infoteam
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iLAB

Integration of Data & Optimisation of Workflows in Laboratory Automation

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iLAB software framework

Effectiveness in lab workflows, despite of progresses made in automation and lab informatics, is often hindered by insufficient integration of devices and of data.

iLAB
- is a middleware
- connects lab devices & higher level enterprise software systems
- provides a plug-in architecture that can be adapted to individual lab environments
- integrates devices based on standardised data and communication protocols (SiLA).

In addition to device integration, process data and result data from different sources (e.g. readers) are converted to standard formats and administered by a powerful database for further processing.

iLAB architecture

The core of the iLAB reference architecture is a central database with modular components so-called plug-ins. Plug-ins can be either business logic or user interface plug-ins but with a strict separation between the two groups.
Generic interfaces provide possibilities for a device and data integration to subsystems as well as to higher-level IT-systems like LIMS.

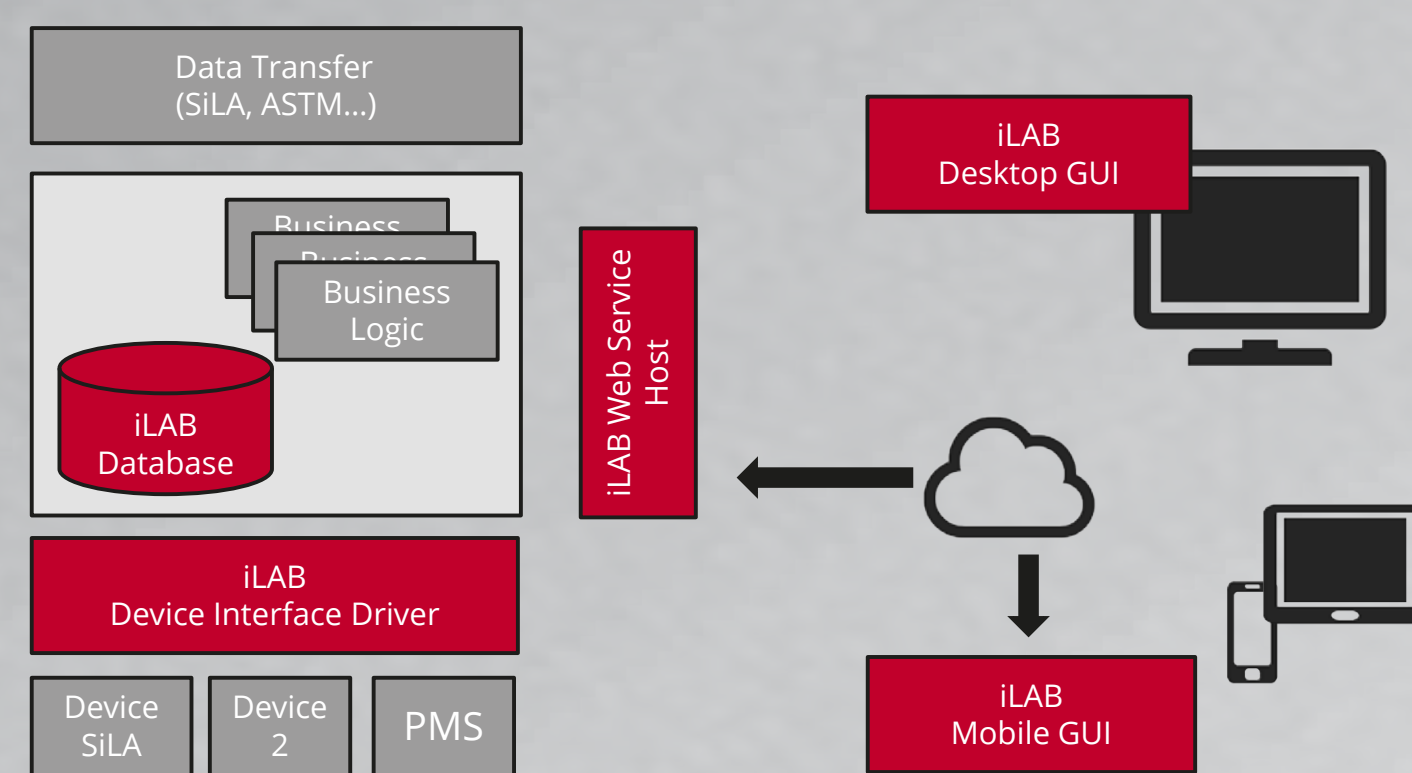**Connection between iLAB and higher-level IT-systems:**
- Data interface to implement any data protocols such as:
  - HL7
  - ASTM
  - SiLA Data Standard based on AnIML

Communication between iLAB and laboratory equipment:
- Generic driver model (iLAB Device Interface Driver) which can be used to represent:
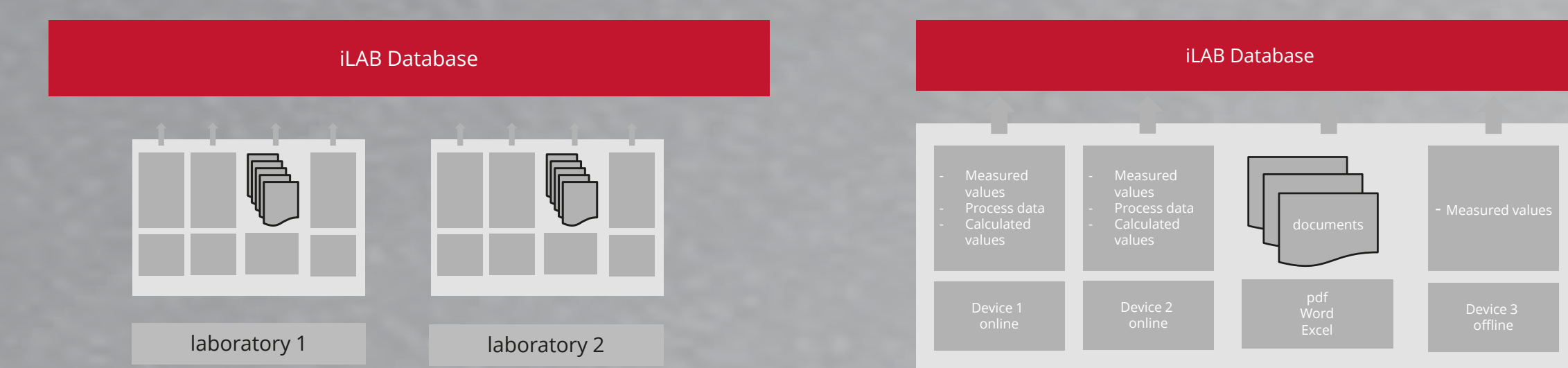 - Standardised interface protocols (SiLA, OPC)
  - Custom communication drivers

User interfaces:
- Desktop GUI
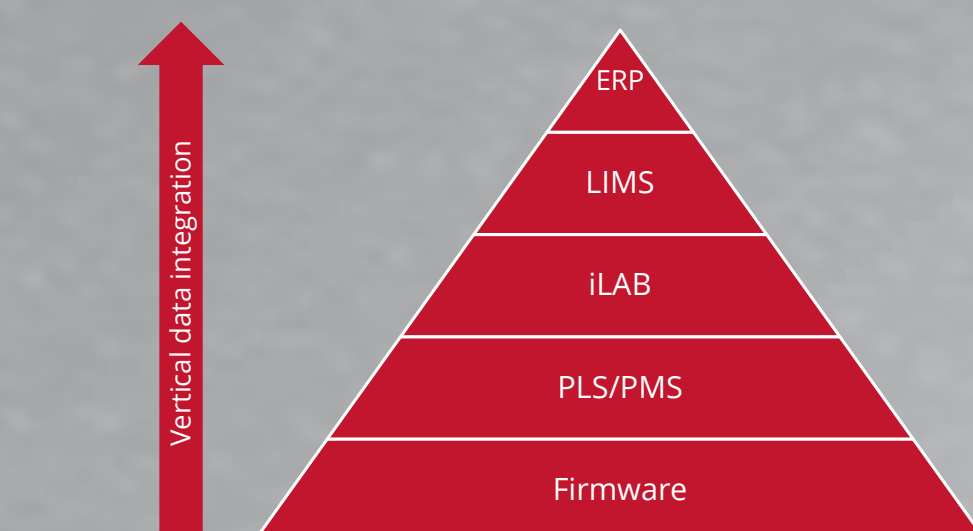- Mobile Devices GUI also with multi-touch

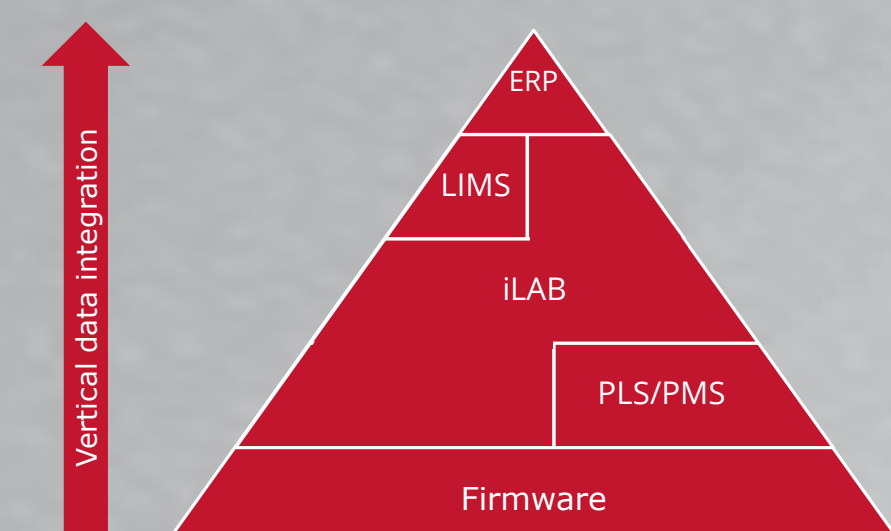## Data and device integration in laboratory environments

Horizontal data integration:

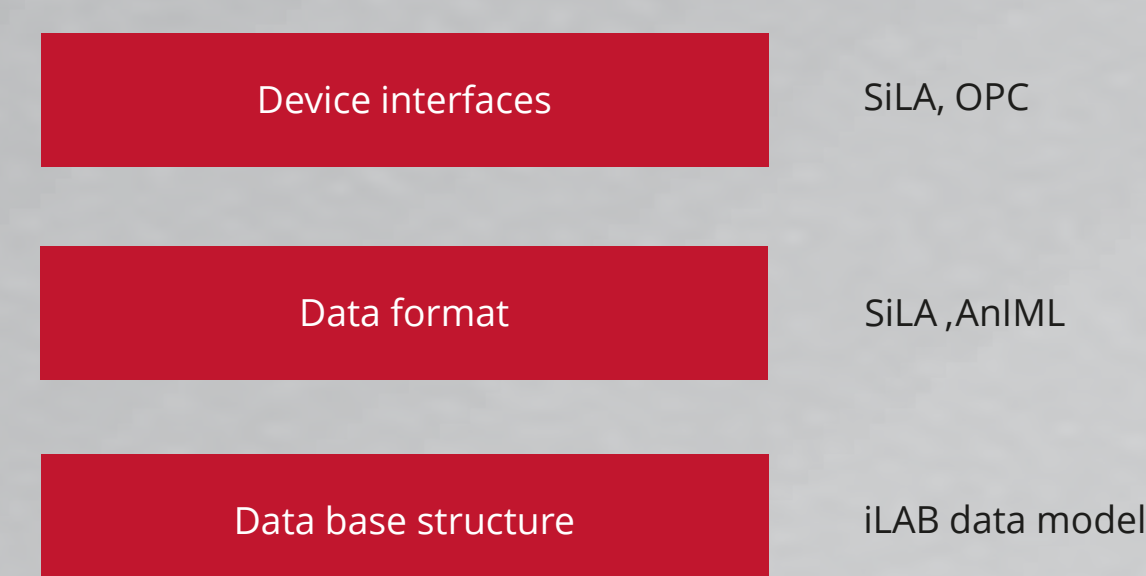**Vertical data integration:**

Scalability:

Standardisation for integration improvement:
- A single standard data format enables the consolidation as well as the information benefit without any system discontinuities.
- Improvement of data exchange and analysis over laboratories and companies
- Improvement of modularisation -> Improvement of system reconfiguration
- Higher module flexibility
- Extension of investment lifecycle
- Compliance with higher regulatory requirements

SiLA Rapid Integration

Device interfaces	SiLA, OPC
Data format	SiLA, AnIML
Data base structure	iLAB data model

iLAB in practice for bioprocess development (iLAB-Bio)

In the scope of the joint project "Auto BIO" funded by the BMBF (FKZ 02PJ1150), infoteam has developed iLAB-Bio, a specific version of the iLAB software framework, with the objective to a significant reduction of the terms and costs of bioprocess development. The automation of the experimental stages on liquid handling platforms and the optimisation of these processes with a model-driven, experimental design are the decisive elements of this approach. iLAB-Bio essentially realises the device-independent analysis, the visualisation and the comparison of experiment data as well as the integration in a central database.
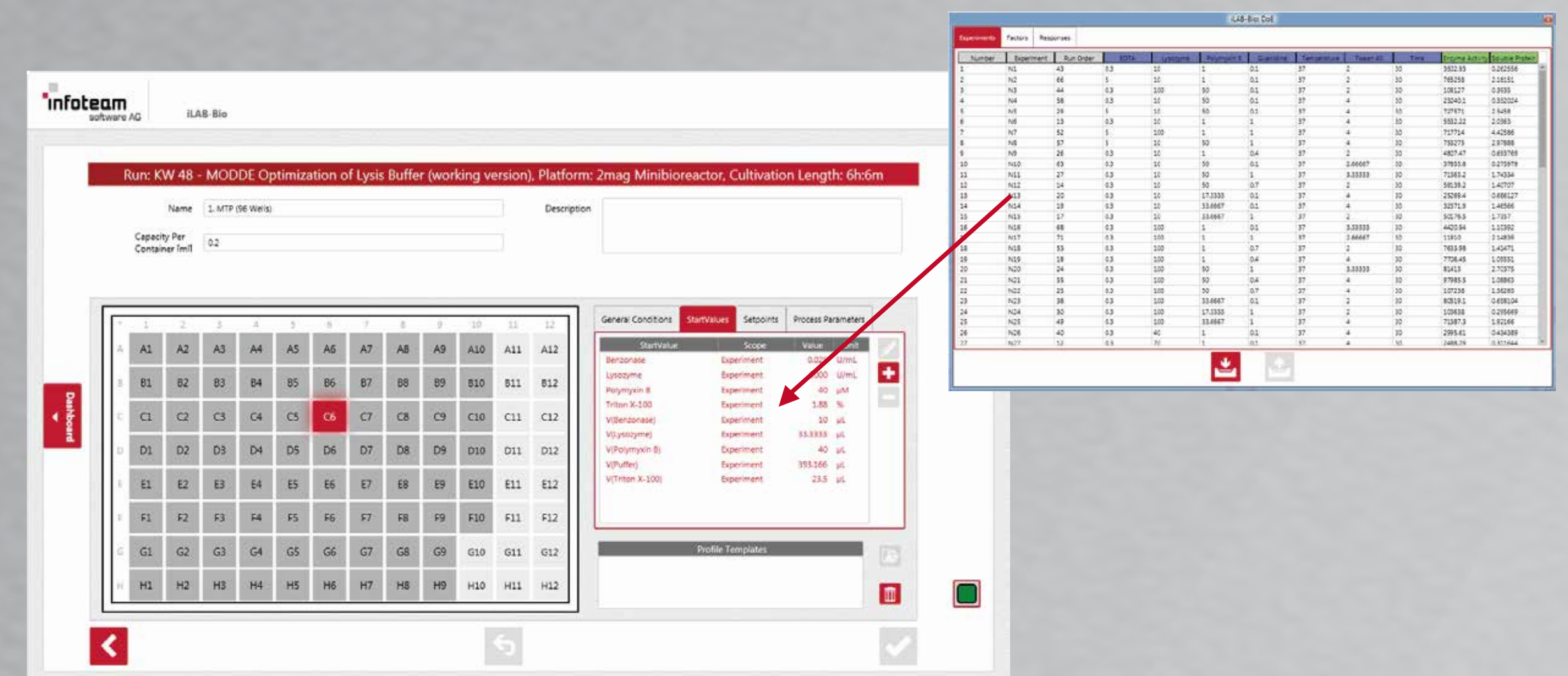

Laboratory of the AutoBio project partner TU Berlin where iLAB is used to collect experiment data running on different platforms: Hamilton Microlab Star with integrated Flow Cytometer (Miltenyi MACSQuant Analyzer) and spectrophotometer (Biotek Synergy MX)

Integration

iLAB-Bio is designed to integrate laboratory devices easily. iLAB-Bio can be used to collect all laboratory experiment data running on different platforms into a single database. iLAB-Bio is using standard-based interfaces like SiLA to connect several laboratory devices.

DoE (Design of Experiments)

Stand-alone DoE software requires the user to transfer experiment input data manually to the software that drives the process and to transfer the results back. iLAB-Bio can read UMETRICS MODDE investigation files and automatically transfer the factors to experiments. According to these factors iLAB-Bio supports automated experiment preparations, e.g. by calculating liquid volumes to be pipetted into MTP wells. When the automated experiments are finished, the response values are written back to the MODDE investigation file and are ready to be processed by the MODDE software.

Analysis

In addition to the visualisation of single runs' experimental data, iLAB-Bio enables the comparison of multiple runs' data, even if the data were generated on different platforms. This simplifies the data handling because all tasks can be done in one application:
- Filtering the experiments according to specific criteria
- Selecting just the necessary types of values
- Getting a very quick overview over selected values
- Exporting data to specialised tools

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