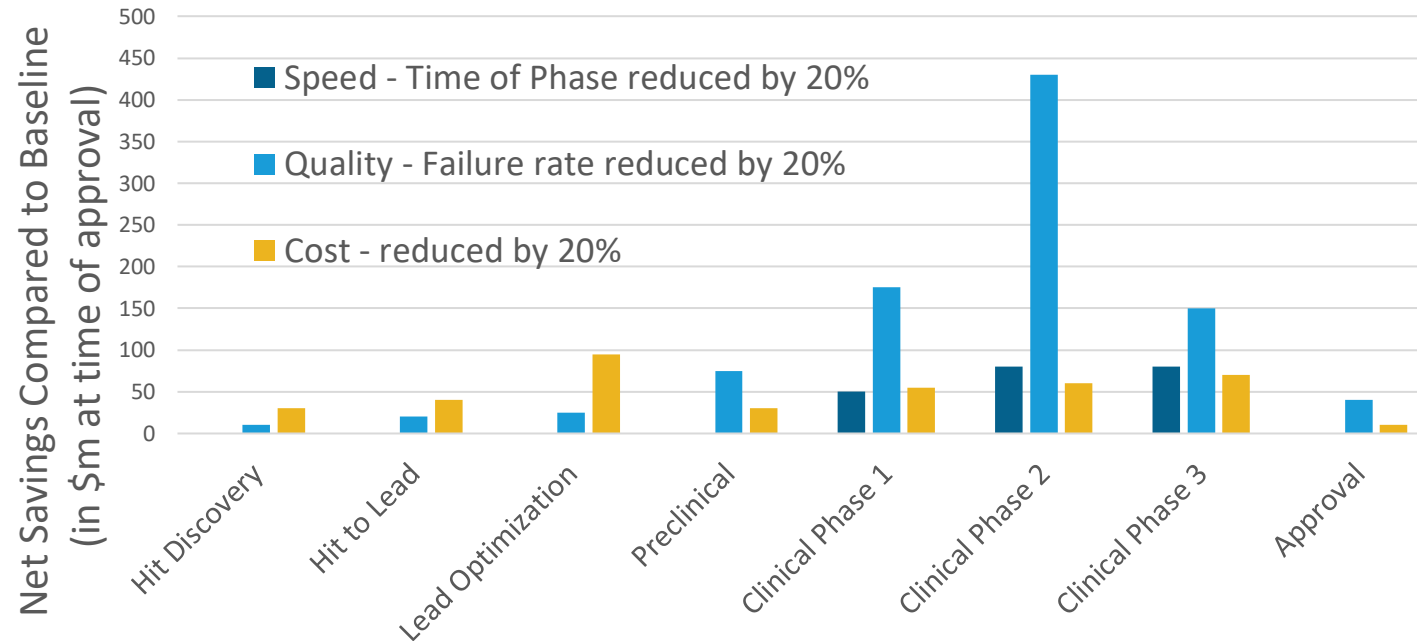


# From Chaos to Clarity: ZONTAL's Digital Solutions for Biotech Wizards!

Prof. Dennis Della Corte  
Allotrope Spring 2023

# Within our scope of responsibility, we are all decision makers.



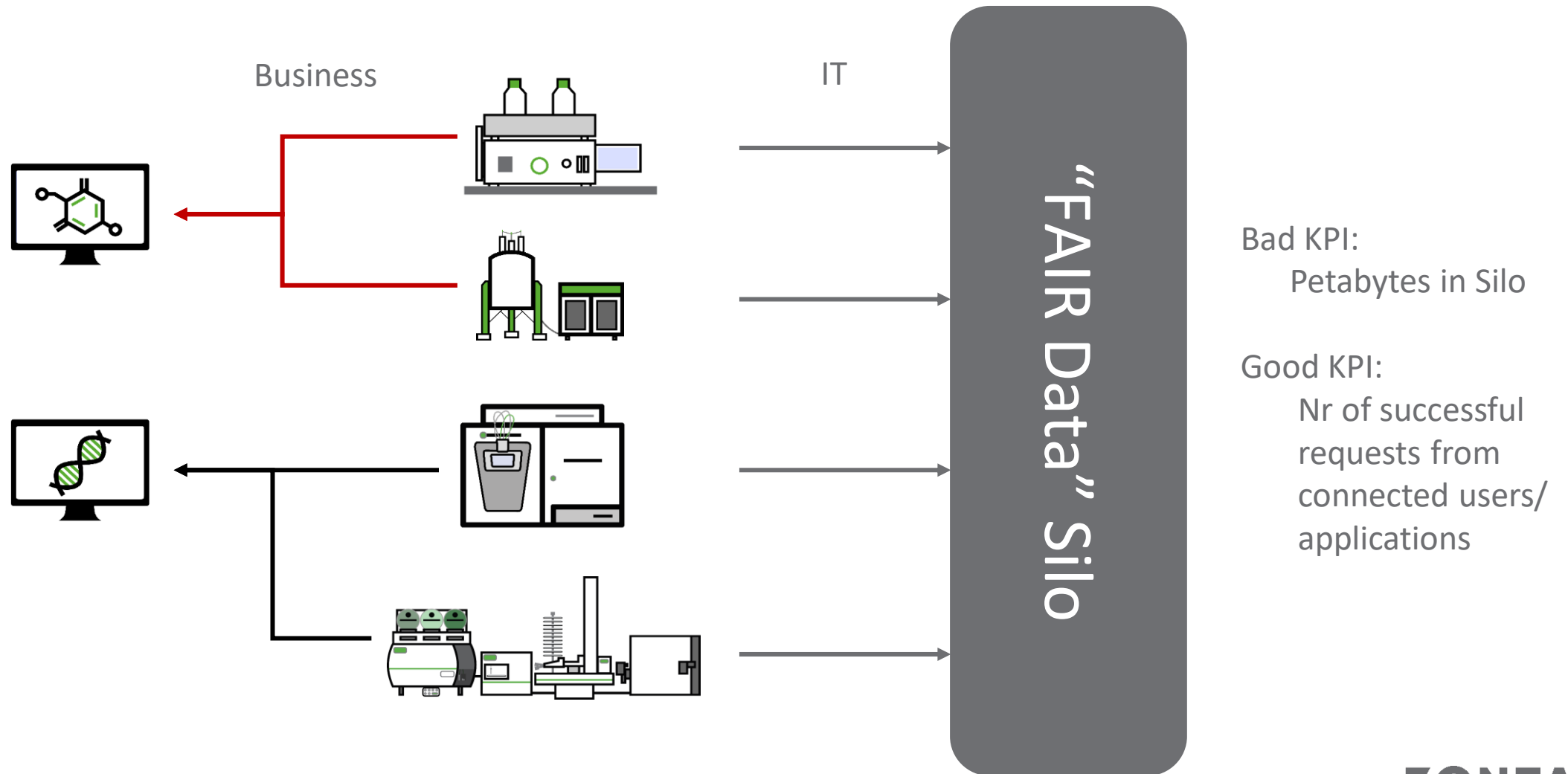
Phase of Drug Discovery and Development, adapted from Bender et al  
(<https://doi.org/10.1016/j.drudis.2020.12.009>)

## What impedes us from making data driven decisions such as:

- Have we done this before?
- Can I trust this dataset?
- Do I need to repeat this experiment?
- Should this project be continued?

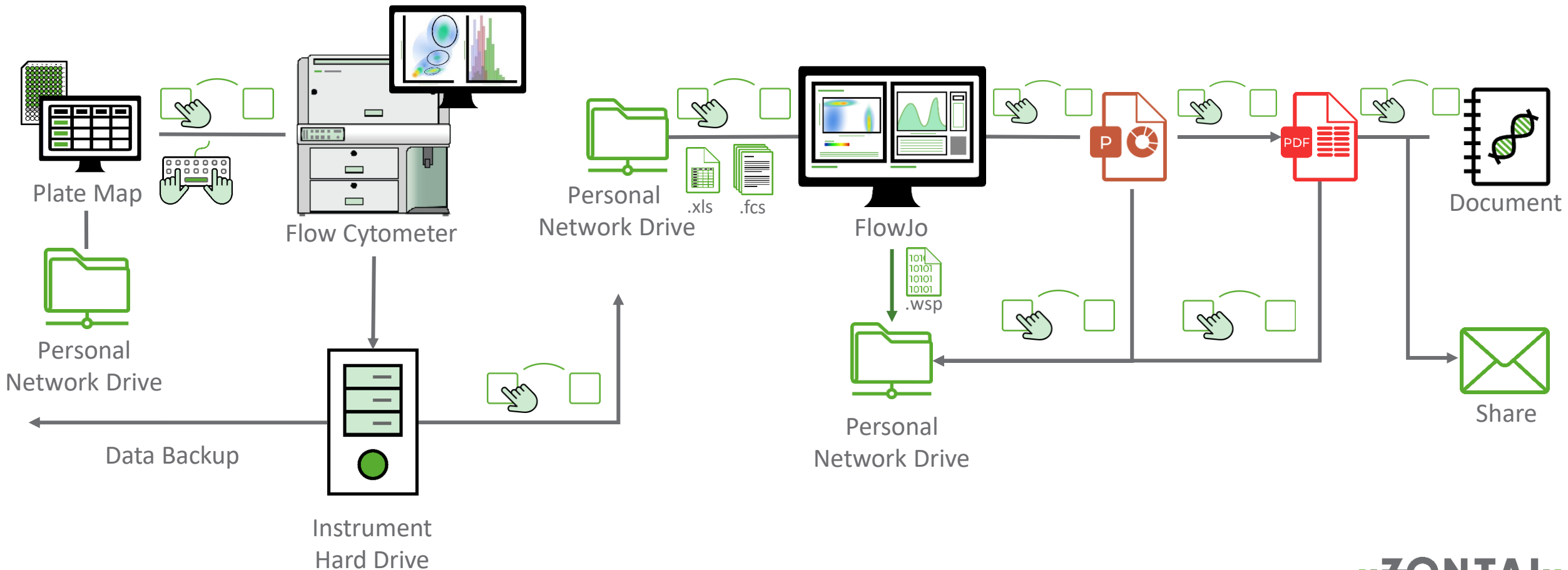
# The FAIR Data Issue

## IT FAIR Data Projects are too often Isolated from Business Reuse Projects



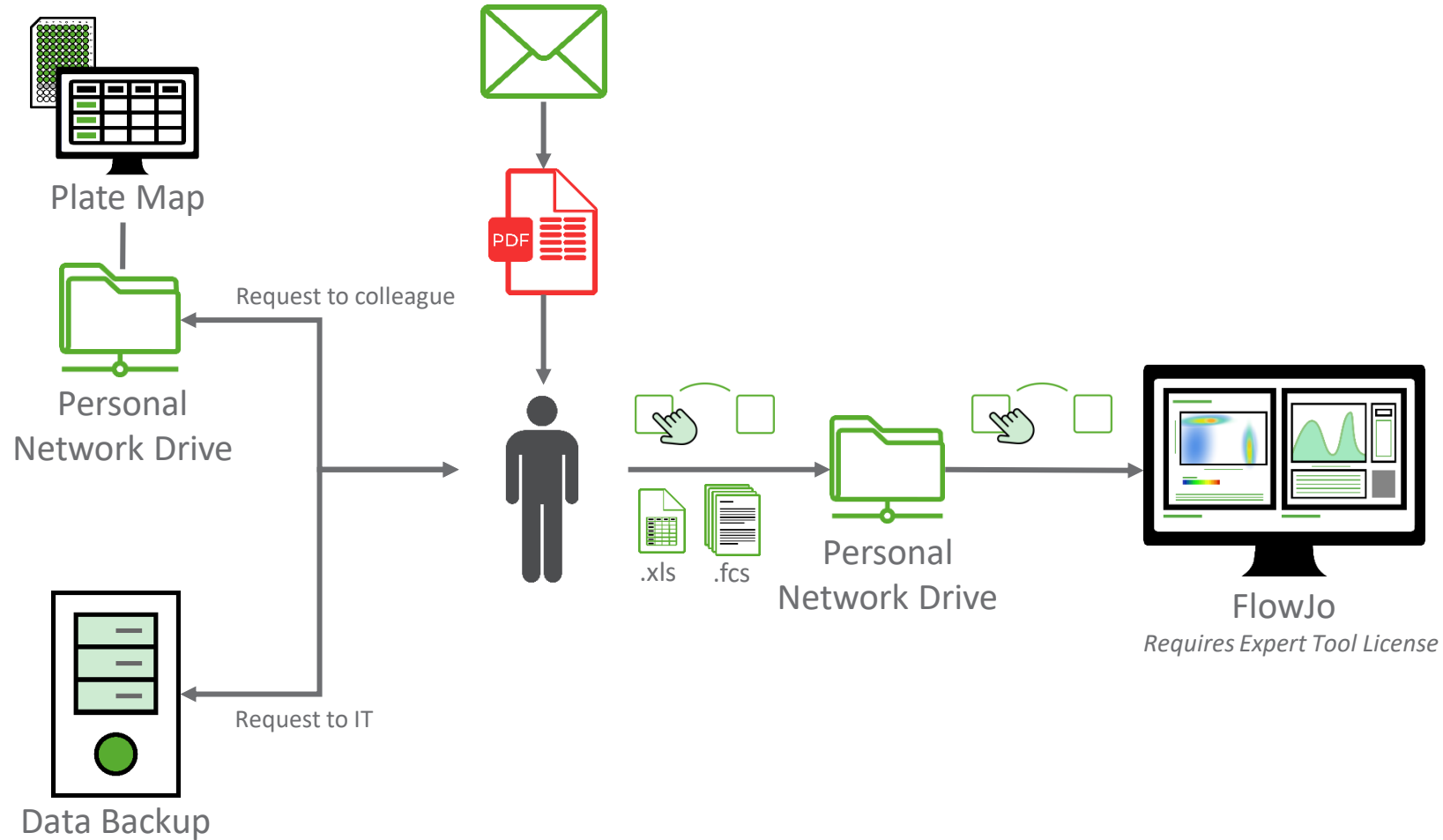
# The Data Problem with Flow Cytometry

Simple Experiments often Result in Complex Manual Workflows



# The Data Problem with Flow Cytometry

## Issues in Finding, Confirming, and Reusing cause Repeated Experiments



THE LIFE SCIENCE DATA PLATFORM

·ZONTAL·

# Our Solution



# Discovery Biology Solution Architecture

## Automation of Workflows Across the Needs of Biological Drug Discovery

HT/HC Screening Systems

Bio ELN

Bio LIMS/ Registration

Data Analytics

Prism™, SoftMax Pro™, etc.

FlowJo™

Data Visualization & Dashboards

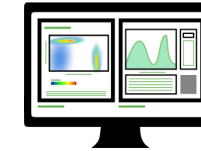
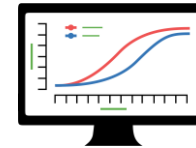
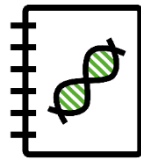
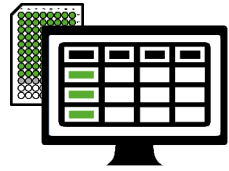
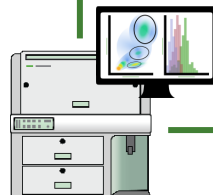


Plate Reader Application



Microscopy Application



Flow Cytometry Application

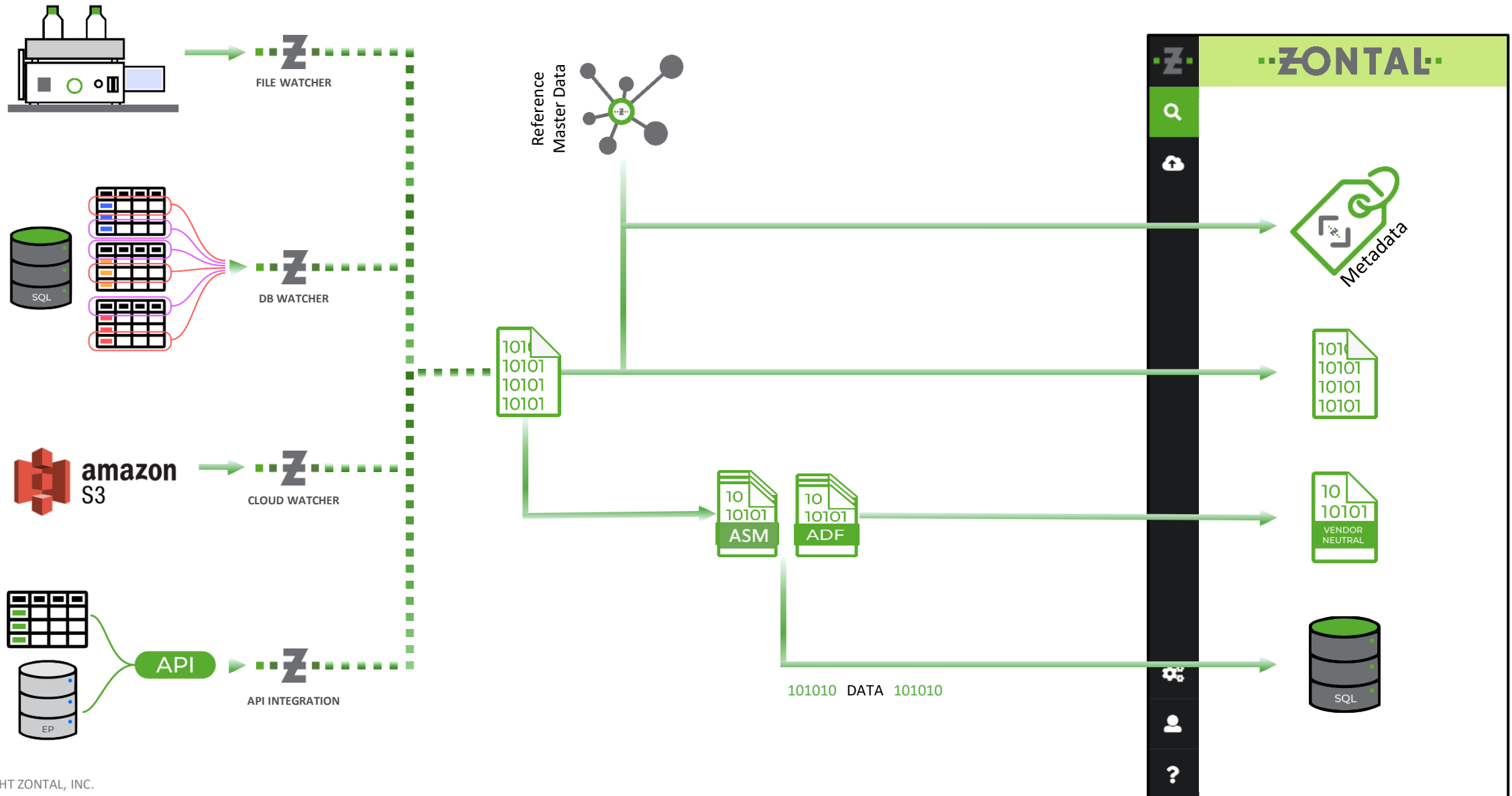


Live Cell Imaging Application



Proteomics & Metabolomics Application

# Data Flow Into ZONTAL – Leveraging ADF and ASM





# The ZONTAL Difference

## Data is Findable, Accessible, Reusable, and Interoperable – Using AFO

**220831\_CLD\_0071\_1061\_LCVR.zip**

Experiment

Experiment Date: 2022-08-31T00:00:00.000+00:00  
 Trigram: LCVR  
 Project Code: 1061  
 ELN Doc: 0071  
 Department: CLD

Lifecycle Status Information Package Profile Search... Add Filter

Download About 3 results (1 selected)

<input type="checkbox"/>	Lifecycle Sta...	Preferred Label	Created On
<input checked="" type="checkbox"/>	Archived	220831_CLD_0071_1061_LCVR.zip	2022/Sep/06 11:51:11 (-0...
<input type="checkbox"/>	Archived	220711_CLB_0081_1062_LUVR.zip	2022/Sep/06 11:49:02 (-0...
<input type="checkbox"/>	Archived	220411_CLD_0061_1060_LUVR.zip	2022/Sep/06 11:45:10 (-0...

Trigram

Experiment  
 Experiment Date  
 Trigram  
 Project Code  
 ELN Doc  
 Department

Lifecycle Status Information Package Profile Trigram X Search... Add Filter

Download 1 result (1 selected)

<input type="checkbox"/>	Lifecycle Sta...	Preferred Label	Created On
<input checked="" type="checkbox"/>	Archived	220831_CLD_0071_1061_LCVR.zip	2022/Sep/06 11:51:11 (-0...

LCVR  
 LUVR

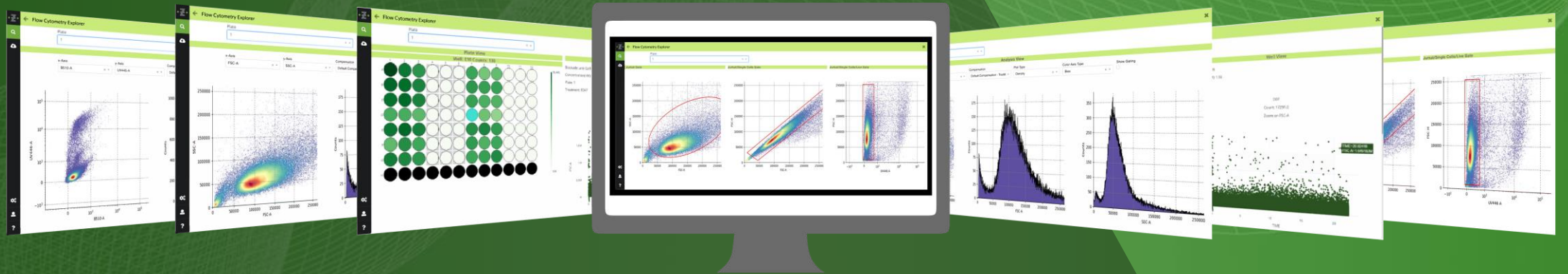
220831\_CLD\_0071\_1061\_LCVR.zip

- 220831\_CLD\_0071\_1061\_LCVR.zip
- 220831\_CLD\_0071\_1061\_LCVR.zip.json
- CES Data.zip
- data\_description.nt.gz

# The ZONTAL Difference

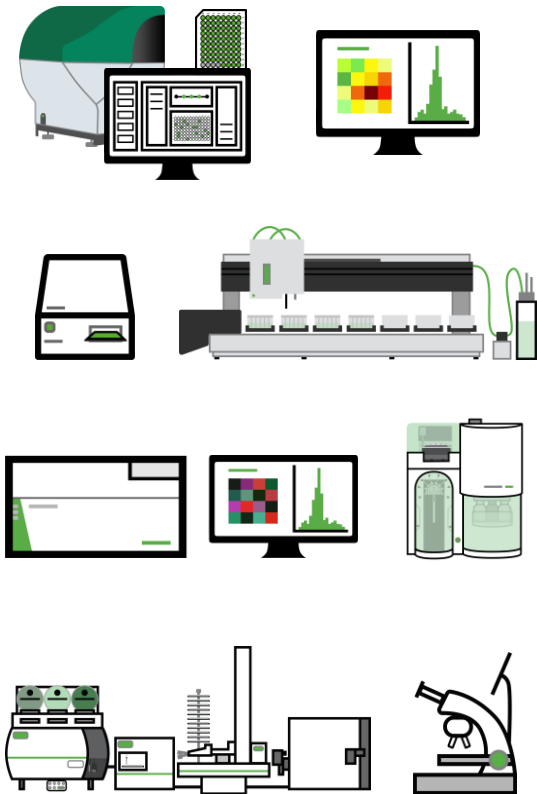
- 1. We Bring the Application to the Data, and not the Data to the Application.**
- 2. Visualization and Analysis are ONE click away From the Data.**

# Discovery Biology Solution



# Applications for Discovery Biology & Development

## Integrated Planning, Execution, Analysis and Data Visualizations for Large Molecules



 **Benchling** 





*NOVA*<sup>®</sup>  
biomedical

 **Spotfire**<sup>®</sup>  
TIBCO Software









 **dotmatics**  
knowledge solutions





**ThermoFisher**  
SCIENTIFIC

**Cedex Bio HT Analyzer**

Ambr<sup>®</sup> 15 Cell Culture

### Data Flows

- Test Request
- Instrument Integration
- Flow Cytometry
- Cell Line Development
- Plate Reading
- Microscopy Data Management >1 TB Files.
- Image Visualization and Automated Annotation
- Plate Based Data Viewing



# Example of Extracted Data in ZONTAL

<input type="checkbox"/>	Lifecycle Status	Preferred Label	Created On	Information Package Pr...	Imported from Host	Imported from URL
<input type="checkbox"/>	Archived	17-Mar-2022 Jurkat TI...	2022/Dec/08 17:20:48 ...	Flow Cytometry Experi...		
<input checked="" type="checkbox"/>	Archived	17-Mar-2022 Jurkat TI...	2022/Dec/22 02:37:03 ...	Flow Cytometry Experi...		

17-Mar-2022 Jurkat TIM3 cell binding Exp #3 JM.wsp



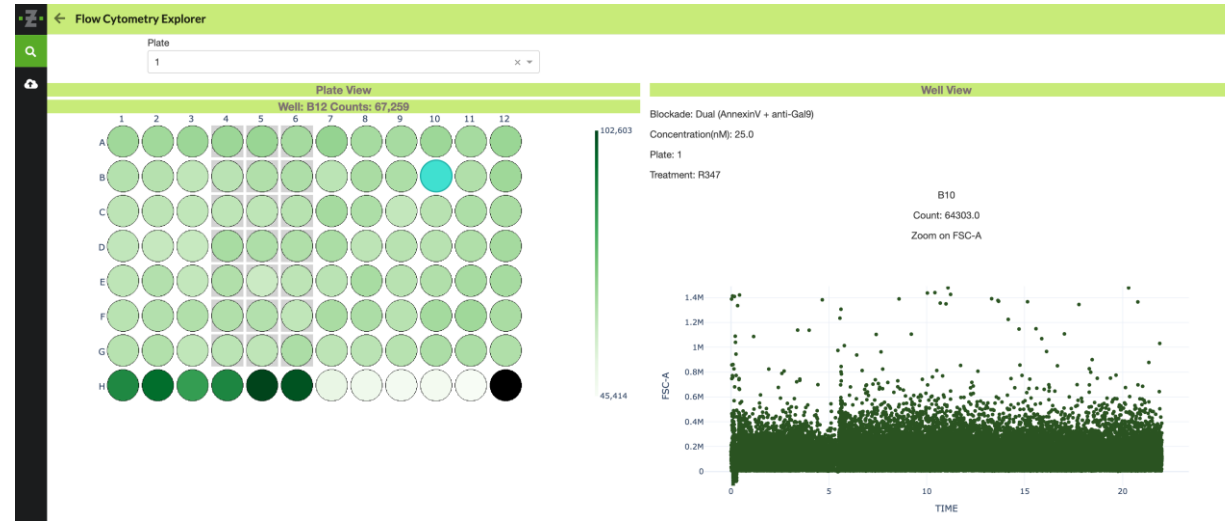
- data\_cubes.json.gz
- data\_description.nt.gz
- parsed\_output.json
- ▼ ExperimentID\_1234
  - ▶ Flowjo\_data
  - ▼ Planning\_data
    - 2022-03-15 Gal9 + AnnexinV blockade + Jurkat TIM3 IgV Cell-Binding Experiment #3.xlsx
    - 2022-10-21 multi-variable plate JM.csv
  - ▼ Raw\_data
    - ▼ Plate #1
      - AnnexinV BV421 FMO\_H10\_H10.fcs
      - Fixable LD Blue FMO\_H7\_H07.fcs
      - Gal9 PE FMO\_H11\_H11.fcs
      - PD1 FITC FMO\_H9\_H09.fcs
      - TIM3 IgV AF647 FMO\_H8\_H08.fcs



# Discovery Biology Solution

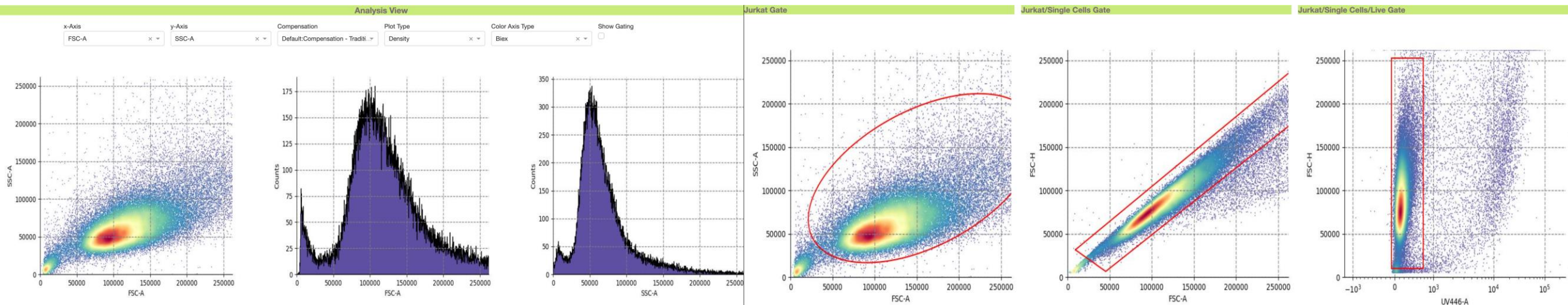
## Turn Static PDF Reports into Interactive Dashboards

*Pictured:  
Flow Cytometry  
Application*



Align in one view:

- planning data
- raw data
- analysis data





# Discovery Biology Solution

## Flow Cytometry Dashboard - Interactive Visualizations with Faceted Browsing

Z
✕

Select Plate from Datahub

Select Filter

Select Mode

### Plate Visualization

**Plate level information**

Heatmap		AWS File Gateway	
Population		<a href="#">Raw .fcs files of all wells in plate</a>	
Population viability		Compensation file	
Population mean		Forseti	
Population median		Controls table/charts	
Population events: 18006		Compensation file	
Doublet population			

### Well Visualization

**Forseti**

Well: E9

Well Properties

Population

Population viability

Population means: 460

Population medians: 460

Population events: 3341

### Sample Information Files

Sample name:

Experiment type

Multiplex logic

Cell type

Protein coating

### Instrument

Protocol details

Instrument settings

### Well Visualization

**Tier\_1\_Flow\_Cell\_Binding\_-\_plate\_6/E9.fcs**

**Cells**  
gated events: 33482 (98%)

**Singlets**  
gated events: 30853 (90%)

**Viable**  
gated events: 26565 (78%)

**Viable**

**Viable**

**Binding Signal (APC)-A**

**R script output**

Well autogate image

Compensation

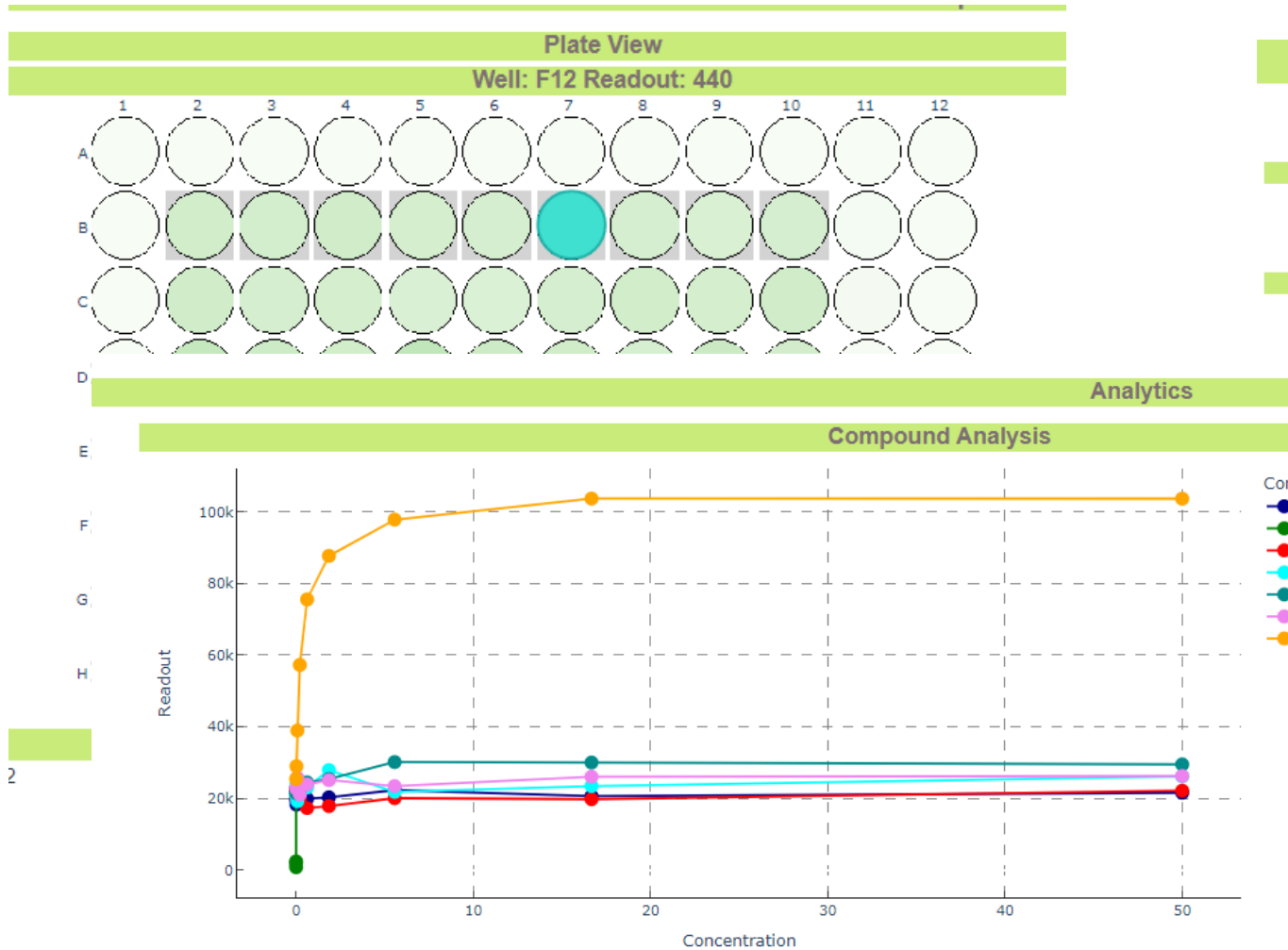
**AWS File Gateway**

[Link to raw .fcs file](#)

Compensation file

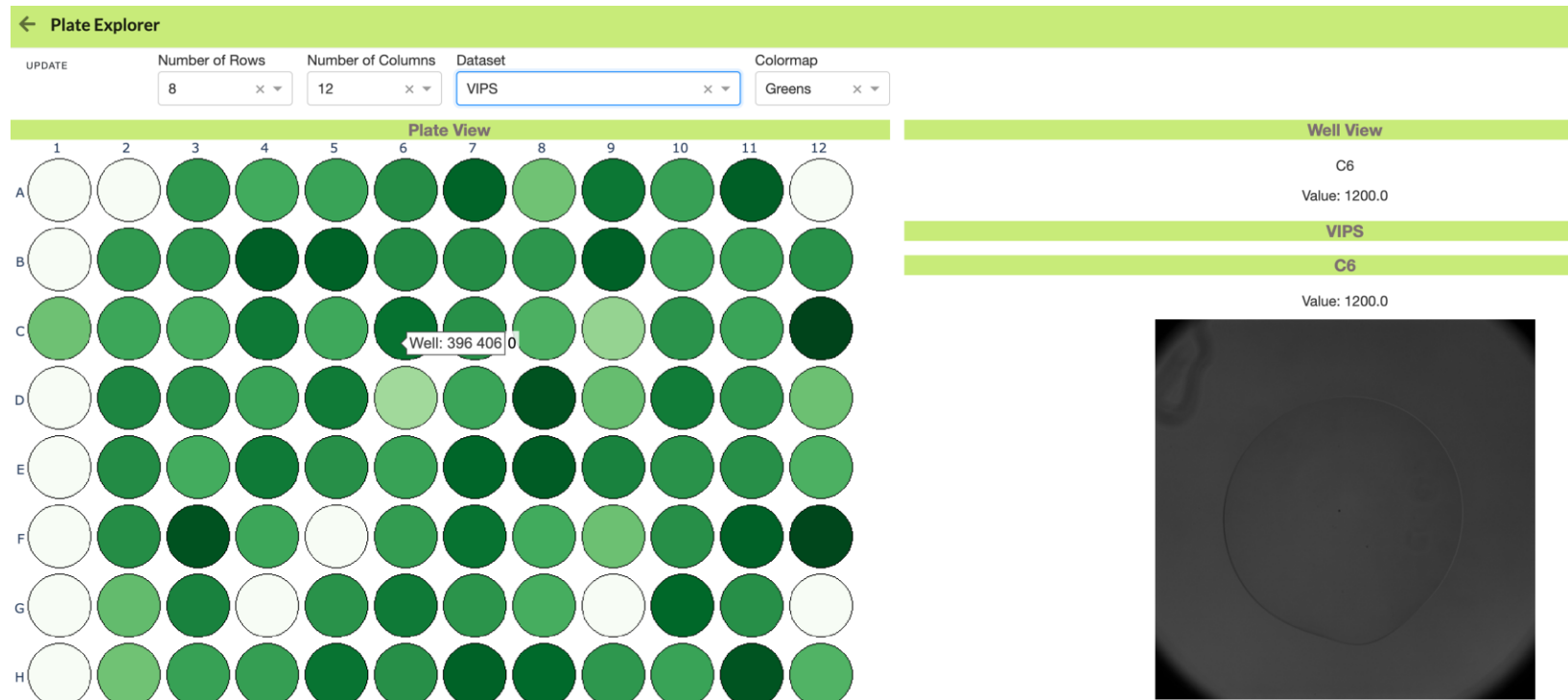
# Plate Reader Application

## Well View with Interactive Data Analysis and Visualization



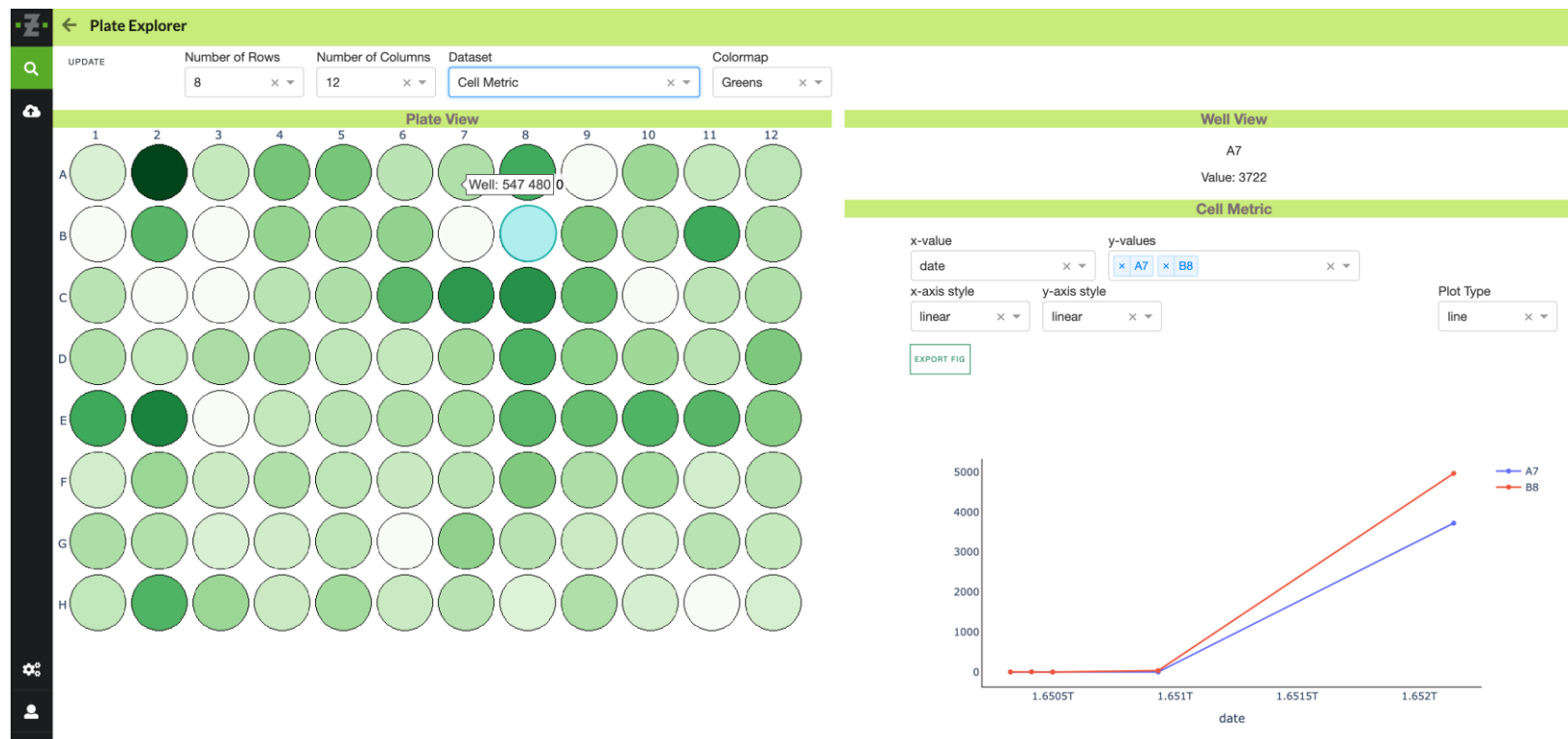
# Upstream Bio-Processing

## Graphical Exploration of VIPS Data



# Upstream Bio-Processing

## Graphically Explore Cell Metric Plate Level and Well Level Data



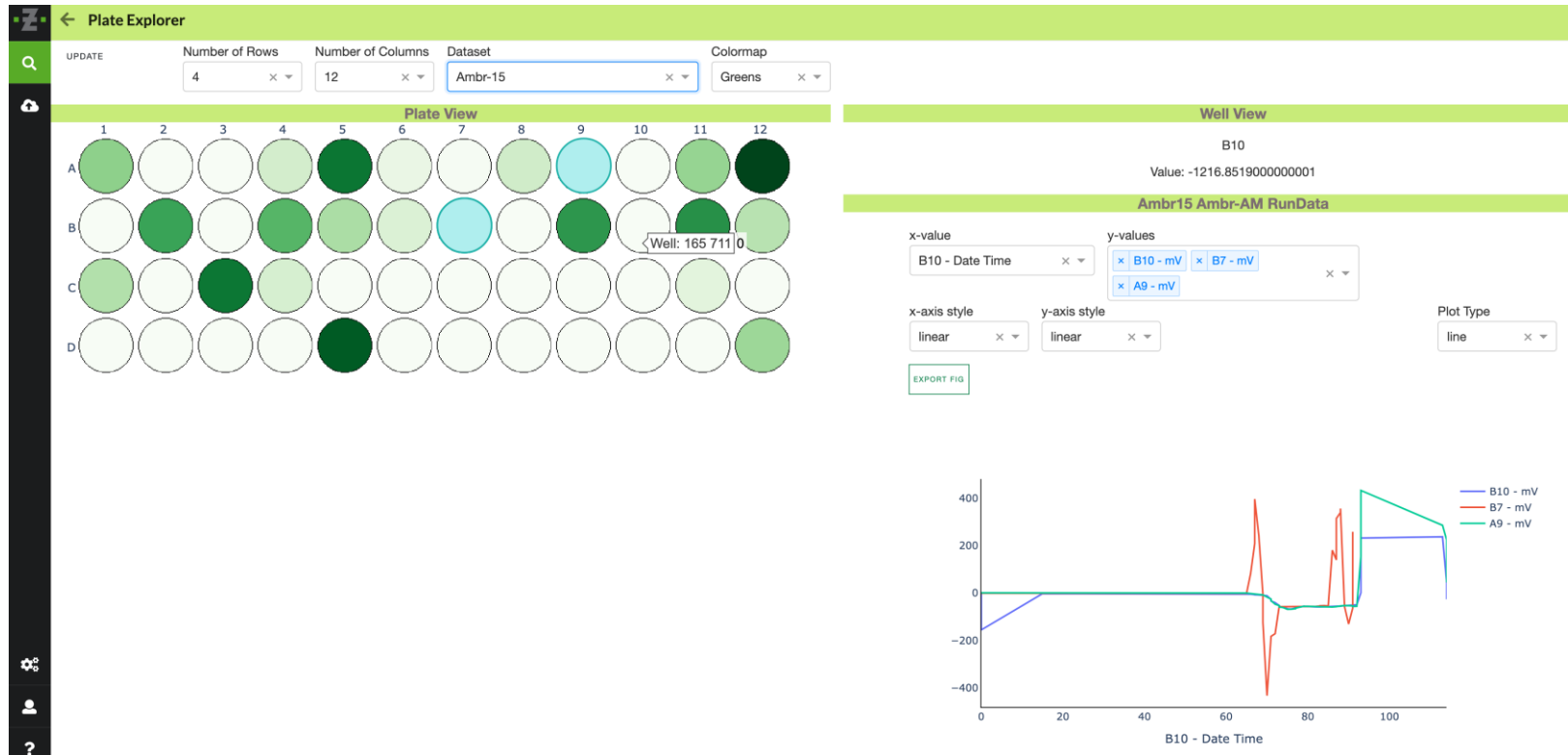
# Upstream Bio-Processing

## Interactive Exploration of ICON Plate and Well Data



# Upstream Bio-Processing

## Ambr15 Data - Visual Exploration of Plate and Well Level Information



# Upstream Bio-Processing

## Visually Explore CEDEX Images and Annotations within ZONTAL

The screenshot displays the ZONTAL CEDEX Data Viewer interface. At the top, a green header bar contains the ZONTAL logo and the text "CEDEX Data Viewer". Below this, a "Select Image" section features a search icon and a dropdown menu showing the file path "dae7c575-1c1c-4376-804f-adb00eb1e60.jpg". To the right, a "Select Annotation Types" section includes a list of checkboxes: "All Cells" (checked), "Viable Cells", "Dead Cells", "undefined", "undefined", and "Aggregates". Below the image selection area, a "Statistics" section displays "Viable Cells: 1207" and "Dead Cells: 16". The main area of the interface is a large microscopy image of cells, with many cells circled in red, indicating they have been annotated.



# Upstream Bio-Processing

## ViCell Data Managed in ZONTAL



# Graphical Exploration of Image Data

## Microscopy

Microscopy

The figure displays a grid of microscopy images. The top row contains five panels: CMU-1 (46000 x 32914) showing pinkish biological structures; CMU-2 (78000 x 30462) showing similar structures; CMU-3 (66000 x 45402) showing a cluster of cells; JP2K-33003-1 (15374 x 17497) showing a circular structure with a central grey area; and JP2K-33003-2 (32671 x 47076) showing two pinkish rectangular structures. The bottom row contains five panels: a small inset of a pinkish structure; a fluorescence microscopy image with a color scale on the right; a fluorescence microscopy image with a color scale on the right; a fluorescence microscopy image with a color scale on the right; and a fluorescence microscopy image with a color scale on the right. The color scales on the right of the bottom row images range from 1 to 13, 1 to 13, 1 to 13, and 1 to 15 respectively.

THE LIFE SCIENCE DATA PLATFORM

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# ZONTAL Integrations

# Overview of ZONTAL's Integration Capabilities

Over 400 Integrations and Counting



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