The Allotrope 2023 Spring Connect Event

LC-UV Methods and Results Interoperability using ADF

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Acknowledgements

+ The extended project team
High Performance Liquid Chromatography (HPLC) instruments:
Pistoia Methods Database Project

Pistoia chartered a project to transform analytical methods into standardized, machine-readable instructions that can be stored centrally and shared across different vendors / models of HPLC-UV to execute the methods.
Methods Database Timeline

Building ADF adapters

- Waters Empower CDS Adapter
- Agilent Openlab CDS

Scope extension:
- Result
- Chromatograms and Peaks

HPLC-UV Data model

2018
- Building architectural solution and testing

2019
- Agilent 1260
- Agilent 1290

2020
- Testing

2021
- Digital, automatic methods transfer between CDSs and between collaborators

2022
- Waters hardware

2023
- Next Phase
- More companies to implement
## Methods DB Phase 1 Proof of Concept – Completed

Transfer methods using OpenLab CDS through ZONTAL Cloud

| Objectives | Import and export methods using OpenLab CDS  
Transfer methods across Agilent 1260 and 1290 instruments  
Overlay OpenLab CDS data on ZONTAL Cloud |
| --- | --- |
| Results | 1. Export and import gradient methods using OpenLab CDS  
2. Export and import isocratic methods using OpenLab CDS  
3. Transfer methods between Agilent 1260 and 1290  
4. Import third party method on OpenLab CDS  
5. Overlay Merck and GSK data |
Methods Portability across Companies: Comparison

Method’s transfer on Agilent 1290
Methods DB Phase 2 Proof of Concept – Completed
Transfer methods between Empower CDS and OpenLab CDS through ZONTAL Cloud and Orbis Gateway

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Import and export methods using Empower, OpenLab CDS and vice versa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transfer methods across Agilent 1260 and 1290 instruments</td>
</tr>
<tr>
<td></td>
<td>Submit sample set from ZONTAL cloud to Empower CDS</td>
</tr>
<tr>
<td></td>
<td>Overlay Empower and OpenLab data</td>
</tr>
</tbody>
</table>

| Results | 1. Export and import gradient methods using Empower CDS          |
|         | 2. Export and import isocratic methods using Empower CDS        |
|         | 3. Transfer methods between Agilent 1260 and 1290               |
|         | 4. Transfer methods between Empower and OpenLab CDS             |
|         | 5. Import third party method on Empower CDS                     |
|         | 6. Overlay OpenLab and Empower data                           |
|         | 7. Sequence submission                                         |
Methods DB Phase 2 Proof of Concept

Video Demo – Sequence Submission from ZONTAL to Empower CDS™
Methods DB Phase 2 Proof of Concept

Video Demo – Empower and OpenLab Data Overlay on ZONTAL Space
Phase 2 – Overlay of Empower and OpenLab CDS Data

Overlay of data collected on Agilent 1290 instrument using Empower and OpenLab CDS

The slight difference in peak height and retention time was expected as different lot of standards and mobile phases were used.

Figure 2: HPLC chromatogram overlay of non-GMP 8-minute generic method (1290 Instrument): (a) original written method on 1290 using OpenLab CDS, (b) 1290 method imported from ZONTAL on Empower CDS and (c) 1260 method imported from ZONTAL on Empower CDS

(a) – Original written method (OpenLab)
(b) – 1290 method imported from ZONTAL (OpenLab to Empower)
(c) – 1260 method imported from ZONTAL (OpenLab to Empower)
## Methods DB Phase 3 Proof of Concept – Completed

Transfer methods using OpenLab CDS through the ZONTAL Cloud on a diverse set of instruments

| Objectives | Import and export methods using OpenLab CDS  
Transfer methods across different Agilent Instruments (with different modules)  
Transfer methods from binary to quaternary pump |
| --- | --- |
| Results | 1. Install OpenLab and ADF plugin on laptop to facilitate instrument control  
2. Update the ADF plugin to support method transfer from binary to quaternary pump  
3. Export and import gradient methods using OpenLab CDS  
4. Transfer methods between Agilent 1290, 1260 and 1200 modules |
| Next steps | – Repeat the experiments on two diverse instruments in the US  
– Share findings internally and externally. |
15 Minute Gradient Method Setup

1. Instrument where the original method is written

2. Method is exported onto the ZONTAL Space

3. Laptop with OpenLab, ADF Plugin and ADF file downloaded from ZONTAL Space

4. ADF method files imported onto instruments with different modules stacking
# HPLC/UPLC Instrument Configuration

## HPLC/UPLC Module Stacking

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Injector</td>
<td>G7167B: 1290 Infinity II Multisampler</td>
<td>G1329A: 1100 Autosampler</td>
<td>G7167B: 1290 Infinity II Multisampler</td>
<td>G7167A: 1260 Infinity II Multisampler</td>
<td>G7167A: 1260 Infinity II Multisampler</td>
</tr>
<tr>
<td>Column Compartment</td>
<td>G7116B: 1290 Multicolumn Thermostats</td>
<td>G1316A: 1200 Thermostatted Column Compartment</td>
<td>G7116B: 1290 Multicolumn Thermostats</td>
<td>G7116B: 1290 Multicolumn Thermostats</td>
<td>G1316C: 1200 Thermostatted Column Compartment</td>
</tr>
<tr>
<td>Detector</td>
<td>G7117B: 1290 Infinity II Diode Array Detector</td>
<td>G1314B: 1200 Infinity Variable Wavelength Detector</td>
<td>G7117A: 1290 Infinity II Diode Array Detector</td>
<td>G7115A: 1260 Infinity II Diode Array Detector Wide Range (WR)</td>
<td>G4212B: 1260 Infinity Diode Array Detector</td>
</tr>
</tbody>
</table>
15 Minute Gradient Method

Results and discussion

• As shown in Figure 3, the data collected on instrument 1 is comparable to instruments 2-5.
• The data obtained confirms our theory that the 1200/1260 has a lag in applying the gradient in comparison to the 1290 pump.
• As expected, the same elution order was observed throughout all the 5 instruments.
• A slight change in difference in retention time was observed on various instruments but this was expected as each instrument will have a different dwell volume.
• The data proves that the ADF plugin can be used to transfer method across a wide range of Agilent HPLC/UPLC instruments.

Figure 3: HPLC chromatogram of 15 minute CSH method collected on instruments 1 to 5.
### Objectives
- Transfer methods between Waters and Agilent Hardware
- Transfer method between Empower CDS and OpenLab CDS

### Results
1. Transferred a gradient method between Waters Acquity and Agilent 1290 instrument (including autosampler temperature)
2. Transferred a gradient method between Empower CDS and OpenLab CDS
3. Overlay data acquired using both CDS

### Next steps
- Draft article to share results with analytical community
Phase 4 Step Up

Instrument method was exported from the cloud onto the instruments.

Methods DB

The ADF method files were transferred to each instrument using the cloud space and ADF plugin.

ADF files were shared between the two different manufacturers using the Zontal Space.
## Instrument Configuration
### UPLC Module Stacking

<table>
<thead>
<tr>
<th>Module</th>
<th>Agilent Hardware WU_STV11</th>
<th>Waters Hardware WU_STV0188</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>G7120A: 1290 Infinity II Binary Pump</td>
<td>Acquity UPLC H Class Quaternary Pump</td>
</tr>
<tr>
<td>Injector</td>
<td>G7167B: 1290 Infinity II Multisampler</td>
<td>Acquity UPLC H Class Sample Manager FTN</td>
</tr>
<tr>
<td>Column Compartment</td>
<td>G7116B: 1290 Multicolumn Thermostats</td>
<td>Acquity UPLC H Class Column Manager</td>
</tr>
<tr>
<td>Detector</td>
<td>G7117B: 1290 Infinity II Diode Array Detector</td>
<td>Acquity UPLC Photodiode Array Detector</td>
</tr>
</tbody>
</table>
Method Comparison
Binary Pump: Quaternary Pump
Method Comparison

Column Compartment: Column Manager
The injection volume in Empower is specified in the sequence table. The ADF method file can also contain the auto sampler temperature which can be transferred across both manufacturers.
Phase 4 – Data from different vendors

Data Comparison on Zontal Space – Agilent and Waters Hardware

The difference in retention time between the two manufacturers is due to the different dwell volumes of the instruments used to execute the method.

Figure 1: HPLC chromatogram comparison of the data collected Merck’s gradient method on Agilent 1290 and Waters Acquity instruments at GSK.

Dwell Volume = 137 µl

Dwell Volume = 357 µl
Conclusion

- Method portability shown across
  - Different instrument vendors
  - Different chromatography data systems (CDS)
  - Different pharmaceutical companies
How to get involved?

• Start implementation of the Methods Db
  – Lab/Instruments/Technical requirements
  – Interoperability across more hardware or software?
  – Own use case?
• Support the project/CoE
Any questions? Contact us:
methodshub@pistoiaalliance.org