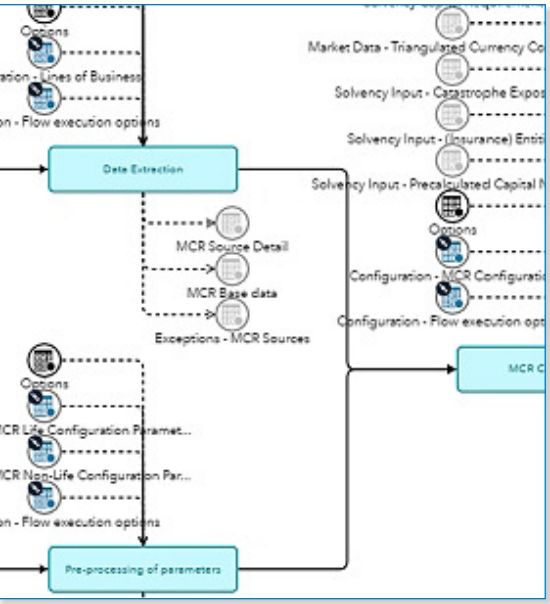
SAS® Infrastructure for Risk Management

Simplify the creation, orchestration and management of risk processes with a visual execution environment



What does SAS® Infrastructure for Risk Management do?

It helps banks and insurance companies improve the efficiency of their risk processes with a visual workflow execution environment. Automatic code synchronization and documentation make it easy for developers to collaborate and track their work. Risk jobs run faster with in-memory computing. It also provides integration with multiple systems, risk regimes and third-party tools, and underpins many SAS risk solutions.

Why is SAS® Infrastructure for Risk Management important?

The infrastructure separates business content from the technical platform so business users maintain their application logic independently from IT. The visual workflow environment simplifies the creation, orchestration and management of multiple code versions for enhanced productivity and auditability. Conversely, it provides IT with an easily managed, plug-and-play environment that serves multiple business applications.

For whom is SAS® Infrastructure for Risk Management designed?

It's designed for use by risk analysts and IT managers. Risk analysts can develop and execute code for any risk calculation. IT can manage the status of job executions and investigate data issues, as well as create and manage a risk data warehouse.

Financial institutions and insurance companies must deal with increasing and ever-changing regulatory requirements along with the demand for better, faster analytical results. This is a challenge because managing various risk tasks and solutions across an enterprise is often a manual effort that is slow and too expensive.

To improve enterprise risk management , two things are imperative – the ability to create and run analytical workflows more quickly and a way to simplify solutions management and meet compliance mandates.

SAS introduces a framework that helps solve these problems. SAS Infrastructure for Risk Management provides a managed, visual view of risk process job flows, and it uses the most appropriate computational technology to execute jobs faster and more efficiently. It provides an integrated foundation for SAS risk solutions while offering the flexibility to incorporate third-party contributions within a single, easily managed risk infrastructure.

Benefits

- **Expedite the creation of risk job flows.** SAS Infrastructure for Risk Management enables developers to efficiently create and execute analytical job flows. Visual representations of complex flows make it easier for risk analysts to collaborate and keep track of their application development. With federated versioning capabilities, they no longer have to worry about keeping their code synchronized – it's done automatically. Embedded documentation is automatically generated from code and therefore is always up to date.
- **Speed up analytical processing for faster results.** The infrastructure features an in-memory architecture that can scale from single nodes to grid implementations. Calculations are executed in parallel with behind-the-scenes, optimally orchestrated processing. Data objects are shared and reused to avoid unnecessary computations. Testing cycles of run options are shortened. Your risk analysts get fast results so they can test and run more analyses.
- **Improve risk transparency and traceability.** Within the SAS infrastructure, all risk calculations are graphically represented through job flow diagrams that can be easily navigated. Input/output tables and results of intermediate calculations are accessible from the user interface so it is easy to trace all analytical flows and dependencies. This provides the transparency and traceability required for auditing and regulatory compliance.
- **Integrate multiple systems and easily implement new risk solutions.** SAS Infrastructure for Risk Management provides an integrated development environment that can be used to create custom risk solutions. It brings together SAS programs as well as third-party, open language coding tasks – all in a single environment. In addition, business content is separated from the technology platform so users can manage their applications independently from IT. And IT can manage and update the platform in a plug-and-play manner without affecting existing applications.

Overview

SAS Infrastructure for Risk Management is a modernized enterprise risk platform, designed to support data and code versioning, automation and transparent processes while applying the power of parallel code execution at a very low cost.

Using SAS Infrastructure for Risk Management, financial institutions and insurance companies can benefit from:

- Faster development and deployment cycles.
- Easier code maintenance, data traceability and automated documentation.
- Simplified management and orchestration of end-to-end risk processes involving multiple systems, applications and languages.
- High performance and scalability.

Capabilities

High-performance, massively parallel computing

The entire infrastructure has been designed for speed. Calculations are executed in parallel and optimized for in-memory processing, resulting in faster answers. The controller understands the dependencies between the tasks and can optimize their execution on CPUs, GPUs or even a grid of those devices.

To increase computational efficiency, SAS Infrastructure for Risk Management pools data objects between computational nodes to be shared. If two flows contain the same nodes, the results of the first run are stored and are reused when the other node is executed. This speeds up calculations and avoids unnecessary computations.

In addition, behind-the-scenes execution orchestration allocates related nodes to the same server to maximize disk caching benefits across grid servers. This increases the amount of data that can be processed in memory.

These features provide the fastest possible execution of complex, analytical job flows with minimal effort on the user's part for implementation and maintenance.

Visual representation of job flows with embedded documentation

Risk solutions require transparency and traceability for auditing and reporting purposes. SAS Infrastructure for Risk Management provides a visual representation of complex analytical tasks so workflow and dependencies are clearly visible.

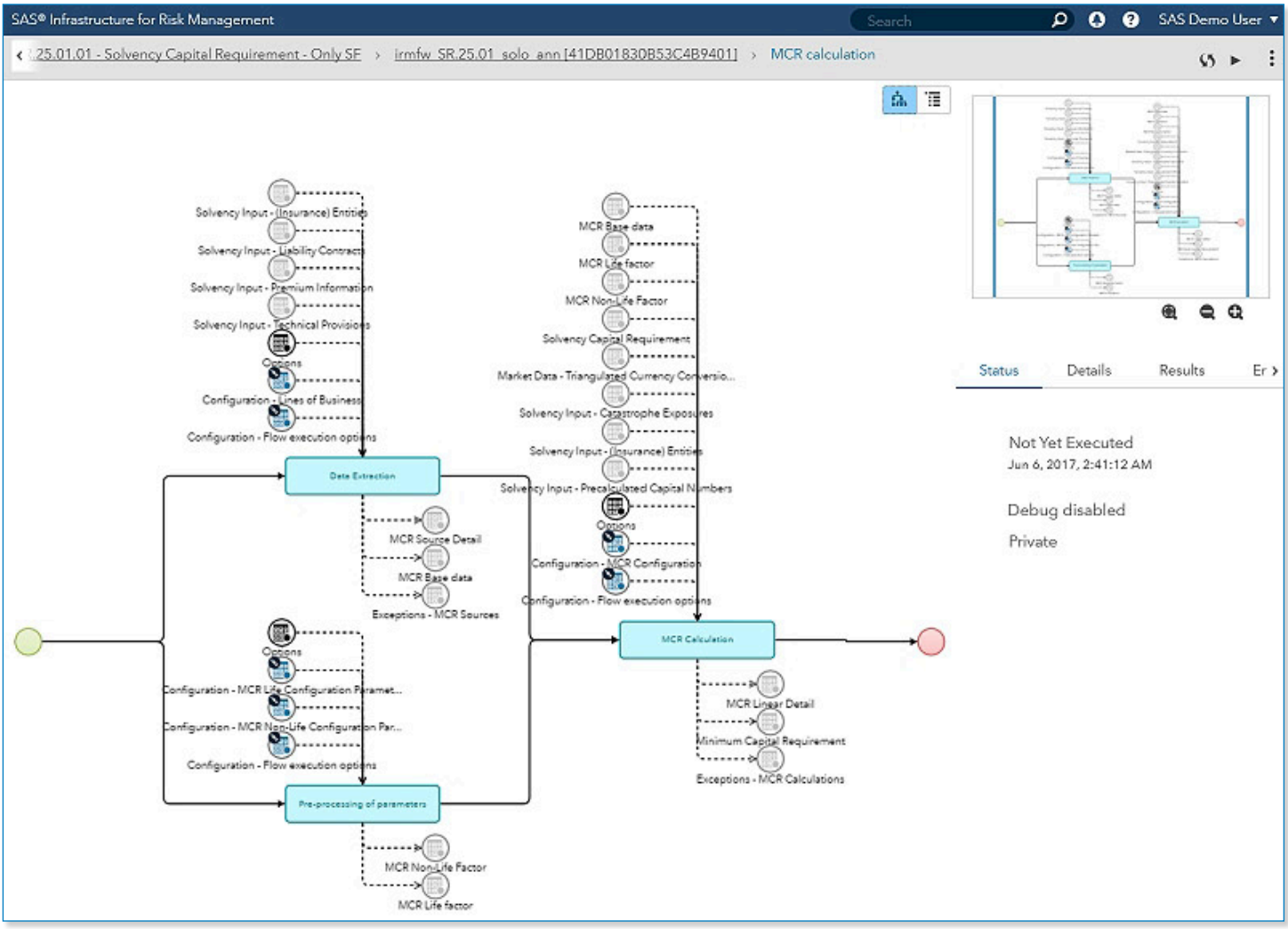


Figure 1: SAS Infrastructure for Risk Management provides a visual representation of analytical flows.

All calculations are graphically represented through job flow diagrams that can be easily navigated. Input/output tables and results of intermediate calculations are also accessible from the user interface.

Job flows and tasks are documented directly in the task nodes as special comments. The documentation is automatically extracted and presented neatly in the user interface at the location where the code is executed in the job flow. Documentation stays in sync with latest versions of the code because they live in the same file.

Federation of business content

SAS Infrastructure for Risk Management introduces the concept of federated areas. Each federated area is a plug-in module that contains the logic for a specific business application. It defines the input data model and contains the code and logic to produce your reports.

Customers can extend their solutions by adding new federated areas without affecting the functionality of existing pieces. Furthermore, the system is able to merge multiple federated areas so if a particular calculation is redefined inside another federated area, the system will execute the new code (if given higher priority) when a new job runs. However, the system will execute the previous code for jobs that were created and executed before the introduction of the new code.

The platform keeps track of which version of the code is used for each calculation, enabling users to preserve and replicate historical results at any point in time.

Separation of business content and the technology platform

SAS Infrastructure for Risk Management separates the business content and the technology platform. A library of risk/statistical functions provides all the business logic required for a particular application (data model, analytics calculations and reporting). The platform provides an environment for the execution of code.

Key Features

High-performance computing

- Massively parallel computing with in-memory processing.
- Automatic scheduling of tasks based on availability of required inputs.
- Data object pooling to share common results across analyses and users:
  - Objects are pooled prior to job-flow instance execution.
  - Job flow definitions are parsed to determine optimum sequence of execution, which nodes require execution and where nodes should be executed to maximize disk cache utilization.
- Data/table partitioning:
  - Node executions can be parallelized by defining a "by group."
  - Partitioning will run a single node definition on a number of cores in parallel, upon which results can be reaggregated.
- Scalability: Supports single- and multi-node grids.
- Can optimize task execution on CPUs, GPUs or a grid of devices.
- Automates the infrastructure required to support many-task computing (MTC), which enables SAS programs to reach unprecedented levels of performance with the simplicity of data synchronization.

Visual job flows and documentation

- Presents a transparent view of your analysis or job flow from beginning to end.
- Flow diagram shows dependencies among tasks.
- Monitor progress of flow as analysis is running.
- View and modify data inputs with SAS Studio and Microsoft Excel.
- Share and publish flows with colleagues.
- View output data in SAS Studio and Excel.
- All code can be documented and viewed through the user interface.

Federated business content

- Custom federated areas where business logic is separate from technical architecture.
- Automatic merging of federated areas to allow for extensible implementations.
- Automatic version control of federated areas.
- Ability to run prior versions for back-testing and challenger models.

Field-enabled, integrated development environment (IDE)

- Uses SAS Studio and the SAS macro language to provide an IDE that can be used in the field to buld custom risk solutions.
- Brings together various SAS components (including SAS® Viya™) and procedures – as well as Java, C, R, Python and Lua coding tasks – in a single integrated environment.
- Provides a common platform for all SAS risk solutions.

The content and underlying technology platform are independent, so an update of one does not require an update of the other. This enables risk analysts to manage and update their application logic independent from IT. And the IT department can make platform changes without affecting business users' existing applications.

TO LEARN MORE »

To learn more about SAS risk solutions and services, download white papers, view screenshots and see other related material, please visit sas.com/risk.

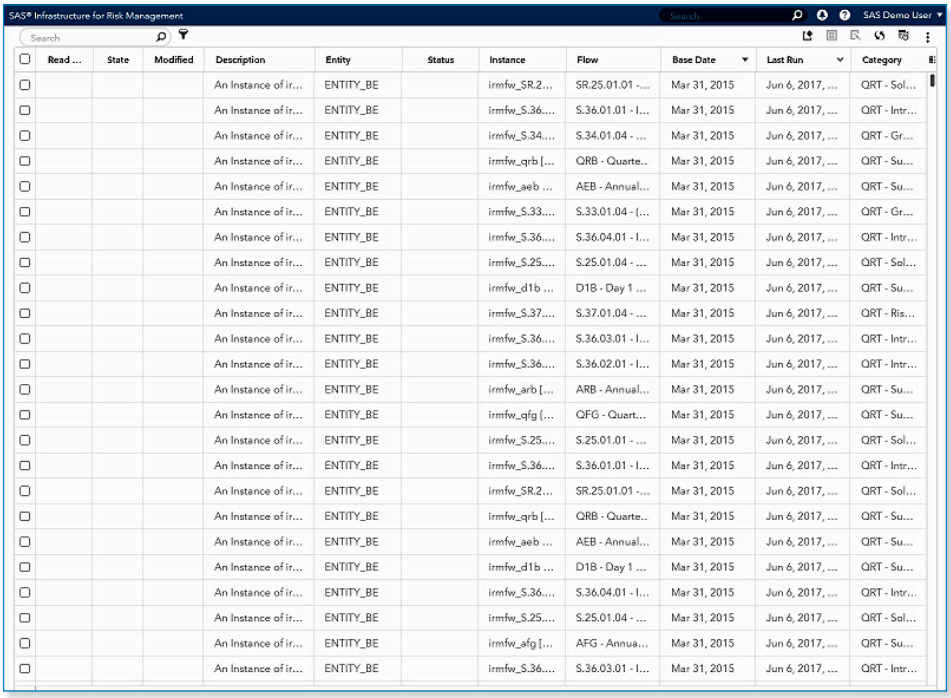


Figure 2: A list view of job-flow instances.

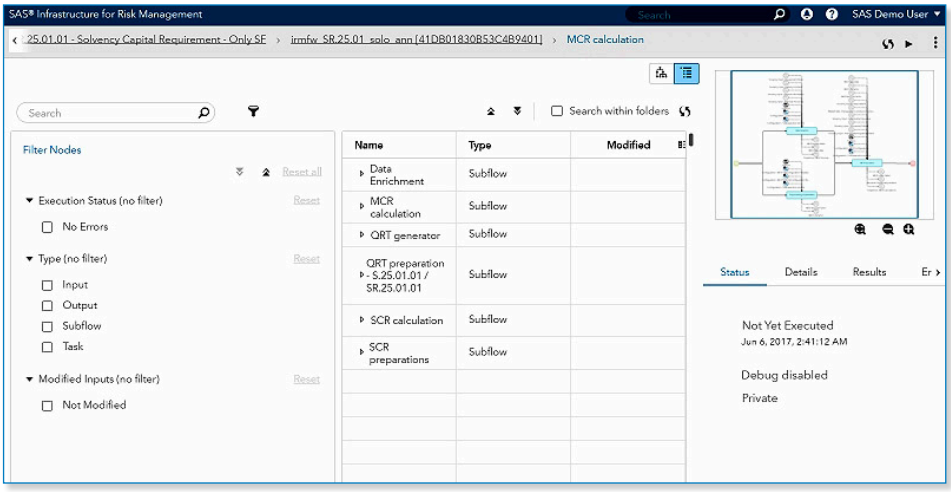


Figure 3: You can easily search for a specific instance.

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