Modernizing Flow Cytometry Analysis to Accelerate Oncology R&D Innovation

A Case Study of Dotmatics Luma Flow Cytometry Workflow at a Major US Pharma Organization

Background

The world of oncology R&D is ever evolving. Scientists are working across traditional boundaries to drive multimodal, collaborative research. Novel treatment modalities like CAR-T cell therapies and multispecific antibodies are offering hope for hard-to-treat diseases. And, artificial intelligence and machine learning are helping researchers work faster and smarter.

With change forever on the horizon, R&D teams need flexible and scalable research tools. They need to eliminate inefficient workflows and dataflows that impede their pursuit of high-impact medicines. One area where many teams need to make adjustments is flow cytometry.

As technology has advanced, many companies now need to update their data-acquisition-and-preparation processes in order to bridge the gap between high-dimensional flow cytometers outputting huge volumes of data across their many labs and the modern, cloud-based software platforms needed to make sense of that data using high-performance, ML-based analytical pipelines.

To overcome this hurdle, the oncology R&D group at one top US pharmaceutical company turned to Dotmatics, whose seamless Luma Flow Cytometry Workflow delivers the ready-to-analyze data and high-performance analysis tools experts need to progress their life-saving research.

Challenge

Flow cytometry plays a significant role in oncology R&D, where it can help with anything from tumor-microenvironment assessment to leukocyte analysis to biomarker research.

Challenge

Manual process to prepare and analyze flow cytometry instrument data was slow, subjective, and error-prone.

Solution

The Luma Flow Cytometry Workflow provides automated instrument data uploads with intelligent tagging, plus centralized file storage, sharing, and accessibility within OMIQ for advanced analysis, including automated gating, deeper contextualization, and auditable analysis pipelines.

Results

Fast deployment:

- < 10 hours to establish parsing environment
- 1 week to connect and onboard 5 instruments and 20 users

Time savings:

- Multiple hours per scientist per week saved with automated transfer of files from instruments to analysis platform

Improved data access and insights:

- Centralized data storage and access
- Seamless sharing across sites
- Automated tagging and metadata capture
- Ready access in cloud analysis platform

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To perform this important work, teams often have dozens or even hundreds of cytometers, with varying degrees of dimensionality, scattered across different labs and locations. They'll use these machines to run a wide array of different assays; the results data and metadata output from these machines not only needs to be efficiently collected, but it also needs to be processed and readied for analysis. All the data must be securely stored and centralized so that it can be made more widely accessible, whether to outsourced analysts hired for gating, or to collaborative research groups running the complex analytical pipelines needed to bring order to high-dimensional data.

Unfortunately, many R&D teams face a common obstacle. Despite having the latest-and-greatest cytometers and analysis software available to them, their processes for acquiring, preparing, and correlating data have not kept pace. This creates major technical hurdles and timesinks that leave IT scrambling to manage scripts, map files, and

build databases, and analysts wasting time massaging and annotating data to prepare for analysis. Once individual flow runs are processed, they need to be contextualized, such as by comparing results for multiple runs or over time, or correlating results back to relevant external data sources, such as patient, clinical, trial, or genomics data. It is this broader view that helps drive decision making.

This scenario reflects the burden that was troubling one major US pharma, known for its bold R&D initiatives to translate scientific research into viable cancer therapies. As shown in Figure 1, the team's road from instrument to insight was marked with many divergent paths needed to manually upload, process, annotate, correlate, and analyze data. The result was a process that not only slowed workflows and risked error, but also obscured insights and failed to provide a unified audit trail.
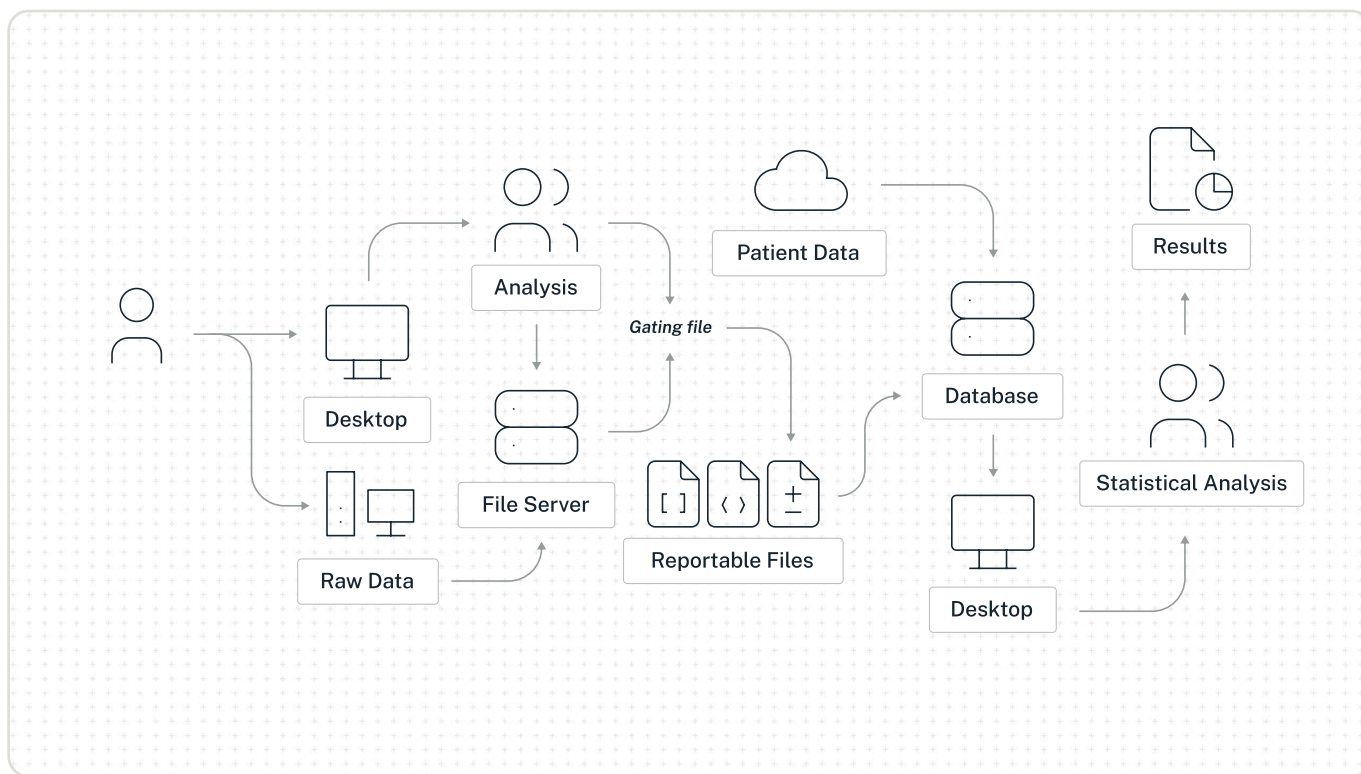

Figure 1: In the oncology R&D department at one top US pharma, turning flow cytometry data into actionable insights was riddled by slow, subjective, and error-prone processes, such as script-based upload and parsing, manual annotation and tagging, limited-access to various local files and drives storing the data needed to progress research, and isolated data processing and analysis.

Solution

Amidst the team's struggle to piece together a solution and build a master database for analysts, Dotmatics presented an alternative: the Luma Flow Cytometry Workflow, an integration solution featuring Luma Lab Connect and OMIQ. The team was readily receptive after having recently migrated from its outdated desktop flow-analysis software program to OMIQ — Dotmatics' modern cloud-based cytometry analysis platform that delivers a suite of machine learning tools, cutting-edge algorithms, and interactive visualizations to help analysts bring order to complex high-dimensional data. By choosing the Luma Flow Cytometry Workflow,the team hoped to address some key priorities it had in its labs, including faster instrument data acquisition, improved data sharing across sites, easier data preparation, and better data accessibility for deeper analysis.

Results

The Luma Flow Cytometry Workflow was deployed in rapid fashion. It took Dotmatics less than 10 hours to remotely deploy an environment to parse the team's data using Luma Lab Connect. For the team itself, set up was simple; all it needed to do was download and install the file agent. Rollout was rapid, with five instruments and 20 users connected and onboarded within one week.

Multiple hours per scientist per week are now being saved thanks to better connection of instrument files to flow cytometry software.

The Luma Flow Cytometry Workflow met the team's top priorities and more by providing:

- ✅ Automated transfer of instrument files

- ✅ Centralized data storage and access

- ✅ Seamless sharing across sites

- ✅ Automated tagging and metadata capture

- ✅ Ready access in a cloud analysis platform

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The following table highlights key benefits the Luma Flow Cytometry Workflow has delivered.

Previous Challenge	Luma Flow Cytometry Workflow
Manual data acquisition and annotation IT was juggling different scripts for uploading FCS files and reports, which all needed to be manually tagged.	✓ **Automatic data upload with intelligent tagging** Flow files and reports are automatically uploaded, parsed, and tagged with Luma's advanced algorithms.
Scattered files, drives, and databases IT was struggling to build a custom database to replace various disconnected computers, drives, and files that researchers and analysts had accumulated over time.	✓ **Secure cloud database** All relevant flow cytometry data and ancillary data are centrally managed in a secure, searchable database that is accessible to all team members based on their permissions.
Slow, costly, subjective gating R&D was outsourcing gating to keep pace with the increasing volume and complexity of flow results.	✓ **Autogating using machine learning** Fast, reliable, consistent automated gating pipelines use machine learning to mirror manual processes.
Disconnect between flow results and broader R&D data Analysts were formatting and annotating flow results manually and struggling to tie results back to older runs or to relevant ancillary data (e.g., experimental, patient, clinical, genomic).	✓ **Contextualization with external systems** External data sources are harmonized with analyzed flow cytometry data to provide the contextualization needed to enable horizontal analyses, spot trends and changes over time, and deliver insights that drive R&D decision making.
Cumbersome analysis processes Analysts were spending an inordinate amount of effort to gather, prepare, and move data between all the various repositories and speciality software needed to complete more complex analysis (like multi-run analyses or contextualized and statistical analyses) which not only wasted time, but also obscured insights.	✓ **Integrated analysis with OMIQ** Multi-run and in-depth analysis are simplified because Luma unites all flow results, ancillary data, and OMIQ advanced analysis tools on one platform, creating a complete environment for traceable and auditable analysis pipelines that help identify trends over time, uncover correlations between data, or even detect potential instrument issues.

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Significance

Because the Luma Flow Cytometry Workflow provides a complete, cloud-based, flow-analysis solution, this innovative oncology R&D team is now able to work faster, collaborate better, and unlock the full potential of its flow cytometry data.

As shown in Figure 2, the Luma Flow Cytometry Workflow streamlines the company's entire flow cytometry data journey, from instrument to insight, with automated uploads from flow cytometers and other relevant external systems using Luma Lab Connect, intelligent parsing, tagging and harmonization with Luma Platform, and integrated analysis with OMIQ. All data are united and accessible in the Luma cloud platform, which features bidirectional dataflow with both Dotmatics ELN and OMIQ, so that the team can continue to build off its insights.
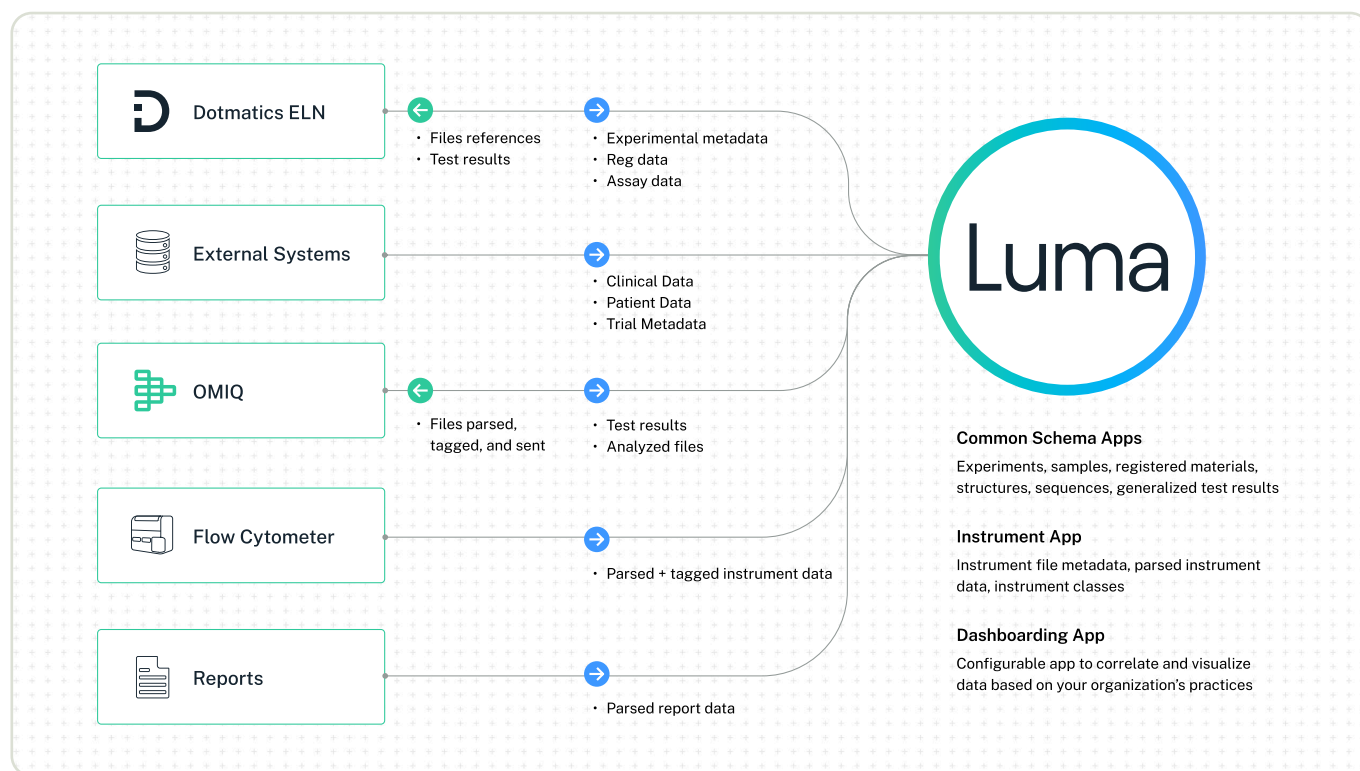

Figure 2: From instrument to insight, the Luma Flow Cytometry Workflow provides a complete, cloud-based flow-analysis solution that streamlines every step of the flow-data journey, enabling automated uploads, intelligent tagging, and integrated analysis.

What's next?

The team has said goodbye to the days of upload scripts, manual data annotation, and physical file directories. With an end-to-end solution from instrument-data acquisition to advanced analysis, the team can now better access and analyze its flow results, working faster and smarter to pursue its bold oncology research endeavors.

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Learn More about Luma Flow Cytometry Workflow

Schedule a demo with Dotmatics to learn how the Luma Flow Cytometry Workflow can help modernize your entire flow-analysis process.

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