Equifax InterConnect is a secure, cloud-based decision management platform for defining and executing decision policies at the front line. It provides a streamlined technology platform for developing powerful decisioning strategies based on easy accessibility to robust data and transparency in consumer acquisition.

Organizations make decisions that range from one-off strategic decisions through monthly and weekly tactical decisions to high-volume, high-speed front-line operational decisions. Increasingly these operational decisions need to be made in real-time across channels both automated and staffed. Especially when credit risk impacts these decisions, sophisticated analytics based on broad, up-to-date data, must be integrated into these decisions.

Consumer acquisition needs to be a cohesive, positive experience for consumers and for the IT and business stakeholders involved. Decisions need to be intelligently personalized in real time, at the moment of contact with the consumer or in automated responses. Policies, regulations and data must all be effectively applied to ensure the best decision possible is being made. Rising consumer expectations and fast-moving markets mean that organizations need an effective platform for managing, improving and evolving automated decisions - a decision management platform.

Equifax InterConnect is a robust, end-to-end decision management solution comprised of four independent tools for orchestrating access to diverse data sources, customizing the attributes used in decisioning, integrating and deploying sophisticated analytic models and managing the business rules at the heart of your operational decisions.
Introducing Decision Management Systems

Decision Management Systems are agile, analytic and adaptive. They are agile so they can be rapidly changed to cope with new regulations or business conditions. They are analytic, putting an organization’s data to work and improving the quality and effectiveness of decisions. They are adaptive, learning from what works and what does not work to continuously improve over time.

Decision Management Systems improve profitability (lower costs, less fraud, better results), increase compliance (with policies and regulations) and deliver more precise and effective risk management. They offer organizations the ability to deliver 1:1 marketing and personalized next best actions for consumers. These systems maximize the value of assets while focusing staff on higher-value decisions. They allow organizations to fundamentally change the staffing ratios at the heart of their businesses, all while delivering unprecedented business agility.

To build agile and adaptive systems that fully leverage “Big Data,” organizations need to adopt proven technologies tested and established in many industries, primarily business rules and predictive analytics. A Decision Management System integrates these technologies and deploys them as a Decision Service that can be consumed by business processes and LOB applications. Business rules handle policies, regulations, best practices and know-how. Predictive analytics predict risk, segmentation and propensity. Decision Services fit at the heart of an Enterprise Architecture as shown in Figure 1.

Building a Decision Management System involves:

- Managing decision logic for transparency and agility
- Embedding predictive analytics for analytical decision making
- Optimizing results given real-world trade-offs and simulating results
- Monitoring and improving decision making over time
Equifax InterConnect

Equifax InterConnect is a secure, cloud-based decision management platform with four main decisioning tools:

- **Insight Gateway** for streamlined transactional access to diverse data sources.
- **Attribute Navigator** for managing the data catalog and derived attributes.
- **Model Integration Tool** to integrate, audit and deploy predictive analytics.
- **Rules Editor** for managing decision logic.

Table 2. Key Features

<table>
<thead>
<tr>
<th>Key Capability</th>
<th>Value Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open and flexible cloud platform</td>
<td>Modular, cloud-based micro-services architecture deployed in Equifax’s multinational clouds to provide a secure, scalable, fault-tolerant, multi-tenant platform of decisioning services.</td>
</tr>
<tr>
<td>A unified, browser-based portal provides access to all tools</td>
<td>Flexible provisioning and a common, knowledge worker-friendly environment engage subject matter experts and reduce the need for IT resources.</td>
</tr>
<tr>
<td>Flexible and discoverable data provisioning based on JSON</td>
<td>Insight Gateway supports extensible, real-time access to global, local and client-specific data sources.</td>
</tr>
<tr>
<td>Pre-defined reporting for data and analytic compliance</td>
<td>The ability to generate reports and specifications for attributes, analytic models and business policy reduces the work of regulatory approval and compliance requirements.</td>
</tr>
<tr>
<td>Powerful browser-based business rule editing and management environment.</td>
<td>Based on Sparkling Logic, the Rules Editor supports in-situ exception editing, champion/challenger, impact analysis, simulation and rule inheritance.</td>
</tr>
<tr>
<td>Production and bureau data can be used for simulation and validation.</td>
<td>Users can run their own production data, or bureau data, through the attributes, models and business rules defined to see the impact of changes on a real dataset.</td>
</tr>
<tr>
<td>Broad range of analytic models can be integrated and deployed with the platform</td>
<td>Model Integration Tool’s knowledge-worker UI and strong PMML support from Software AG (formely Zementis) eliminate IT dependency when deploying analytics into production.</td>
</tr>
<tr>
<td>A catalog of data elements and derived attributes can be managed across multiple data sources.</td>
<td>Purchased and in-house data can be integrated and layers of third party sources can be defined by non-IT professionals allowing reuse and supporting pre-deployment sanity testing.</td>
</tr>
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</table>
Product Architecture

SaaS Architecture

Equifax InterConnect deploys a set of Restful services on a Platform as a Service (PaaS) layer. This allows developed services to run on the Equifax private cloud in multiple international geographies. It is highly scalable and resilient, providing a foundation for a modern microservices architecture.

Figure 3 shows the key elements of the InterConnect SaaS architecture:

- **IaaS** - an open layer that provides virtualized computing resources for the Equifax private cloud.
- **PaaS** - cloud-based Micro-Services to manage restful services developed using the InterConnect decisioning tools that connect to needed data services. Event processing to support replication and data services for database access.
- **SaaS** - The InterConnect Decisioning Tools wrapped in a configurable web portal.
InterConnect Decisioning Tools

There are four main elements to the platform, the InterConnect Decisioning Tools, that run in the SaaS layer and support the definition of a decision management system for deployment on the PaaS layer:

- Insight Gateway
- Attribute Navigator
- Model Integration Tool
- Rules Editor

All four are presented in a common role-based web portal, so only selected tools are exposed to users. This portal is gradually becoming the presentation layer for all Equifax services.

Insight Gateway

Insight Gateway gives real-time transactional access to data sources. This includes many standard data sources (such as Equifax’s own credit bureau data) as well as specific local data sources developed in each country. Each data service supports a set of data elements and publishes a data access API, a metadata API and a print image API. This ensures that each service is discoverable and self-describing.

Insight Gateway access is configurable through a Data Provisioning Tool that discovers available data services and allows the definition of conditional data service orchestration for real-time inquiries. Waterfall and conditional flow from a preferred data service to alternative data services can be defined. The environment supports default data handling like unavailable, error, invalid or no hit.

Taken together, this delivers a flexible microservices architecture that supports easy and rapid extension for new data sources. Some 20 US data sources are already supported while other countries have additional ones and new ones are continually being added.

Attribute Navigator

Attribute Navigator allows users to create a catalog and then refine the attributes to be included from available data sources. Additional attributes can be defined based on calculations and refinement of these base attributes. Custom attributes can be defined against multi-bureau data, third party data or an organization’s own data. This data does not have to be hosted by Equifax and can be behind the firewall. A hierarchical model is supported and a catalog can also be defined for the payload - the data provided to the attribute calculation microservice.

Attribute Navigator supports pre-defined libraries of attributes (a generic, reusable project) and uses a simplified scripting language to define the attributes. Projects and catalogs can be validated and an analysis feature allows for a sanity test.
whereby the user can load JSON data file and see the results for calculated and derived attributes. Compliance and audit reports can be generated for the project and it can be generated and deployed into production.

**Model Integration Tool**

Model Integration Tool is focused on analytic professionals and walks through the integration of SAS, SPSS or R models. This allows teams to integrate, audit and deploy predictive analytic models. Attributes from the Catalog are mapped to the model, allowing the model to be audited and tested against defined attributes. Scorecards, decision trees and fusion models that can include multiple models as inputs, as well as other ensemble models are supported. Scorecard details, bins and reason/reject codes can all be added directly (or imported if they are already defined) as the model is integrated (see Figure 4).

**Figure 4. Model Integration Tool User Interface**

Once the walk through is complete and the model audit is validated, Model Integration Tool generates PMML (based on PMML 4.2) ready for execution in the platform as well as a specification document for compliance and governance. This generated PMML, or other PMML models, can be executed in the InterConnect platform using the well-known Zementis engines from Software AG (both ADAPA for cloud deployment and the Hadoop plugin).
Rules Editor

Rules Editor is based on the modern business rules platform Sparkling Logic SMARTS. This provides a data-driven rule editor with authoring, visualization, testing and simulation all in one interface (see Figure 5). The Rules Editor workspace supports role-based access and allows work to be divided into many projects each with multiple decisions within them. These decisions or projects are deployable as releases, creating a single decision service with multiple decisions and a single data interface.

Strong collaboration tools as well as tagging and saved searches make it easy for multiple authors to work together on rules. Rules Editor provides fluid rule authoring so rules can be viewed and edited as decision tables, decision trees, graphics and text. Sets of business rules can cascade, allowing for inheritance and specialization. Champion/challenger and A/B testing can all be defined and tested in-situ.

All rule editing is done with live data in the user interface, providing continuous feedback on rule outcomes as rules are edited and allowing exception handling to be added directly when an exception is identified. Rule validation and verification as well as testing and simulation are integrated into the editors.

Figure 5. Rule Editor User Interface
Standard Approach

Figure 6 shows how these four tools can be used to develop decisioning applications. In this case, the example is acquisition-acceptance of a consumer application.

The elements come together to make an approval decision in real-time:

- Insight Gateway connects to the data sources that will be used to validate and process the consumer’s application. These might be Equifax, third-party or organization data.

- Attribute Navigator defines the custom attributes that will help categorize and assess the consumer’s risk.

- Model Integration tool applies analytic insight, bring risk models into the decisioning to make data-driven assessments of the consumer.

- Rules Editor defines the rules that will use the consumer provided information, additional retrieved data, custom attributes and analytic scores to determine if the consumer’s application can be accepted and to extend a compelling offer.

All this is packaged up and deployed as a decision service in support of an organization’s new or existing processes or systems.
Key Features

Equifax InterConnect is an open and flexible cloud platform for defining and executing decision policies at the front line. It delivers robust data, powerful decisioning and streamlined technology through a unified, browser-based portal. A wide range of data can be integrated with the platform thanks to a flexible and discoverable data provisioning environment. A catalog of data elements and derived attributes can be managed across these multiple data sources.

This data can be used to power a broad range of analytic models that can be developed in third party tools and easily integrated, audited and deployed with the platform. Data and analytic insight can be combined with business rules to create decision services using a powerful business rule editing and management environment. Throughout, production and bureau data can be used for simulation and validation and pre-defined reporting is provided for data and analytic compliance.

Open and flexible cloud platform

Equifax InterConnect is a cloud-centric platform for decision management. The use of microservices architecture mean that independent and interoperable services developed using the InterConnect decisioning tools can be arranged and coordinated to develop a rich set of decisioning solutions. These solutions can be deployed to Equifax’s multinational clouds to provide a secure, scalable, fault-tolerant, multi-tenant platform that can be distributed across multiple data centers with support for replication.

The InterConnect platform also offers strong logging and monitoring, support for multi-tenant deployment (for multiple countries or lines of business, for instance) and allows shared and local services to coexist.

Unified, browser-based portal

Decision Management Systems require a mix of different elements - to access data, derive complex attributes from that data, create analytic insight and manage business rules or decision logic. All these elements must come together in a final solution. Users of InterConnect develop the elements of a solution as interoperable services using a set of decisioning tools (described above) and deploy these services to an open and flexible cloud platform.

To ensure that these individual tools can be used effectively as a set, InterConnect offers a unified portal for access to all the InterConnect applications, shown in Figure 7. This provides a common environment for defining data source access, attributes, analytic models, business rules and more inside the configurable Equifax Access Point portal. This is designed for use by knowledge workers, reducing the need for IT/Dev resources. The portal supports role-based access definition, allowing each user to see only the applications they are working with. Recent
updates and other information keep users up to date as the applications evolve and
the whole environment is browser-based, avoiding the need to install or manage
client software.

Flexible and discoverable data provisioning
Equifax provides a rich set of data to its clients. Its clients regularly use this data in
conjunction with data purchased from third parties and data internal to each
client. The InterConnect platform ensures that all decisioning applications
developed on it can access the widest possible range of data. The data discovery
and provisioning of Insight Gateway is extremely flexible and powerful. It supports
the development of fully discoverable data services on a SaaS platform. This allows
Equifax to develop standard data services for its global data offerings and for
standard third party providers, allows in-country teams to develop services for local
data sources and supports clients in developing data services for their own, internal
data - even if this is behind the firewall. Insight Gateway leverages all Equifax’s
experience with its own consumer, commercial, fraud, employment, wealth and
alternative data as well as with 3rd party data sources to deliver real time access
to global, local and client-specific data sources.
Each data microservice publishes a Data Access API, a Meta Data API and a Print Image API. As shown in Figure 8, each new data service first registered. This allows its meta data to be discovered by the Data Provisioning tool so that its data access API can be queried for data. When the data service is deployed in the Insight Gateway, this data access API is used to execute data requests against the service.

JSON is used throughout to maximize the flexibility of the developed services and to keep the integration as lightweight as possible. Orchestrated and waterfall access can define a primary and back up sources of important data to ensure high availability of the decisioning applications that rely on the data.

Managed catalog of data elements and derived attributes

Managing the data being used in a decisioning application is often complex. Multiple sources of data must be combined to produce a rich picture of a consumer. Analytic models require calculated or derived attributes, characteristics, to make effective predictions. The applications and processes that rely on the decisioning application have their own data from which they must create the payload for the decision service.

The InterConnect platform has a powerful and user friendly data and attribute management capability, Attribute Navigator. Business users can define a set of hierarchical catalogs each containing defined attributes. These can be populated from any of the data sources connected through Insight Gateway or from a defined payload. Standard definitions exist for data available from multiple credit bureaus (tri-bureau data) and standard libraries of pre-defined attributes are provided to make it easy to get started quickly. Once created, these hierarchical catalogs can be shared and reused.

Once the basic data has been mapped, additional attributes can be defined that are calculated or derived from this data. For instance, the number of times something shows up in a credit record can be calculated or whether a consumer meets a specific criteria checked. These calculations are stored with the attribute and can also be reused, allowing this derived data to be seamlessly and consistently integrated into multiple decisioning solutions.

The catalogs can be validated, to make sure all calculations make technical sense, and sanity tested using small samples of data loaded from the data sources before being deployed to test or production environments. The use of proprietary, third party and a client’s own data is completely transparent in the catalogs, making it easier to manage the range of data required by solutions developed on InterConnect.
The attributes can be referenced in analytic models loaded through Model Integration Tool. The Spring integration allows the attributes in these catalogs to be delivered to analytic models and business rules in production but in the future the catalogs will be more completely integrated so that analytic models and business rules are defined against the same catalogs.

Attribute Navigator allows non-IT professionals to manage the integration and extension of purchased and in house data as well as potentially multiple layers of third party sources.

**Analytic models can be integrated and deployed**

Any advanced decisioning solution needs to include analytic models, especially predictive analytic models. Whether developed using data mining, predictive analytic, data science or machine learning, analytic models must be deployed and integrated with a decisioning solution to add value. InterConnect’s Model Integration Tool offers two ways to bring advanced analytic models into solutions, both based on the open standard for advanced analytics - the Predictive Model Markup Language or PMML.

InterConnect embeds the Software AG (formerly Zementis) PMML execution engines. Both ADAPA, Software AG’s cloud solution for execution of PMML, and UPPI (the Universal PMML Plugin) for Hadoop are supported. This allows any analytic model that can be represented using PMML - which is almost every useful analytic model - to be executed as part of the InterConnect platform. Analytic models can be developed outside the InterConnect environment using R, Python, SAS, SPSS, or other tools and converted to PMML for execution. Model Integration Tool can be used to directly deploy the provided PMML into an acceptance environment for auditing and then into production. The attributes and characteristics used in the model are simply mapped to the attributes defined in the InterConnect platform to create analytic scoring services that can then be integrated using Spring.

Model Integration Tool also allows external models, such as scorecard regression models, decision trees or ensembles to be loaded into the environment. The tool walks a user through configuring the model type and properties, mapping it to the attribute catalog defined, setting up reason and reject codes (which can be imported from external sources), optionally defining scorecard features such as attribute bin ranges and contributing point values, and then running audits and checks to ensure everything is set up correctly. Once the user accepts the model, PMML is generated for deployment into the platform along with a reference model specification document.

**Powerful business rule editing and management**

The logic of a business decision is generally best described using business rules. InterConnect provides Rules Editor for managing this logic. Rules Editor is based on the modern rules platform provided by Sparkling Logic - SMARTS. This provides a social, collaborative environment in which all business rule editing is done in
context, using cases from real-data, and immediate visual feedback is provided on the impact of any changes made.

Users working in Rules Editor can see projects, groups, discussions, notifications, to dos, decisions and more. They can assign or share tasks, collaborate, apply tags and create saved searches to maximize the effectiveness of a combined business/IT development team.

Business rules can be edited using any of the standard metaphors - decision tables, decision trees, decision graphs or text. Each decision can be switched between metaphors without any loss of detail. The rules are validated and verified as they are edited to prevent inconsistencies, gaps etc. Metrics and real-world datasets are associated with each project. Dashboards displaying these metrics, showing acceptance or fraud detection rates for instance, are constantly updated against the datasets as rules are edited to provide immediate visual feedback.

The real or example data can be viewed in a form-like environment also to see how the rules apply to a specific transaction. As the user reviews each case in the form it can be edited and the new results reviewed. Rule changes can be made too, allowing exception handling or updates to be added with a clear sense of which fields are involved. Similarly, the underlying vocabulary can be edited and managed as the rules are being edited.

Decisions defined in Rules Editor can be extended or specialized as necessary. For instance, location or line of business specific decision-making could be added to extend or override a base decision-making approach. Changes are tracked and can be compared while unchanged pieces can be further inherited or changed at a more granular level. This maximizes reuse while allowing for specificity where required.

**Simulation and validation with production and bureau data**

Impact analysis and simulation is supported throughout the environment. Attribute Navigator allows the sanity testing of defined attributes using data loaded through the data services defined in Insight Gateway. Third party, proprietary and internal data can all be transparently mixed and matched in this process to ensure that the attributes used in decision-making are as expected. Production data can also be run through analytic models also to see how scores are distributed and to make sure that the analytic models will also work as expected.

Rules Editor continually simulates and validates all the business rules against associated data sets, allowing those editing the rules to see exactly how their rules are likely to perform. Rules Editor also offers built in support for champion-challenger and A/B testing. Experiments can be defined for any part of a decision, any group of rules, and any number of alternatives can be defined. A set of experiments can then define which alternative should be used when. Experiments can be run as simulations using the datasets associated with the project and then can be deployed into production where they generate enough data to allow experimental results to be compared.
Pre-defined reporting for data and analytic compliance

InterConnect is widely used in environments where data and analytic compliance are critical. If a decision is regulated, then regulators may demand to know what data is being used and how it is being used to ensure that regulations are being compliance with.

InterConnect offers a rich set of tools for data and analytic compliance. Attribute Navigator can generate reports and specifications for all the attributes defined in a catalog so it is completely clear what data is being used in the decision. Model Integration Tool generates documentation of the analytic models that can be presented to get regulatory approval and used to meet compliance requirements. These reports ensure complete transparency for the attributes and scores used and the execution of business rules on the platform generates a complete log of every rule that fires for every transaction, allowing the exact approach used to make each decision to be individually recorded and presented for review if necessary.

Availability

Equifax InterConnect is available in a variety of packages:

- Flex - Configurable decisioning applications for mid-market or vertical market solutions based on the InterConnect platform with limited configuration options.

- Select - Fully customizable solutions including custom capabilities and configuring the standard InterConnect tools by Equifax services to meet the unique, complex needs of the business.

- Access - For customers who have the need and expertise, the InterConnect tools can be accessed via the Equifax Access Point portal to develop or manage components of their solution, such as managing their rules based strategy with Rules Editor.

InterConnect is available in multiple geographies including the US, Canada, UK, Spain, Peru, and Chile. Argentina, Paraguay, Uruguay, Mexico, Australia and India are expected to be added in the future.

Future development plans include but are not limited to:

- Integration of the attribute catalog throughout the development lifecycle, including in the Model Integration Tool.

- Support for additional analytic model types and upgraded governance and release management for models.

- Increase capabilities in the customer life cycle beyond initial acquisition to address customer portfolio management needs.

- Providing customers with access to a broader set of data sources.
Conclusion

Equifax InterConnect builds on Equifax’s strength in data services to deliver a flexible, scalable, cloud-based platform for customer acquisition decisioning. A set of integrated and browser-based decisioning tools allow the definition and management of business rules as well as the integration and deployment of predictive analytics. A flexible microservices architecture is particularly well used to enable flexible and robust data access, allowing the decisioning solutions developed to leverage a wide range of Equifax, customer and third party data sources. Strong attribute management, support for compliance reporting and intelligent use of data for simulation and testing all enhance the platform.

Equifax has been developing and supporting decision management systems for many years and has leveraged this experience and some well-chosen partnerships to deliver a robust decisioning solution.

Works cited


CONTACT US

Decision Management Solutions specializes in helping organizations build decision-centric, action-oriented systems and processes using decision management, business rules and advanced analytic technologies.

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