Content

LYSIDATA
SCIENTIFIC DATA
SOFTWARE SYSTEMS

- The Architecture of scientific data acquisition in the lysimeter research facility at GSF-Neuherberg, Germany

  - Introduction
  - Technical Structure
  - Intentions and Requirements
  - Common Methods of Resolution
  - Database Architecture
  - Software - Data Acquisition
  - Software - Data Visualisation
  - Software - Facility Controlling
  - Software - Protocol and Database Administration
  - Summary

Introduction

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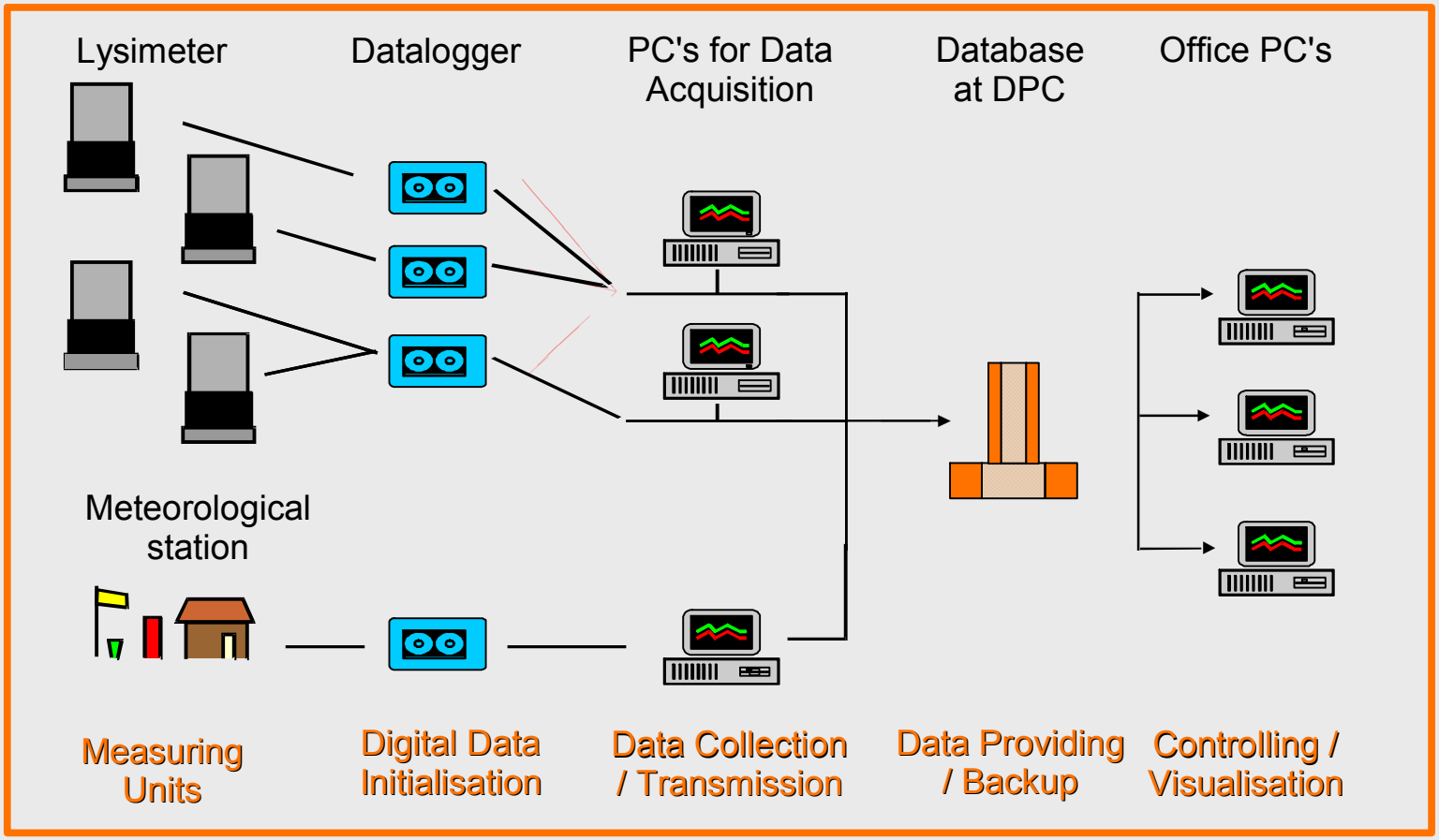
- Personal Profile
  - Georg Janker, Munich
    - Consultant for Software Engineering
    - Involved in GSF Department EUS since 1990
  - Dirk Römermann, Munich
    - System- and Software Engineering
    - Consulting and Software Engineering since 1992
- Activitiy Focus
  - Consulting and software engineering for research facilities
  - Since 2001 consulting the GSF lysimeter facility and
  - Development of a most efficient data acquisition architecture
  - Development of an integrated software system for research facilities, in particular for the GSF lysimeter facility.

Technical Structure



- Up to 48 lysimeters with measuring units connected to different types of datalogger
- 2 PC for data collection and data transmission
- One meteorological station nearby the lysimeter field
- Database Management System (DBMS) at the GSF Data Processing Centre (DPC)
- All components connected via LAN

Intentions and Requirements

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- Scientific User and Operator

  - Data Availability
    - immediately after acquisition
    - for different users like scientists and operators
    - Continious data flow ???
    - long time storage, especially for lysimeter research projects

  - Data Access !
    - Data transparency : distinct data allocation
    - Verifiable data : distinct data origin
    - Interpretable data : saving available measuring circumstances

  - All this qualities should be available after years independent from active scientist or operator

Intentions and Requirements

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- Common Software Requirements

  - Continuous data acquisition and storage from different datalogger types
  - Easy data access, visualisation and export with standardised user interfaces
  - Efficient operating and controlling of the whole facility
  - Automation of administrative database jobs

Common Methods of Resolution

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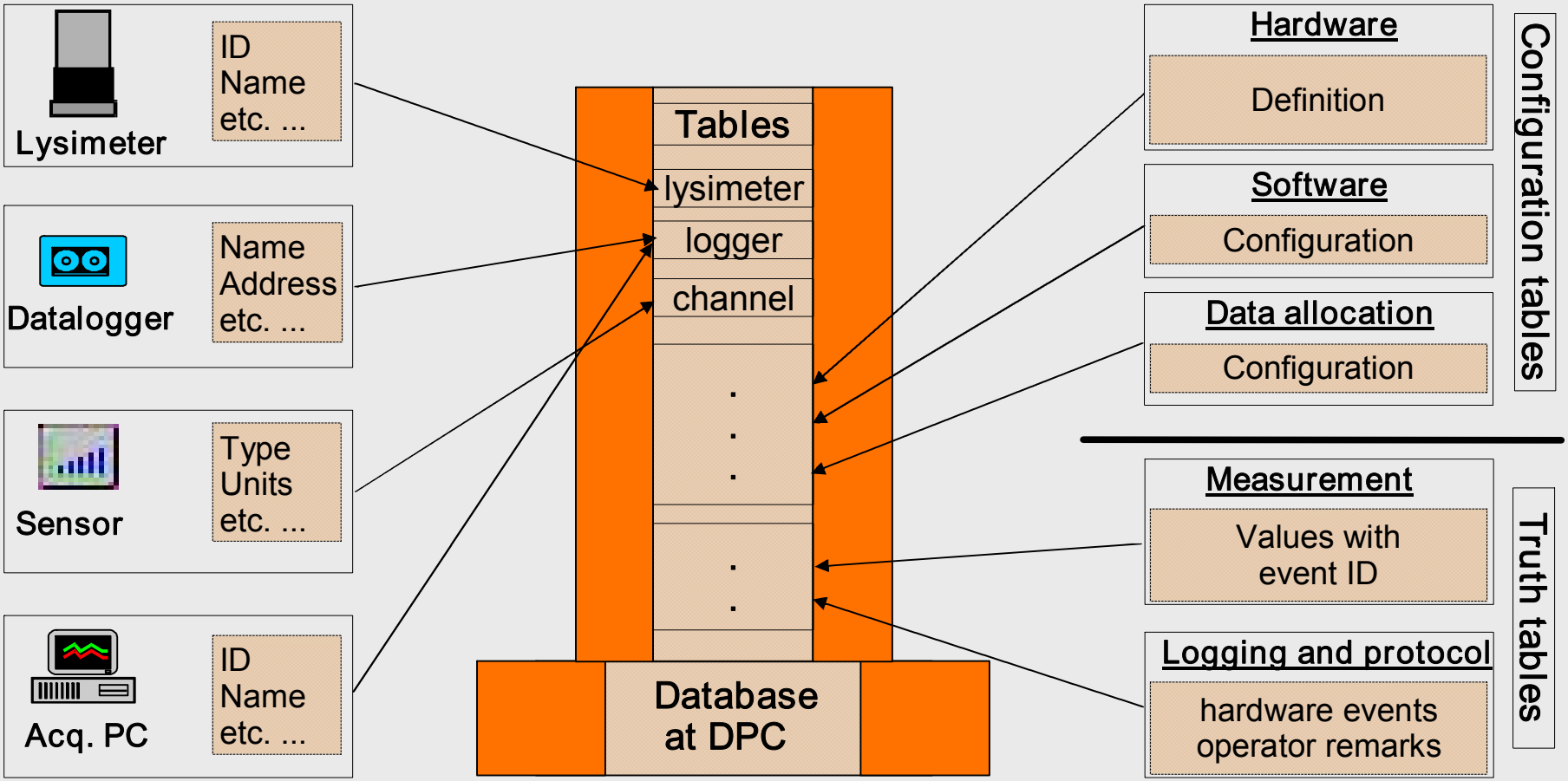
- Methods of Resolution
  - Constructing the database architecture !!
    - maintains all infrastructure information
    - central configuration of sensors, datalogger, etc.
    - Global software configuration
  - Developing independent software modules for
    - Data collection and transmission
    - Data Visualisation
    - Facility controlling
    - Database administration
    - Manual event logging and data mining

Database Architecture



- Each measuring unit property is mapped to configuration tables
- Each definition and configuration is registered
- Logging and protocol tables for advanced data interpretation

LysiMess - Data Acquisition

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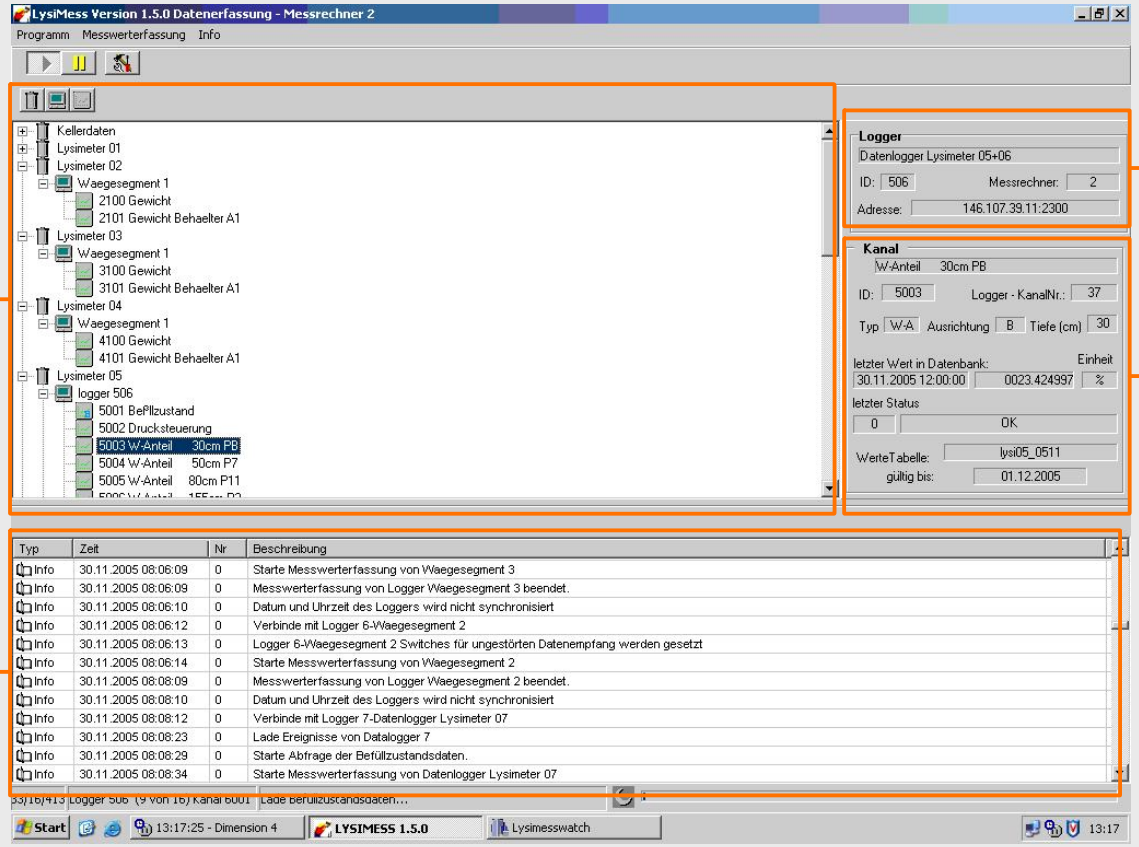
- Program Overview

Structured tree view of connected units



Active datalogger details

Active sensor details
+ last Value
+ last State

Runtime activity protocol

- free scaleable acquisition cycles
- special module to collect soil water drain values and to tare weighing units
- integrated runtime watchdog

LysiMess - Data Acquisition

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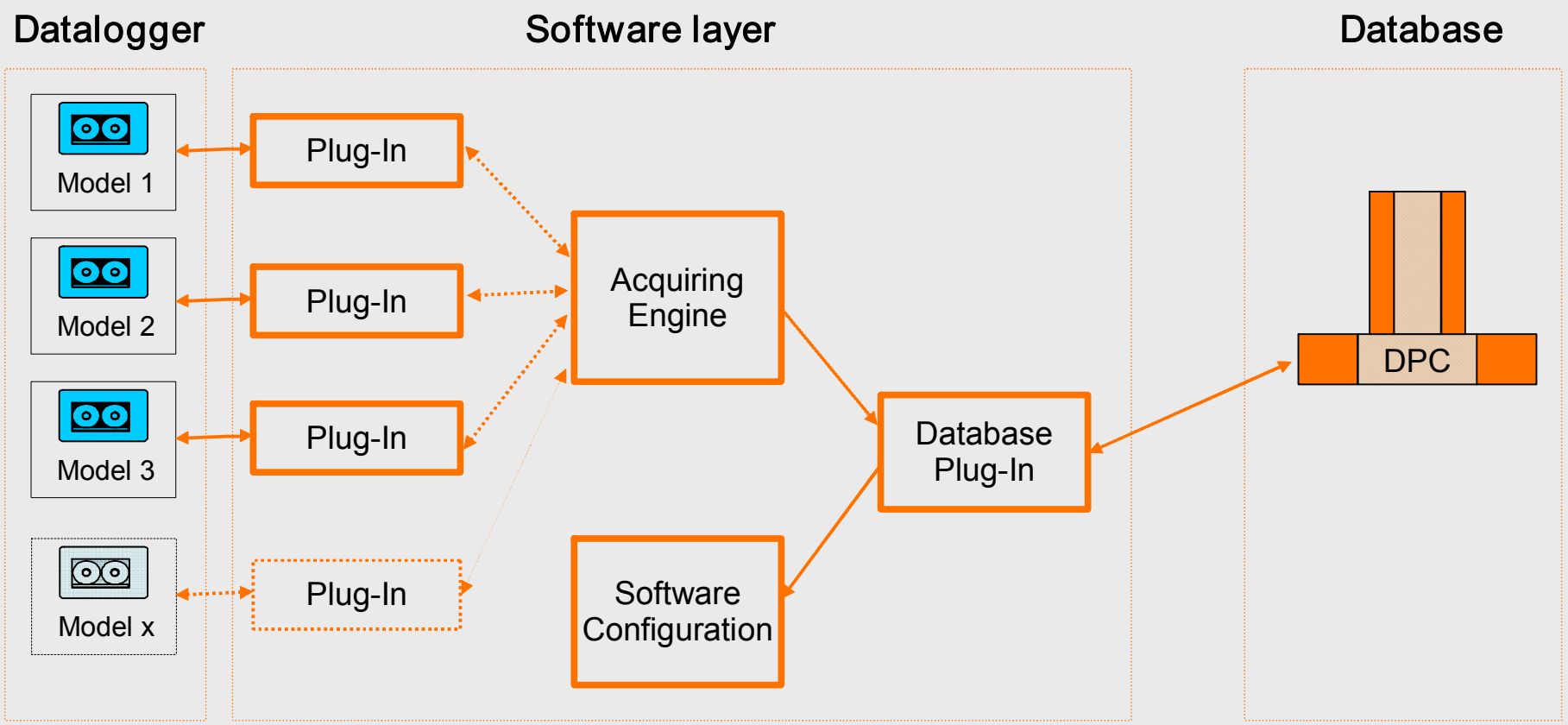
- Acquisition software model



- Changing datalogger model only needs changing configuration
- Adding datalogger model only needs integrating new plug-in
- Changing database-system only needs changing database plug-in

LysiVisu - Data Visualisation

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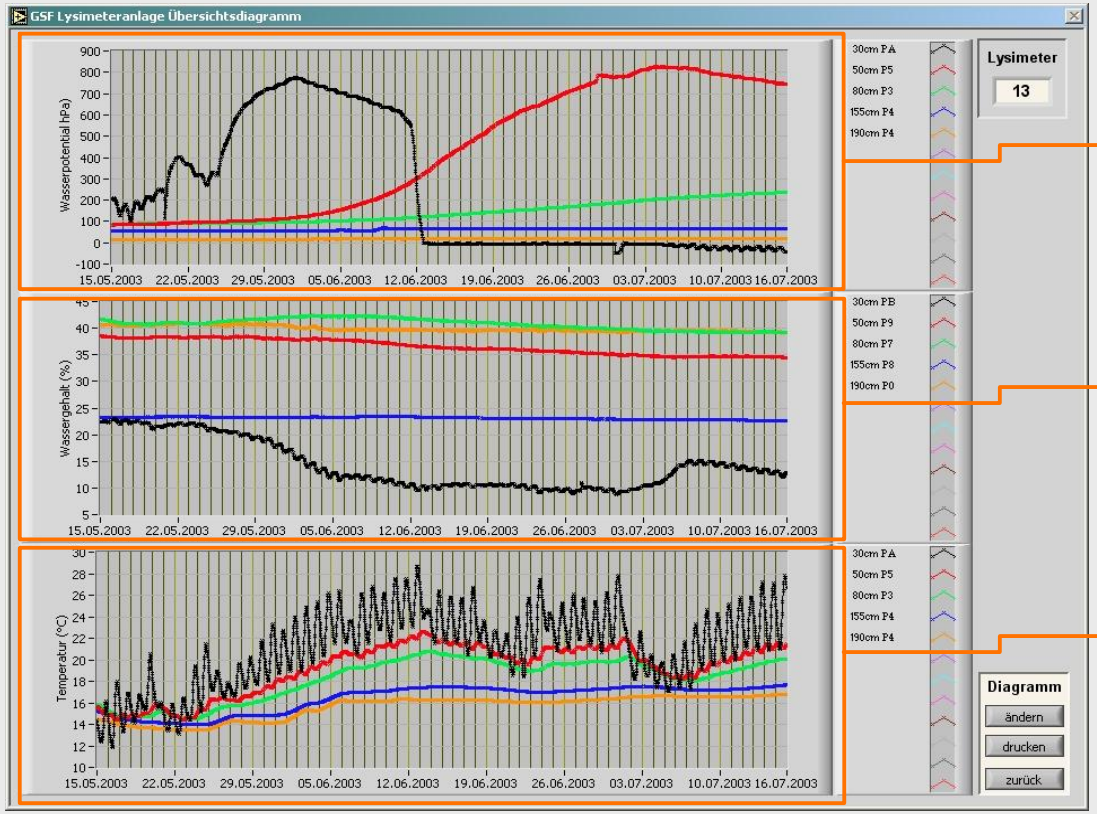
- Overview diagram



suction power

soil water content

soil temperature

- Ergonomic overview
- Quick determination of actual lysimeter state
- Easy sensor failure detection

LysiVisu - Data Visualisation

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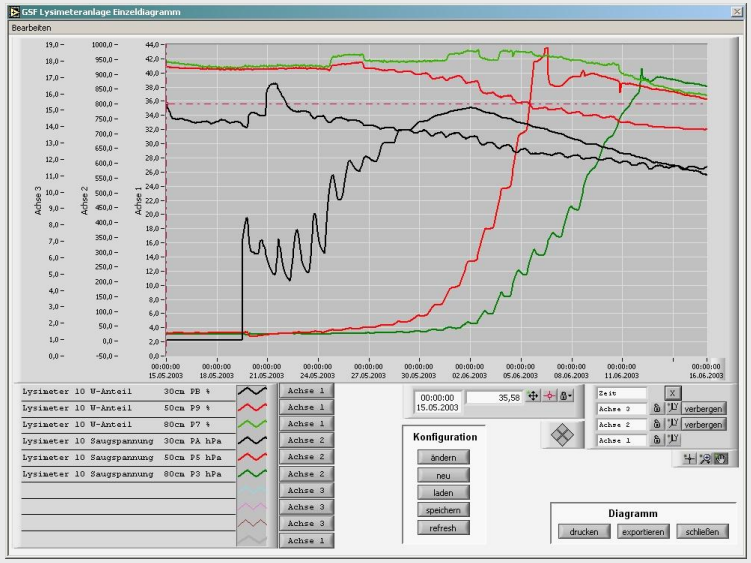
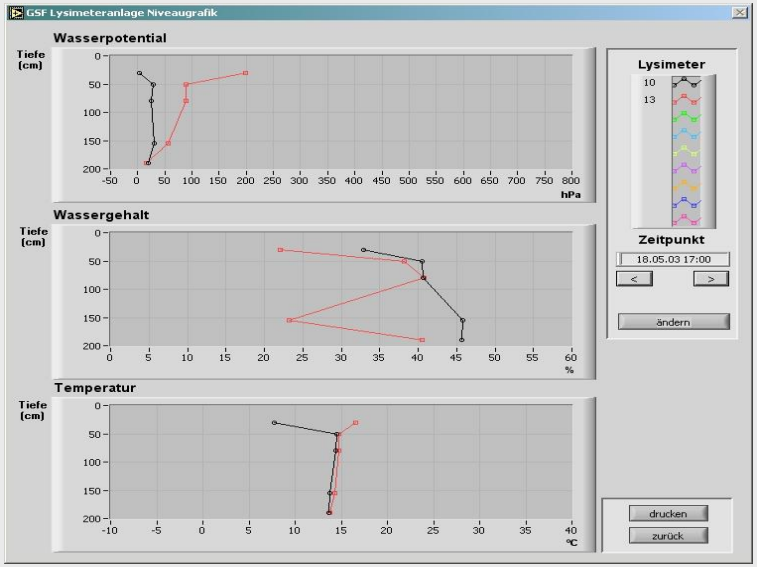
- Individual view



- Level diagram



Visualisation benefits

- Standardised Interface
- Create, save and reuse of individual views
  - Useful for scientific analysis as well as daily service and maintenence
- Data export
- Adjusts automatically to new facility configuration

LysiControl - Facility Controlling

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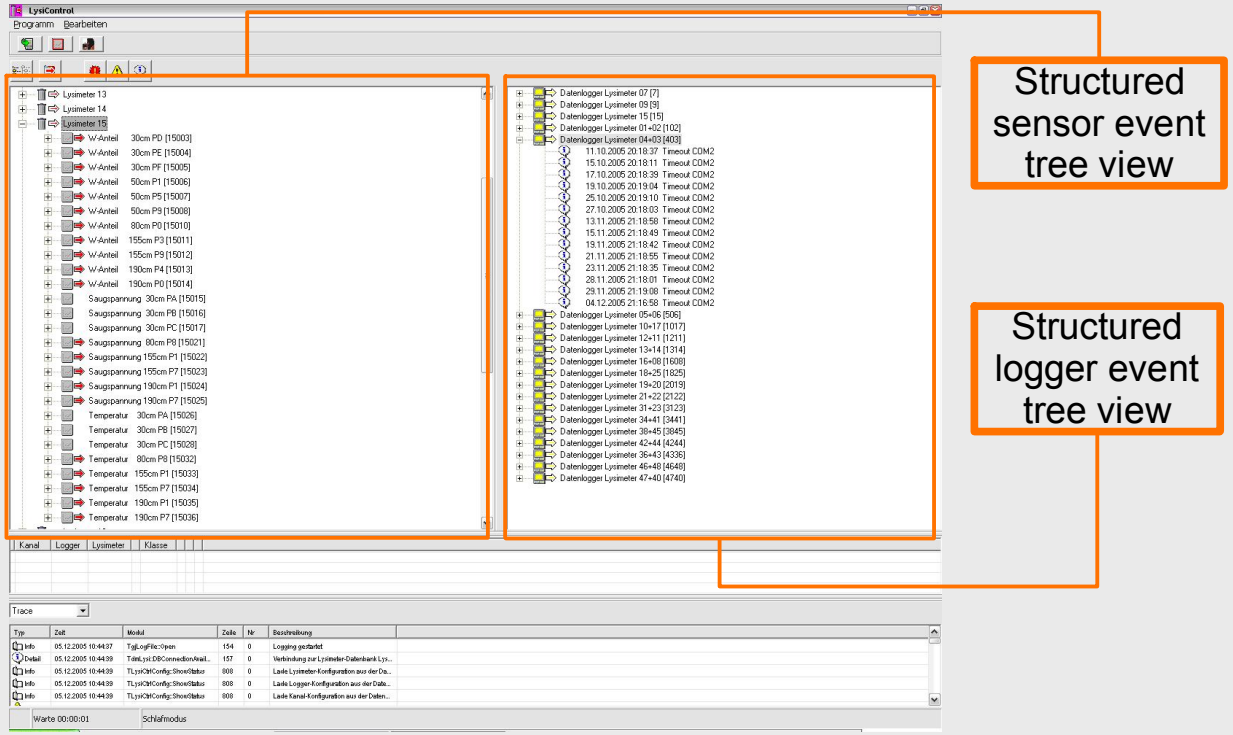
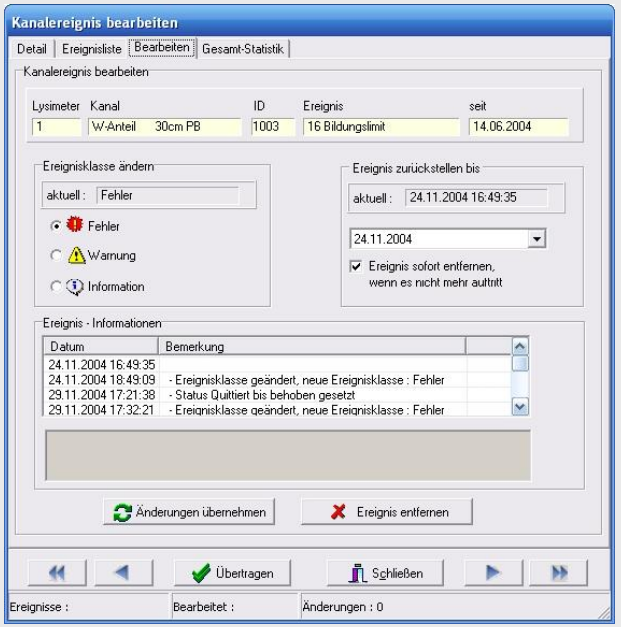
- Main Program view



- Edit sensor event mask



Controlling benefits

- Quick facility state overview for operators just in time
- Advanced hardware event interpretation and annotation
- Considering event classification

Protocol and Database Administration

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- LysiProtokoll
  - Logbook for Operators
  - Search engine for events and remarks
  - Creating facility reports over time periods and units

- LysiDBAdmin
  - Realise database administration jobs without system knowledge
    - Creating new truth tables and data allocation entries
    - Handling user access

Summary

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- Conclusion

einführungssatz

- Using the universal database architecture guarantees
  - most reliability in data availability and accessibility
  - independence from different users data models and storage format
  - comparable measurement results
- Using integrated software models gives
  - standardised interfaces for each field of activity
  - most flexibility in hardware modification
  - highest standard in facility operating

- Thank you for your attention