Driving Business Modernization with Workflow Orchestration

How Control-M orchestrates workflow execution in complex, hybrid environments
Executive Summary

Modern computers and networks make IT systems run faster. The cloud makes them scalable. The Internet of Things (IoT) lets enterprises get data from almost anywhere, and mobility lets information go almost everywhere. While the fundamental components of a modern IT environment have changed, one thing has not: business operations still rely heavily on workflow execution.

The technological evolution, along with approaches like DevOps, has changed the role of IT operations from beyond the big job of executing workloads, to automating and orchestrating workflow execution across heterogeneous ecosystems. Therefore, workload processing operations, architectures and solutions need to change too. They need to:

- Orchestrate end-to-end workflow execution from the mainframe to the cloud, across diverse infrastructure that includes multiple on-premises, public and private cloud resources.
- Embed workflow orchestration in the DevOps tool chain, so developers can build automated execution right into their jobs, and complete workflows can be developed, tested, promoted and managed like any other piece of code.
- Simplify and scale data pipelines so data can be easily ingested, processed and output to multiple platforms, including Hadoop, Spark, EMR, Snowflake, Redshift and others.
Today’s Typical Workflow Orchestration Challenge

Batch processing today may seem unrecognizable compared to just five years ago, in large part because systems handle more data, from more sources and distribute it to more systems and users, with more built-in automation and security than ever before.

Control-M gives users the power to tame this mess by building automation into every step of the process so organizations can easily execute workflows across multiple environments, systems, applications and users.

Control-M has end-to-end orchestration that simplifies complex application, data, and file transfer workflows. Combining ease-of-use with rich functionality, Control-M helps organizations accelerate applications with DevOps processes, gain business critical insights from the newest and most demanding data technologies, and deliver complete freedom to choose any infrastructure to meet their business flexibility demands. And, it does it in a way that ensures compliance with your operational standards, even while giving users extensive self-service access to build, schedule, manage and monitor their own jobs. With intelligent predictive analytics and fully automated and event-driven workflows, Control-M proactively prevents failures, ensuring digital services are delivered on time, every time.
Control-M supports IT operations, developers, and line-of-business users

The technological evolution, along with approaches like DevOps, has changed the role of IT operations from beyond the big job of executing workloads, to automating and orchestrating workflow execution across heterogeneous ecosystems. Therefore, workload processing operations, architectures and solutions need to change too. They need to drive:

- End-to-end workflow connectivity across any application, any data source, and all critical systems of record – from mainframe to cloud
- SLA management with intelligent predictive analytics
- Auditing for compliance and governance
- Logs and output with intelligent predictive analytics
- Proven stability
Orchestrate End-to-End Execution

Today most IT and business processes are not self-contained. Processes workflows rely on input from other applications, systems and business partners, and provide output to various systems of record and reports. Businesses have been breaking down their silos for years and have made systems more interconnected than ever before. Mobile and cloud components enable even greater interconnectedness than ever before. For operations, this means workflows that used to execute on one platform (and could be built and scheduled with a tool specifically for that platform) now need to accept file transfers and other input from additional data sources and provide output to others, often in the cloud. For developers, it means for the applications and business services they build to execute properly, safeguards and automations should be built in to account for the inputs and prompts that are needed from other systems.

Control-M provides orchestration across all processes and environments from a single point of control. Organizations can use Control-M to orchestrate workflows across leading PaaS offerings on AWS and Azure, and also seamlessly integrate these with workflows running in hybrid architectures.

Control-M integrates with and builds upon your existing application, data, and infrastructure technology. This means you can leverage your infrastructure investment while transitioning to modern technologies in an incremental fashion. This approach allows you to keep business processes running reliably and securely throughout the transition. Of course, Control-M supports modern infrastructure and includes out-of-the-box integrations for Amazon AWS and Microsoft Azure, including AWS Lambda, Step Functions and Batch, and Azure Logic Apps and Functions.

Companies rely on Control-M to run their business, meeting the most demanding workflow automation and orchestration in the most complex operational environments. Multiple capabilities clearly distinguish Control-M from other batch automation offerings, making it the leading solution for workflow orchestration. Some of these key capabilities are described below.

What’s Workflow Orchestration?

The word workflow, as we use it here, implies a series of steps that make up a business service delivered by applications (managing the creation or deployment of application components is a different kind of workflow). Orchestration means automated coordination and management.

In layman’s terms, the service delivered to a customer may be made up of several steps. Workflow orchestration makes sure those steps are carried out in the correct sequence, interacting with the right systems and data, completed at the right time.
Embed Automation into DevOps Toolchains

To provide complete end-to-end orchestration, a solution should help improve the way application workflows are created, not just manage how they run. Development teams are under a lot of pressure to deliver new applications and business services faster, and more often. Adopting DevOps has been the go-to response. But DevOps will fall short if organizations only develop faster but can’t promote, deploy and run new applications in production at the same rate. The total time cycle needs to be reduced. An integrated, coordinated orchestration solution can do that.

Without integrated orchestration, handoffs between development and operations teams will inevitably have hiccups that result in delays to getting new services into market. Like a relay team, it doesn’t really matter how fast developers and operations staff run if they drop the baton. Integrated workload orchestration can automate and enable smooth handoffs by building automated workflow management into the application during the development process. This approach is known as Jobs-as-Code.

Control-M enables developers to create jobs during the coding phase that embed automation and compliance with operations policies into applications and business services, while still allowing developers to work with their favorite tools. Using a Control-M enabled Jobs-as-Code approach with REST APIs and JSON, within the CI/CD toolchain, workflows become versionable, testable, and maintainable, so developers and DevOps engineers can work collaboratively. Jobs-as-Code embeds DevOps principles and collaboration into workflow automation. Learn more at jobsascode.io

Control-M has two core components that support Jobs-as-Code and enable faster, deployment ready, workflow development: Control-M Automation API and Control-M Workbench.

“A Jobs-as-Code approach is paramount for anyone doing agile development and DevOps. We have been using Control-M for years in operations, and now the product gives our developers full ownership and control of their jobs in a coding environment that is familiar to them, so they can define the business processes they want to automate in production.” — Robert Stinnett, Automation Analyst, IT Operations, Carfax
Control-M Automation API

Control-M Automation API creates consistency among the development, test, and production environments by giving developers the ability to embed workflow automation while applications are being developed. This results in applications running more reliably and errors being diagnosed more quickly. Control-M Automation API lets developers automate workflows within applications using their preferred environments and tools.

Control-M Automation API enables developers and DevOps engineers to take a Jobs-as-Code approach as part of the agile application release process. Using JSON notation for job definitions, Git, and RESTful APIs for validation, configuration, and deployment, workflow scheduling artifacts are seamlessly integrated with the enterprise’s automated application release and deployment process.

No scripting is required to build, test, and debug sophisticated application automation using an enterprise-grade production solution. The automation for running, scheduling, and managing applications is embedded into the entire SDLC, as Control-M Automation API supports most all existing tools in the delivery pipeline. Now, the people that create applications and those responsible for running them can work with a consistent, familiar solution that addresses the entire lifecycle.

Control-M Workbench

Control-M Workbench is a complete, stand-alone development environment that lets users code, debug, and test job flows without requiring any additional services. It provides developers a ready-to-use Control-M sandbox as a virtual appliance that runs in Apple® macOS®, Microsoft® Windows®, and Linux® environments. Control-M Workbench enables developers and DevOps engineers to build, test, and debug batch automation for business applications in the same way that any other coding activity is performed.

With Control-M Workbench, users can:

- Accelerate application delivery by up to 20%
- Run in production with up to 25% fewer incidents
- Require up to 50% fewer FTE resources
- Reduce MTTRE by as much as 20%
Simplify and Scale Data Pipelines

Data is the lifeblood of modern business operations. Companies are making significant, strategic investments to generate or obtain data from new sources, get new insights from it through analytics, machine learning, artificial intelligence and other technologies, share it with more employees and partners, and use it in new ways to engage customers, manage operations and inform strategic decisions. For many businesses, data handling and workload management have not kept up with the exponential growth of data, the myriad ways it is being used, or the speed at which results are needed. Data flow is often a constraint to business transformation.

Control-M helps organizations build and scale the pipelines and workflows they need to manage their exploding data pools and satisfy their ever-growing appetites for information. It supports real-time, streaming and batch data, and workflows across disparate, hybrid IT environments. Control-M has native support for numerous data sources and environments, including file transfers, databases, ERP systems, IoT devices, data and analytics, cloud storage, and much more.

Case in Point: Managing Data & Analytics for Business Advantage

Navistar developed a competitive advantage over other heavy vehicle manufacturers by supporting its customers with predictive analytics that tell them when vehicles need maintenance and are at risk of a breakdown. Navistar receives more than 100 data points on over 160,000 vehicles every day. It manages these millions of inputs easily by automating workflows. It uses Control-M to orchestrate data input from fleet owners and telematics technology providers, load the data into its Hadoop system in Amazon Web Services (AWS), and automatically run the various data-dependent jobs. Navistar didn’t need to install and learn a new management system to do it, because Control-M runs the company’s other business-critical workflows.

“Prior to bringing Control-M into our Hadoop environment, we had two engineers working full time pulling this data from AWS, aggregating it, and put it into a spreadsheet for the design engineers. It took about a week to get the data into a usable form. Control-M now handles these tasks automatically, freeing up those to engineers to take on strategic tasks,” says Todd Klessner, Navistar’s senior data operations specialist.

The result? The program has helped reduced downtime for Navistar’s customers by up to 40 percent and eliminated up to 80 percent of unplanned repairs, while also helping them optimize their maintenance schedules and parts inventories.

“These projects are beginning to deliver significant value to Navistar’s business, enabling us to build higher-quality vehicles and ensure that customers get maximum value from the products they buy.”

Learn more at: https://www.bmc.com/blogs/big-trucks-deliver-big-data-navistar/
The following sections highlight Control-M capabilities for simplifying and streamlining the data and analytics pipelines that deliver necessary data to and from workflows and related file transfers.

**Control-M for Big Data**

Every day you collect vast amounts of data from various sources, such as enterprise data warehouses, relational databases, and traditional applications. The data must be synchronized, ingested, consolidated, cleansed, and analyzed to get the actionable intelligence your business needs. These integrations are often difficult to build, and development is typically done with scripts, which are time consuming to develop and maintain. This complexity limits the speed at which data applications can be delivered, making it difficult to adapt to the challenges posed by accelerated applications, disparate data, and increasingly diverse infrastructure.

With Control-M for Big Data, you can orchestrate ETL and other data workflows on premises and in the cloud, ingesting and processing data from platforms like Hadoop, Spark, EMR, Snowflake and RedShift. It provides an end-to-end view of data pipelines at every stage. You also get end-to-end visibility into data workflows through a simple drag-and-drop interface that provides universal visibility and control.

**Control-M Managed File Transfer**

Most data pipeline workflows (and jobs in general) involve file transfers, so automating and optimizing file transfers as part of the workflow is a key efficiency driver. Control-M Managed File Transfer helps you reduce risk and deliver business services faster by automating internal and external file transfers in a single view, with related workflows on-premises, in the cloud, or both. You get an intuitive graphical user interface to guide you through job definitions and ensure transfers are associated with comprehensive automated workflows. You also get instant visibility into the status of internal and external file transfers with a dashboard view, enhanced security with encryption options, and reduced risk of downtime with automated monitoring and recovery features. Control-M Managed File Transfer supports all types of files, and has native support and enhancements for S3, FTP, SFTP, and AS2.

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With the increased requirement for big-data-fueled applications, we need to deliver files reliably and quickly. The new dashboards and enhanced search functionality that come with Control-M Managed File Transfer are very popular with our first- and second-line support staff, and we anticipate that this will result in up to a 75 percent reduction in time spent on customer inquiries.

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Andrew Taylor
Batch Operations Team Leader
British Sky Broadcasting
Control-M for SAP

Many data workflows intersect with enterprise resource planning systems, so orchestrating data exchange and job execution with an ERP is essential. ERP integrations have historically been complex. If your ERP is from SAP, Control-M for SAP® makes it seamless and reliable. Control-M for SAP®, an SAP certified solution, automates and simplifies the scheduling of SAP batch jobs within enterprise IT environments, resulting in improved service delivery.

A powerful graphical interface makes it easy to build and monitor workflows across the enterprise, regardless of the workload type, delivering an end-to-end view of all business services from a single point of control. It automates scheduling and management for SAP S/4HANA and R/3 jobs as well as supports all applications in the SAP ecosystem. The intuitive interface gives users access to view service and job status, while schedulers retain control over scheduling and execution through a graphical interface that shows SAP jobs and all other enterprise workloads—without the need for custom scripts.

Control-M for Databases

Enterprises depend on their databases, so database integrity is essential to many applications and business services. Not only do businesses depend on databases, their databases depend on other databases. These dependencies typically require careful synchronization and scripting to prevent errors and shutdowns. Managing these compound processes independently can be inefficient, costly, and error prone.

Control-M for Databases allows you to integrate and automate database workflows from a single point of control. A user interface with interactive object selection makes it easy to define new jobs, which minimizes manual input and prevents errors. The single, consistent interface also reduces database-related learning curves for operations staff, enhancing accuracy and productivity. Control-M for Databases eliminates the ongoing requirement to develop, deploy, and maintain scripts and queries to manage database interactions, which frees up time for more valuable activities.

“[With] BMC support for newer technologies such as SAP S/4HANA, Oracle R12, MFT, web service client, and Hadoop, we are confident Control-M will be able to support our environment as we move forward.”

Larry E. Hicks
Manager
Data Center Services
IT Infrastructure
Eaton
Support for Business Users & Enterprise Standards

Control-M does more than automate and orchestrate data workflows and bring development and operations closer together. It makes it easy for business users to view, manage and even build their jobs, and has features that reinforce operational standards. For example, the improved web interface in Control-M 19 simplifies role-based access to view and manage specific workloads across the organization. With its Web Viewpoints, users will be able to use Control-M Self Service to display jobs and job flows. It also enables workflow management over mobile devices. Mobility support, plus the built-in predictive analytics, make operations staff aware of potential problems before they occur, and give them the means to prevent job failures.

That improves SLA performance, which benefits the whole business. Control-M also has several features that make it easier to meet auditing and compliance requirements, including automatically capturing and managing logs and other output. Overall, Control-M gives you the ability to build, monitor and manage workflows for any application, using any data source in any host environment, from the mainframe to the cloud. In this section we cover many of these key capabilities.
Control-M on the Cloud

Orchestration must extend to the cloud, and Control-M does it. Innovations by public cloud providers allow provisioning of highly scalable and flexible platforms and infrastructures for customers with little more than a click. With time to provisioning now reduced to minutes, companies are looking for ways to achieve the same speed when installing and configuring applications running on cloud platforms. Many of these applications include batch processes that must be deployed and managed along with the application.

Control-M on the Cloud helps you extend comprehensive Control-M automation functionality to a broad range of public, private, and hybrid cloud environments. Control-M automates business application workflow creation and management and file transfers across multi-cloud and on-premises infrastructures with a single-view, end-to-end enterprise scheduling platform. With Control-M, you can take advantage of the improved agility and scalability of cloud ecosystems.

As shown below, you can easily provision, install, and configure the full Control-M stack on Amazon Web Services (AWS) and Microsoft Azure in minutes, using interactive deployment or DevOps automation tools. You can also take advantage of modern container technologies. Control-M on the Cloud integrates with Amazon Web Services (AWS), Relational Database Services (RDS), Elastic Computer Cloud (EC2) and PostgreSQL Databases, and is available for download in the AWS and Azure marketplaces. You can provision Control-M through AWS Cloud Formation, Chef, or other provisioning tools.
Service Level Monitoring with Control-M Batch Impact Manager

Orchestration works better when you can predict what will happen and plan for it, instead of responding to what already happened. That’s why predictive analytics are embedded in Control-M. With Control-M Batch Impact Manager, you extend your visibility and control. The impact of a process failure or latency on the business isn’t always immediately obvious. Yet you can’t afford to delay your response, especially if the failure could interfere with a critical business process.

Control-M Batch Impact Manager detects potential delays and errors in workflow processing, enabling IT staff to take corrective actions before business services are affected. It proactively determines how a delay or failure in workflow execution will affect systems and business users. With that insight, IT can prioritize incident responses to minimize disruption to the most important workflows.

Control-M Workload Archiving

When problems do occur, information contained in output and logs generated by jobs can help on-call programmers, business analysts, and IT staff resolve them. This data is essential for achieving and demonstrating compliance with auditing and governance regulations. However, organizations often find it difficult to gather, store, search, and retrieve this data efficiently. As a result, issue resolution times may increase, and it may be difficult and time-consuming to demonstrate audit and regulatory compliance.

Control-M Workload Archiving is a data archiving solution that quickly delivers historical output and logs for problem analysis and audit compliance. It provides access to all interested stakeholders via powerful but simple-to-use interfaces. Flexible administrative options make it fast and easy to establish and automate policies for retaining specific types of data for their required retention periods. The results are faster issue diagnosis and repair, and simplified audit and compliance processing.

Batch Impact Manager tells us if a problem is coming so we can suspend parts of the system and do mitigations instead of stopping everything. It’s an early warning system that lets us intervene in time to complete all the jobs within the batch window.

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April Johnson
Senior Engineer & Project Manager
Seattle Public Schools
Control-M Self Service

Traditionally, when users need to run business-related workloads or determine their status, they must involve IT staff by phone, email, or service desk tickets. These queries add to IT’s already significant workload, soaking up valuable staff time, driving up costs, and causing delays in responding to these business users. This approach drives down everyone’s productivity.

With Control-M Self Service, business users can get the answers they need immediately and on their own—an essential capability in the digital-first era. Control-M Self Service provides a web-based portal that business users can access on demand, from any device. Users can execute jobs from a catalog or check their status without assistance from the scheduling staff. Control-M Self Service gives them the visibility, control, and responsiveness they need in a way that’s easy to understand.

BMC has found that organizations that leverage Control-M Self Service can reduce the number of service requests by up to 60 percent, which frees up time for the scheduling staff to focus on activities that improve customer satisfaction and business results.

Control-M Application Integrator

Organizations are under pressure to deliver new services to their business users and customers more quickly. Development teams are challenged to keep up with demand, often having to support different applications across on-premises and cloud environments, as well as having to write proprietary scripts for many of the applications and systems in use. Without the right automation, IT and development teams struggle to deliver business services quickly, securely, and cost effectively.

Control-M Application Integrator helps you easily integrate any application workflow through a simple, web-based design tool. It replaces complex scripting for developing and scheduling business services. Users can easily create their own job types to quickly and reliably deliver business services to customers. It is backed by the Control-M Application Hub, an open community exchange where users can find, use, and share crowdsourced job types. Unlike workload automation integration tools that require the development of custom scripts and programming skills that are costly to implement and maintain, Control-M Application Integrator guides you through the steps for integrating your critical application workflows with Control-M, resulting in a single, enterprise view.

Control-M enables us to get more done in less time and minimize risk by running jobs more reliably. And with Self Service and the mobile interface for our project managers, we can do a better job of serving our customers while increasing our own productivity.

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Wilson Lucas
Applications Support Manager
Instituto de Informàtica
Enforce Standards for All Users with Control-M Workload Change Manager

Schedulers and developers may have competing responsibilities and priorities, which can create delays and conflicts that slow the development cycle. Many application development organizations are slowed by their manual processes for creating and modifying workflows and getting them into production. These tasks are often handed over to a scheduling specialist who is also responsible for managing all other enterprise workflows. Businesses need a way for schedulers and developers to collaborate so that they can become more agile in delivering applications.

Control-M Workload Change Manager is a collaboration portal that automates and simplifies workflow creation and modification, resulting in faster application implementation and improved service delivery. Control-M Workload Change Manager gives developers the ability to quickly build and modify workflows that adhere to enterprise-defined standards that are automatically enforced. Automation features manage important quality control functions and reduce deployment time, while schedulers retain authority for approving workflows and putting them into production. The solution decentralizes the workflow development process without compromising quality or control.
Business continues to become more complex, and so do the systems that support it. Information systems must make sense of more data from more sources than ever before, process it more quickly, and deliver it to line of business users in more easy-to-consume ways. Doing this all effectively requires execution across multiple environments and platforms, including many legacy ones that weren’t built to meet modern integration needs. There are tools available to execute each step, and many introduce automation. However, execution and automation are not enough to ensure reliable operations that meet today’s standards. Effective operations also require orchestration across your entire ecosystem.

Control-M delivers end-to-end orchestration that simplifies complex application, data, and file transfer workflows. The solution makes it easy to define, schedule, manage and monitor your application workflows, embed workflow automation into your CI/CD toolchain, and scale your data pipelines.

- **End-to-end orchestration**: Control-M integrates, automates, and orchestrates application workflows across on-premises and cloud environments. It automates files transfers, integrates workflows with any application environment, predicts and prevents job failures, and has native support and integration features for leading public clouds.

- **Embed workflow automation in the DevOps toolchain**: Control-M enables a Jobs-as-Code approach so development and operations teams can work collaboratively. Automation can be built into the entire software development life cycle, without any scripting. With REST APIs and JSON within the CI/CD toolchain, workflows become more versionable, testable and maintainable.

- **Simplify and scale data pipelines**: Control-M manages ETL and other data from Big Data environments, provides a single point of control for interaction with multiple database formats, and schedules and executes ERP-dependent workflows.

Combining ease-of-use with rich functionality, Control-M helps organizations accelerate applications with DevOps processes, gain business critical insights from the newest and most demanding data technologies, and deliver complete freedom to choose any infrastructure to meet their business flexibility demands.
For more information

To learn more about Control-M, please visit bmc.com/control-m