LIOS TECHNOLOGY

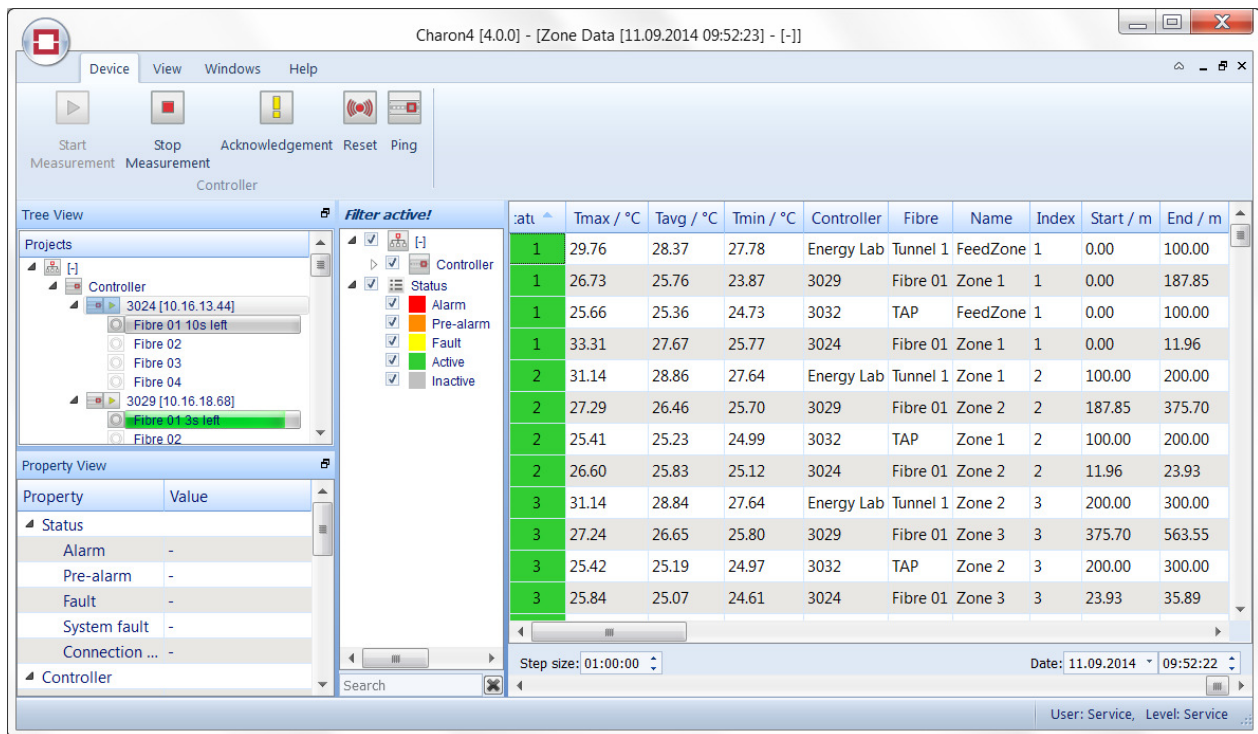# Charon4 Database and Visualisation Software

Figure 1: Main window of Charon4 showing Tree-View Navigator and Zone View.

General

Charon4 is a user-friendly and easy-to-learn software application for storage and visualization of data from LIOS distributed temperature sensing (DTS) systems. Data from point data sources and optional En.Sure Real-Time Thermal Rating (RTTR) results are also stored and visualized by Charon4.

The measurement data is stored in a powerful SQL database for convenient access. Data visualisation presents desired information in a comprehensive manner. The enhanced visualisation options of Charon4 offer various customisable views of data. Data export, import and software interfaces support third party tools. Optional En.Sure RTTR provides real-time information about conductor temperatures of power cables.

Technical Background

Charon4 is a multithreaded 64-bit (or 32-bit) Windows application. State-of-the-art object oriented software techniques are adopted using the Qt framework. Measurement and configuration data is stored in a powerful SQL database using a database server.

In a standard installation, database, communication services and visualisation client are installed on a single PC. Network installations with a central database and several clients can be used in applications with several users accessing the same data.

A Windows software package and maintenance procedure can be used for installation, update and removal. Communication with the DTS systems can be established over TCP/IP connections. Data compression algorithms are applied for efficient communication and minimum use of data storage. Data integrity is guaranteed by the use of cryptographic hashes. The GUI (Graphical User Interface) of Charon4 is compliant with modern Microsoft Windows standards in order to offer intuitive operation to the user. A concept of user levels with different access rights is used to protect sensitive settings. The display language can be changed. Further display languages can be easily implemented using the LIOS Technology translation tool.

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dB Database

 Measurement data is stored in a SQL database on the user PC or optional on a database server with huge storage capacity normally sufficient for several years. Historic measurement data can be deleted automatically after a user-defined period. With this feature, measurements can be run for unlimited time without overloading the database. Measurements during alarms, fibre breaks, errors and other events can be excluded from automatic deletion or deleted after a longer period. High availability and safety of data can be achieved by running two databases in parallel. DTS systems communicate with the database over a network via UDP and TCP/IP protocols.
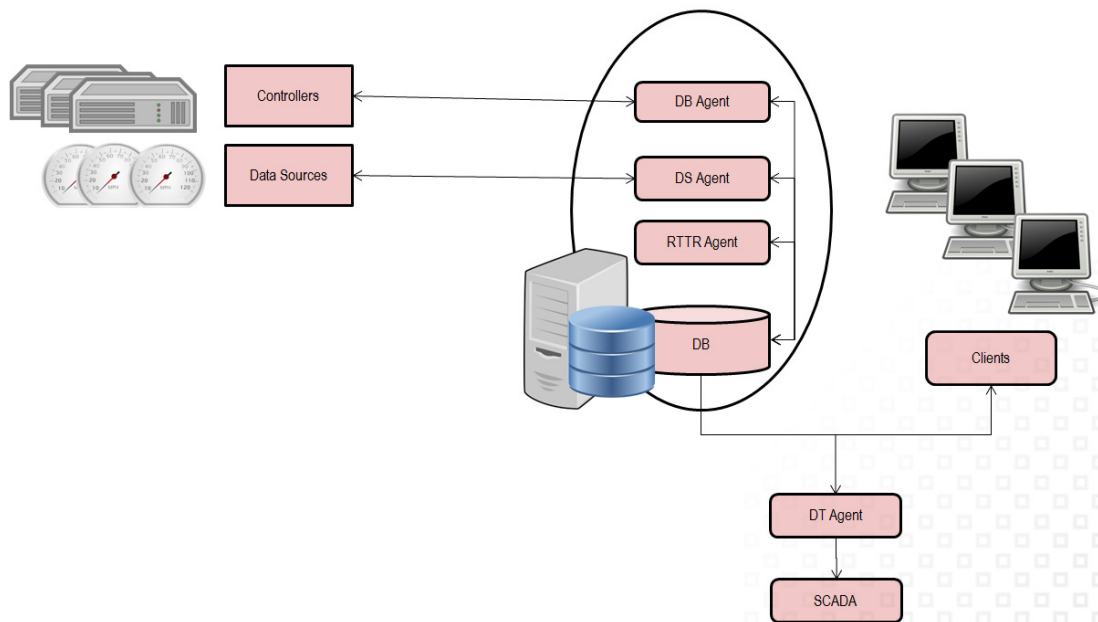

Figure 2: Structure of Charon4 database, services and visualization applications.

Visualisation Capabilities

Various data types of DTS systems and other data sources (e.g. temperature profiles, temperature history, zone data, point sensor history) can be shown synchronously in different windows or on multiple screens.

DTS, data sources, structures and user-defined enhanced views are listed in a tree-view NAVIGATION window with project folders.

Properties of a selected project, DTS, fibre, data source, structure or enhanced view are shown in the PROPERTIES window (name, alarm and failure status, IP address, …).

Temperature profiles from several channels can be visualized on a common CHART window. The charts can be scaled and zoomed. Reference curves and curves from the repository can be added for comparison.

Zones from all DTS systems within a project can be visualized in a common ZONE VIEW window. Zones can be sequenced according to status, temperatures and other criteria in order to show most relevant information always on top.

The HISTORY window can show the history of temperature data at selected locations and data from point sensors.

Temperature data can be visualized in a contour plot showing temperature as false colour over time and location.

All windows are updated in real-time.

Structure Monitoring

Structures combining data from several DTS can be easily defined and visualized. The structures enable the combined visualization of large or long installations, plants, tunnels, cables or pipelines that are monitored by multiple DTS. It also allows to combine data from different DTS monitoring the same area using certain rules (minimum, maximum or average). This feature is especially useful for safe

monitoring of structures using redundant DTS installations.

Enhanced View

The optional ENHANCED VIEW can be used for custom visualization of installations. Custom pictures, maps or drawings can be used as background. Zone, temperature and point sensor data can be visualized using different shapes for numerical, colour or chart displays.
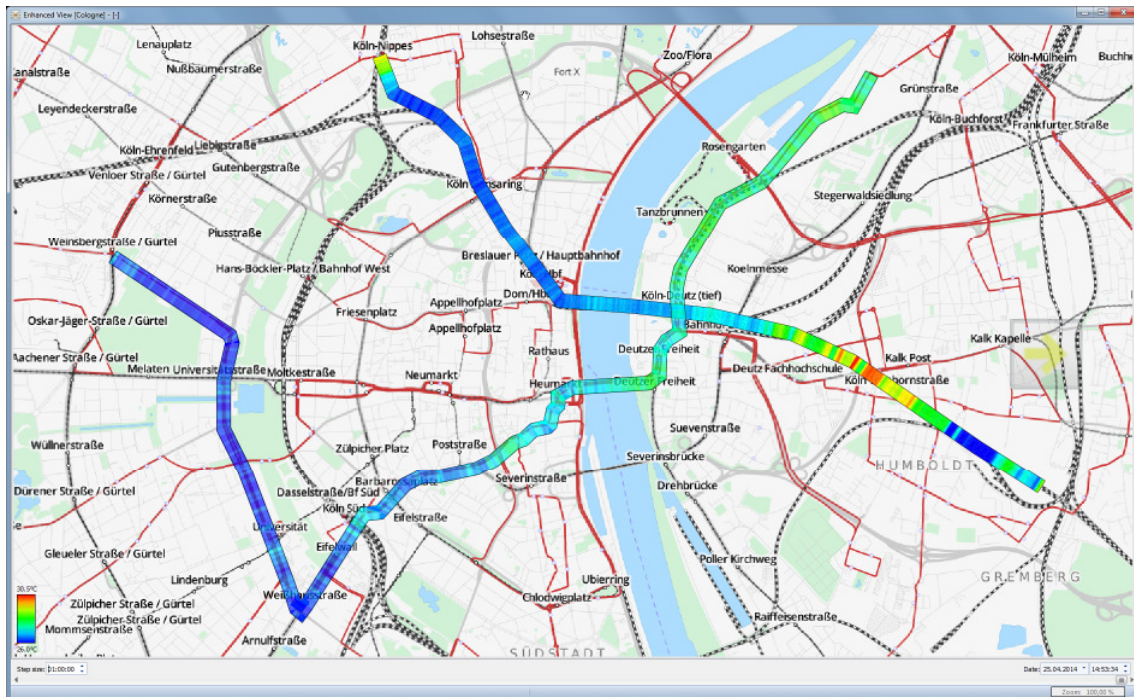

Figure 3: Enhanced view showing temperatures along two railway lines.

Point Sensor Data

Point sensor measurement data can be stored and visualised by Charon4. Supported protocols are MODBUS/TCP, DNP3, IEC 60870-5-104, IEC 61850 and OPC-DA. Combination of sensor values is possible as well. Please contact our technical support for information on other fieldbus protocols.

EN.SURE RTTR - Real Time Thermal Rating of Power Cables

The optional integrated EN.SURE RTTR application is a state-of-the-art cable rating engine that is dedicated for using online DTS temperature and current sensor readings. The calculation algorithms are optimized for high speed, thus enabling the calculation of conductor temperature profiles along the full length of a cable as well as rating all critical locations with different laying schemes. The engine is based on IEC standardised methods (mainly IEC 60287 and IEC 60853) and includes enhancements according to latest scientific results. Thermal models of the installations are optimized and verified by comparison with physical finite element simulations. The engine has the capability to adjust external parameters such as ambient temperature and thermal resistivity of soil in accordance with the rating results and can process measured ambient temperature as well.

Data Export

Project, measurement and configuration data can be exported from the database. The complete information will be stored to a file in order to archive the data or for transfer the data to another Charon4 database. Manual and automatic ASCII data export can be used to transfer the measurement data to third party software (e.g. Microsoft Excel).

Data Transmission

Results from En.Sure CT/RTTR can be feed over fieldbus protocols directly into a SCADA system. Supported protocols are DNP3, IEC 60870-5-104 and IEC 61850. Please contact our technical support for information on other fieldbus protocols.

Technical Data

Operating Systems
- Windows 7 (Service Pack 1 or higher), 64-bit recommended
- Windows 8.1
- Windows 10
- Windows Server 2008 R2
- Windows Server 2012 R2

Hardware Requirements: Visualization Client
- PC with dual-core processor
- 4 GB of RAM memory
- 10 GB of free hard disk capacity
- 19" or larger screen recommended

Hardware Requirements: Database Server
- Server with dual-core processor
- 4 GB of RAM memory
- 250 GB of free hard disk capacity
- RAID 1 or 5
- UPS (uninterruptible power supply)

Hardware Requirements: Dynamic Cable Rating)
- PC with high-end quad-core processor
- 8 GB or more of RAM memory
- 250 GB of free hard disk capacity
- RAID 1 or 5
- UPS (uninterruptible power supply)

Database Capabilities (performance depending on server hardware)
- 32 TB maximum Table Size
- Connections to multiple DTS and other data sources
- Connection to multiple clients (depending on license)
- Import, export, clean-up
- High availability and data safety with dual database setup

Visualization Capabilities
- Tree view navigation for DTS systems, data sources and views
- DTS status
- Zone data, temperature profiles and history of data
- Visualization of structures monitored by multiple DTS
- Enhanced views with pictures of installations or maps (option)
- Languages: English, German, Chinese, Russian, Korean, traditional Chinese, others on request
- Systems of units: SI, Imperial units

EN.SURE RTTR (option)

Input data	• DTS temperature data • Point sensor data (e.g. electrical current, ambient temperature, moisture of soil)
Advantages	• Compliant to IEC standards • Multilayer soil model • Self-learning of ambient temperature and thermal resistivity of soil • Models validated by FEM simulation
Results	• Conductor temperature over cable position • Dynamic rating of temperature, current and time with constant or variable load
Data Export	
Database export	• Measurement data in *.mex4 format • Enhanced views in EV4 format
ASCII	Writes measurement data to a text file.
Data transmission	Fieldbus interface to feed RTTR results to a SCADA system

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