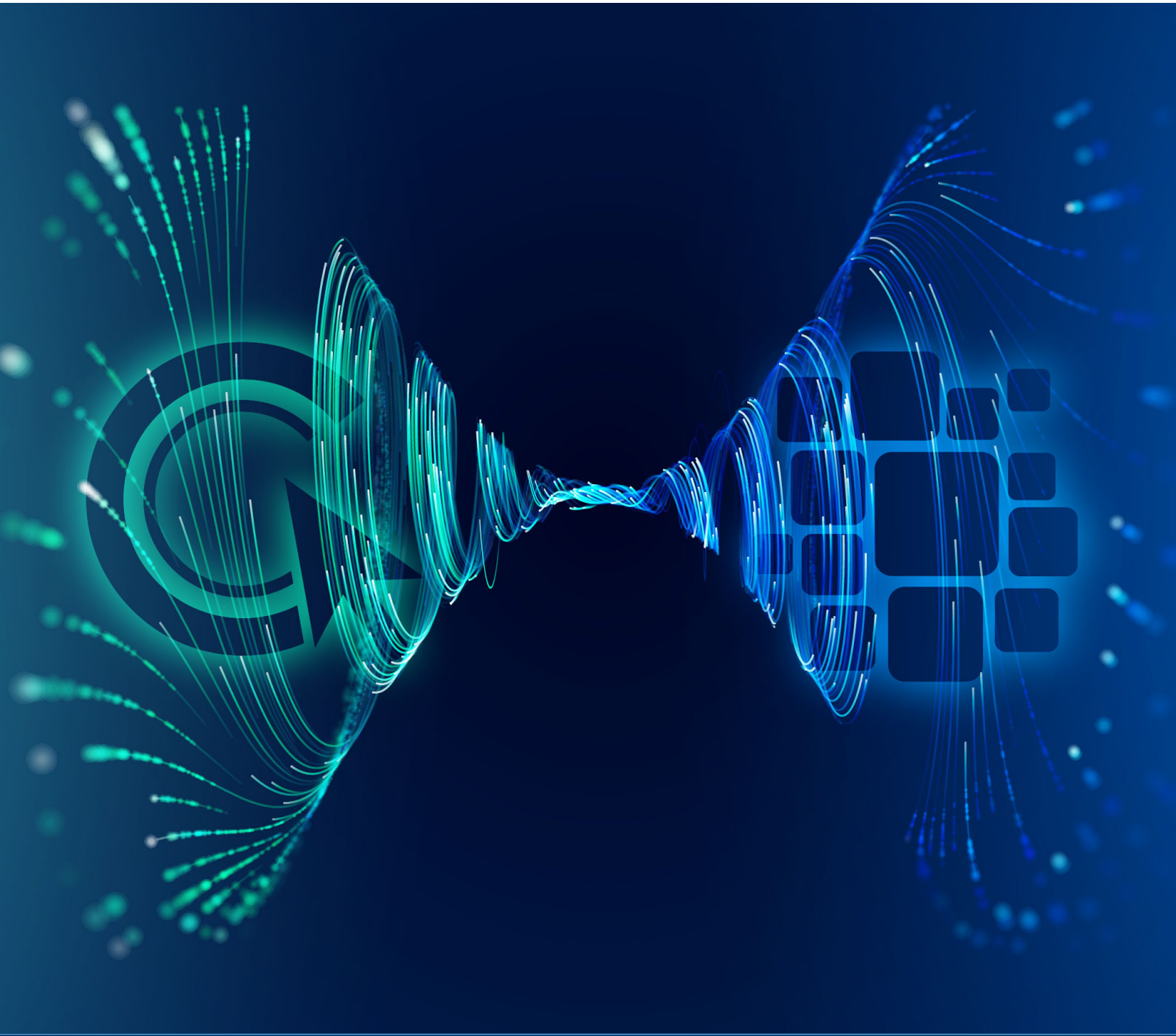
Tech Note

HighRes biosolutions

Combining the Power of Cellario™ and Mosaic to Realize Efficiencies in Sample Management



HighRes® biosolutions

Overview

The modern scientist is required to manage and track all their research samples, processes and procedures across multiple instruments and controlling software systems all of which are obtained from a wide variety of different providers. This results in multiple handover points between systems as sample and data progress through a device-rich environment, all making it difficult to track samples and manage data. Potential errors are introduced each time a handover point is manually managed. However, automating handover points is also problematic because instrumentation is different from one laboratory to the next, and bespoke integrations are expensive and time-consuming to create.

Cellario™

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HighRes® Biosolutions and Titian Software solve the problem of multiple handovers between multiple devices and software by seamlessly streamlining your processes, integrating sample tracking, and managing your workflows and data. Standard, modular Nucleus™ hardware, working in concert with Cellario™ and Mosaic software, enable you to take control of your science once again, creating sample-distributed workflows and managing data at levels that would please even the most discerning regulatory body.

Automation from HighRes Biosolutions

HighRes Biosolutions provides state-of-the-art laboratory automation solutions for life science practitioners, including the X-Dock, MicroCart, and other hardware which enable you to change your laboratory devices to any workflow configuration that you may need at any time (*see Figure 1*). The Prime® automated liquid hander (ALH) and other automated storage and work-enabling devices from HighRes can be used on their own or as part of a larger Work Cell to create adaptive and dynamic systems that can be configured on-the-fly to immediately adapt and scale to your requirements. Cellario software is equally dynamic, controlling automated Work Cells that contain devices from any supplier, thus allowing scientists to choose the best tools for their application free of integration concerns. Industry-leading design and total integrated hardware and software solutions are the hallmarks of the HighRes user experience.

Figure 1: Nucleus™ hardware from HighRes Biosolutions enables continuous access to data by adapting to evolving scientific, technological, and organizational landscapes.

Mosaic Software from Titian

Workflows created with Mosaic sample management software from Titian mimic the business processes that are performed on samples in a typical laboratory, and ALH operations can be captured in a variety of ways. The most secure of these is through direct integration of Mosaic with the ALH's controlling software, which dramatically reduces the need for user intervention and eliminates potential sources of error during file manipulation. Mosaic software supports all typical ALH operations including, but not limited to, well-to-well transfer, compound serialization, plate replication, and transfer to and from microtubes/well plates.

When coupled with an automated system software such as Cellario, scientists are given a powerful platform for managing daily operations, tracking sample movements, and meeting laboratory objectives.

Cellario-Mosaic Software Integration

The powerful workflow management features of Mosaic support Cellario processes which include serialization, replication (including serialization in combination with a subsequent replication), acoustic dose response, cherry picking, add control, and plate labelling.

The Cellario Fulfilment Module (CFM) within Mosaic software interfaces with Cellario to enable order creation and workflow tracking. CFM communicates directly with Cellario via a Cellario module known as the Cellario Order Broker. This module feeds workflow (or job) processing parameters into Cellario for execution.

Figure 2 illustrates the high-level architecture of Cellario integration, which is briefly described below.

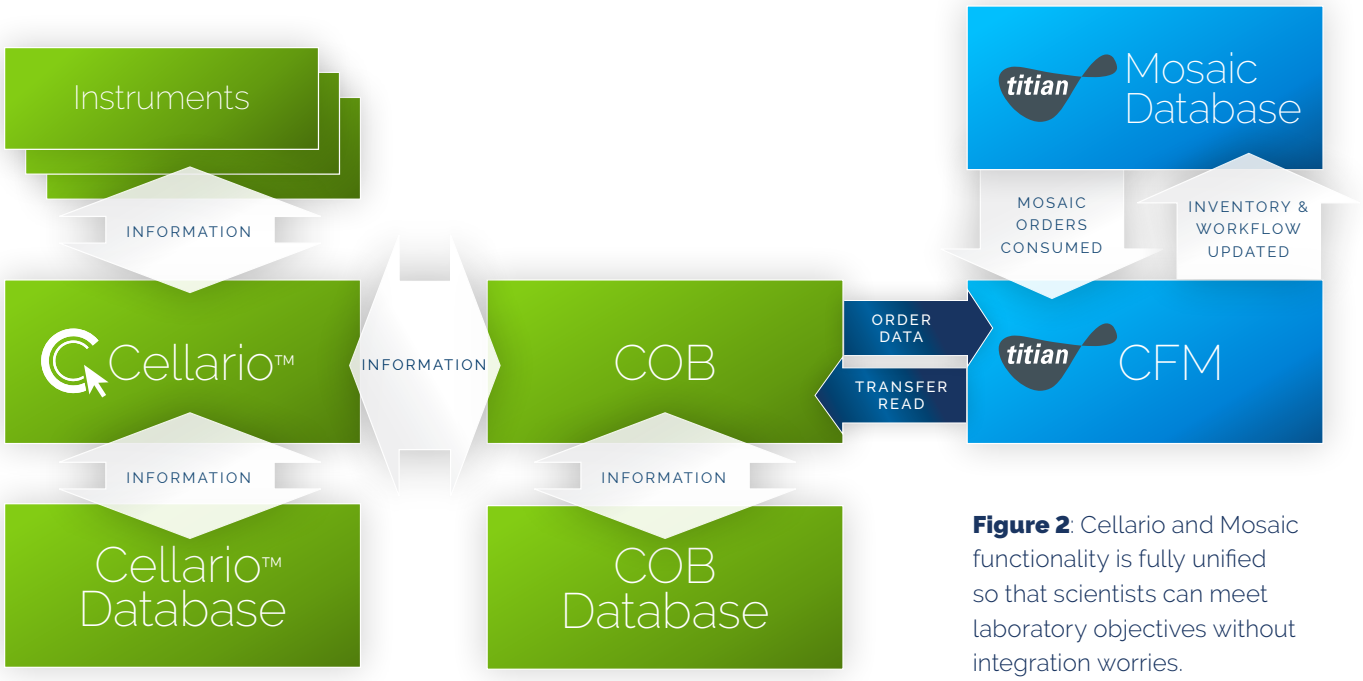


Figure 2: Cellario and Mosaic functionality is fully unified so that scientists can meet laboratory objectives without integration worries.

First, an operator uses the CFM desktop application to select an order(s) to fulfil from the Mosaic database – the desired Mosaic order output for a Cellario job – and the preferred tip layout from a verified worklist. The job is created and sent to the Cellario Order Broker (COB). The CFM then creates an XML Job specification containing all the order parameters, including input/output labware items and the specific transfers to be performed. The CFM submits the job specification to the Cellario Order Broker (COB) web service. The operator then fulfils the job using Cellario to control the required HighRes automation components. Cellario tools are intuitive, enabling users to identify and manage production bottlenecks due to over-allocation of critical resources (such as ALH) and pause jobs to add higher-priority samples into production runs with ease. The Mosaic Transfer Reader polls the COB-web service for notifications and transfers information, updates the Mosaic inventory and workflow, and notifies COB when all transfers are processed.

The CFM offers several distinct advantages compared to other machine integration fulfilment software. For example, all necessary workflow and transfer data are provided up-front to Cellario. This means that users can track assay control additions and labware labelling is highly configurable. This also ensures that network connectivity or server issues that are encountered in the middle of a run do not impede the work at hand.

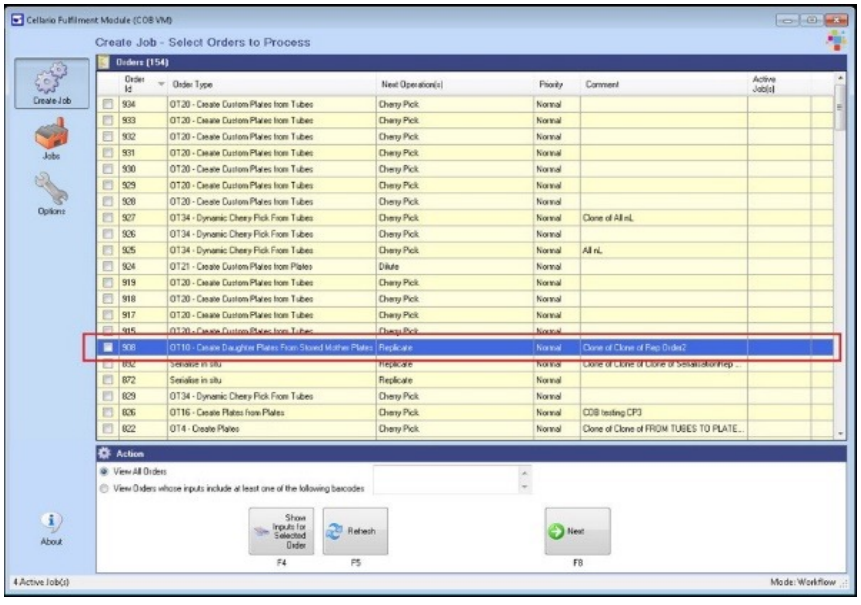
Cellario automatically performs a pre-run checklist and inventory scan to ensure the system has everything that it needs to produce the required output. Jobs are specified independently of the ALH device type, which allows maximum flexibility when work is processed in parallel across multiple ALH. A flexible Cellario template is automatically selected based on the output required and the parameters given. This is further refined to perform only the steps needed for fulfilment, significantly reducing the time needing to be spent to create and maintain multiple automation protocols on other systems.

Lastly, loosely coupled architecture results in significant cost savings in terms of configuration, testing, and maintenance. A well-defined Cellario web services interface avoids Cellario/Mosaic version incompatibilities, and the Mosaic Transfer Reader processes transfers only when a transfer is completed (successfully or otherwise).

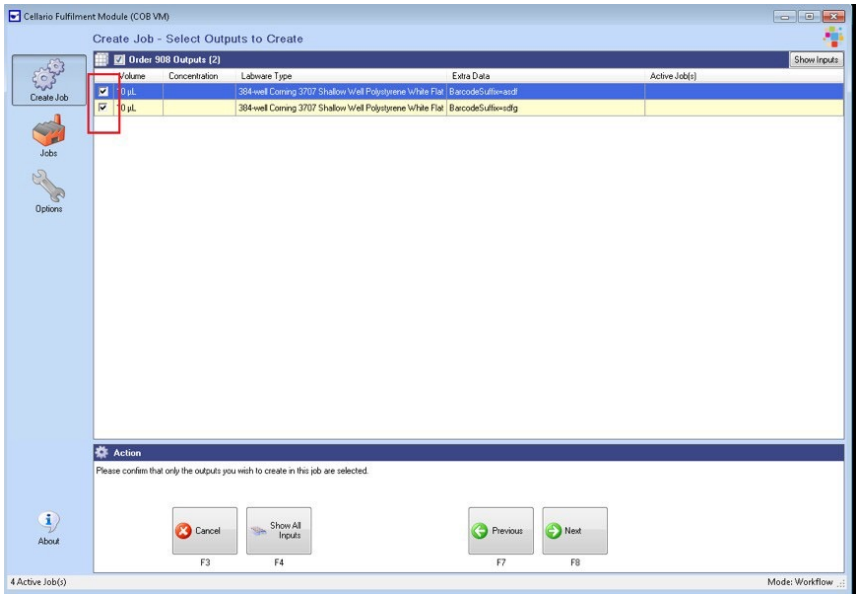
Example of Mosaic Order Fulfilment

The steps that an operator undertakes to fulfil a Mosaic order workflow step (*in situ serialization*) on a HighRes workstation are as follows:

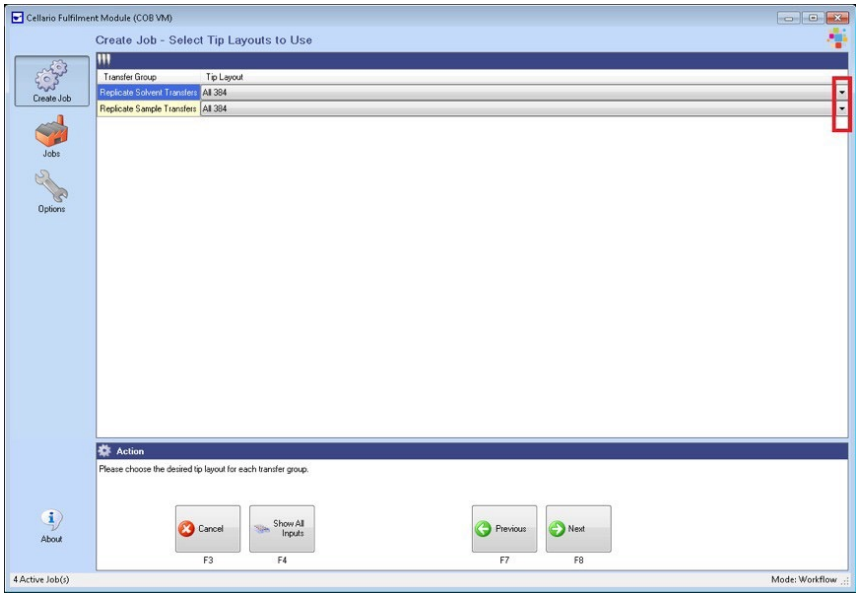
1. In the Titian CFM application, select the Mosaic order(s) for which you would like to create a Cellario job



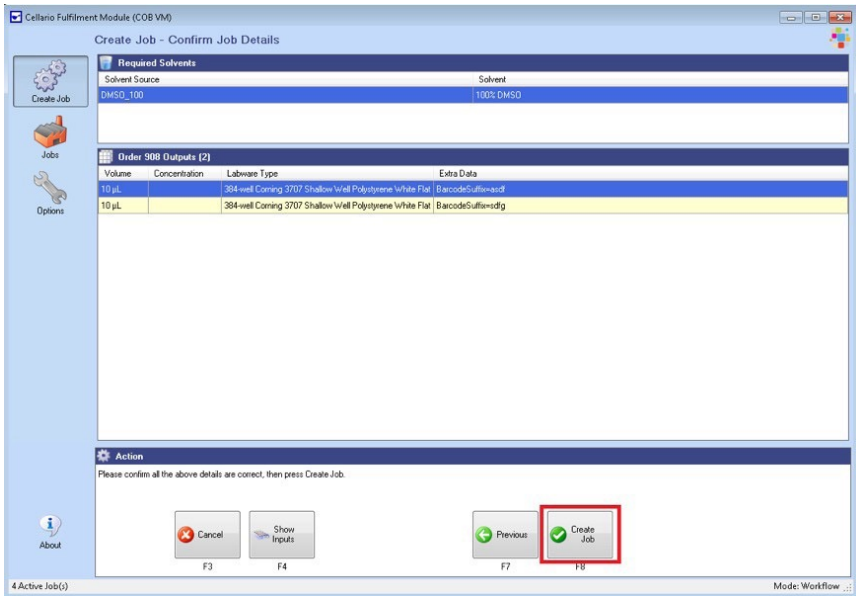
2 Select which output labware (i.e., from your Mosaic streams) you wish to create during the run



3 Confirm the CFM job parameters and create the job

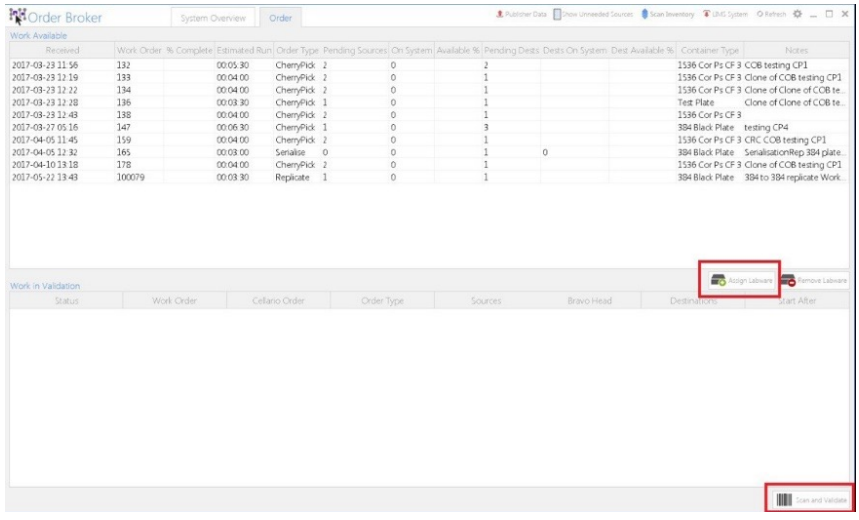


4 Confirm the CFM job parameters and create the job

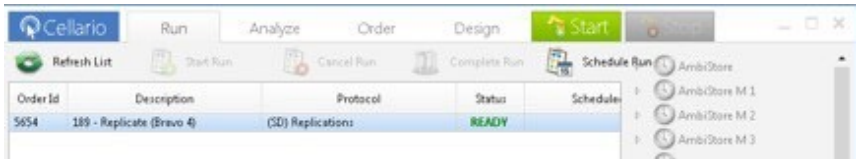


5 The Job appears in COB and is automatically associated with the correct master template Cellario Protocol based on the job parameters, e.g., Replication workflow fragment with < 5 copies maps to Cellario protocol X

6 Using the HighRes COB interface, assign labware locations, scan and validate the source and destination labware on the HighRes workstation

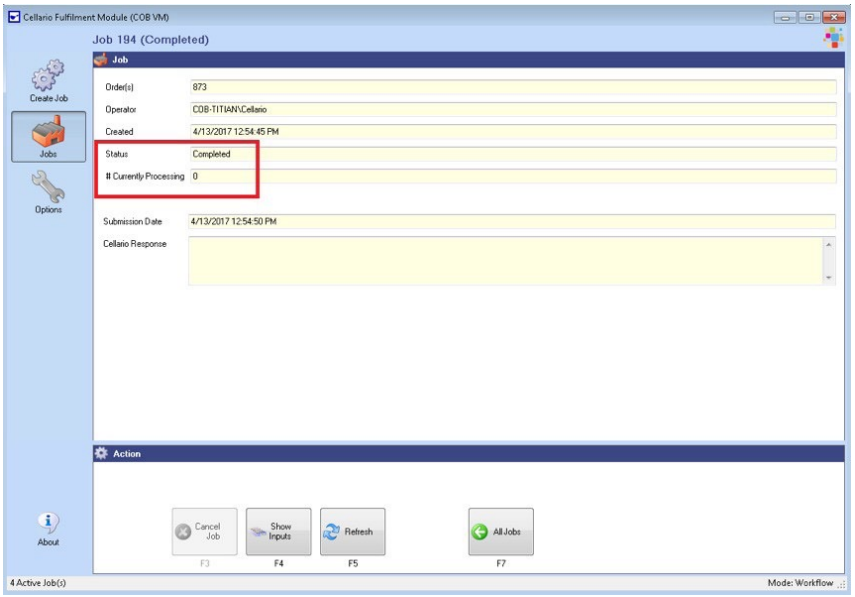


7 Fulfil the job in Cellario



8 The Mosaic inventory and workflow will be updated as Cellario reports each completed transfer for the Mosaic Transfer Reader to process

9 After the job has finished the operator should click 'Complete Run' in Cellario, where upon labware will be unlocked in Mosaic and can be unloaded from the machine



SUMMARY

HighRes Biosolutions and Titian Software collaborated to provide life scientists with a high quality, simple and effective solution to manage and track every research sample, process, and procedure. Mosaic sample management software and automated Work Cells powered by Cellario/COB unite to provide a truly seamless automated sample management order fulfilment process.

Automated Work Cells from HighRes Biosolutions enable continuous access to life-improving data by adapting to evolving scientific, technical, and organizational landscapes – wherever in the world they may be. The unique modular nature of these systems allows for a vast array of workstation configurations, and adaptive automation scheduling makes it easy for users to follow their science. Highly developed Cellario web services enable efficient external job parameter processing from CFM and the transfer of process results data to Mosaic.

Mosaic is configurable, flexible, and capable, offering detailed inventory recording for complete sample traceability and audit capacity allowing operators to focus on providing essential process parameters to Cellario without the concern of automation control logic. This enables every robotic system (and scientist) to do what they do best.

ABOUT HIGHRES BIOSOLUTIONS

HighRes Biosolutions is a leading global laboratory automation company that enables scientists to create data factories connecting their instrumentation with informatics for unprecedented levels of productivity. Their uniquely designed hardware powered by Cellario™, the most robust laboratory software available, empowers you to immediately adapt and re-adapt to your science, your technology, and your organization – wherever in the world you may be. HighRes invites you to design, build and test your experiments. Stream samples uniformly across single and multiple Work Cells. Collaborate. HighRes is total laboratory automation moving at the speed of science.

ABOUT TITIAN SOFTWARE

Mosaic Sample Management is Titian Software's comprehensive, configurable, and modular software product to control and monitor all aspects of sample storage, preparation, and delivery. From small biotech to global pharma, Mosaic helps to provide a seamless, error-free sample supply chain and audit trail. Titian's industry leading Mosaic Sample Management software is available as a tailored solution for all your sample management requirements, or as optimised packages pre-configured for rapid deployment.

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