The CAIMAN project

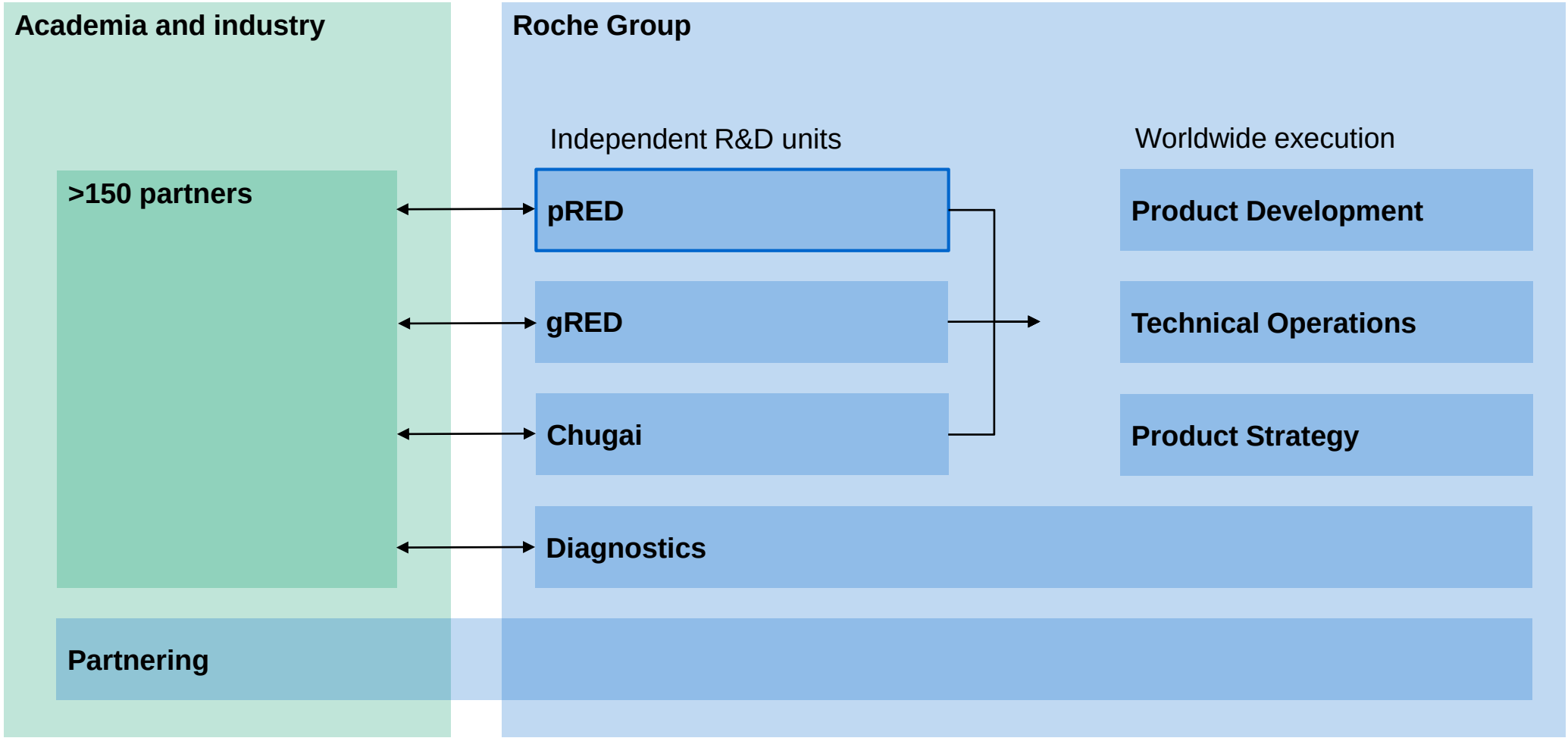
Making most of our data with D360

Marc Pompiati, LMR, Roche Innovation Center Munich

Roche *pRED*

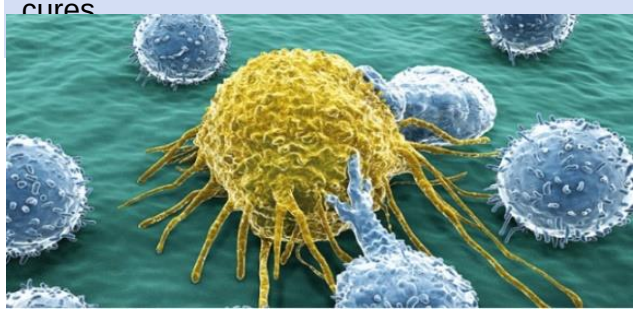
The Roche Group organisational structure

Roche pRED is one of three independent research & development units

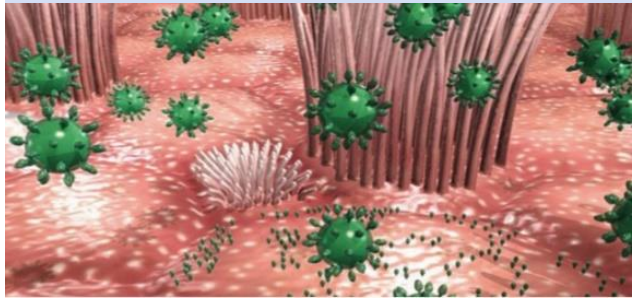


The Roche pRED disease areas

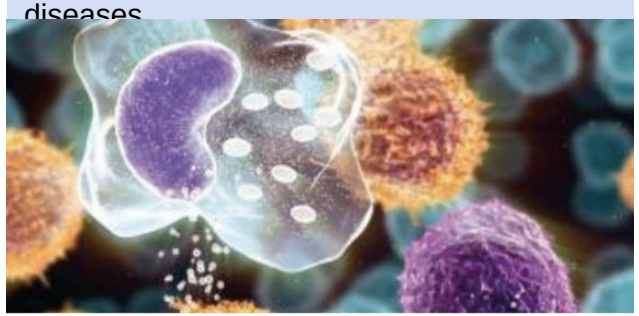
Oncology
Combining cancer immunotherapy and tumour targeted therapy approaches to seek cures



Infectious diseases
Developing targeted treatments for life-threatening infectious diseases



Immunology & inflammation
Developing differentiated medicines for people with immune and inflammatory diseases



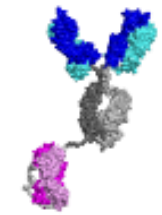
Ophthalmology
Restoring sight

Neuroscience
Developing medicines for serious neurological diseases

Monogenic rare diseases
Tackling inherited genetic disorders

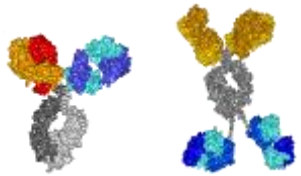
Roche pRED's modular biologics

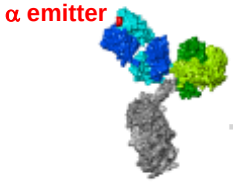
Advancing therapeutic antibody sciences



Brain shuttle antibody fusions

Glycoengineered antibodies

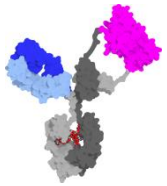




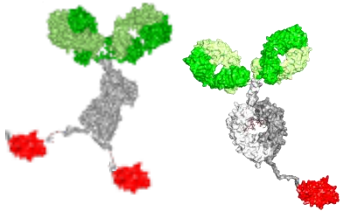
Radio-immunotherapy

Antibody

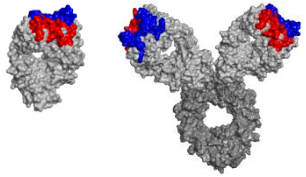
T cell BsAbs (2+1)



Tumor-targeted checkpoint modulators



Antibody cytokine fusions (2+1 & 2+2)



DutaFab/DutaMab BsAbs

Roche business opportunities and digitalization

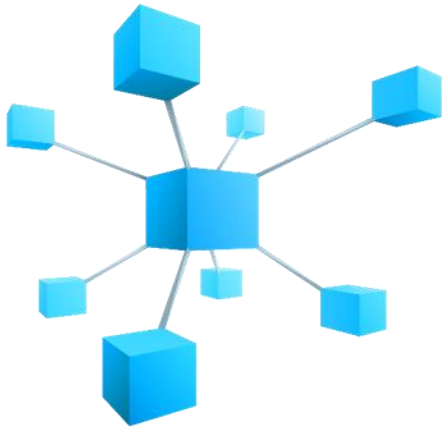
- Digitalization is creating exciting new opportunities .
- To be equally successful in this new environment, Roche pRED depends on making better use of our research data, which continue to increase exponentially.
- The **CAIMAN project** is part of the Lab of the future initiative that addresses digitalization and supports the overall pRED digitalization goals.

pRED: Pharma Research and Early Development

LMR: Lab of the future

Embrace digital and automated solutions to aid discover and develop superior biologics

Landscape	Data&learning	People
We are developing ONE landscape from registration, data capture, visualisation to interpretation and learning.	Value will increasingly be generated by digital and automated solutions. Data are a central asset.	Skills in biology, biotechnology, data science and automation is needed.



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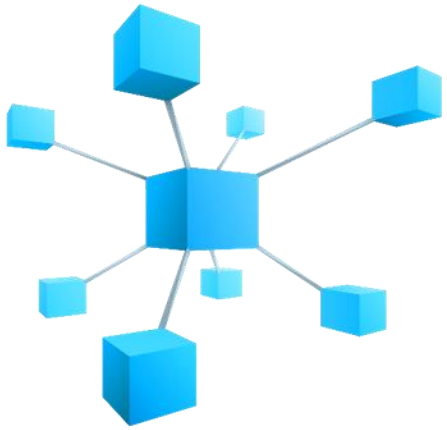

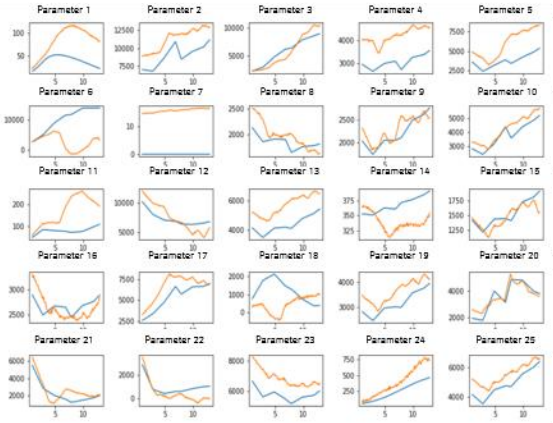

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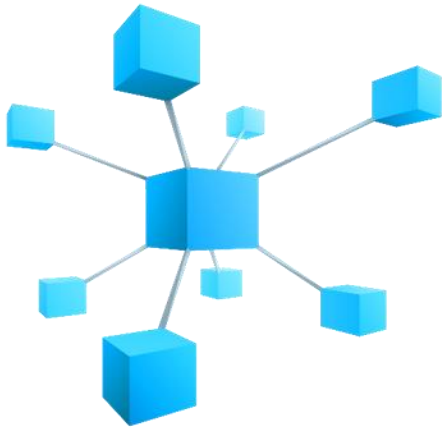

Data&learning

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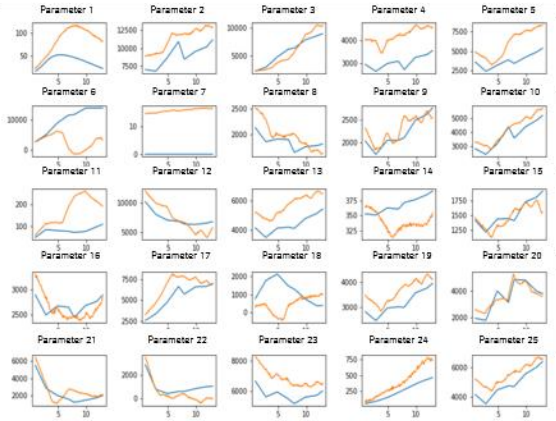


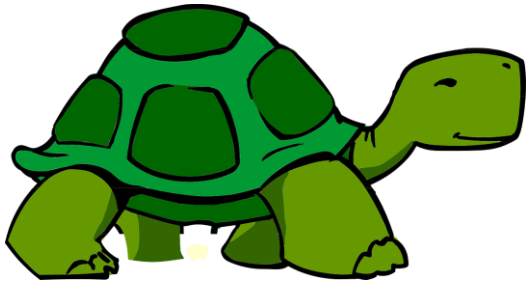
People

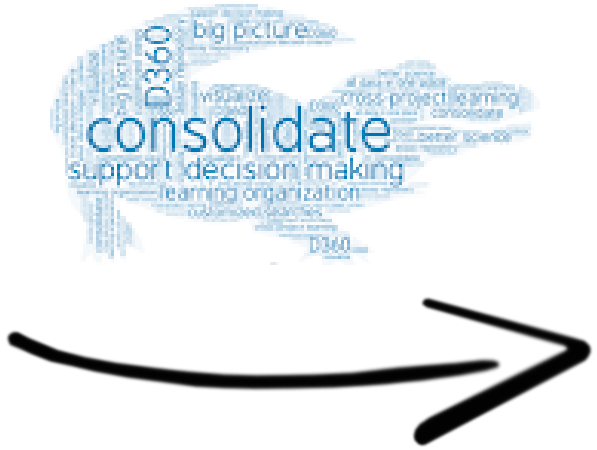
Skills in biology, biotechnology, data science and automation is needed.

The CAIMAN project

CAIMAN = **C**onsolidated Platform for **A**ssay, **I**nventory, **M**olecule and **An**alytics Data

Before CAIMAN

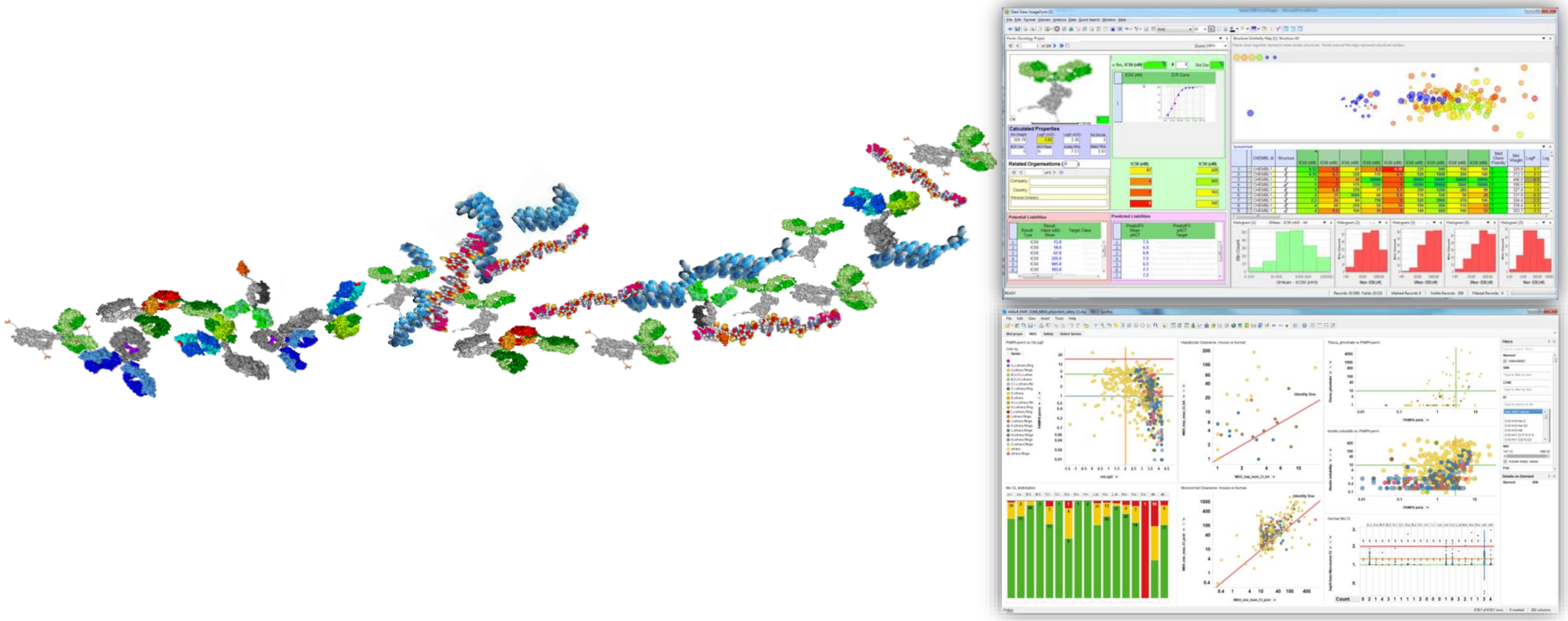




After CAIMAN

CAIMAN Vision

A single interface for accessing and analyzing data across modalities and achieving quality data mining for project teams to increase efficiency and reduce effort for advancing portfolio projects



The goals of the CAIMAN project

- Make access, integration and analysis of relevant and understandable data less cumbersome and time-consuming and more reliable.
- Help shift the focus from data collection and capture to data analysis by establishing automated data workflows that use existing assay data-capturing tools like BioBook and registration systems like TaPIR, and merging them with other existing project metadata into scientifically meaningful records.
- Guarantee that high-quality data are available in pRED for informed decisions by establishing a review process for assay description and data structure.

LMR: Lab of the future

The Project

TaPIR ▸ Therapeutic Protein Identifier and Registration

SaLaManDeR ▸ Sample Management

CAIMAN ▸ Consolidated Platform for Assay, Inventory, Molecule and Analytics Data

INDALA ▸ Integrated Data Analysis for LMR Automation

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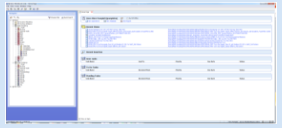
CAIMAN Definition Phase

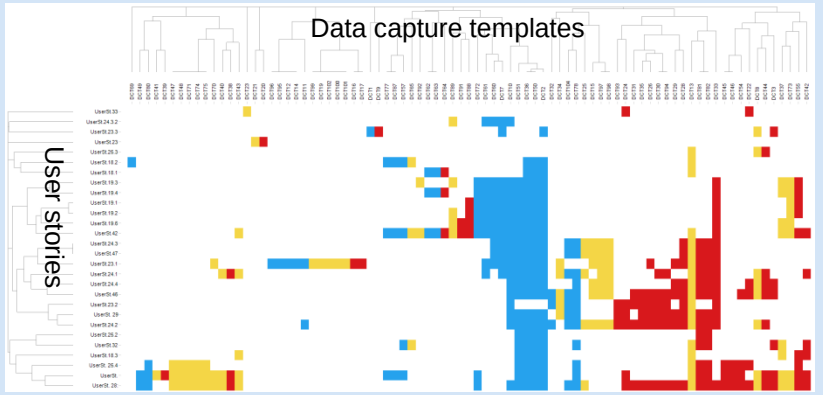
In a Nutshell – User Stories and Data define the Project S

As a <project leader> I want <goal> so that <reason>.

PowerPoint

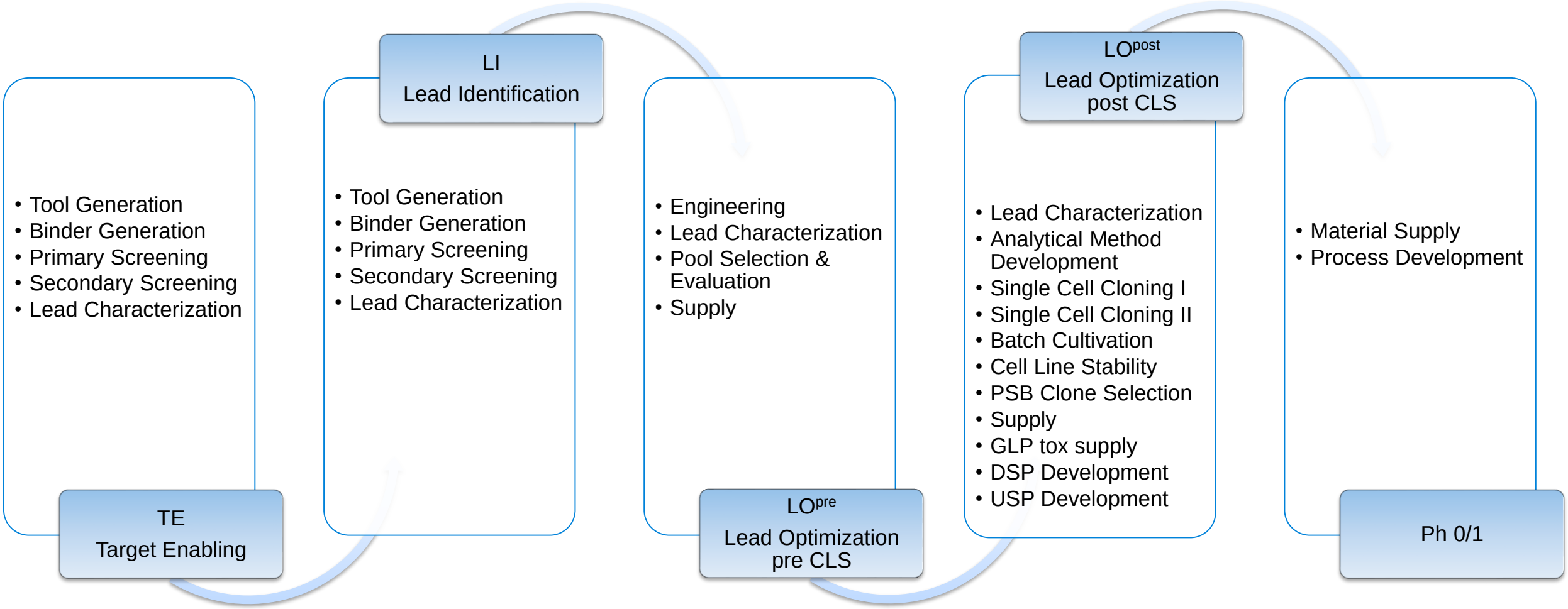
Excel





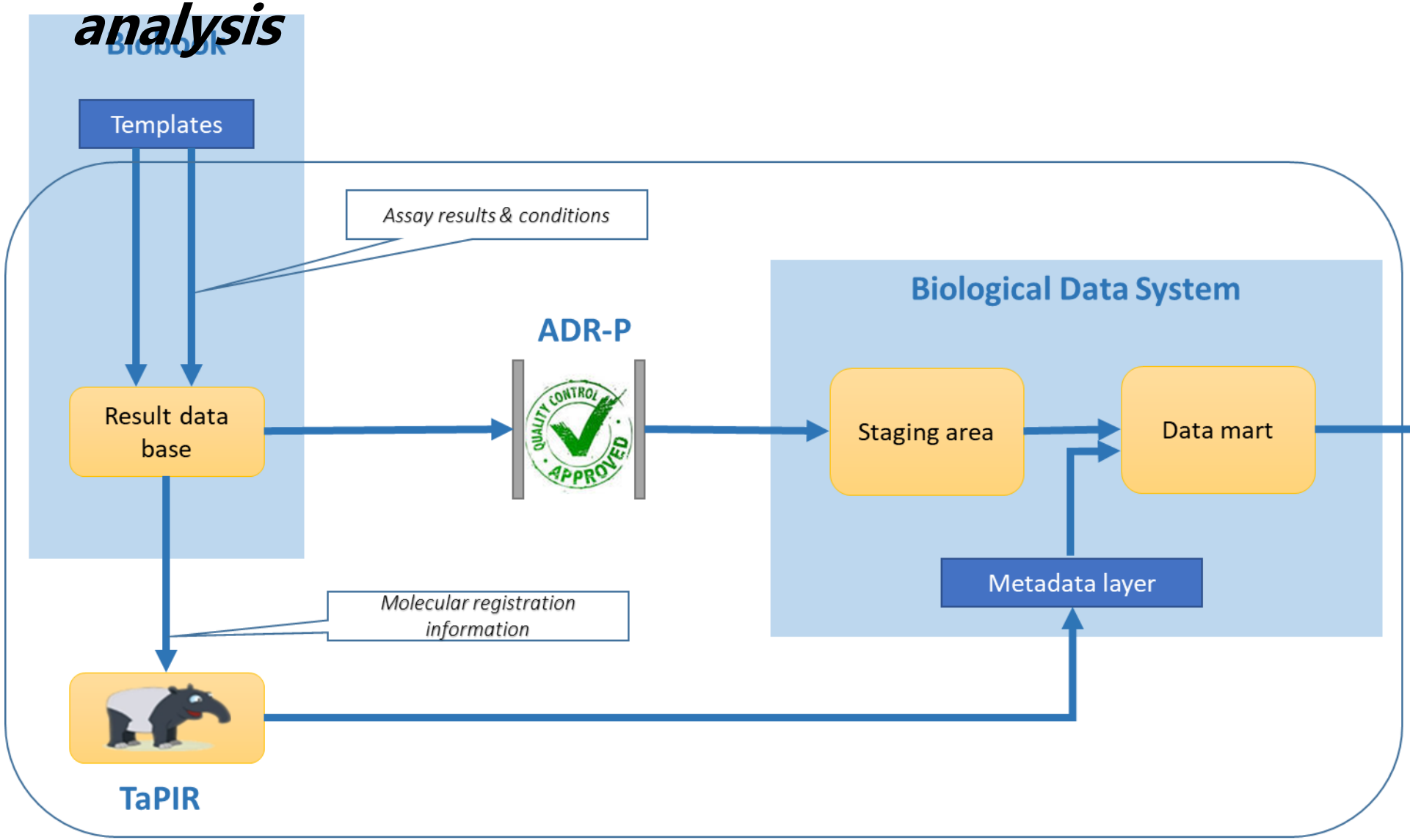
User Stories evolved into **23** Decision Points in **5** major phases

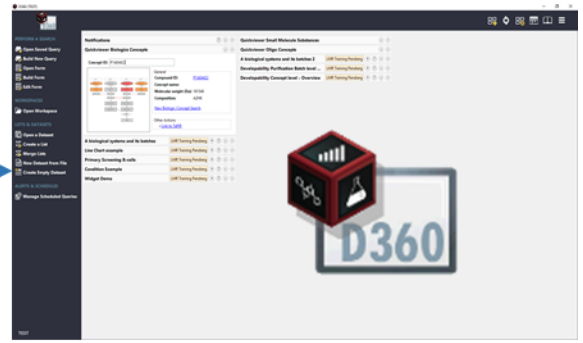
The CAIMAN phases



The CAIMAN solution

A modular landscape and foundation for advanced data analysis





ADR-P= Assay Data Repository Protocol

TaPIR= Therapeutic Protein Identifier and Registration

Implementation of quality controlled assay information

Assay data upload: IDBS BioBook templates
Quality control: Roche ADR-P System
Assay Data warehouse: Roche BDS System

From detailed assay description

Title: Purification of antibodies and antibody like constructs on a liquid handling platform using OPUS robocolumns
LIMS protocol name:
Assay owner:
Date/Site: 27.03.2018

ASSAY PURPOSE & PRINCIPLE

Protein samples are purified from cellculture supernatants before being tested in assays, because cell culture medium can disturb assay results. Another reason is that proteins are concentrated for further analysis, in order to improve signal-to-noise ratio in the assay.
A common technique is affinity chromatography. It is based on specific interaction between antibodies (or antibodylike constructs, Fabs ...) and chromatography material (see Figure 1). The antibodies bind to the column and are separated from the undesired material that does not interact. Washing the stationary phase with washing buffer, undesired molecules are eluted first while the desired proteins are eluted using an acidic buffer.

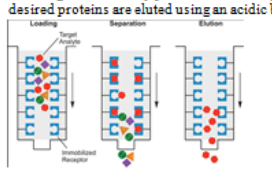
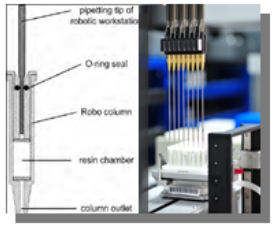


Figure 1: Principle of affinity chromatography

For the fully automated purification of antibodies in parallel, the liquid handling robot Freedom EVO from Tecan in combination with OPUS robocolumns (Repligen) (see Figure 2) is used



The robocolumns can be filled with any commercial available chromatography material. Loading of the robocolumn is performed using an 8 channel liquid handling arm (LiHa) with steel needles.

Figure 2: OPUS Robocolumn

Protein concentration is determined by UV measurement at 280 nm. Sample volume is determined by measurement at 998 nm and 900 nm.

to template

Results: PRODUCT_CONCENTRATION, PRODUCT_VOLUME, PRODUCT_AMOUNT
Conditions: LMR_PROJECT_PHASE, CHROMATOGRAPHIC_COLUMN, PROJECT, BUFFER, BUFFER_PH, TAPIR_BATCH

LIMS protocol reference:	IgG_Micropurification_Tecan/v1		
Annotation scheme:	general	Protocol comment:	
Owner:	werneru	Editors: (-> RUD)	avinashn,werner
Last modified by:	rocheo	Detailed assay protocol: (-> Template)	Micropurification
Creation site:	PENZBERG	Data producer group:	PhysChem
NMP Project short name:	PHYSICOCHEMICAL_STUDIES [→ details]	Used for multiple projects:	No
Biosample & Target			
Biological system:	in-vitro	Species: Strain:	~NotApplicable
Tissue type:	~NotApplicable	Cell line: (-> RNCB)	
Subcellular fraction:	~NotApplicable	Assay target: (-> TDM)	

Technical & data query template coverage

23 data query templates (decision points) in total, **13** decision points ready

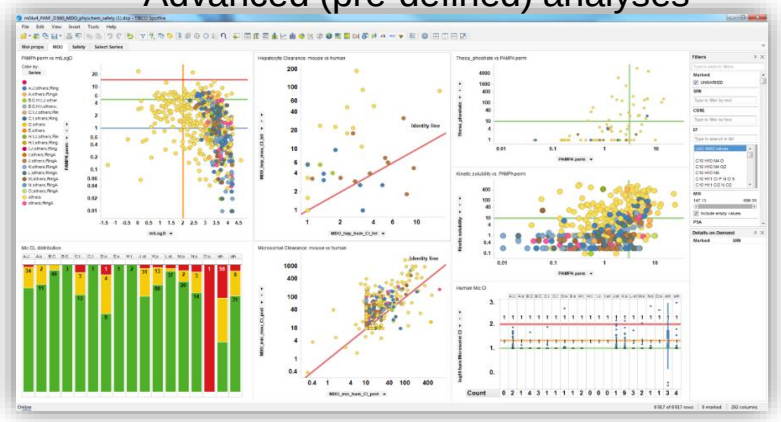
55 Spotfire visualizations supporting **8** decision points, **22** D360 visualizations supporting, **3** decision points

7 special data categories based on TaPIR data packages, **4** additional data sources integrated, **1** data source left

Data access, project layouts and analyses

Multiple data sources (internal and external)

Advanced (pre-defined) analyses

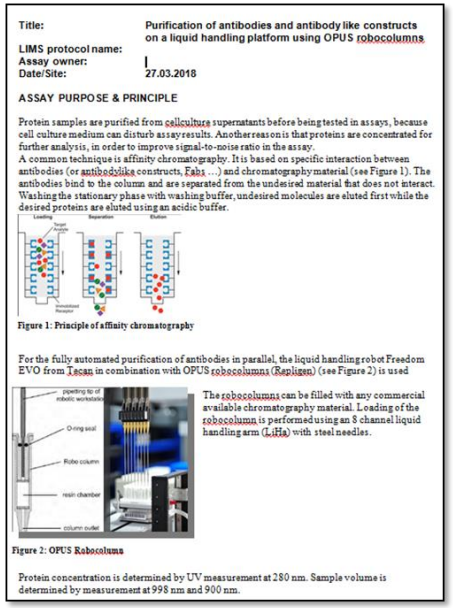


Technical & data query template coverage

631 experiments loaded to BDS/D360 PROD (**128** Assay protocols, **117** LIMS protocols , **207.539** TaPIR batches, **1.184.545** data points, **16** TaPIR projects)

In total: **1085** Assay protocols created, **42** assay protocol owner

65 BioBook templates overall productive or close to productive



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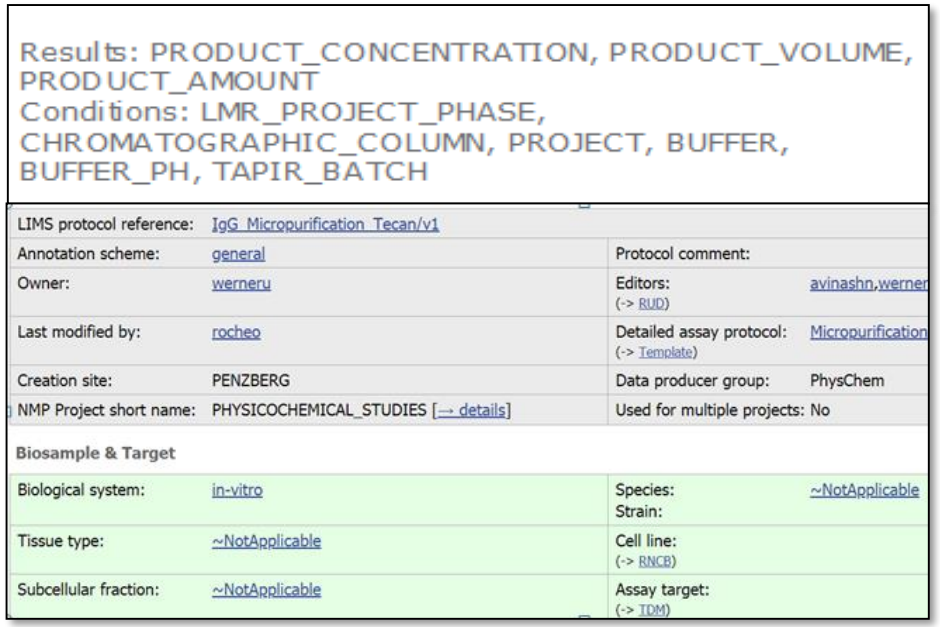

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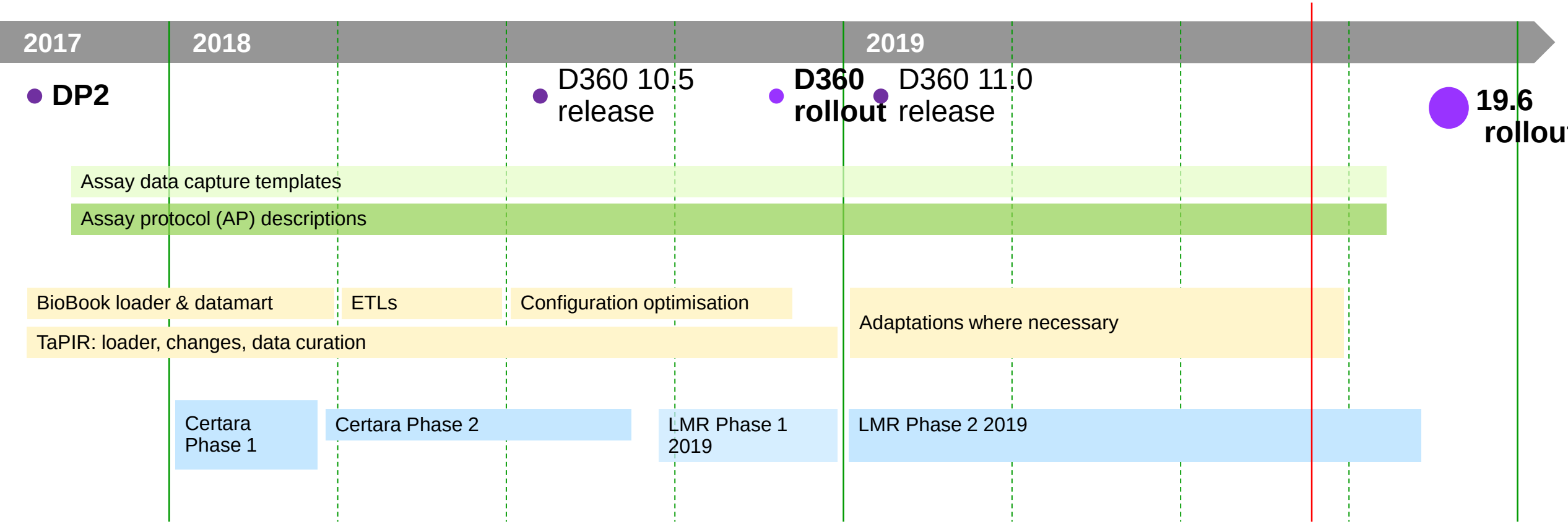
Timelines

CAIMAN delivery – high level activities



The CAIMAN project
Value

The CAIMAN project helps to …	By …
shift focus from data collection to data analysis	• establishing an industry-leading project-data-analysis platform • enabling comprehensive data access, tracking, comparison and visualization
support collaboration and faster decision-making	• streamlining and simplifying the compilation of project reports • reducing elapse time to complete a particular stage of research
promote improved quality decisions	• ensuring provisioning of all project-relevant information • providing multifaceted analysis capabilities tailored to project needs
enable a learning organization	• supporting rapid hypothesis testing (across projects) for knowledge generation • facilitating cross-project learning • using a sustainable platform to ensure data quality and

Acknowledgements

Business Team

Annette Vogt
Xenia Wezler
Lydia Jasmin Dürner
Christine Küttel
Hubert Kettenberger
Wolfgang Paul

Project Organization

Jan Wörner, Project Lead
Petra Harr-Dehn, Project Coordination
Christian Blumenröhr, Technical Team
Oliver Roche, Data Quality
Marc Pompiati, Business Project Manager

Business Analysis

Monika Bug
Cathrin Pautsch, Quattro Research
Anke Eisenmann
Noan Rajamani, Zifo
Niveda Avinashilingam, Zifo
Christophe Chabbert

D360 Support

Shijun Yu

Doing now what patients need next