What does SAS® Decision Manager do?
SAS Decision Manager streamlines analytical model deployment. It takes data, business rules and models and creates validated, managed assets – providing assurance and integrity for automated operational decisions. All from a single interface.

Why is SAS® Decision Manager important?
By automating thousands of decisions daily, SAS Decision Manager makes organizations more efficient and consistent. It prevents duplicate efforts and eases the burden of manually redefining models for production. A common decision authoring and deployment environment for business and IT, it preserves version control, testing traceability and continuity of all analytically driven operational decisions.

For whom is SAS® Decision Manager designed?
It’s designed for business analysts who must assess alternate decision scenarios for optimal outcomes. It makes it easier for compliance personnel to trace operational decisions. And for IT staff and database administrators who put analytical decision models into production environments.

SAS® Decision Manager
Streamline analytical model deployment and automate operational business decisions

A typical day brings countless business decisions that affect everything from profitability to customer satisfaction. What is a reasonable price point? When is a discount too excessive – and unprofitable? Which clients qualify for special programs? How can services and logistics be more efficient?

These day-to-day decisions alter the trajectory of a business. And while one bad move may not be too detrimental, hundreds or thousands of such operational decisions are made each day. So it’s important that each decision is made with the best, most accurate information – and is consistent with organizational policy.

SAS Decision Manager automates analytics-based decision making so organizations can function more efficiently while improving interactions with customers, partners, suppliers and employees. Likewise, organizations that are highly regulated – such as financial services, health care and insurance – can more easily achieve compliance as a result of documented, traceable decisions.

Benefits

- **Instill confidence by automating operational decisions.** Based on operational data – informed by analytical models and governed by business rules – IT and business can jointly engineer operational decisions to automatically define the best action to take.

- **Standardize analytic model deployment with one environment for all.** A common decision authoring and deployment environment used by different specialists dramatically reduces IT time spent validating and deploying analytical models. Shared, flexible processing control logic lets analysts select data and models from existing repositories. Defining business rules in context ensures continuity and shared terminology.

- **Develop once, deploy anywhere.** Skip the manual work and recoding. SAS Decision Manager generates the entire code path – including necessary business rules – residing in context of the analytical models. So there’s no need for IT to reassemble decision flows for batch or real-time deployment, or piece together code for deployment testing.

- **Industrialize model deployment.** Make the most of scarce human resources and skill sets through integration with SAS Factory Miner. And automated rule discovery – along with complete, contextually defined decisions – helps you to be more efficient, responsive, proactive and creative so analytically based decisions happen while they’re still relevant.

- **Control operational decisions.** Managed, automated decisions defined for operational activities deliver analytically sound, consistent actions across the organization. A fully integrated application on a single framework means users’ activities are fully traceable and open to detailed investigation, helping ensure governance and policy compliance.
Overview

Responding to dynamic environments and changing business requirements, SAS Decision Manager consolidates and streamlines the deployment of analytical models, automating repeated operational decisions and making them both data-driven and analytically sound. This ensures rapid deployment and consistent decisions in dependent applications and by front-line workers or other systems. Written once, these defined, systematic operational decisions can be quickly and easily adjusted to policy changes, new market conditions and the dynamics of today’s business environment – before models become obsolete or the opportunity passes. With the common user interface, analytical model deployment is explicit, fully documented and traceable – providing proof of adherence to compliance and regulatory requirements as well as organizational policy governance.

Streamline analytical model deployment

Business and IT users face the cumbersome task of logging in to different tools to access and manage information, select analytical models and define the business rules that create the context for production use. SAS Decision Manager provides one common and consistent method for each of these tasks, bringing analytical models into production before they become obsolete. It alleviates duplicate effort across departments and provides clear, centralized instruction regarding how analytical models are defined and how they are meant to be used. From one interface, analytical models and business rules are natively integrated, managed and published, with identical logic for both batch and real-time web service execution. Your organization enjoys faster deployment, as well as assurance and integrity, in your analytically driven operational decisions.

Retain control over operational decisions

Many analytically savvy organizations don’t have standardized or efficient processes to apply advanced analytical models in their businesses. Often, they have to ask IT to recode analytic models for deployment – but IT seldom has the business context, analytical rationale or even shared terminology. As a result, not only does the relevance of the models deteriorate due to delays associated with these manual tasks, but operational controls necessary to trace full lineage, authorized approvals and more are lost or require tedious, additional work.

SAS Decision Manager provides a common decision authoring and deployment environment for both IT and the business that preserves documentation, testing traceability and continuity in a shared environment. One environment used by different specialists to orchestrate decision flows simplifies validation of the entire decision.

Figure 1. The decision builder interface helps you assemble models and rules.

Figure 2. Easily model relationships and lineage.
and provides complete version control. Comprehensive impact analysis for the entire operational decision flow is visible, and includes models, rules and data – making it easier to assess the impact and dependencies associated with changing elements and conditions. Now model inventories can import and recognize models from any code base, using models from SAS/STAT® software, SAS® Enterprise Miner™ software, generic R, PMML, SAS Factory Miner models/projects and any code snippet (from C, C++, Java, Python, etc.) in decision flows.

**Empower IT to execute**

With extended Hadoop environment support, in-database execution, and full decision support – for both batch and web services – consistent decision logic is defined once, and can be deployed many times. The micro analytic web service creates an analytical scoring service in just a few clicks, automatically generating the deployment code from the interface. These small, self-contained scripts run in memory and don’t require in-state software or other servers to run, which streamlines IT tasks and easily extends analytical model use. Simplified IT testing of applications that call operational analytics also includes usage reporting and any documentation or attachments detailed in the process, such as comprehensive user logs, notes, and testing and audit history. Enhanced security to lock down rule flows provides better control and governance for publication.

**Make the most of machine learning**

Prior to deploying an analytical model, it’s important to define the logical elements of a decision and how they combine, rigorously testing business scenarios. All of these activities take time – sometimes so much time passes that analytical models become obsolete before they’re put into production. Bringing science to the art of operational decisions, SAS Decision Manager helps expedite this process. It integrates model development automation with SAS Factory Miner and accelerates common manual tasks, like the definition of business rules and automatic generation of vocabularies using machine learning techniques.

### Key Features

#### Decision flow builder
- A centralized HTML5 web interface lets you assemble business rules and models into complete decision flows from pull-down menus, minimizing the need to write code.
- To define decisions, you can browse existing data, model and business rules repositories and select from existing assets.
- To control decision orchestration, add condition logic (i.e., IF-THEN-ELSE) and use outputs from any preceding rule or model.
- The enhanced rule list view provides compressed, easy-to-read rules for readily identifiable logic definitions.
- Full version control for entire decision flows simplifies testing.
- Decision flows are integrated with the enterprise decision management node for batch execution using SAS Data Integration Studio.

#### Impact analysis
- Comprehensive impact analysis for the entire operational decision flow makes it easier to assess dependencies associated with changing elements and conditions.
- The enhanced lineage viewer provides full visibility into the relationships between models, business rules and operational data used in decision flows, depicted in easy-to-read, linked graphics.
- Visual and tabular depictions detail how elements are used in different rule sets.

#### Machine-generated business rules
- Wizard-driven system allows a selection of analytical methods to discover business rules from operational data.
- You can choose the algorithm for business rule discovery from decision trees, market basket analysis, scorecard creation and from recency, frequency and monetary (RFM) analysis.
- Group-by processing option further delineates business rule discovery within specific operational data segments.

#### Testing and governance
- **Business rules:**
  - Integrated with SAS workflow for guided and comprehensive traceability of rule versioning, supporting reviews, approvals, version locking, history and granular rule element controls.
  - Rule versions can be locked down or augmented.
  - Explicit and detailed rule-fire analysis can be used for testing, refinement and rule auditing documentation prior to operational deployment.
  - Rule tests, test suites and log details can be saved for documentation and reuse.
- **Deployment:**
  - Disciplined testing, change management, auditing and validation are available from one common environment.
  - Comprehensive lineage for impact analysis is written for entire decision flows.
  - Complete decision flows can be created from within the interface for both batch and real-time environments, simplifying IT integration and acceptance testing, as well as operational deployment.
  - Simplified IT testing for applications that call operational analytics as web services includes reporting and associated documentation and attachments, as well as user logs for audit history.
  - Multiple tables can be registered from the SAS Metadata Sever for SAS Decision Manager.
Improved content and access security
• Role-based security is available for creation, deletion, updates and publishing actions.
• Granular-level authorization can be used at the object level for business rule flows, business rule sets, vocabularies, entities, terms and lookup tables.
• Rule flows and versions can be automatically locked down by authorized personnel for better control and governance when it’s time to publish.

Enhanced vocabulary management
• Automated rule-to-term mapping includes type and domains from existing data dictionaries and tables.
• You can rename terms and choose what to include/exclude from the input and output.
• Vocabulary import includes support for all tables registered in SAS metadata, not just CSV.

Model inventory management
• SAS Factory Miner projects and models are directly accessible, registered as portfolios within the model management capabilities of SAS Decision Manager.
• The champion model designated by the data scientist or statistician is recognized distinctively from all the other models accessible to the business analyst.
• Published or republished SAS Factory Miner projects are automatically versioned.
• With model inventory management, you can import models from any code base, recognize them and then use them in a decision flow. This includes SAS/STAT software, SAS Enterprise Miner software, R, PMML and SAS Factory Miner models/projects, as well as any generic model (e.g., importing models from virtually any code base, which can be C, C++, Java, Python, etc.).

Simplified deployment
• Real-time deployment (via web services):
  • Micro analytic web service (MAS) provides an exceptionally fast, scalable mechanism for web service deployment.
  • With just three clicks from the decision builder interface, you can move complete decision flows into IT web service testing environments and even production deployment.
  • Supporting analytical scoring as a service, MAS execution operates in a self-contained and portable standalone architecture (with a minimal footprint), using in-memory threaded kernel processing for simplified integration with transactional systems, as well as IoT edge or in-stream computing.
• Batch deployment:
  • With SAS Data Integration (included with the product), you can schedule decision flow jobs to run at optimal times – that is, times that are most economical and effective for your organization.
• In-database deployment:
  • Based on the SAS embedded process technology, processing occurs where the data resides – so you can execute business rules and analytical model scoring without moving the data.
  • Deployment of business rules and related analytical models in Hadoop distributions is supported, which transforms data lakes into functional IT testing and implementation environments for prescriptive decision actions.
    • Extended support is included for the following Hadoop environments: Cloudera, Hortonworks, MapR, Pivotal and BigInsights.
  • In-database rule execution is supported for Hadoop, Teradata Enterprise Data Warehouse, Teradata Aster, Greenplum and SAP HANA. Model execution is supported for these platforms as well as IBM DB2, IBM Netezza, Oracle and SAS Scalable Performance Data Server.