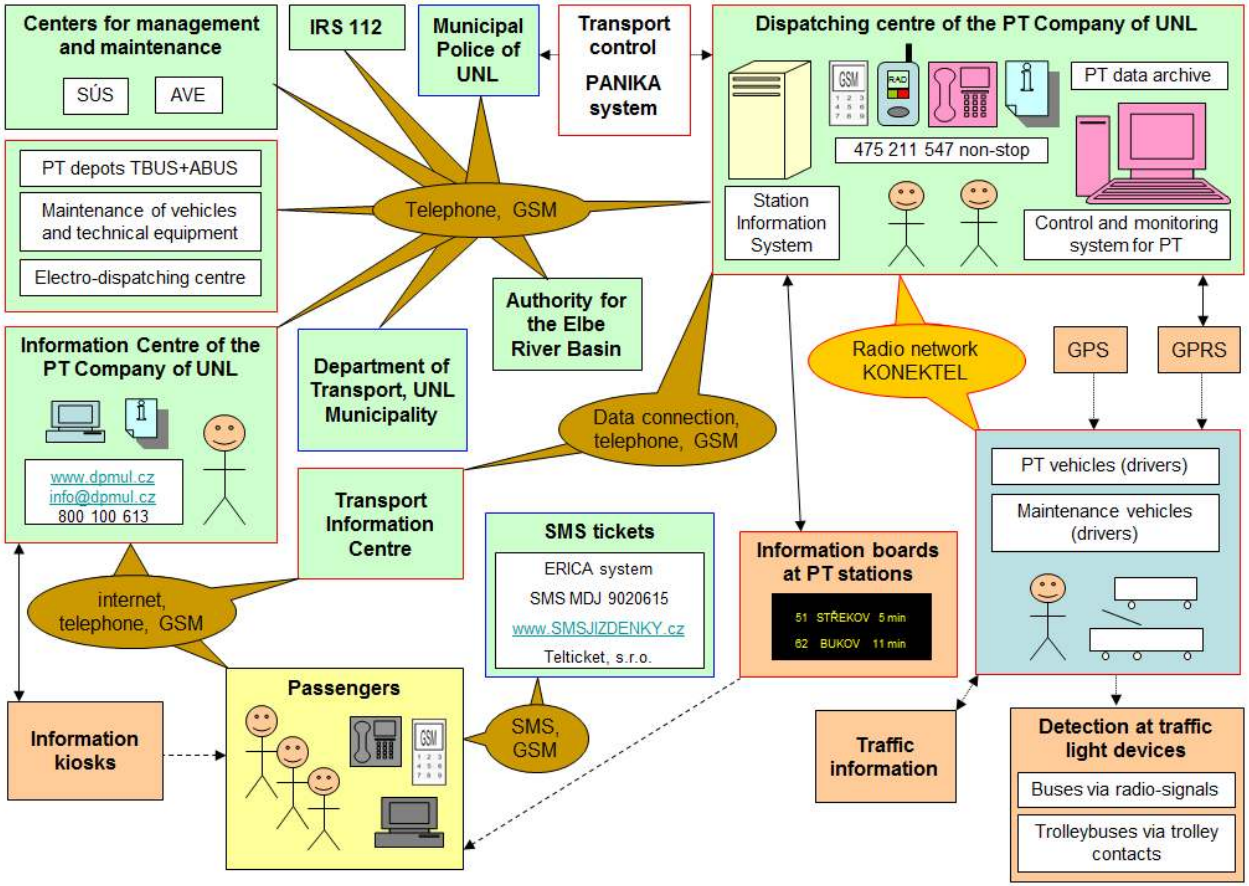
For visually impaired citizens, display panels will be supplemented by voice information with command transceiver, which will inform about the PT line number, final destination of the vehicle standing in the station, etc. This voice information can be used also to inform passengers at stations about extraordinary situations which will be received directly from the dispatching centre.

It is preferable to view actual departure times. All vehicles will be equipped with a radio-modem, which sends a signal when closing doors at each station. After receiving the signal, the relevant PT departure is removed from the display. The panel subsequently transmits the information to other 'intelligent' stations on the route of that line, and updates times of departure if necessary.

In terms of management of ZIS and its linkage to the dispatching centre, it is appropriate to apply the combined ZIS memory, i.e. the controller of the display panel does not store timetables; rather basic information on individual PT lines, their departures and deviations from the schedule are received from the control centre. Information presented about individual lines is managed by the controller itself. This reduces data load on the transmitting channels and the control centre does not have to deal with routine operations, such as sorting and updating times.

Another source of PT information may be kiosks at stations, or at other important transport nodes. A self-service kiosk would allow collecting transport information by searching for connections, or accessing the transport information website.

Figure 6 - Proposed physical architecture of the PT system in UL



4.5 Freight Transport

Currently, the system of goods transport in Ústí nad Labem is not centralised. Individual companies secure their own transport chains and it is highly improbable that such a goods transport centre will be established in near future, in particular due to the size of the territory.

In the field of transport of excessive loads and dangerous goods, strategic traffic management offers improvement in terms of increasing awareness among road users about nature of the transported load, date, time and route of the journey. The Traffic Information Centre would acquire such information in advance from the appropriate Road Administrative Office, which authorises the transport, and the information would be subsequently available to the general public, both via telephone and website application collecting relevant transport information.

Another issue related to freight transport is the proposed construction of tunnels in the city territory. Within the draft of the Master Plan of Ústí nad Labem, there are new backbone roads designed for the city, which, due to the terrain configuration, lead mainly underground through tunnels or above ground on bridges. In case of approval of the Master Plan and implementation of such tunnels (e.g. connecting streets Vítězná – Střekov – Žižkova), it will be necessary to ensure appropriate roundabouts for freight transport carrying dangerous loads, which is prohibited in tunnels.

As mentioned above, the city of Ústí nad Labem is an important source and destination of passenger and freight transport. Its relatively important share consists of transit traffic passing through the city, in particular in the direction of the Czech Republic – Germany. Due to the launch of the section of the highway D8 between Trmice – state border and unfinished final sections of the highway, local urban roads in Ústí nad Labem became part of the international road network. Currently, the last unfinished part of the highway D8 between Prague - Dresden - Berlin is the section Lovosice - Řehlovice. Temporarily, the route leads as the road E55 from the north in the direction from Ústí nad Labem to Lovosice from the highway D8 through roads II/613 and I/30 towards south. In the opposite direction, the route leads as the road E55 from Lovosice through roads I/8 and R63 on the highway D8. According to conducted traffic surveys, the more frequently utilised bypass is the road I/30. This is caused by its flat profile ensuring relatively constant speed of freight vehicles.

Part of the incomplete highway D8 should also include 2 tunnels – Prackovice (260 m) and Radejčín (620 m). After completion of the route in its entire length, it will be thus necessary to envisage not only planned closures and restrictions on these sections, but also exceptional closures and restrictions caused by congestion and road accidents. The only bypassing routes with sufficient capacity will become local roads, which currently serve as major transport links in the city. For this reason, it is not desirable to implement physical barriers limiting freight traffic in the city centre. Instead, it is necessary to design such regulatory measures, which would continue to allow transit to freight vehicles in case of non-standard operating conditions of the relevant section of highway D8.

4.6 Traffic Surveillance Systems

Outputs from the city camera system are currently processed and displayed only at the dispatching centre of the Municipal Police. Some of the traffic light-controlled intersections are equipped with devices that allow surveillance cameras to monitor roads, measure speed of vehicles and detect vehicles passing through red lights. Another supervisory system is a device measuring speed of vehicles at road profiles (instantaneous speed) or at road sections (average speed). These devices are located on the streets Pražská, Masarykova and Klíšská. Image information is displayed in a surveillance centre of the administrator of traffic light devices in the city (NTD Group).

The analysis of the current state conducted within ARCHIMEDES task 11.3.4 Strategic Traffic Management shows that there is a need for sharing visual information from the surveillance system among multiple subsystems. Proposed solutions should integrate other existing autonomously operating subsystems. Providing visual information on the current traffic situation would be enabled by establishing the above mentioned Transport Information Centre collecting traffic data from the region and providing views from cameras. A server presenting all traffic information should be accessible by all subsystems, which will benefit from it through faster and better targeted corresponding responses. This includes in particular units of the IRS, centres for maintenance and management of roads, and the dispatching centre of the PT Company. Data from selected cameras located especially in locations susceptible to congestion and at major roads in the city would be automatically sent to the National Traffic Information Centre in Ostrava and will be also displayed within the framework of United System of Traffic Information on the national website www.dopravniinfo.cz.

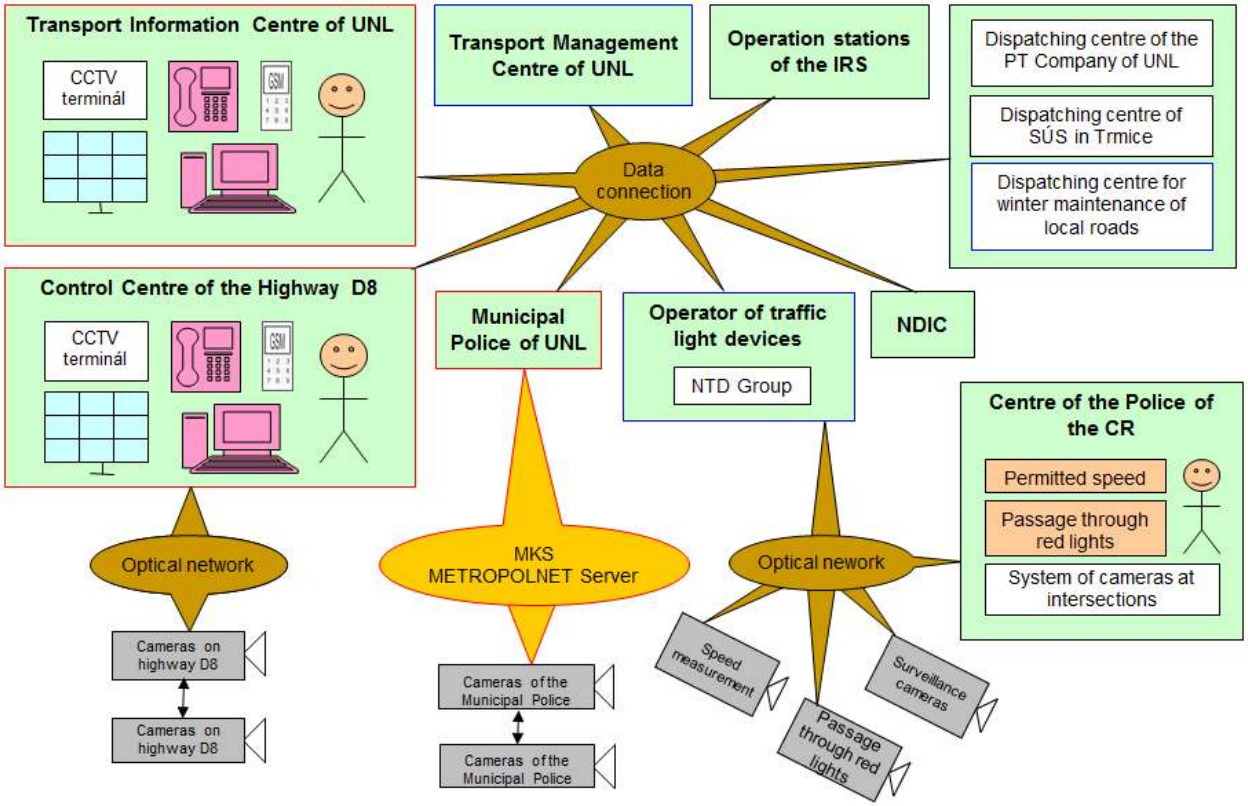
It is also important to provide a communication link with the Control Centre of the Highway D8, which is located in the Centre for Administration and Maintenance of the Highway in Řehlovice. Outputs from the highway cameras would be sent, besides the currently operating Control Centre of the Highway D8 and the Headquarters of the Highway Police, also to the local Transport Information Centre in Ústí nad Labem. The concept of connecting the camera system to the dispatching centre also presents direct link to all components of the IRS.

The city intersections with the most intensive traffic and road accidents (based on the analysis of traffic accidents in the city realised within the ARCHIMEDES task 11.5.3 Safety Audit) revealed the need to equip such locations with surveillance cameras. This is required at the following intersections in particular:

- Intersection Předmostí x Důlce
- Intersection Přístavní x Hrnčířská
- Intersection Bělehradská x Sociální Péče
- Intersection Sociální Péče x Mezní
- Intersection Žižkova x Makro
- Intersection Havířská x K Zahrádkám.

Additional devices measuring profile and sectoral speed should be installed on the street Žižkova, which is the main artery carrying traffic load incoming from highway D8, the street Přístavní in the direction from Děčín and the street Hoření.

Figure 7 - Proposed physical architecture for surveillance systems in the city



4.7 Emergency Systems

In case of emergency situations, such as accidents or breakdowns, it is necessary to alert rescue and security forces as soon as possible and to inform road users about the event. Emergency systems operate hierarchically at higher level than city level, and therefore, they are not subject of this study. Synergy and behaviour of individual units of the IRS during emergency situations is directed by the Act No. 239/2000 Coll. on the IRS. Emergency systems have a significant effect on urban environment and specifically, on local road infrastructure.

There are three operating centres established in Ústí nad Labem to receive emergency calls from the public telephone network and the GSM network. Each operating centre ensures reception and recording of calls, and activation of relevant units of the IRS. Calls on the international emergency hotline 112 are accepted by the Telephone Emergency Call Centre located at the headquarters of the Fire Brigade of Ústí region. Technology at the Telephone Emergency Call Centre connects the basic components of the IRS. If the reported emergency situation has an effect on traffic in the city, the dispatcher transmits data about the event into the JSDI and it is recorded at the NDIC. In case of implementation of the regional Transport Information Centre, the event would be recorded also here and then distributed to road users in the city.

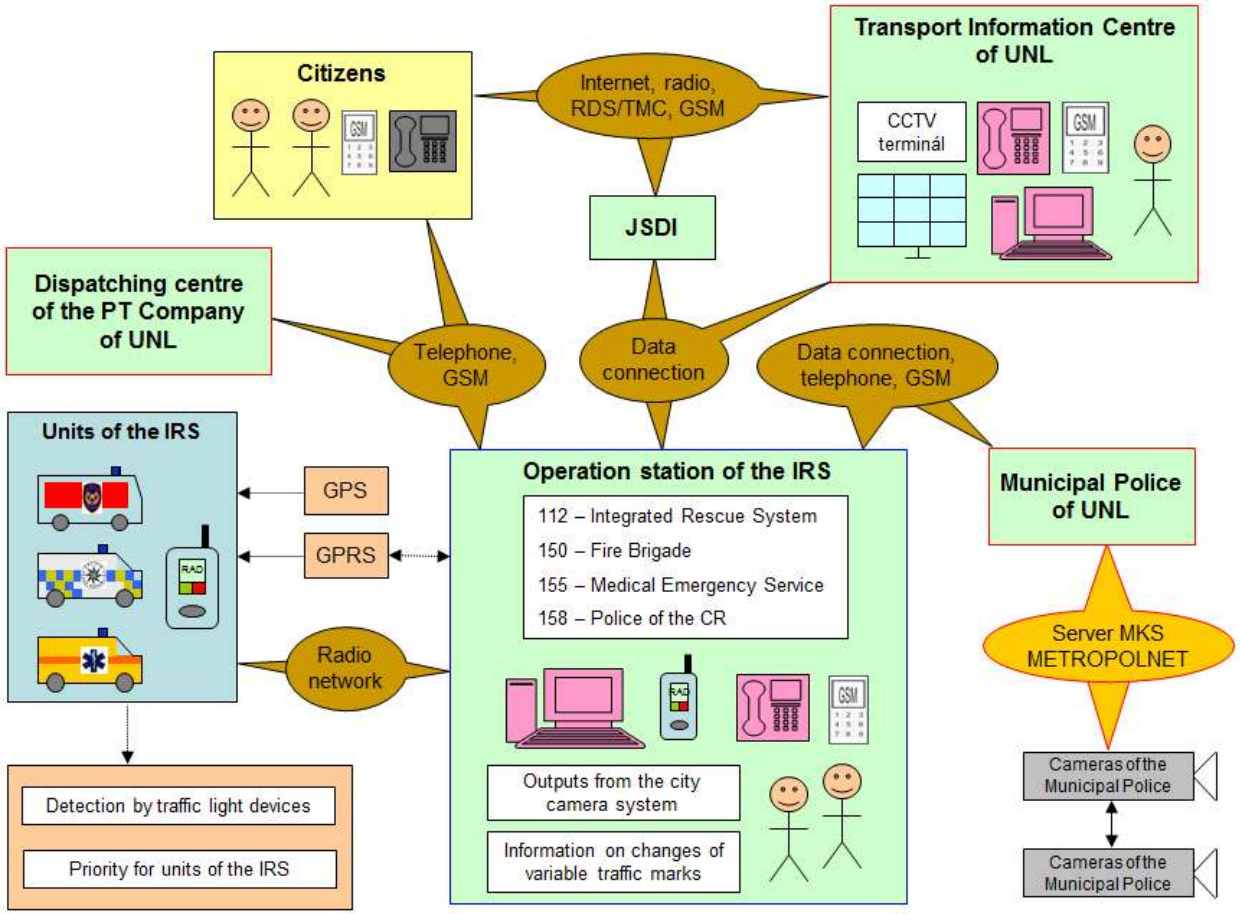
One of the technologies utilised on traffic light-controlled intersections is the system for priority passage of vehicles of the IRS. The vehicles are equipped with a radio transmitter sending signals to the detector, which identifies the direction from which is the vehicle coming and allows priority passage in that direction, while other directions on the intersection are stopped. Units of the IRS are provided with drivers allowing wireless transition of the signal to the controller. The signal is recorded by infra-red beacons and the relevant phase for priority passage of an IRS unit is activated immediately. The programme ensures non-conflict transit of traffic by incorporating appropriate transition phases within required intervals. In case of another request for priority passage, the controller may extend the relevant priority phase. After passage of the vehicle and its logoff, the controller switches to the regular mode. Almost all of the traffic light-controlled intersections in the city centre allow priority for vehicles of the IRS, except the intersection Přístavní with Hrnčířská.

To verify or update information on extraordinary events in the city, or to obtain additional information about such events, installed municipal cameras are utilised. Currently, it is possible to use the output from the camera system only based on telephone requests. In the future, it would be appropriate to allow access to the camera system for the IRS and other entities in the city. Data from selected cameras in the city territory would be transferred to the operation centre of the Fire Brigade and processed optimally into a website application as a map layer. Sufficient frequency is one view per 15 seconds, with a resolution of at least 1024x768 pixels.

Another improvement can be realised by establishing a link between the units of the IRS and the system controlling variable traffic marks. Variable traffic marks are in Ústí nad Labem installed on the street Přístavní. They allow changes to traffic management during emergency situations, such as floods and torrential rains. The system is used to divert traffic and close the section of the street between the intersections Pražská with Přístavní and Přístavní with Hrnčířská. In case of road closure, operation centres of all the three elements

of the IRS should receive automatic information displayed on a map at their website application and telephone alert. Additional information would be gathered from the urban camera system monitoring that particular road section.

Figure 8 - Proposed physical architecture of the subsystem of the IRS in Ústí nad Labem



4.8 Payments and Fees in the Transport Sector

In general, payments and fees in the transport sector in Ústí nad Labem are divided into:

- Payments on roads
- Payments for parking
- Payments for PT.

Charges on roads, such as charges at the entrances to the city centre and charges for transit through specific road sections, are currently not implemented in the city. The only payments implemented in the field of individual motor transport are payments for parking at designated locations. Payments are realised through parking machines or SMS.

Payments for PT services in the city are also established and can be realised by SMS tickets.

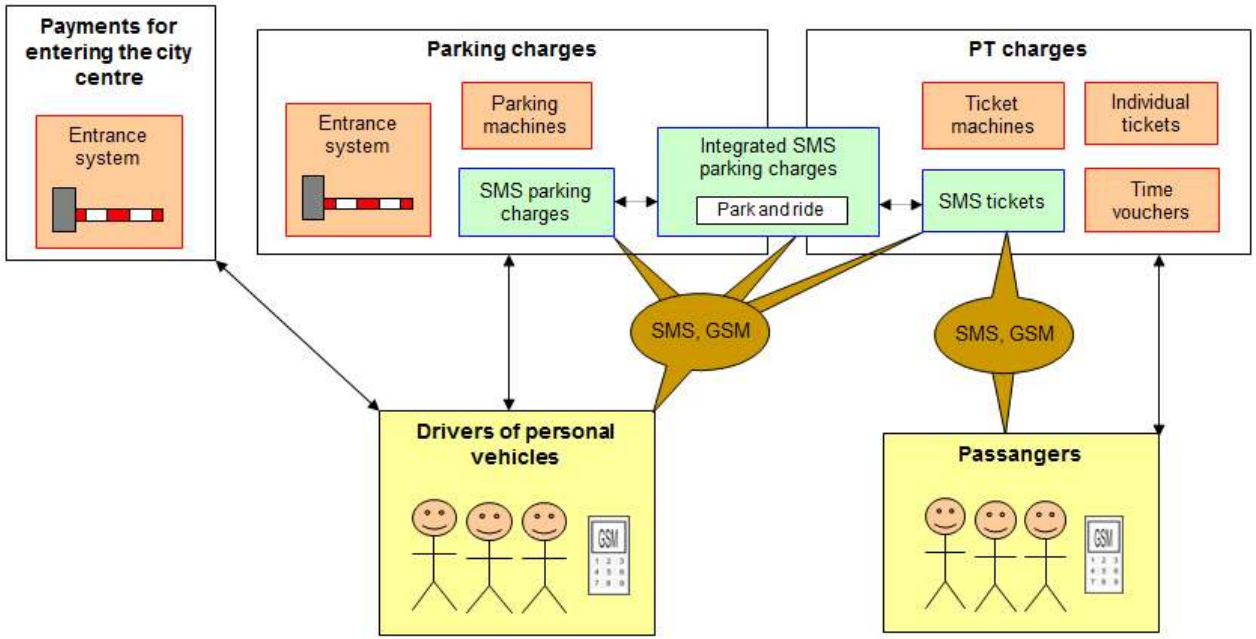
Payments on roads can be further divided into:

- Payments at entrances - for example entrances to the city centre or selected zones
- Payments for transport performance – such payments are based on travelled distances and may be combined with vehicle categories (passenger or freight).

In Ústí nad Labem, the system of paid entrances to the city centre could be implemented by payment mechanisms at the entrances equipped with gates, or by prepayments, while vehicles are controlled according their licence plates and checked in the database. Entrance to other minor roads leading to the city centre would be completely forbidden.

Other charges, which could simplify the transport system and motivate passengers to utilise PT, are integrated parking charges at collective parking premises and payments for PT services. Due to the fact, that payments for parking and for PT services can be currently realised by SMS, a solution of merging these two payments into one single SMS is evident, which would be cheaper than sending individual SMS messages separately.

Figure 9 - System of payments in the transport sector proposed for Ústí nad Labem



4.9 Management and Maintenance of Transport Infrastructure

Management and maintenance of class II and III roads in Ústí nad Labem is currently carried out by SÚS, with headquarters in Trmice. Class I roads are also maintained by SÚS but managed by the Directorate of Roads and Highways of the Czech Republic (ŘSD), which is their owner. Other local roads belong under the administration of the Ústí nad Labem Municipality and their maintenance is carried out by a private company hired by the municipal authorities (currently it is AVE). There are no foreseen changes to this system so far.

Information on management and maintenance of local transport infrastructure important for road users includes mainly those events influencing road traffic in the city. The information is divided into static and dynamic. Static information does not change frequently in time, e.g. information from the city traffic evidence or information on planned traffic restrictions. Static information must be presented to road users in a clear way, preferably with graphic outputs. It is necessary to update static information and announce the changes at least 24 hours ahead. It is desirable to store information in a form accessible to the widest possible number of users. The most appropriate instrument for static information is currently the internet; for dynamic information, the changes must be reflected by the Intelligent Transport System.

Traffic information can be further divided into the following areas:

Static traffic information:

Information from city map evidence – used to inform road users on certain characteristics of roads and their components, including width and directional layout of roads, construction conditions, capacity of bridges, height of tunnels, restricted zones and parking zones.

Static restrictions – information on planned traffic restrictions caused by construction works, occupancy of roads, organisation of sport and cultural events, etc. giving specifications on location, time, extent and duration of each restriction.

Dynamic traffic information:

Emergency restrictions – information concerning the actual limitations of transport due to construction works, repair or maintenance works, occupancy of roads, occurrence of accidents or breakdowns, etc.

Accessibility of roads – winter information for road users on accessibility of roads, snow cover, icy surface, etc. including meteorological information for most important localities.

Status of devices for traffic management – the system for traffic management requires timely information on failures of related devices and time of their correction. In case of long-term non-functioning of devices caused for example by repair works, information for road users include planned date of restored services.

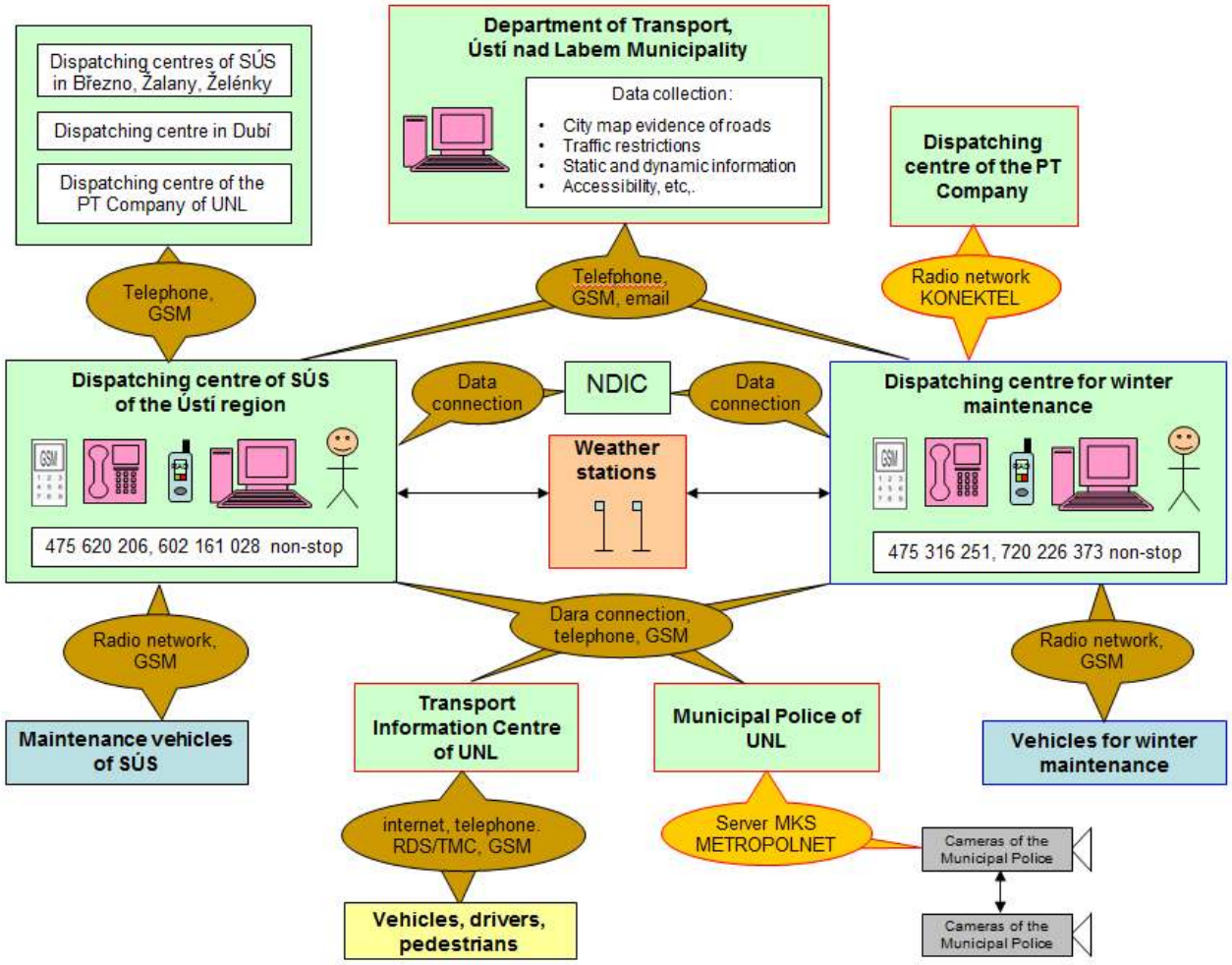
Dispatching centres of SÚS of the Ústí region provide data and traffic information to the National Traffic Information Centre (NDIC) within the United System of Traffic Information. Static information about traffic restrictions can be also obtained from the website of the Ústí nad Labem Municipality or of the Regional Authority of the Ústí Region.

Information most required by city inhabitants is information regarding local roads. The administrator of local roads, and thus the main source of information, is the Ústí nad Labem

Municipality. The Municipality, together with the dispatching centre for winter maintenance, will provide all static and dynamic information to the regional Traffic Information Centre, which will process it and announce the outputs via variable information boards or RDS/TMC (Radio Data System - Traffic Message Channel) to road users.

In terms of winter maintenance and improvements of accessibility, entities ensuring maintenance of roads in the city require actual updated information on current conditions of individual roads, preferably in the visual form, which could be obtained from the city camera system. Cameras should be placed at selected localities crucial for winter maintenance. Among the most appropriate locations currently are the streets Důlce (I/30) and Sociální Péče (I/30). These locations are also suitable for installation of weather stations, along with the bridge of E. Beneš.

Figure 10 - Proposed physical architecture of the subsystem for maintenance of local roads



5 Conclusion

Based on the analysis elaborated within ARCHIMEDES task 11.3.4 Strategic Traffic Management in Ústí nad Labem, the follow-up study was conducted to design the new architecture of the system of traffic management in the city. The proposal was based on conclusions of the previous task, specifically in terms of identified shortcomings of the current management scheme. The proposal defines an integrated traffic management system gathering, processing, storing and sharing information among the relevant bodies in the city with centralised management. Entities proposed to be included within the architecture of ITS are primarily administrators of roads, units of the IRS and road users (drivers, pedestrians, cyclists and PT passengers). Surveillance and regulation functions should be also integrated to effectively eliminate violations of traffic rules.

The proposed solution is designed to contribute to improving the quality of transport in the city, increasing traffic flow, improving road safety and lowering negative effects of traffic in the city, including the amount of accidents, injuries, deaths, material damages, emissions, noise pollution. The impact of the proposed traffic management scheme will be essential particularly during emergency events, which in Ústí nad Labem typically result from unfavourable weather conditions, such as floods and winter ice and snow. As a result of improved strategic traffic management, the city will be more suitable for development of non-motorised transport (pedestrians and cyclists) and for PT services.

The proposal will be integrated into the Sustainable Urban Transport Plan being developed within the ARCHIMEDES task 11.8.9 SUTP Development in Ústí nad Labem.