

DATAMANAGEMENT CONCEPTS



IN COOPERATION WITH





PART 1

LYSIDATA

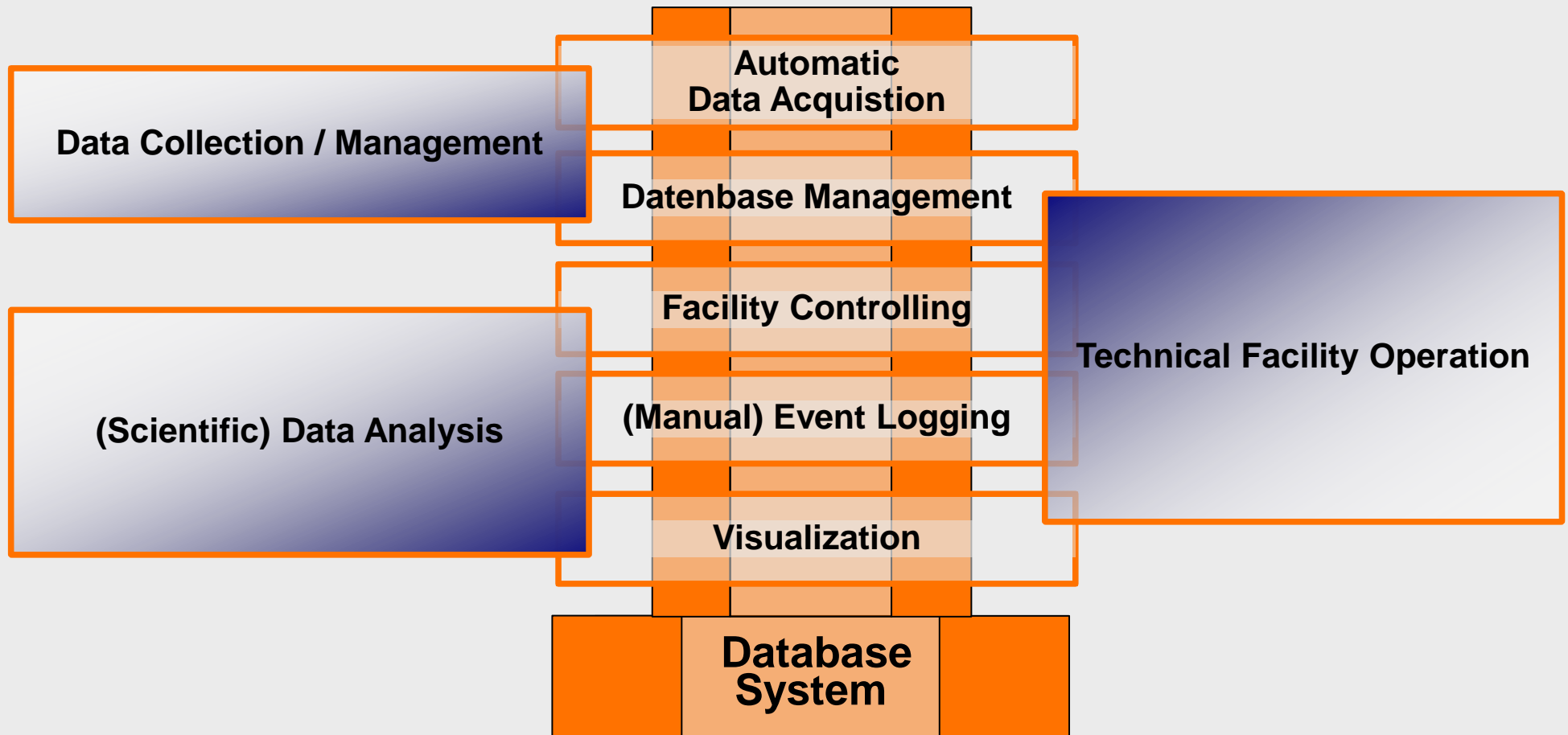
Integrated Scientific Data Management System

The universal software system for measuring facilities



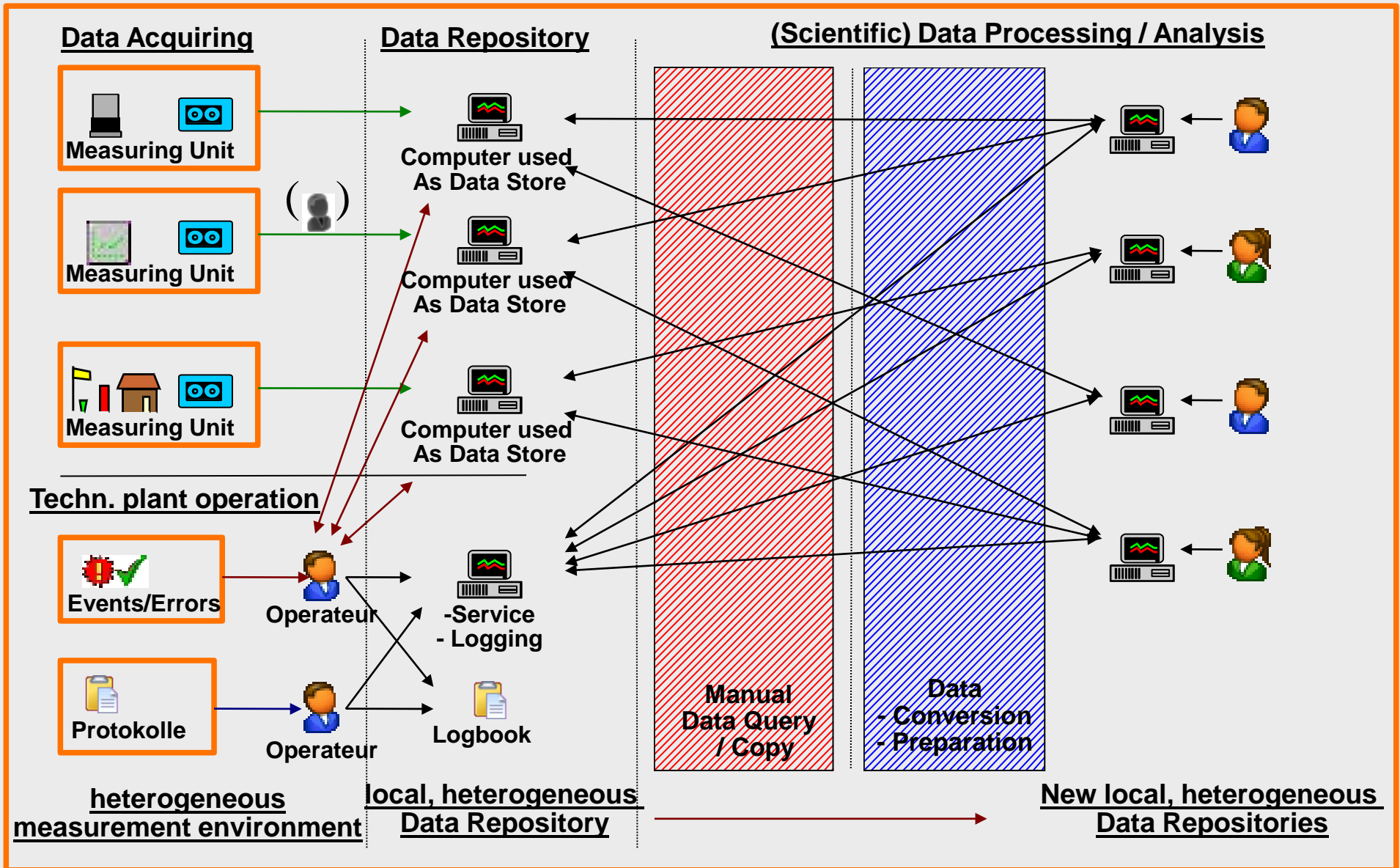
● **STANDARD SOFTWARE COMPONENTS**

- LysiData is a software package for measuring equipment and research institutes that consists of different, independent software modules, which can be scaled according to your requirements. It covers all aspects from data capture and data visualization/analysis to technical facility management.
- LysiData is designed independent of hardware, logger and sensor manufacturers. Existing or new measuring devices can be easily integrated after first time of establishing a LysiData Software System.
- LysiData uses a central SQL database to store all data of system configuration, measurement and event data and settings to control the software modules. The database system is individually designed and established to the customer.
- Your SQL database can be installed locally on a computer, on a (data) server in your lab or department, or connected to a central database server in your data center. This way any college or technical operator who is authorized can work on your measuring data immediately after acquisition.

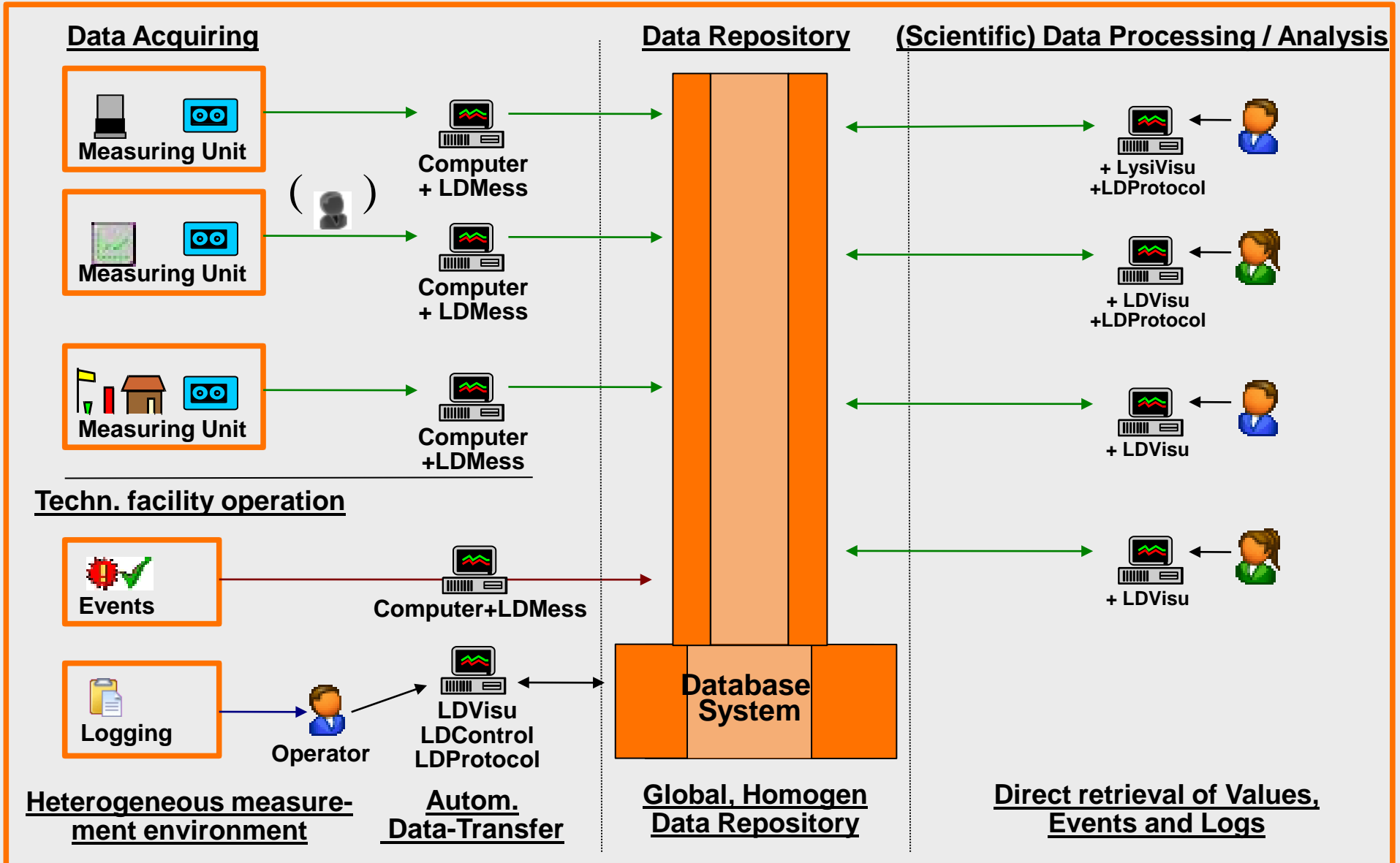


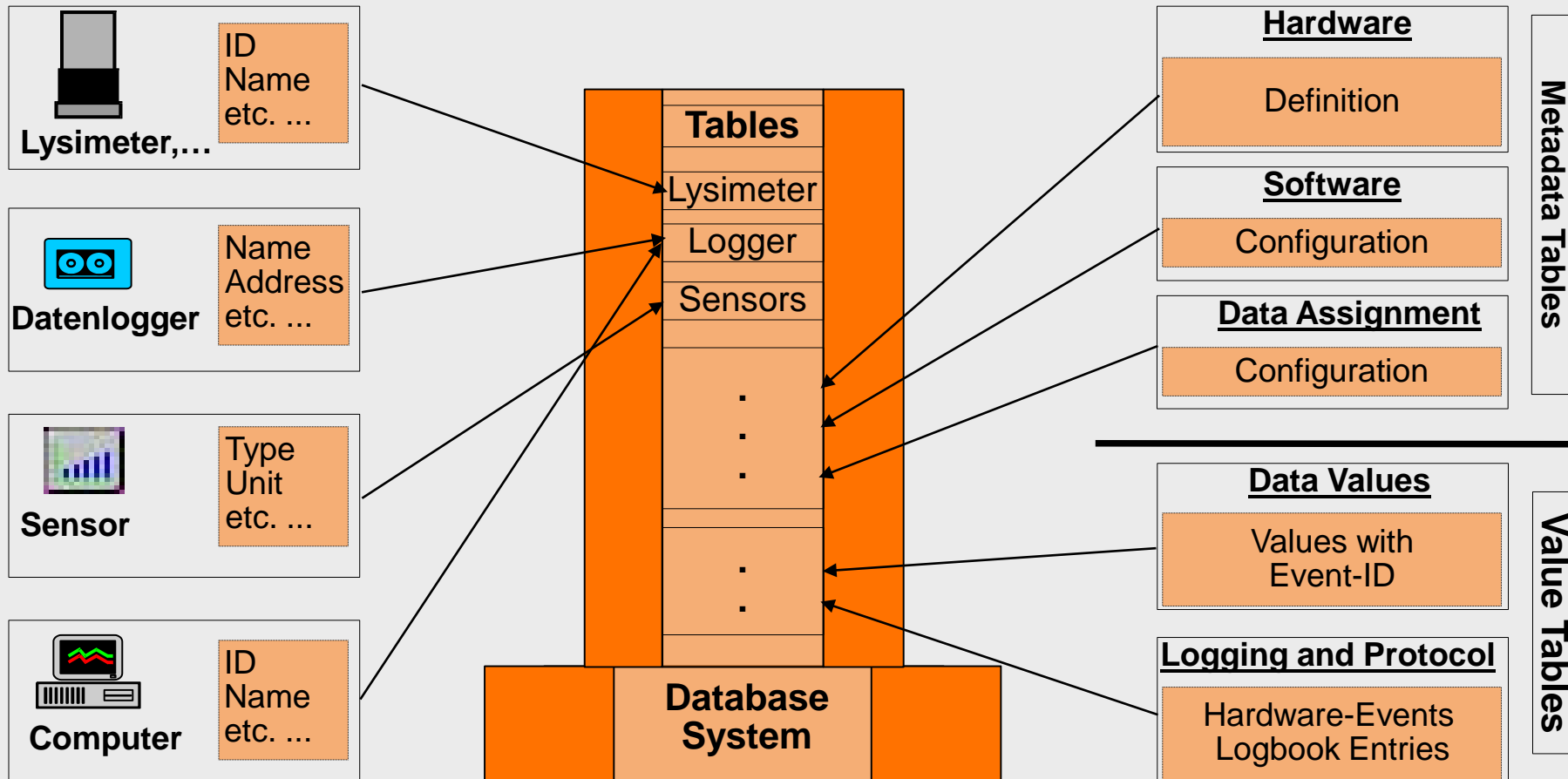
■ LysiData Software System offers you a Software-Module for any Requirement

Default Environment without LysiData System



• Default Environment with LysiData Software System





- All properties of the measuring units are mapped to configuration tables
- All definitions and configurations are stored in configuration tables
- Event- and Logbook-Tables provide clear evaluation of measurement conditions



● STANDARD SOFTWARE COMPONENTS

- **LDMess** – Automatic Data Acquiring
- **LDVisu** – Data Visualization and Export
- **LDDBAdmin** – Simple User Database Management

● ADVANCED SOFTWARE COMPONENTS

- **LDWeb** – WWW-Visualization
- **LDProtocol** – Logbook and Data Mining
- **LDControl** – Controlling Big Facilities
- **????** – Software-Moduls an Plugins for individual demand



- **LDMess** acquires your measurement data in regular and adjustable time intervals from your dataloggers, evaluates this data and at last transmits your data to the central database system. It comes with following benefits :

LDMess – Data Acquisition



IFWMess v2.3.0 Datenerfassung - Messrechner 1

Programm Messwertenerfassung Info

Institut für Wasserwesen
Wasserwirtschaft und Ressourcenschutz

der Bundeswehr
Universität München

PAUSE

Meteostation Neubiberg

- Logger[947] - Meteo-Logger 947
- Logger[948] - Meteo-Logger 948
- Logger[200] - Distrometer 00
 - 2000 SYNOP 4677 1 Minute
 - 2001 SYNOP 4680 1 Minute
 - 2002 METAR 4678 1 Minute
 - 2003 Intensität alle Niederschläge
 - 2004 Intensität flüssige Niederschläge
 - 2005 Intensität feste Niederschläge
 - 2009 Hageldurchmesser maximal
 - 2039 Anzahl aller gemessenen Partikel
 - 2041 Partikelanzahl <min. Geschwindigkeit (0.15m/s)
 - 2043 Partikelanzahl >max. Geschwindigkeit 20m/s)

Messort
Meteostation Neubiberg

Logger
Distrometer 00
ID: 200 Messrechner: 1
Adresse: C:\Lysidata\LDLocalMonitor\Data\

Kanal
SYNOP 4677 1 Minute
ID: 2000 Logger-Kanal: 10
Typ: SYNOP; Höhe/Tiefe (cm): 100
Ausrichtung: letzter Wert in Datenbank: 12.10.2012 17:18:00 Einheit: 0000,000000 SYNOP
letzter Status: 0 Messwert OK

Liste der Kanäle mit aktuellen Messfehlern

ID	Kanal	Messzeit	Ereignis
1018	Blattnässe	12.10.2012...	Messwert g
1021	Strahlung Pyra...	12.10.2012...	%Messwer.
1107	Bodenfeuchte E...	12.10.2012...	%Messwer.
1108	Bodenfeuchte T...	12.10.2012...	Messwert g
1109	Bodenfeuchte T...	12.10.2012...	Messwert g
1110	Bodenfeuchte T...	12.10.2012...	Messwert g
1111	Bodenfeuchte T...	12.10.2012...	Messwert g
1112	Bodenfeuchte T...	12.10.2012...	Messwert g

Detail

Typ	Zeit	Nr	Beschreibung
Debug	12.10.2012 17:2...	0	Trenne Verbindung mit Datalogger
Detail	12.10.2012 17:2	0	Trenne Logger 948-Meteo-Logg...

(1/3/75) Warte 00:06:58 Schlafmodus. Neue Messwertabfrage : 12.10.2012 17:33:22

- Automatic Acquisition in free scalable Time Periods
- Continuous Software Activity Protocol
- TreeView of Measurement Unit, DataLoggers and Sensors
- Detail Information Sensor e.g.
- Actual Error Sensor List
- Automatic Validation of measurements Values. Standard Validation :
 - Maximum, Minimum, Delta, Error -Values by Hardware
 - Custom Validations
- Software-Side generated for Values in Time Periods:
 - Average, Maximum , Minimum, Dropped-Values
 - Custom Methods on Demand

LDMess – Data Acquisition



The screenshot shows the 'Data Acquisition - Service Lysimeter Station Michalovce' window. A popup window titled 'ScheyernMess - Fehlende Messdaten!' is displayed, containing a table of missing data points. Below the table is a critical error message: 'kritischer Fehler bei der Messwerterfassung' with an 'OK' button. The main window also shows a list of channels with measurement errors and a log of events.

Datenlogger	Datum letzte Verbindung	Messort	Logger	Kanal	Datum letzter Wert
171-Logger W...	Verbindung abgebrochen o. fehlgeschlagen	30-Weather ...	171-Logger Weather Station	3001-battery	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3002-humidity	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3003-wind speed	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3004-wind direction	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3005-global radiation	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3006-air temperature	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3007-temperature soil surface	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3008-precipitation	14.08.2014 14:00:00
		30-Weather ...	171-Logger Weather Station	3009-wind-r-vec	14.08.2014 14:00:00

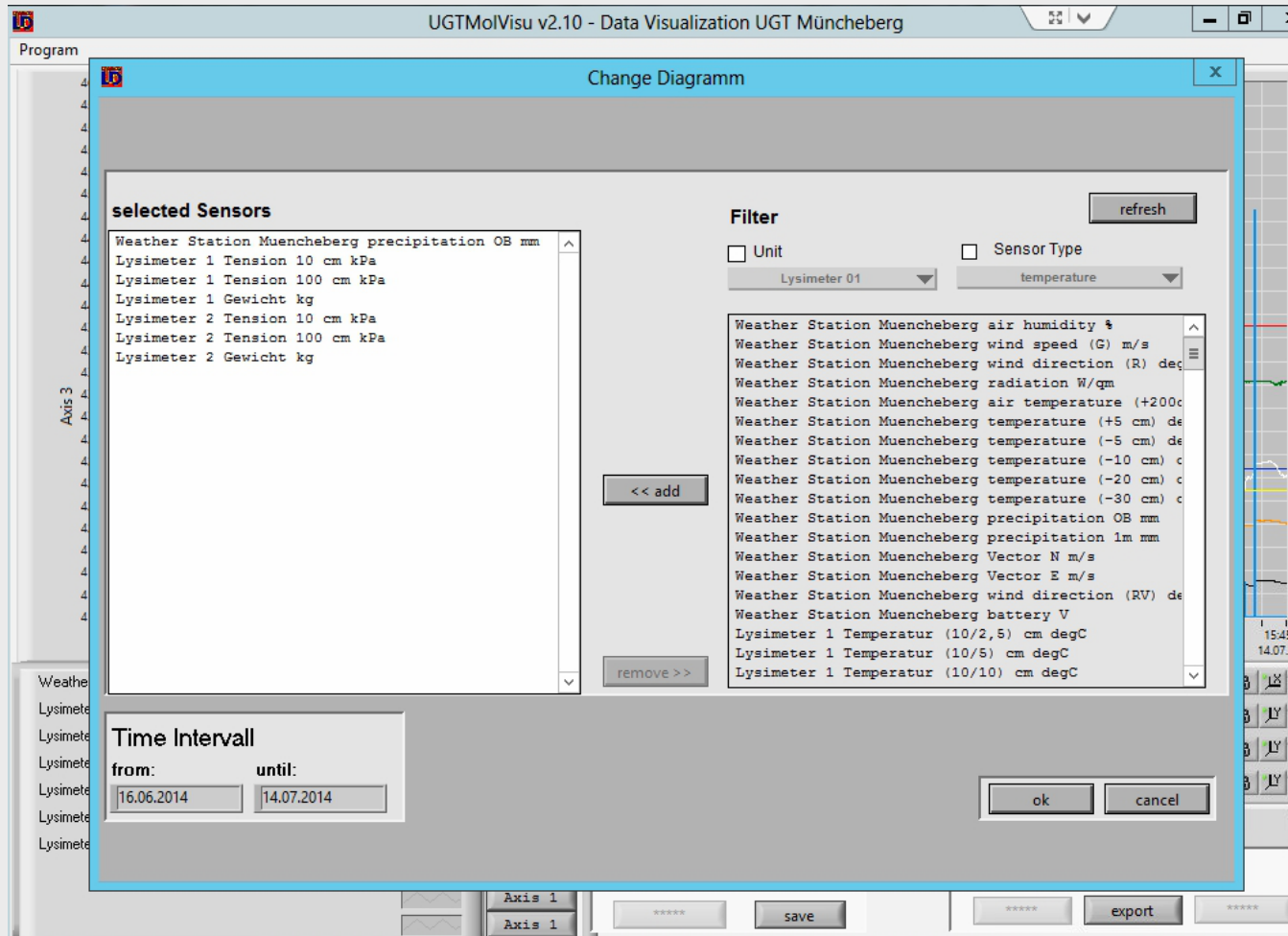
kritischer Fehler bei der Messwerterfassung
Es konnten keine (neuen) Messwerte abgefragt werden
oder es konnte keine Verbindung zum Datenlogger aufgebaut werden
Überprüfen Sie umgehend die Messeinrichtungen, Datenlogger und Netzwerkverbindungen

- Popup-Alarm-Window if datalogger is not accessible for defined time intervall or last measurement values are older than specified
- .Sending an email notice, if an irregular measurement state is happened (needs a setup and integration of your email-server)
- Automatic distribution of daily status reports regarding your measuring plots, data loggers and sensors(optional, needs a setup and integration of your email-server)



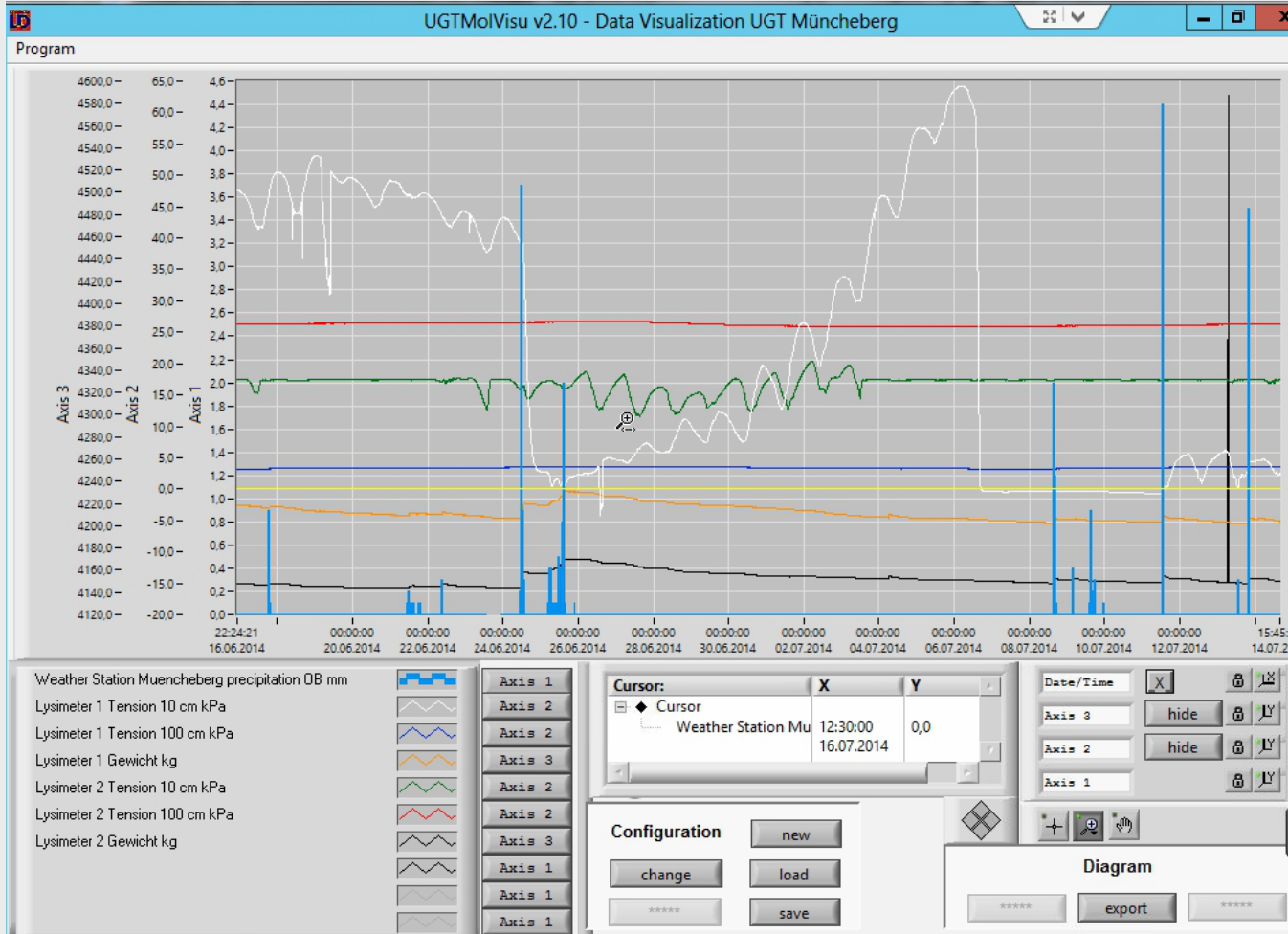
- **LDVisu** is used for the visualization of your data. You can view the data of all your measuring devices in one visualization software/GUI.
- The visualization Software LDVisu can be used from any computer which has the privileges to access the database at the same time.

LDVisu – Data Visualization



- Visualize 10 Sensors on 3 Axis at once
- Viewing data over arbitrary, individual selected time period
- Save and load individual chart configurations including sensors, time period or until today and viewing details like graph-type and color selection for frequent or daily use
- Export Data To Advanced Analysis Software-Tools

LDVisu – Data Visualization



- Comfortable presentation and charting features :
 - Zoom in/out on x-/y-plane or visual selected area
 - automatic adaption to the actual measurement rang
 - Line-, Plot-, bar-graphs or combined graphs for any sensor, individual color selectio
 - ...



- **LDDBAdmin** LDDBAdmin is used to process administrative tasks for maintenance and best performance of SQL-Database with no need of Database or SQL knowledge.

LDDbAdmin – Database Management



The screenshot displays the MichalovceDBAdmin v2.5 software interface. The main window has a menu bar (Program, Tasks, Info) and a toolbar with buttons for Settings, Check Database Connection, Create Value-Tables, DB-User Management, and Check Value-Table-State. A 'Create new Value-Tables' dialog box is open, showing a task list for creating tables for various measuring sites (Lysimeter 01-05, Groundwater, SSA, Weather Station) and associated tasks like creating tables and granting rights. Below this, a 'Change Database-Users Properties' dialog box is shown, displaying a list of database users and a table of access rights for value tables.

Name	Type
michalovceadmin@localhost	System-User
michalovcemess@localhost	System-User
michalovceweb@localhost	User
michalovcevisu	User
sk_mi_weather@localhost	User

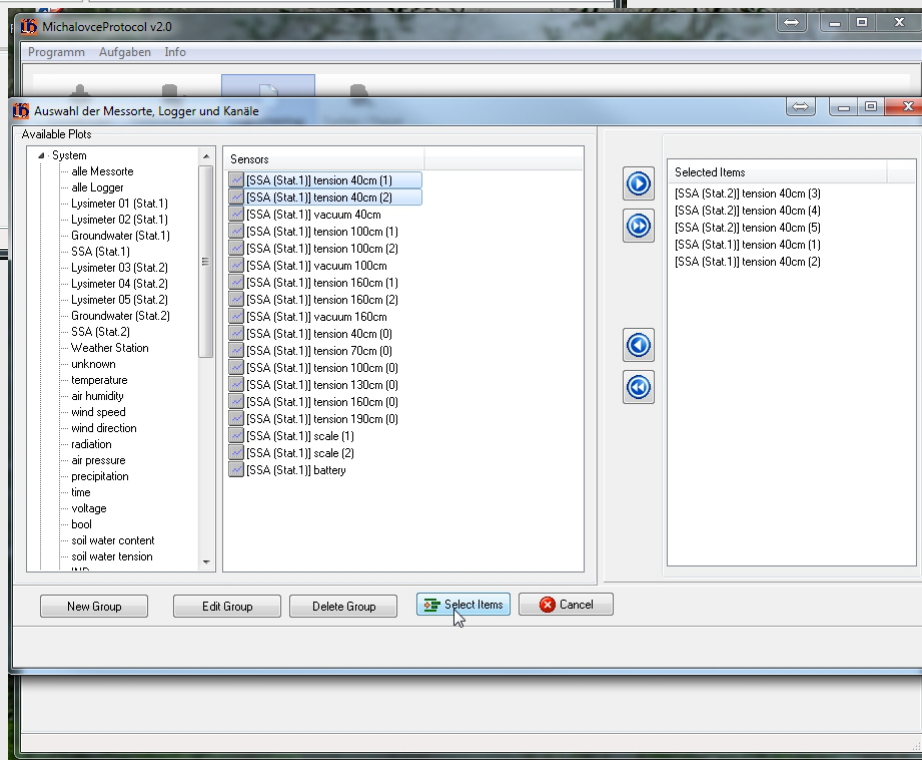
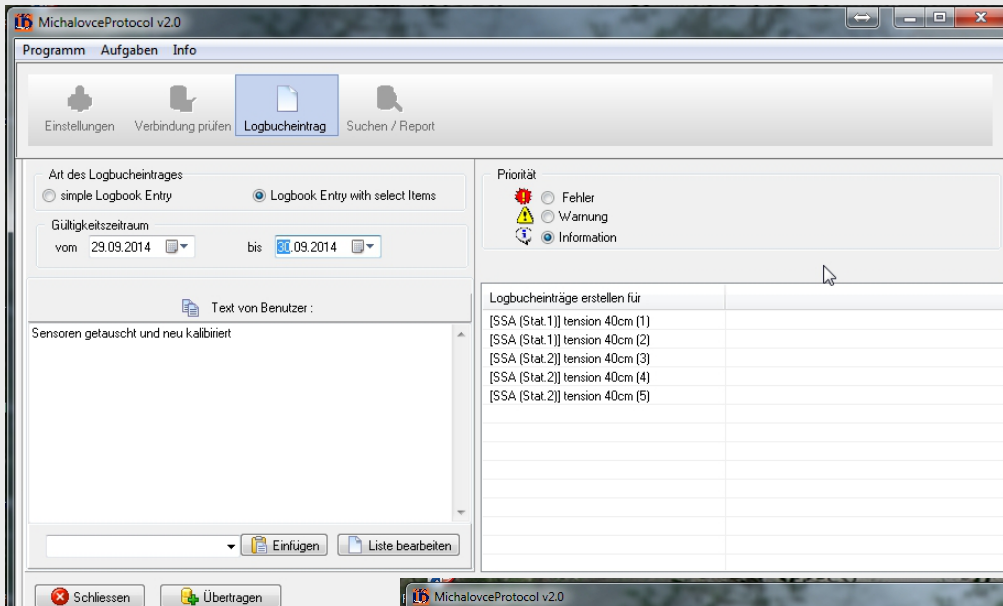
ID	Measuring Sites	Read	Insert	Copy fr...	valid until
<input type="checkbox"/>	11 Lysimeter 01 (Stat.1)	no	no	no	unlimited
<input type="checkbox"/>	12 Lysimeter 02 (Stat.1)	no	no	no	unlimited
<input type="checkbox"/>	14 Groundwater (Stat.1)	no	no	no	unlimited
<input type="checkbox"/>	15 SSA (Stat.1)	no	no	no	unlimited
<input type="checkbox"/>	21 Lysimeter 03 (Stat.2)	no	no	no	unlimited
<input type="checkbox"/>	22 Lysimeter 04 (Stat.2)	no	no	no	unlimited
<input type="checkbox"/>	23 Lysimeter 05 (Stat.2)	no	no	no	unlimited
<input type="checkbox"/>	24 Groundwater (Stat.2)	no	no	no	unlimited
<input type="checkbox"/>	25 SSA (Stat.2)	no	no	no	unlimited
<input type="checkbox"/>	30 Weather Station	yes	no	no	unlimited

- **Certain Benefits :**
- Automatic Creation of Data Value Tables for best performance
- Checking Data Table and Sensor Data State
- Creating User Access Rights to Data Tables
- Checking Database Connection
- ...



- **LDProtocol** offers additional options for an ideal (technical) management and maintenance of your facility/measurement equipment.
- It is useful for leading a central electronic logbook and data mining / creating reports on your facility.

LDProtocol – Logbook/Data Mining



Logbook :

- Central logging / protocolling of all event data, which were not automatically generated:

- Events like power or logger blackout, external damages or manually switched auxiliary devices (Heating, etc. ...)

- Service- und calibration activities

- cultivation time periods and data

- ...



Datum	T	A	Messort	Ereignis	Datum aktiv bis	Benutzer	Information
16.07.2014 1...	!	!	[SSA (Stat.2)] battery	delta value exceeded	00:00:00	System	
15.07.2014 1...	!	!	[SSA (Stat.1)] battery	delta value exceeded	00:00:00	System	
18.05.2014 0...	!	!	[SSA (Stat.2)] battery	measured value underruns minimum	00:00:00	System	
17.05.2014 2...	!	!	[SSA (Stat.1)] battery	measured value underruns minimum	00:00:00	System	

Data Mining / Report :

- Generate reports/memorandums about all logbook entries and, in combination with LDControl, all measurement events from your sensors, loggers or measurement equipment :
 - Search for events or logbook entries over free defined time periods and combinations of sensors, dataloggers and measurement plot
 - Search for maintenance, service or calibration activities
 - Search for extended information like cultivation time periods and data
 - ...
 - Save all search result and reports in files for later use



- **LDControl** is the ultimate software tool for the maintenance and operating of all your sensors and measurement equipment in your facility.
- **LDControl** comes with an clearly represented Graphic User Interface for daily monitoring of your facility operations and shows all state messages which will be generated, automatically by the software system or manually by the operator(s) .

LDControl – Daily Facility Operating



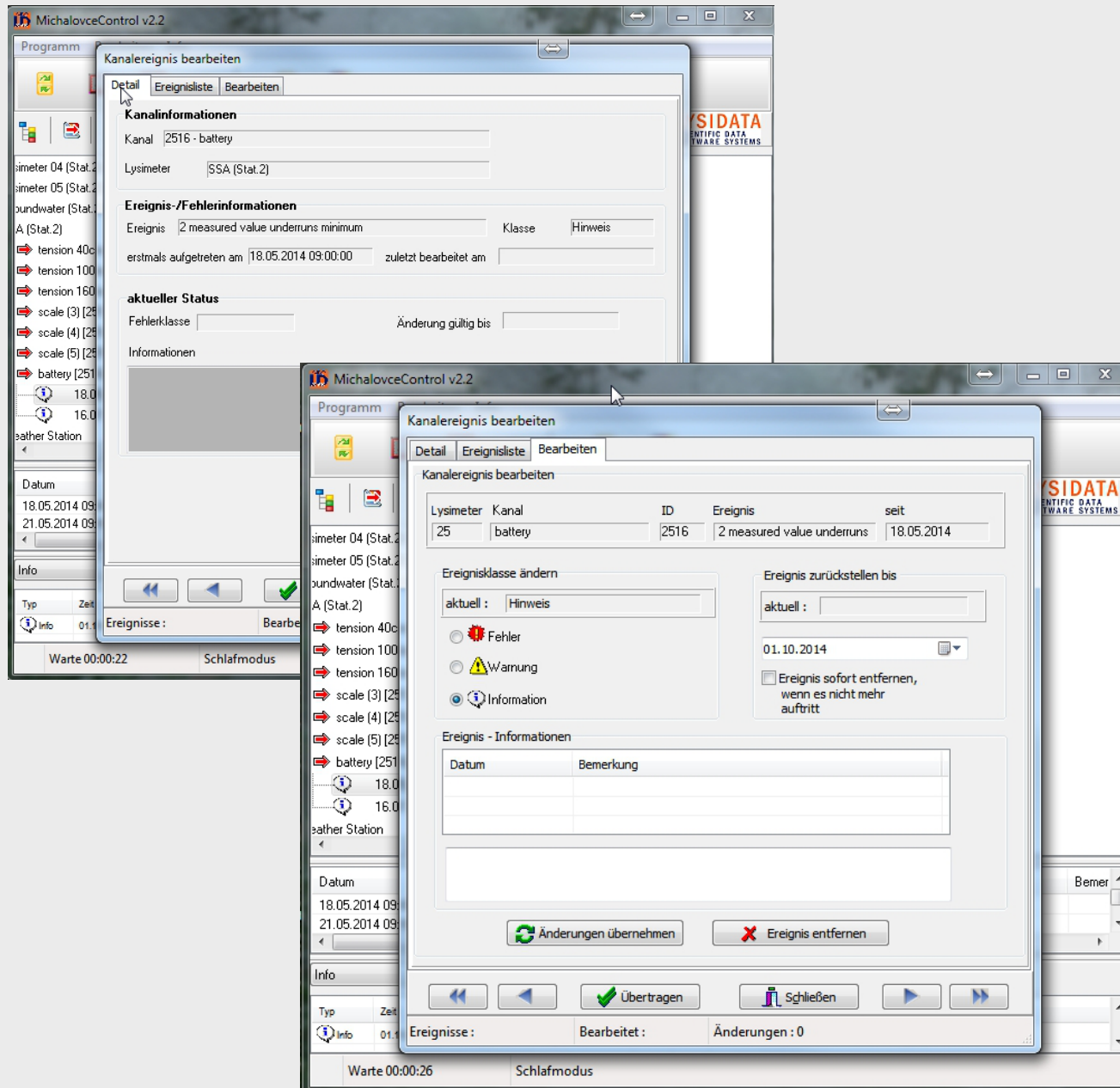
Datum	Kanal	Logger	Lysimeter	Ereignis/Fehler	Klasse	Status	gültig bis	Bemerkung
18.05.2014 09:00:00	2516	205	25	2-measured value underruns minimum	Hinweis	occured		
21.05.2014 09:00:00	2516	205	25	2-measured value underruns minimum	Hinweis	terminated		
21.05.2014 15:00:00	2516	205	25	2-measured value underruns minimum	Hinweis	occured		
12.06.2014 10:00:00	2516	205	25	2-measured value underruns minimum	Hinweis	terminated		

Typ	Zeit	Modul	Zeile	Nr	Beschreibung
Info	02.10.2014 00:08:14	TLvs/Ctrl/Confo-ShowStatus	1029	0	Laden der Konfiguration beendet

Warte 00:00:52 Schlafmodus

LDControl GUI :

- Main Window with Sensor and Logger Events Overview in Treeviews with Details per unit, classified and grouped by sensors/logger and event.
- Filter events by processed / unprocessed events and event classification
- List of event details
- Automatic refresh of event states on free defined time periods(occured / terminated)
- ...



- **LDControl Edit Events :**
- Detailed event informations
- Extended event list on single events (occured / terminated)
- Redefine event classification (Error, Warning,...)
- Leaving comments on every event state or timestamp
- postponement of events (e.g. outside humidity sensors in wintertime)
- Manual or automatic removal of events from actual event list
- Editing multiple events at one time
- ...

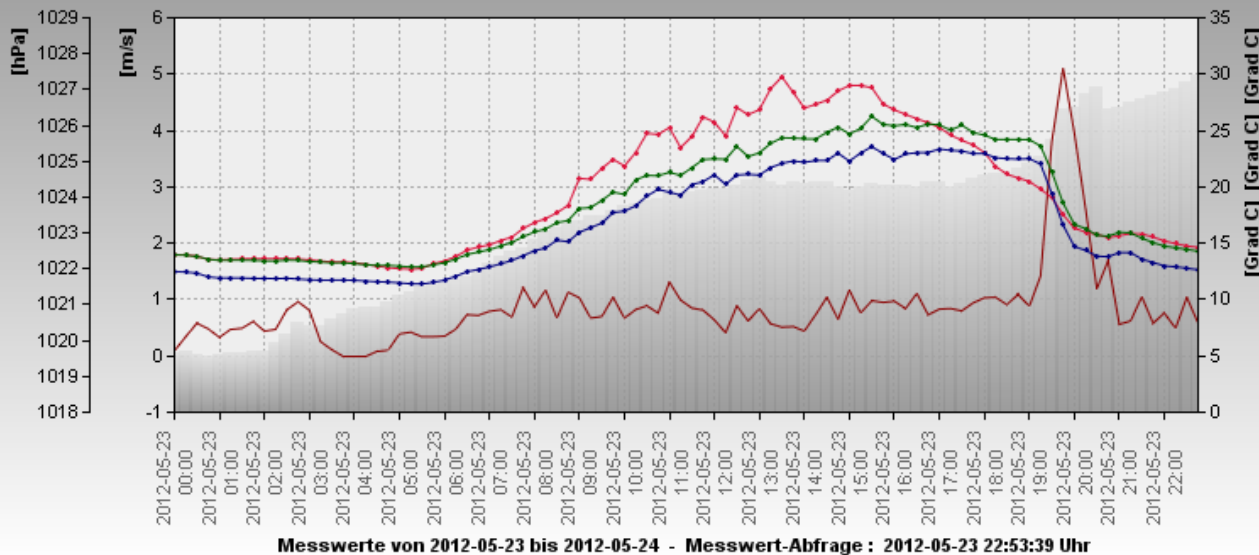


- **LDWeb** is an online visualisation package for use in internet or intranet. It is a webserver application to present or monitor your data on any common used web browser without any software installation on client side.



Meteostation Neubiberg IfW-WWR der UniBW München

— Lufttemperatur 2m 2012-05-23 22:45 Uhr : 14.29 [Grad C] — Lufttemperatur 10m 2012-05-23 22:45 Uhr : 12.64 [Grad C]
— Temperatur Boden 2012-05-23 22:45 Uhr : 14.63 [Grad C] — Windgeschwindigkeit GA 2m 2012-05-23 22:45 Uhr : 0.58 [m/s]
 Luftdruck 2012-05-23 22:45 Uhr : 1027.39 [hPa]



Meteostation Neubiberg - UniBW München IfW-WWR

Bitte die Sensoren auswählen und den Achsen zuordnen:

Lufttemperatur 2m	Achse 2	green
Lufttemperatur 10m	Achse 2	navy
Temperatur Boden	Achse 2	crimson
Windgeschwindigkeit GA 2m	Achse 1	darkred
Luftdruck	Achse 3	silver

Die Diagrammtypen, ggf. mit Achsenmaxima und -minima anpassen:

Achse 1:	Liniendiagramm	min:	<input type="text"/>	max:	<input type="text"/>
Achse 2:	Punktendiagramm	min:	<input type="text"/>	max:	<input type="text"/>
Achse 3:	Balkendiagramm	min:	<input type="text"/>	max:	<input type="text"/>

Darstellung:

Breite:

Seitenverhältnis:

Chart generieren

- **Benefits :**
- Visualise 5 sensors on 3 axis at the same time
- Free time period definition
- Line-, point, bar- or area-charts on every axis
- Redefine maximum and minimum on every axis
- Normal- or widescreen visualisation (3/4 or 16/9) up to 2400 pixel width
- Detailed measurement information (sensor, date/time and value/unit) on mouseover event
- Multiple Window Visualisation , every subset can be shown in an own browser-windows
- ...



● INTEGRATED SOFTWARE SYSTEM

- **Based on a most flexible and intelligent SQL-Database Architecture**
 - **Easy extendable to nearly unlimited number of Sensors** (limited by Hardware- / Database-System)
 - **Distinct Long Time Data Storage and Accessibility**
 - **Individual adapted and equipped Database Model**
 - **Easy data access for scientists and operators**
- **Modular and independent Software components for each individual demand**
 - **Independent from Measurement equipment / provider**
 - **One GUI/User-Interface for each operation task** (e.g. data acquisition, visualisation, ...)
 - **Software Components self configuring by the database system**
 - **All Software Modules are developed in C++/LabView**
- **LysiData Scientific Software System is in progress since more then 12 years**



• **TOP WORKFLOW DEMANDS**

• **DATA ACQUISITION**

- **Automatic Data Acquisition from nearly any resource into one data repository**
- **Automatic Standard Data Evaluation**
- **Easy Data Management in the data repository without SQL-Database knowledge**
- **Extendable by integrating Software-Plugins**

• **(TECHNICAL) FACILITY OPERATION SUPPORT**

- **Manual and automatic event logging and alarms**
- **Facility Controlling by Visualization-, Controlling-, Data-Mining- and Logbook-Tools**
- **Easy User and Database Management by specific Software-Module**

• **Scientific Data Evaluation and Analysis**

- **Extended Data Visualisation and Export Tools**
- **Distinct Access to Measurement-, Operation- and Event-Logging**



● REFERENCE PROJECTS

● HELMHOLTZ CENTER D-MUNICH

- IBOE : Lysimeter Station with 48 Lysimeter and Weather Station
 - Supported Since 2001 (about 800 Sensors)
- EUS/BIOP : Phytotron, Sun Simulation and Climatic Chambers
 - Supported Since 2005 (about 1300 Sensors)
- IBOE : Research Farm / Platform Scheyern
 - Supported Since 2010 (about 3500 Sensors)



● REFERENCE PROJECTS

● BUNDESWEHR UNIVERSITY / TU MUNICH D-MUNICH

● IfW/WWR : Climate and Soil Hydrology Station

- Supported Since 2011 (about 80 Sensors) – Cooperation UGT

● CVRV INSTITUTE SK-PIESTANY

● Lysimeter and Weather Station

- Supported Since 2013 (about 120 Sensors) – Cooperation UGT

● CVRV INSTITUTE SK-MICHALOVCE

● Lysimeter and Weather Station

- 2014 (about 800 Sensors) – Cooperation UGT



● Person

■ Dirk Römermann, Munich

- Born 1960 in Düsseldorf
- Consulting und Software Engineering since 1992
- Working in Munich and Düsseldorf

● Activitiy Focus

- Consulting und Software Development for Research Facilities
- Development and Maintenance of Database and integrate Software Systems
- COOPERATION with UGT since 2008 on different Software and Research Facility Projects

LysiData is a Trademark of Dirk Römermann



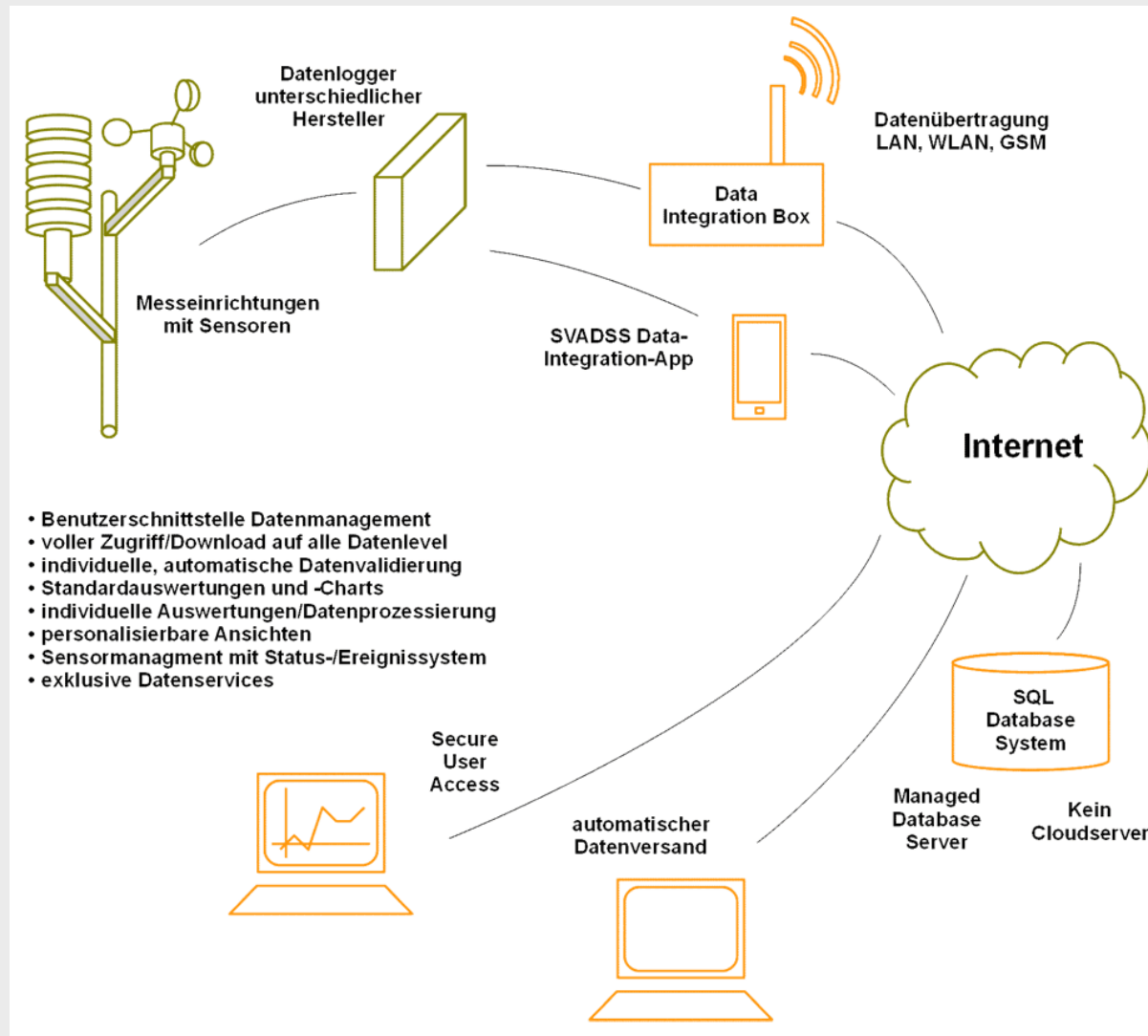
PART 2





- Datamanagement Solution in environmental science
 - Online Allround Solution for small and medium measurement devices
 - No own Inhouse-IT-Infrastructur necessary
- Standard, Extended and Exclusive Data Management packages available

Main Principle



- Data Management Services
 - Automatic Data Acquisition
 - Long Time Saving Data in SQL-Databases
 - Data Vaidation (automatic / manual)
 - Standard Statistik Routines
 - mean value, sum, maximum, minimum, etc.
- Exclusive Data Services
 - Individual Charts und Data Export Interfaces
 - Individual Data Processing
 - Quality procedures and -verification



- **Sensor Management Services**

- Logging of Hardware-/Sensorstate and Events
- Notification on Hardware events (E-Mail/SMS)
- Exclusive Notifications on cumulated events from different sensors
- Logbook and notification on service and maintainence
- QM-Reports on sensors/equipment



PART 3

Practical Unit