Biologics Characterization- Extending Use of the Allotrope Framework for Intact Mass Determination by Walk-Up LC/TOFMS

Agilent | Bristol-Myers Squibb | Zifo

Business need and collaboration opportunity

The Opportunity: Move data generated from instruments into LIMS or ELN

- Current systems require scientists to transcribe or copy/paste text and graphics from instrument-generated data
- Time/labor-intensive process with potential for error
- No link between report, ELN entry, and original data

Future State: A seamless process

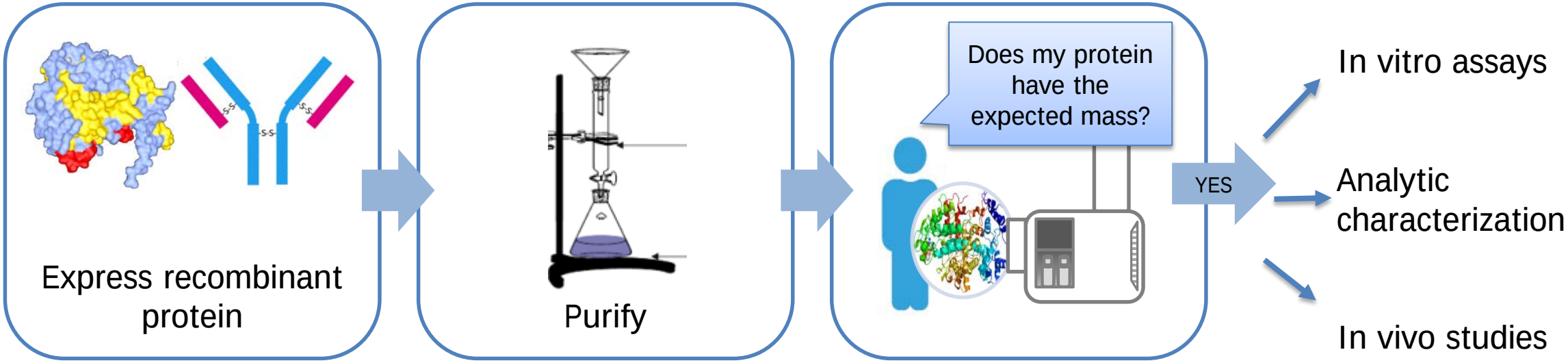
- Automate LIMS integration and report generation → save time and ensure quality
- Employ Allotrope Data Model (ADM) and Ontology (AFO) to harmonize on universal data standards
- Facilitate access to historical data & reports
- Flexible custom reports for downstream processes

Proof of Concept: Develop and integrate process components for a simple use case

- BMS: Use case (intact mass analysis using LC-TOFMS) and project management
- Agilent: Instrument vendor with previous experience implementing ADF for LC-UV instruments
- Zifo: Automation of the ADF conversion process and report generation form the ADF

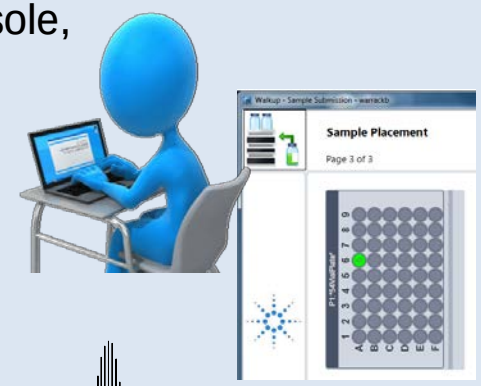
Use case: Intact mass analysis at BMS

Molecular Discovery Technology (MDT) scientists prepare and characterize protein or antibody drug candidates or therapeutic targets for downstream experiments

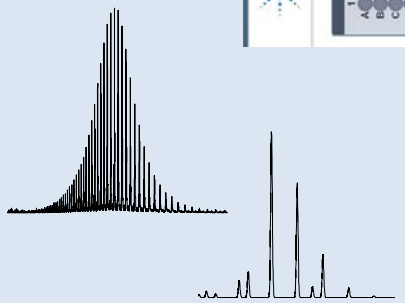


LC-MS automated “walk-up” process at BMS

Scientist logs into instrument console,
Enters info about the sample,
Selects method,
Places Sample in tray



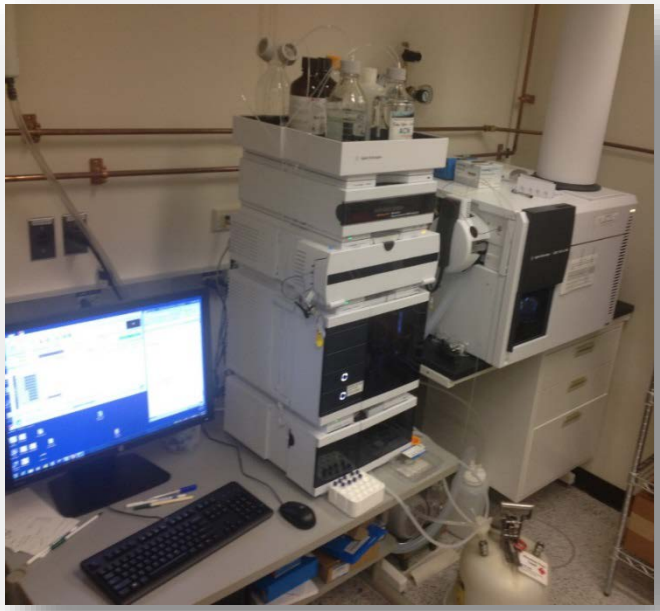
Instrument runs physical separation, mass analysis, & spectrum deconvolution based on method



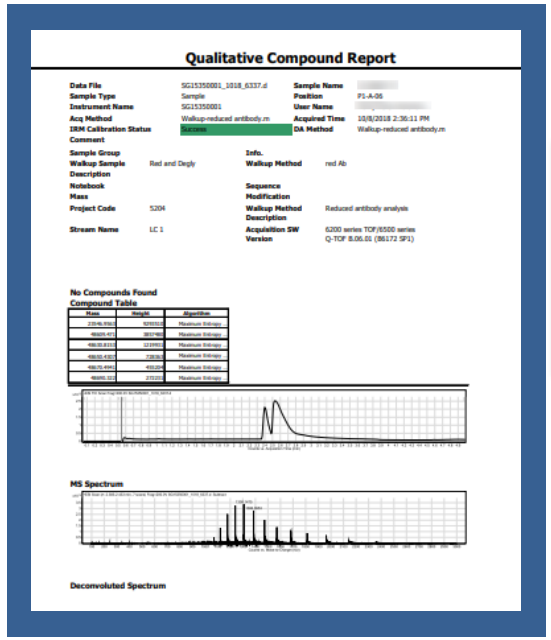
Standard results report delivered by email

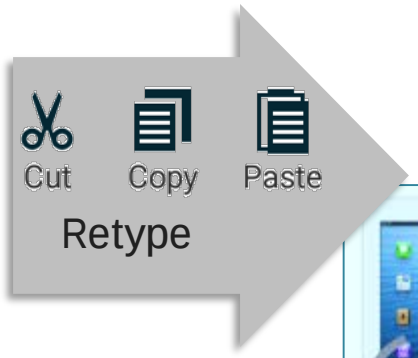
Instrument: Agilent Walkup Protein LC-MS

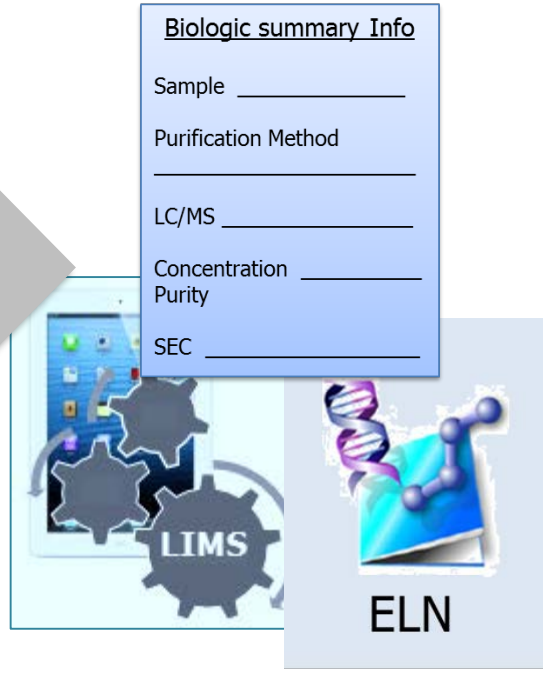
- Agilent Infinity 1260 UHPLC (separates proteins in sample)
- Agilent 6230B TOF Hi-Res Mass Spectrometer (measures mass of separated components)
- Instruments at multiple BMS sites running intact and reduced mass analysis for proteins and antibodies

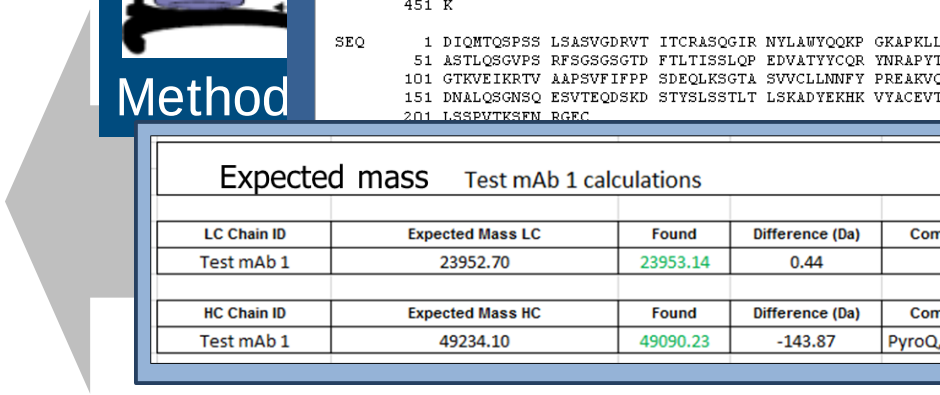


PDF report data is required for multiple customized downstream systems, documents, and processes





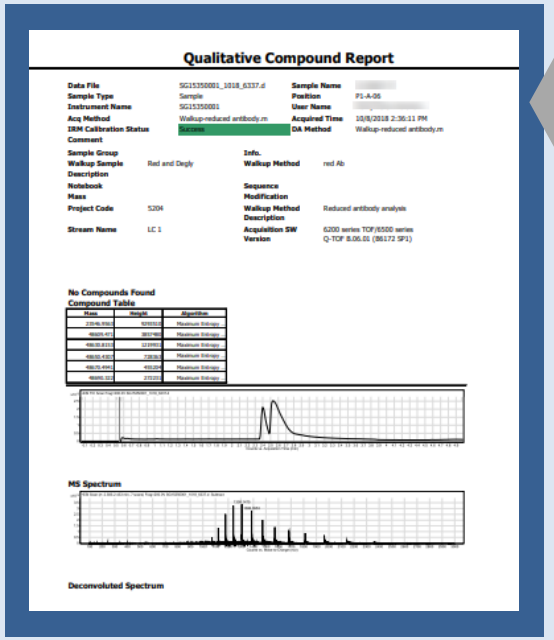




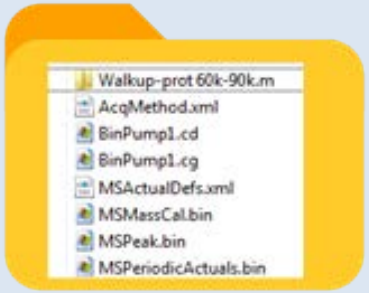
Current state:

- Scientists transcribe or copy/paste to transfer sheets, spec sheets, LIMS, ELN, etc. along with additional inputs like methods, sequence, and calculation worksheets
- Time intensive process with potential for error

PoC Objective: Demonstrate an integrated process to produce an instrument-agnostic ADF file for intact mass analysis

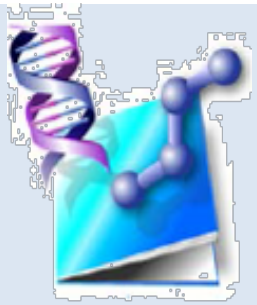


Intact mass report: defines entities we need to capture



from instrument raw data files

ADF

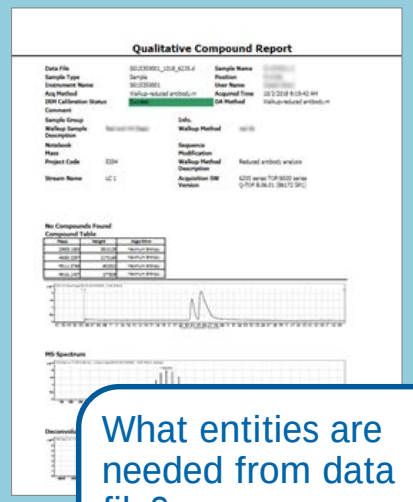


BioBook (IDBS) ELN: example of a downstream system

Benefits of ADF:

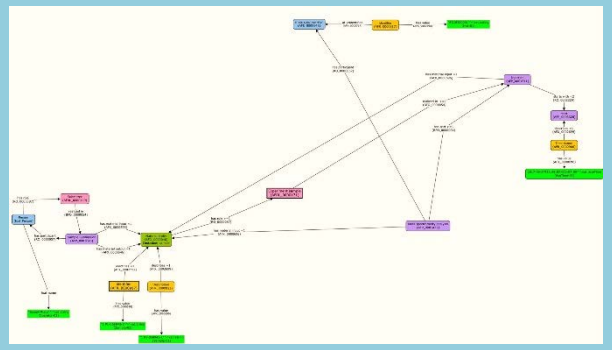
- Seamless ingestion of data from instrument to a downstream system by way of a standard data format
- Standardization ensures consistent, reproducible processes across sites, instruments, operators
- Enables future state customization to push to additional systems or reports

PoC Approach: Put together process components



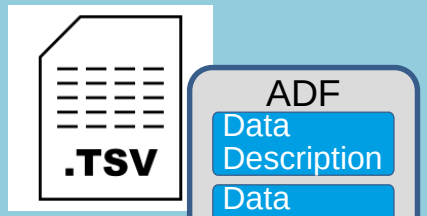
What entities are needed from data file?

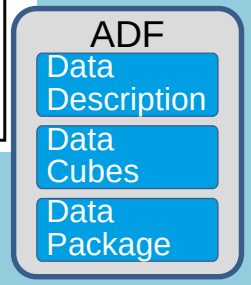
- BMS scientists identify from PDF report
- Review with Agilent



Model required entities to Allotrope framework

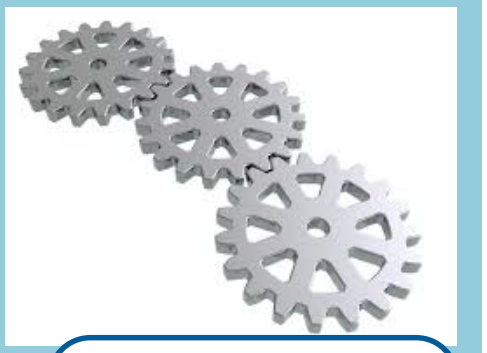
- Agilent, BMS, LC-UV WG
- For more info see our poster





ADF delivery approach

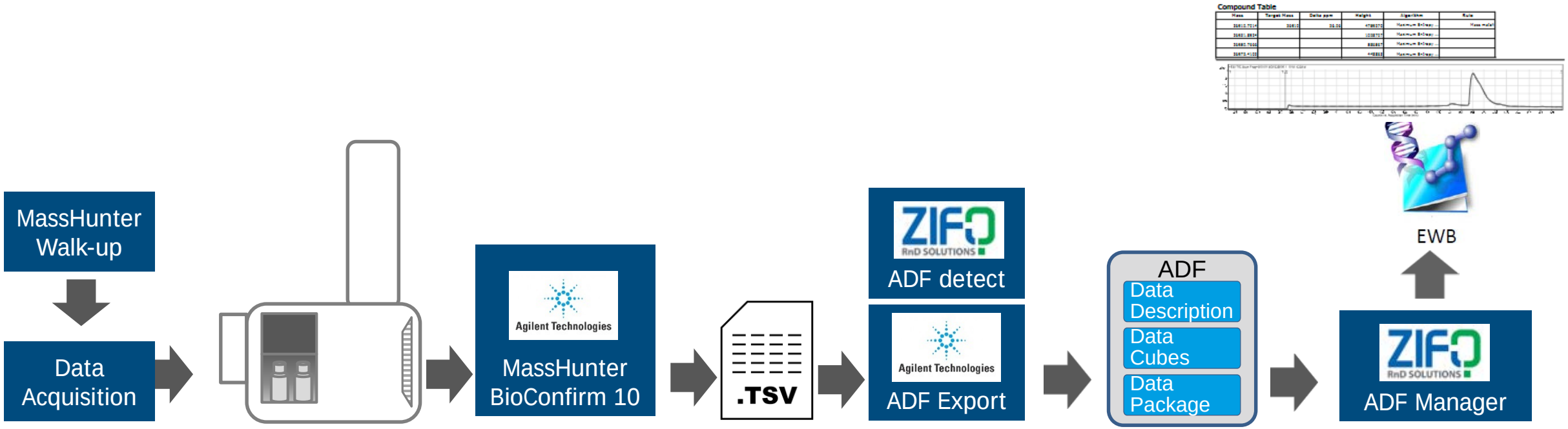
- Agilent team working on SW components to deliver TSV and ADF



ADF integrators

- Zifo ADF Manager plug-in to import ADF files to ELN
- ELN template for Intact Mass report

Components of integrated work flow from Instrument data file to destination report(s)



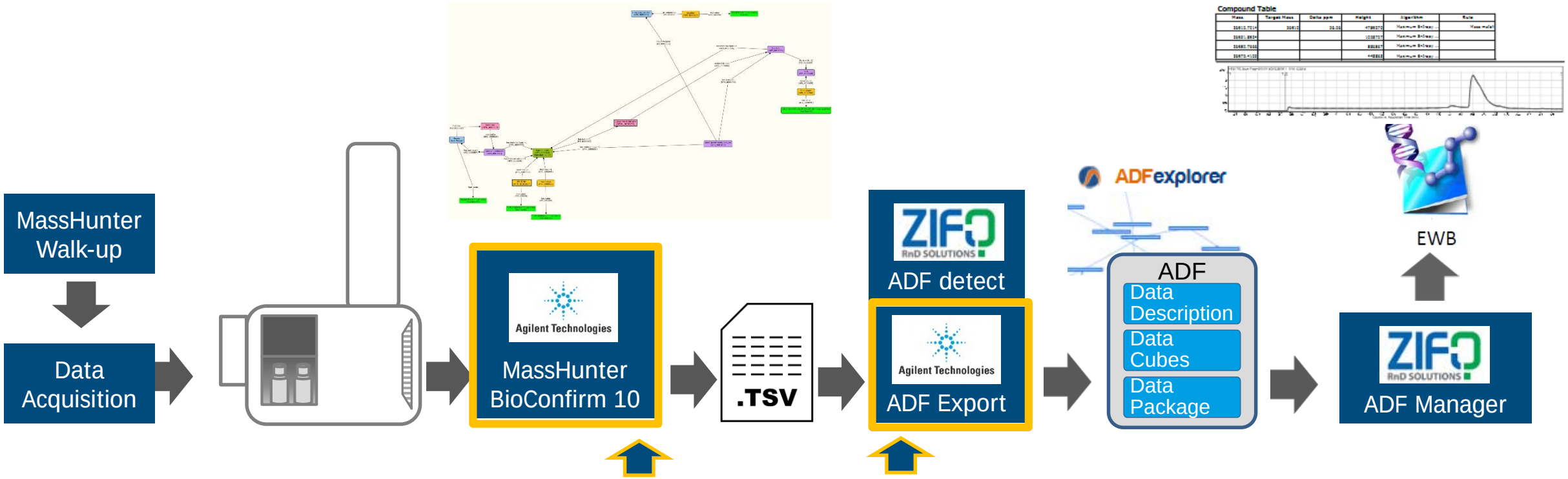
User enters sample information and selects method at walk-up instrument

Sample is analyzed and data files are outputted to TSV

TSV file is detected and converted to ADF

ADF is pushed to templated report in ELN or LIMS

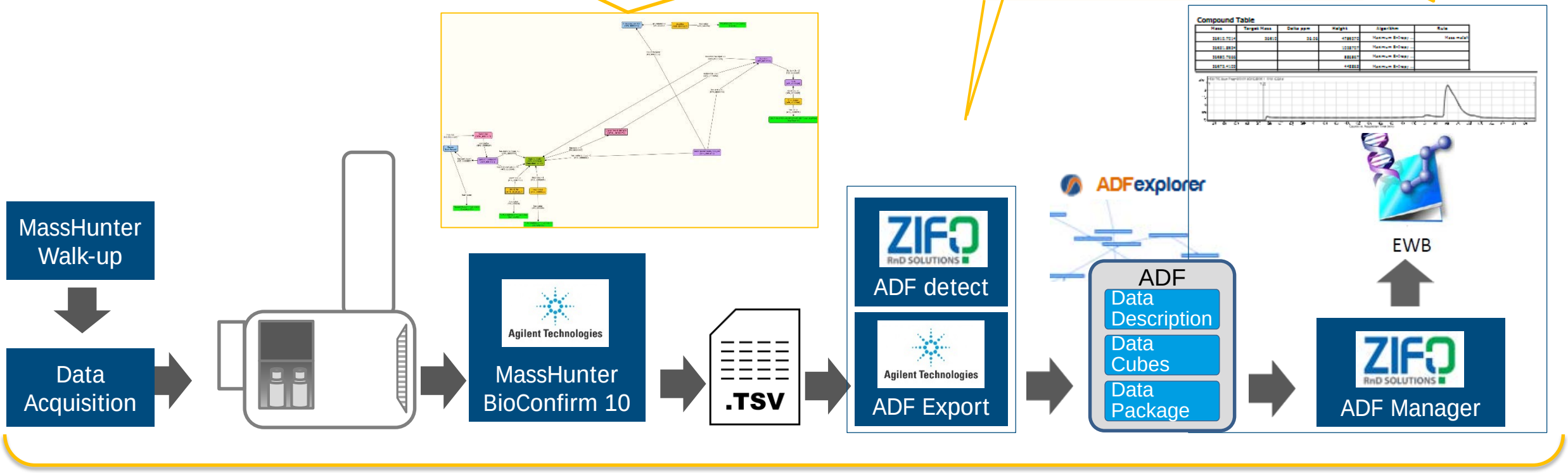
Recent achievements



PoC next steps

Expand data model to enable parsing of all required entities in ADF export

Complete components that enable the integrated process



Full process integration:

- Employ Amazon Web Services (AWS) environment to run process in the cloud; enable multi-party collaboration
- Demonstrate incremental value to BMS scientists

Future plans

- Continue mapping of LC-MS vocabulary and data model to define all required entities
- Work with OSTHUS & Allotrope governance to conform model based on ADM style guidelines & contribute to Mass Spectrometry working group efforts

Contributors

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