LINK

Lumetics

LINK Training – Fundamentals & Basic Operation

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CONTENTS

1.0 Objective

The objective of LINK training, Fundamentals & Basic Operation, is to provide introductory training to the LINK software platform. Following this training, a user will be able to successfully import data, analyze data, create reports, and manage their projects/analysis templates. Training of advanced features is outside the scope of this document.

The "Lumetics LINK™ software product" is referred to as LINK. The "LINK database" is referred to as LINKdb. LINK and LINKdb are trademarks of Lumetics Inc. LINK commands and menu labels are identified by use of **Bold** text. Features/capabilities/nomenclature of LINK are Capitalized. Please consult the full LINK user's manual, for detailed definitions and explanations.

2.0 Functional Components

Lumetics LINK™ will scan folders/drives for any new instrument measurement files, parse useful data from these files, and then transcribe this data directly into a centralized LINK database. LINK also provides a powerful User Interface to the database for data analysis and automated report generation. Networking Configuration and LINK Terminology information are detailed below.

2.1 Network Configuration

LINK utilizes a client/server-based architecture. The LINK server consists of a MySQL (MariaDB) database, Apache Tomcat webserver, and Java-based data processing engine. The LINK client is a dedicated portable Chrome-based application that connects to the LINK server via http or https. The LINK server hardware is not provided by Lumetics and resides on the end user's network. The LINK installation bundle includes all required third party software (MariaDB, Apache Tomcat, and Java), and is fully supported by Lumetics.

Client/Server communication occurs over http port 8080 by default however, an alternative port number may be selected and applied at the point of installation should this be requested. Client/server communication may be configured to utilize https for secure communication, and LDAPS for secure user login/authentication. If this is of interest, please contact your Lumetics representative for further discussion regarding configuration and installation of security certificates.

2.2 Glossary – LINK Terminology

LINK Server Computer: The computer hardware where the LINK server software is installed. This is typically where the Lumetics LINK™ database resides, and where all the data processing takes place.

LINK Client PC: The computer hardware where an instance of the LINK client software is installed. Typically, this is an office or lab pc.

Measurement: The complete results set relating to tests upon a single physical sample. Each measurement within a LINK project will have its own unique LINK Record ID.

Project: A partition in the LINKdb, where measurement data is stored. A project is limited to 1000 measurements, unless otherwise configured in LINK Settings to be up to 5000.

Raw Data: XY data sets (curves) produced by the instrument software, imported to the LINKdb, and available to plot on LINK raw data dashboard charts or from which LINK parameters may be calculated.

Instrument LINKdb Fields: Information pertaining to each measurement, obtained from the from instrument data files. Typically, instrument/analysis settings and parameters calculated by instrument software upon the raw data.

User LINKdb Fields: Information pertaining to each measurement, that have been User-defined. LINKdb fields defined by a single text/numeric value, are referred to as a Standard LINKdb Fields (typically used for applying measurement metadata). LINKdb fields computed from the Raw Data or computed from other LINKdb fields, are referred to as Computed LINKdb Fields. LINKdb Fields, once created, are calculated and available for every measurement in the entire LINK database.

Metadata: a set of data that describes and gives information about other data.

Analysis Template: A collection of dashboards (charts/tables/images) that define the visualization preferences for a given project/study.

Dashboard: Analysis templates consist of dashboards, where each dashboard is defined by the chart type that it supports. Each dashboard will optionally display a chart, a chart series stats table, a customizable notes/discussion block, one or more measurement summary tables, and thumbnail images (if applicable). There are two types of dashboards: those designed to view raw xy data sets (curves or distributions), and those that are designed to plot parameters calculated from the raw data, or any other numeric instrument or user defined LINKdb field. Each dashboard may be fully customized in terms of visualization preferences, by right-clicking and dashboard object (chart, table, or image).

Filter Panel: The portion of a dashboard that allows for selecting which measurements are included in that dashboard's analysis, and how to group/average measurements together.

Measurement Summary Table: highly flexible user-configurable tabular summaries that may contain instrument LINKdb fields, user LINKdb fields (metadata or custom calculations), statistical calculations, and even columns calculated as a function of other columns in the table.

3.0 LINK Overview

Lumetics LINK™ automates and simplifies the complex and time-consuming process of data transfer, analysis, and reporting. LINK's unique import engine parses data directly from over 50 different analytical instruments and stores all useful parameters, curves, and images in a centralized database easily accessed by multiple users across an organization. LINK offers a powerful analytical suite to aggregate, visualize and analyze the data, supporting up to 5000 sample data sets spanning multiple analytical techniques in a single analysis. User-customized analysis templates can be applied for rapid and consistent data visualization, analysis, and reporting. Completed reports may be locked and permanently stored within LINK or exported in a wide range of convenient formats including PDF, Word, and Excel.

Lumetics LINK™ software can save days or weeks by eliminating manual aspects of data transfer from instrument measurement files, aggregation of multiple measurements, and comparison of complimentary and orthogonal techniques. LINK provides a convenient easily accessible storage solution for both raw and processed measurement data, while employing highly effective data compression algorithms that result in a very low memory footprint. LINK is 21CFR Part11 compliant and available with IQOQ services should GMP application be a requirement. As a data parsing and processing engine, LINK is a very strong complement to existing ELNs or LIMS.

Please download the following videos before continuing through steps 1-9 of the LINK training basic overview:
- LINK Platform Overview: https://lumetics.com/wp-content/uploads/2022/07/Sales_Vid_Report_Gen.zip

4.0   Step 1 – Launch Client

The login screen allows a user to login with a valid username and password (i.e., registered in the license file stored on the LINK Server), login using Windows login credentials (if the license has been configured for Windows AD/LDAP support), or to login using a read-only viewer license. The read-only options allow an individual to view projects/analysis templates without consuming a license subscription.

Downloadable Video: Launch Client
- Step 1: http://lumetics.com/marketing/LINK_Basic_Training_Step1.mp4.zip

5.0   Step 2 – Import Data

The data import function is used to transcribe all useful information from instrument data files to the LINKdb. Useful information typically includes instrument settings, information the user has added during sample measurement set-up, 'raw' xy curves, and parameters calculated by the instrument software based on the raw data.

Data is transcribed to the LINKdb into user-specified projects. Each project can contain up to 1000 sample measurements (configurable to 5000) and may contain measurements from multiple instruments. Data imports may be initiated manually or scheduled. E.g., a user may request that the LINK server scan select network locations at a particular time every day for any new instrument data that has been generated and add this new data to an existing project.

Downloadable Video: Import Data
- Step 2: http://lumetics.com/marketing/LINK_Basic_Training_Step2.mp4.zip

Downloadable Supplementary Videos:
- Manual Data Import: http://lumetics.com/marketing/LINK_Training_Manual_Import.mp4.zip

6.0   Step 3 – Produce Analysis Template

The Analysis and Reporting option permits one to create analysis templates (data visualization preferences) and apply them to a given LINK project (source of data). After selecting a data project, LINK will pre-select an analysis template matching the project name (if it exists). If no such analysis template exists, New Template will appear as the default. One may apply any analysis template developed for another project and modify as necessary to suite the specifics of the project of interest.

Analysis templates consist of dashboards, where each dashboard is defined by the chart type that it supports. Each dashboard will optionally display a chart, a chart series stats table, a customizable notes/discussion block, one or more measurement summary tables, and thumbnail images (if applicable).

Downloadable Video: Produce Analysis Template
- Step 3: http://lumetics.com/marketing/LINK_Basic_Training_Step3.mp4.zip

7.0   Step 4 – Edit Analysis Template

Once an Analysis Template has been created, a user can edit the template to include specific visualization preferences. Navigating the Analysis template will be included in the Step 4 video. This will include:

- Applying the newly created Analysis Template to project
- How to manipulate dashboards panel - Right clicking on any dashboard name in the dashboard panel (list of dashboards), to view the configuration and manipulation options. Dashboards may be grouped together, based on the type of study they are intended to summarize. Individual dashboards may be renamed, deleted, imported, exported, duplicated, and added to a user's Dashboard Favorites.
- How to manipulate filter panel - The filter panel is used to define the specific project measurements that are to be included in that dashboard's analysis, and to Split the data into different groups based on the values of one or more Instrument or User LINKdb Fields. By default, each dashboard will average all available measurements for each instrument together. The Split function permits grouping/averaging by one or more User or Instrument LINKdb Fields. This will manifest in charts as separate series and thumbnail images as separate thumbnail groups. However, Measurement Summary Table Templates have their own independent Split controls for grouping/averaging results.

Downloadable Video: Edit Analysis Template
- Step 4: http://lumetics.com//marketing/LINK_Basic_Training_Step4.mp4.zip

Downloadable Supplementary Videos:
- Series Display Options: http://lumetics.com/marketing/LINK_Training_Series_Display.mp4.zip
- Measurement Summary Table Guide: http://lumetics.com/marketing/LINK_Training_MSTT.mp4.zip

8.0   Step 5 – Add Measurement Metadata

LINK supports the creation of User LINKdb Fields for the purposes of adding metadata to measurements (e.g., formulation/sample attributes) that may in turn be utilized in analysis/processing/reports. Metadata may be populated manually on a per-measurement basis within the pre-import method or added automatically to all measurements in a project via external source (e.g., Excel file) based on user-defined criteria (e.g., matching Sample Name, or Sample ID).

Downloadable Video: Add Measurement Metadata
- Step 5: http://lumetics.com/marketing/LINK_Basic_Training_Step5.mp4.zip

9.0   Step 6 – Explore Dashboard Chart Types

There are two types of dashboards: those designed to view raw xy data sets (curves or distributions), and those that are designed to plot parameters calculated from the raw data, or any other numeric instrument or user defined LINKdb fields. Each dashboard may be fully customized in terms of visualization preferences, by right-clicking and dashboard object (chart, table, or image).

Downloadable Video: Explore Dashboard Chart Types
- Step 6: http://lumetics.com/marketing/LINK_Basic_Training_Step6.mp4.zip

10.0   Step 7 – Export Analysis Template Visualizations

LINK contains a variety of tools to export LINK-processed data. Any dashboard object, such as charts and tables, can be exported as an image (i.e. copy to clipboard, for subsequent paste to Word to/from clipboard) or to a TSV spreadsheet file format. They may also be export to PDF or Word Reports, including user-defined custom Word Report Templates. A URL for a project/analysis template combination may be extracted from LINK. When selected from within another application

(e.g. Word, or an ELN), it will automatically launch Chrome, login to the LINK server using a read-only license, and open the requisite project/analysis template.

LINK analyses may be exported in a variety of forms, including Word documents, PDF reports, PNG images, TSF files, and spreadsheet compatible data tables.

Downloadable Video: Export Analysis Template Visualizations
- Step 7: http://lumetics.com/marketing/LINK_Basic_Training_Step7.mp4.zip

11.0   Step 8 – Import Additional Instrument Data

LINK software can aggregate multiple measurements from different instruments and use LINK's analysis flexibility to compare complimentary and orthogonal techniques. Multiple imports can be initiated in parallel and project analysis can begin while data is being imported; new measurements will dynamically appear after each dashboard screen refresh.

Step 8 illustrates how to import data into an already constructed Project and analysis template. Importing data from a complimentary technique from the same particle analysis family as well as an orthogonal technique.

Downloadable Video: Import Additional Instrument Data
- Step 8: http://lumetics.com/marketing/LINK_Basic_Training_Step8.mp4.zip

12.0   Step 9 – Manage Project and Templates

LINK database (LINKdb) management tool is available for searching and managing the LINK database entities. Users with Administrator level privileges will see all projects/templates with ability to rename, edit, delete. Users with Analysis level privileges may one see the projects/templates that they have created and are the owner of.

This training will provide insight into how to manage all projects, analysis templates, and measurement summary table templates.

Downloadable Video: Manage Project and Templates
- Step 9: http://lumetics.com/marketing/LINK_Basic_Training_Step9.mp4.zip

13.0   Contact Information

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