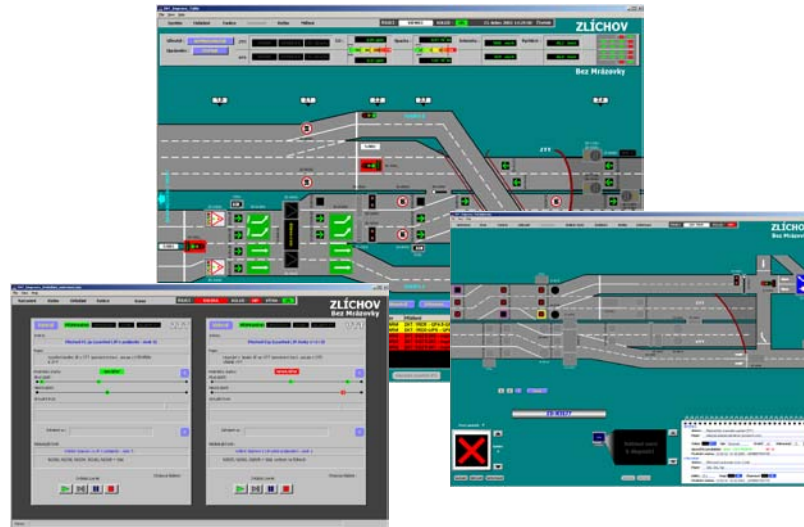


Kerberus®



Basic information

The **Kerberus®** control system is designed for controlling technology equipment in tunnel structures (air-conditioning, illumination, water management, safety systems, and others), and equipment for the traffic control in the tunnel and outside (variable traffic signs, luminous signal devices, information signboards, gates, and others).

The system is the result of combining the long-term development and hands-on experience with tunnels structures the company of ELTODO accomplished in the past. The algorithms are highly optimised and proved by long-term use in already accomplished developments.

The system can be divided into separate control of the traffic and technological sections that can be situated in independent centres within the tunnel control. In this case, both sections automatically interchange information needed for correct operation of the whole control system.

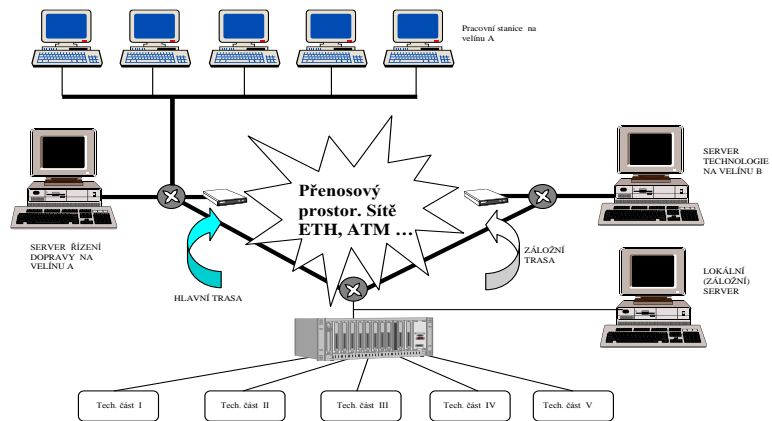
The system also supports SW and HW of the so-called Hot Standby redundancy of HW elements on all the levels. The safety rate is, thus, ensured to the maximum possible extent.

Structure

The tunnel can be controlled from several locations. It is assumed that the control will be concentrated in a local control centre, or a regional or central room of the traffic or technology control. In single locations, the Client/Server architecture may be applied when the server can be self-contained or formed by a couple of servers. The support of multi-display workstations is a matter of course. Control can be performed from any location, server or client. It is ensured that just one workstation is the master and the others subordinate for the given section of the control system and the given time. The control may be switched to another workstation at any time.

Structure Diagram

Legend: Přenosový prostor – Transmission space; Sítě ETH, ATM – ETH and ATM networks



General Features

- System parameterisation - Defined set of variables that the dispatchers with respective authorisation may set up during the control system operation
- SQL database support for storing all the system reports (alarms, events, dispatcher activities) and all the measured quantities and their archiving in the CSV format
- Acoustic output support - Generating respective sound according to the severity of the alarm
- Different authorisations for single traffic and technology dispatchers
- Open interface allowing automatic data exchange with other applications, such as
- OLE, ODBC, XML, OPC, and DDE standards support
- Graphical representation of the measured analogue quantities
- Screen display in the web browser
- Possibility of sending SMS or E-mail messages to service organisations
- The system complies with the TP98 requirements for stability, safety, and response (>1s).

Automatic Response

SW incorporates several ways of automatic responses that depend on the input triggering parameter (fire, stationary vehicle, failures of technology units, high concentration of harmful pollutants, traffic density, and others, or their combination).

- Instantaneous response without cooperation with the dispatcher – when lives of road users are endangered
- With time delay – when an event occurs, a prompt is displayed and counting-off triggered. When over, the measure is taken automatically. During this time delay, the dispatcher has time and a chance to block the system response and resolve the situation at his own discretion.
- Confirmation by the dispatcher – when an event occurs without being life threatening (e.g. failures of technology units), the system offers the possibility of resolving the event. Then, it is up to the dispatcher whether or not he/she embraces this offer.

<p>Traffic Control</p> <p>For controlling traffic in the tunnel and its vicinity, functions are implemented in the SW for comfort and protection of the dispatcher against improper or dangerous intervention with the traffic control.</p>	<p><u>The following belong among the basic features:</u></p> <ul style="list-style-type: none"> • Monitoring actual condition of all devices • Automatic controlling of the traffic signage • Direct (on-line) controlling of the traffic signage • Sequential (time-dependent) control • Defining tunnel's traffic situations • Defining user sequences, including triggering conditions and condition for the operation alone • Defining collision set-ups for symbols in the variable signage • Unlimited size of the user definitions database • Support to strip signalisation switch-off • Cooperation with the CCTV system • Simulation mode • Integration
<p>Tunnel Modes</p>	<p>The system allows defining various tunnel modes on whose basis it changes its behaviour (limits and enables competences of traffic dispatchers), or its appearance.</p> <p>Example: If the tunnel allows one-way and two-way traffic in one tunnel tube and the respective variable traffic signage (VTS) is available for dynamic transition, the system makes safety mechanisms stricter when transiting to the two-way traffic, or less strict when transiting to the normal traffic. This means that the symbols on the VTS designed for the two-way traffic are blocked in the normal traffic mode and vice versa. Thus, the maximum safety is ensured for the road users in the tunnel.</p>
<p>Control Modes</p>	<ul style="list-style-type: none"> • Real (on-line) mode – In this mode, all commands from the dispatcher are performed directly on respective VTS. • Simulation mode – In this mode, simulation of any tunnel traffic condition is enabled without making changes on VTS. This mode is used for simulating future traffic conditions and for training dispatchers.
<p>Control Layers</p>	<p>The system comprises several control layers of which every one is designed for a different operation type. The resulting command on the VTS is then a combination of requests from single layers with accepting their priorities.</p> <ul style="list-style-type: none"> • Disaster – Performing disaster sequences stored directly in the PLC control unit. It has the highest priority independent of the visualised communication condition. • Manual – Controlling single VTS separately or in groups • Priority – An automatic system response (automatic adjustment of symbols on the VTS depending on other symbols, or in cooperation with the control systems of other tunnels in one road route). • Sequential – Triggering and performing user sequences

<p>Safety Mechanisms</p>	<ul style="list-style-type: none"> • Quitting commands in order to prevent an unwanted command from sending to the VTS • Using passwords for special commands • Imaging the future condition before its implementing with the possibility of cancelling the operation • Evaluation of collision adjustments before performing the operation.
<p>Defining Tunnel's Traffic Condition</p>	<p>This function allows defining the tunnel's traffic condition for the dispatcher having respective authorization; the defined condition can then be used for defining sequences or for the function of comparing with the actual set-up of the VTS, and, thus, finding out differences between the real set-up and the respective definition. This is suitable for changing shifts and finding out of the specific situation by the previous dispatcher. All the conditions created are stored in the database for later use.</p>
<p>Defining Traffic Sequences</p>	<p>The sequence is a time-dependent succession of commands on the VTS. The dispatcher can configure sequences freely. He/she also defines single steps (command on the specific VTS), the time for transiting to the next step, triggering conditions (the set of conditions in the tunnel under which the specific sequence can be triggered), conditions of transiting to the next sequence (checking the commanded VTS within the step), the flag of cooperation with the operator and the sequence type.</p> <p>Up to 8 types of sequence can be defined (disaster, emergency, normal, transition to/from the two-way traffic, etc.). The specific type is derived from the customer's requirements. Every type, then, affects the control system behaviour in different ways.</p> <p>Defining the cooperation with the camera surveillance system can be incorporated in the sequence definition. For every step, it is possible to define a certain number of camera/monitor/pre-position requirements</p> <p>The advantage of this solution consists in the possibility of modifying a definition any time during the operation according to the actual situation. The proposed solution does not always correspond to the traffic control needs when the tunnel is put into operation.</p>
<p>Collision Conditions</p>	<p><u>The system incorporates three types of collision set-up definitions:</u></p> <ul style="list-style-type: none"> • Definitions dependent on the tunnel mode. They are defined in the design of the control system software for the specific tunnel. This is a table of banned symbols for single VTS and the respective tunnel mode. It is a fixed definition, and the dispatcher is not allowed to change it during the control system operation. The system will prevent an attempt to set-up a combination from occurring.

- The user-defined collision conditions (cannot be quit). This is a combination of symbols and VTS conditions that could endanger the tunnel's operation safety. The system will prevent an attempt to set-up a combination from occurring.
- The user-defined collision conditions (cannot be quit). This deals with incorrect set-up of symbols on the VTS that do not endanger the traffic safety. While attempting to close the gate into moving vehicles, the dispatcher will be warned, but no attempt of preventing him/her from doing that will be taken.

Integration

The **Kerberus**[®] SW contains a mechanism allowing cooperation with other tunnel control systems (or other traffic control systems) forming one entity. The user (operator, traffic engineer) is, thus, capable of compiling various variants of resolving traffic situations within the whole entity without the necessity of intervening with the structure of own control systems in single tunnels.

Technology Control

The **Kerberus**[®] tunnel structure control system SW is an open and user-friendly tool for reliable controlling and monitoring of the traffic facility technology equipment.

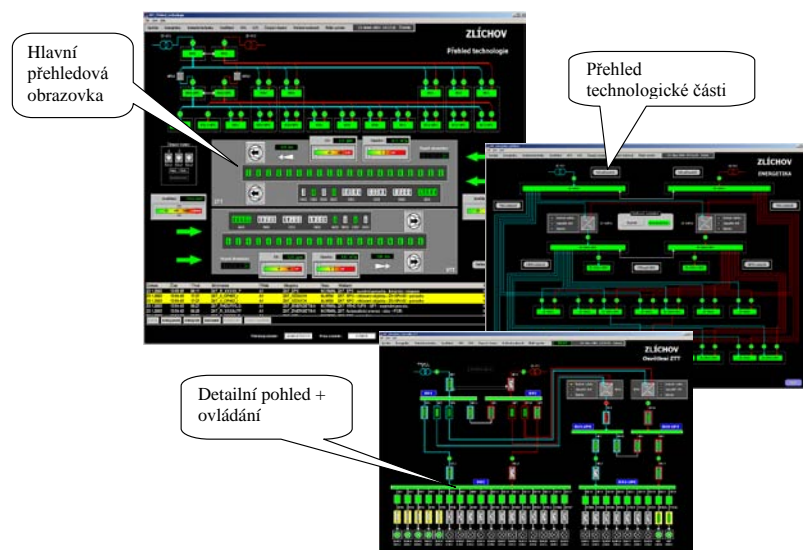
It is prepared for a specific application, including integration into superior centres.

Controlling elements is uniform in the whole system.

Legend: Hlavní přehledová obrazovka – Main overview screen; Přehled technologické části – Overview of single technology entities; Detailní pohled + ovládání – Detailed views with control elements

The SW part for technology control is designed as three-level imagery.

- Main overview screen
- Overview of single technology entities
- Detailed views with control elements



This SW part is primarily capable of controlling the following technology groups:

- Energy management
- Air-conditioning
- Illumination
- Water management
- Pumping stations
- EPS, EZS
- Door system
- CCTV

Dispatchers may also use comprehensive diagnostics of the whole control system, information on conditions of all the traffic devices, and the imagery of all the measured analogue quantities. For the technology, the SW part also contains on-line help with descriptions of all the animations used.

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