

Increased Automated Screening Efficiency Through Parallel Processing and Advanced Scheduling

AUTHORS:

Nicolas Houvenaghel, M.Sc.¹, Alex Vanuxem, B.Sc.¹, Veronique De Vroey, M.Sc.² and Kevin WP Miller, Ph.D.²

¹Galapagos, Mechelen, Belgium
²HighRes® Biosolutions, Beverly, Massachusetts, USA



Summary

Inflammatory disorders such as rheumatoid arthritis affect tens of millions of people globally. High throughput screening techniques can be used to identify small molecule medicines inhibiting inflammation. We used proprietary target discovery platforms to identify disease-critical proteins so that chemical molecules could be designed to inhibit its biological activity.

This intensive and iterative screening initiative required the combined power of laboratory automation hardware and software to meet the need for rapid and efficient project progression. Cellario™ software allows multiple in vitro assays to be scheduled and performed in parallel with two different scheduling approaches of which the benefits of each are described herein.

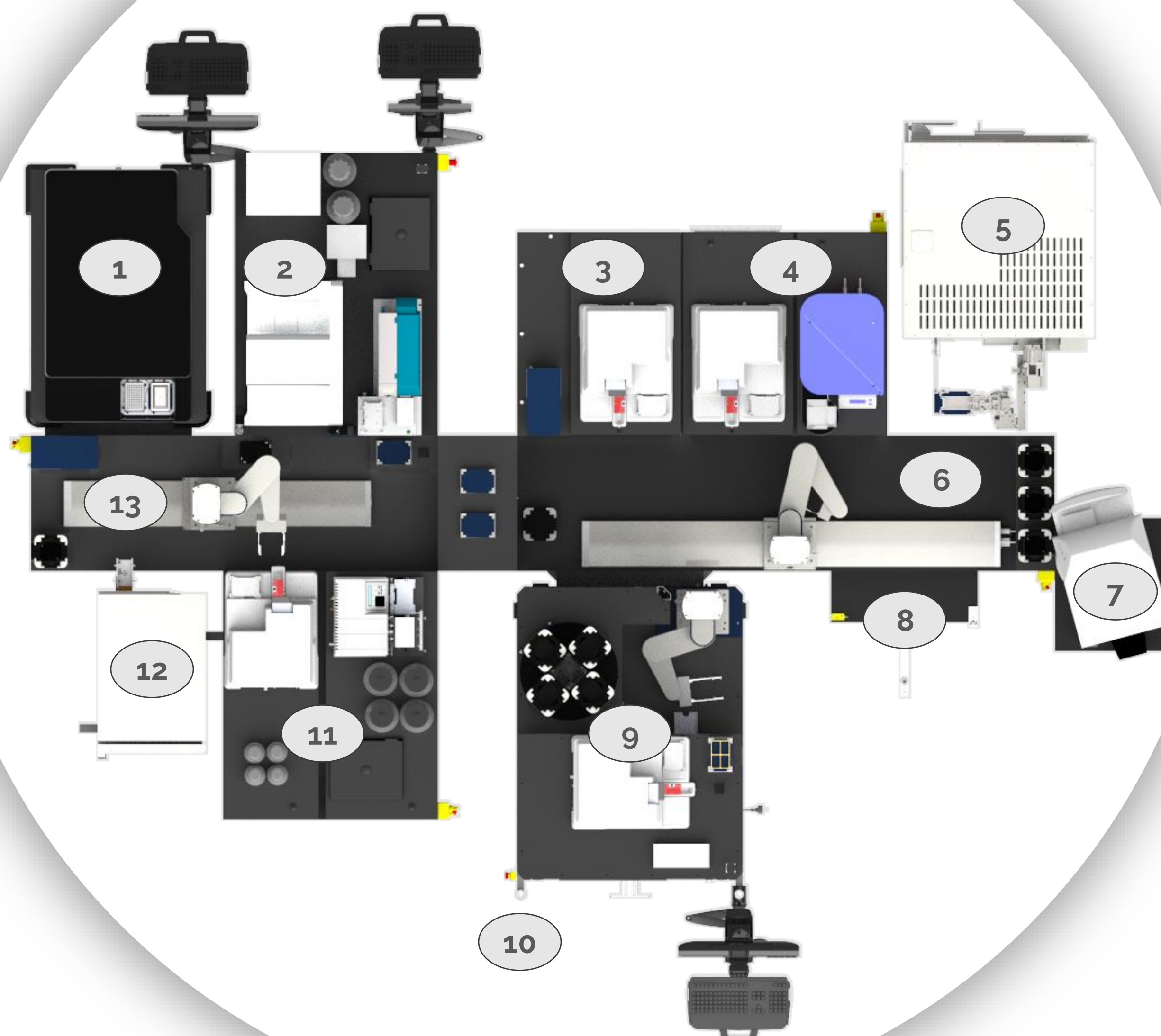
The first of these approaches employed multiple workflow “threads” which were constructed within a single assay protocol to allow **up to 15 assays** to be managed in parallel using the same parameters. The second approach employed the advanced scheduling feature of Cellario to execute different types of assays, such as high content, cellular and biochemical assays, simultaneously.

By optimizing laboratory automation and device hardware, assay timing and plate logistics, the work efficiency was increase significantly.

System Design & Workflow

This flexible and high-throughput automated screening Work Cell integrates fully into our compound profiling program, and is designed to include:

1. Dockable cart with cellular imaging system (above) and LidValet lid manager (below)
2. Fixed table with automated liquid handler & microplate labeler (above) & AmbiStore D (below)
3. Fixed table with Lid Valet lid manager & liquid dispenser (above) & microplate sealer & centrifugal wash system (below)
4. Fixed table with plate seal remover & liquid dispenser (above) & MicroSpin centrifuge (below)
5. SteriStore D (shown) & SteriStore M (not shown)
6. Rail-mounted ACell 712 with plate hotels, PlateOrients, 1-D barcode scanner, & shaker
7. Fixed table with microplate reader
8. Fixed safety platform
9. CoLab FLEX mounted ACell 512 with PlateOrient, liquid dispenser & barcode scanner (above), PicoServe storage carousel & LidValet lid manager (mid), & MicroSpin centrifuge & centrifugal wash system (below)
10. Additional dockable CoLab FLEX mounted ACell 512 & traditional carts (not shown) for workflow flexibility
11. Fixed table with a plate washer & liquid dispenser (above) & centrifugal wash system & liquid dispenser (below)
12. Incubator with plate hotel
13. Rail-mounted ACell 57 with 2 x LidValet lid managers, PlateOrient, shaker, 1-D barcode reader, & plate hotel



Results & Discussion

Due to the power of Cellario™ software, we can perform multiple in vitro biological assays in parallel.

Approach 1 Multiple Workflow Threads

For compound profiling, Cellario protocols were created to manage up to 15 assays in parallel using the same assay technology for both biochemical and cellular-based assays. These protocols have been optimized to preserve the biologically critical assay timings, such as incubations, and to avoid issues such as deadlock.

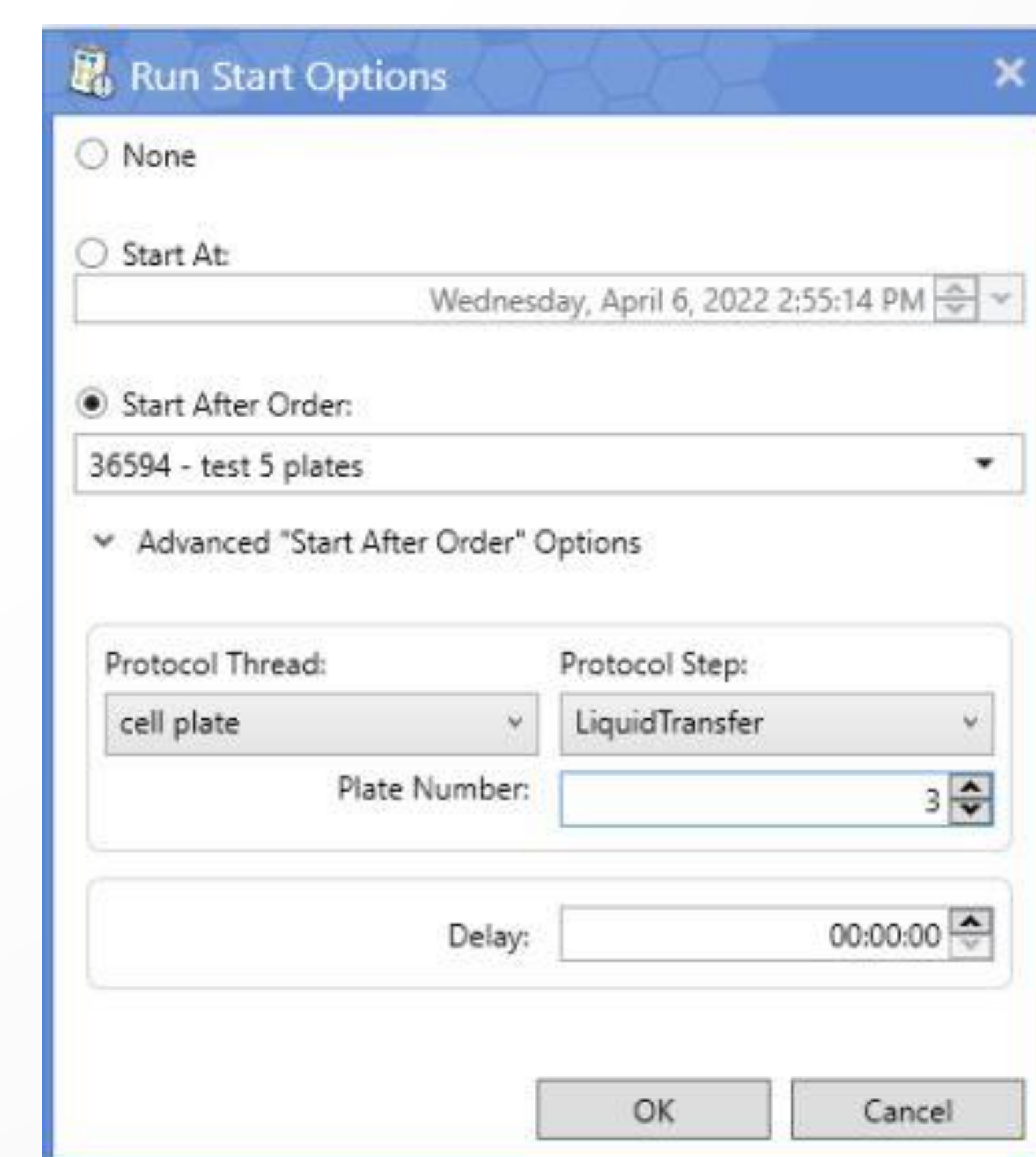
Figure 1: Example of a multiple protocol thread strategy within a workflow that allows multiple assay plates to be run simultaneously.



Approach 2 Advanced Scheduling

Alternatively, the advanced scheduling feature of Cellario can be leveraged to initiate an assay order that is triggered by having reached a given step in the thread of a previous order. In this way, multiple *in-vitro* assays can be performed that either share the same or use different devices and assay and data collection devices at the same time and with minimal impact to one another.

Figure 2: The scheduling feature of Cellario can also be leveraged to manage multiple assay plates.



Conclusions

- The ability to automate experiments in parallel is paramount to the timely discovery of drug compounds.
- Cellario provides several options to achieve the goal of performing assays in parallel, including the use of multiple threads and advanced scheduling.
- Galapagos has verified and implemented these methodologies in order to boost productivity and bring promising compounds further down the discovery pipeline faster.