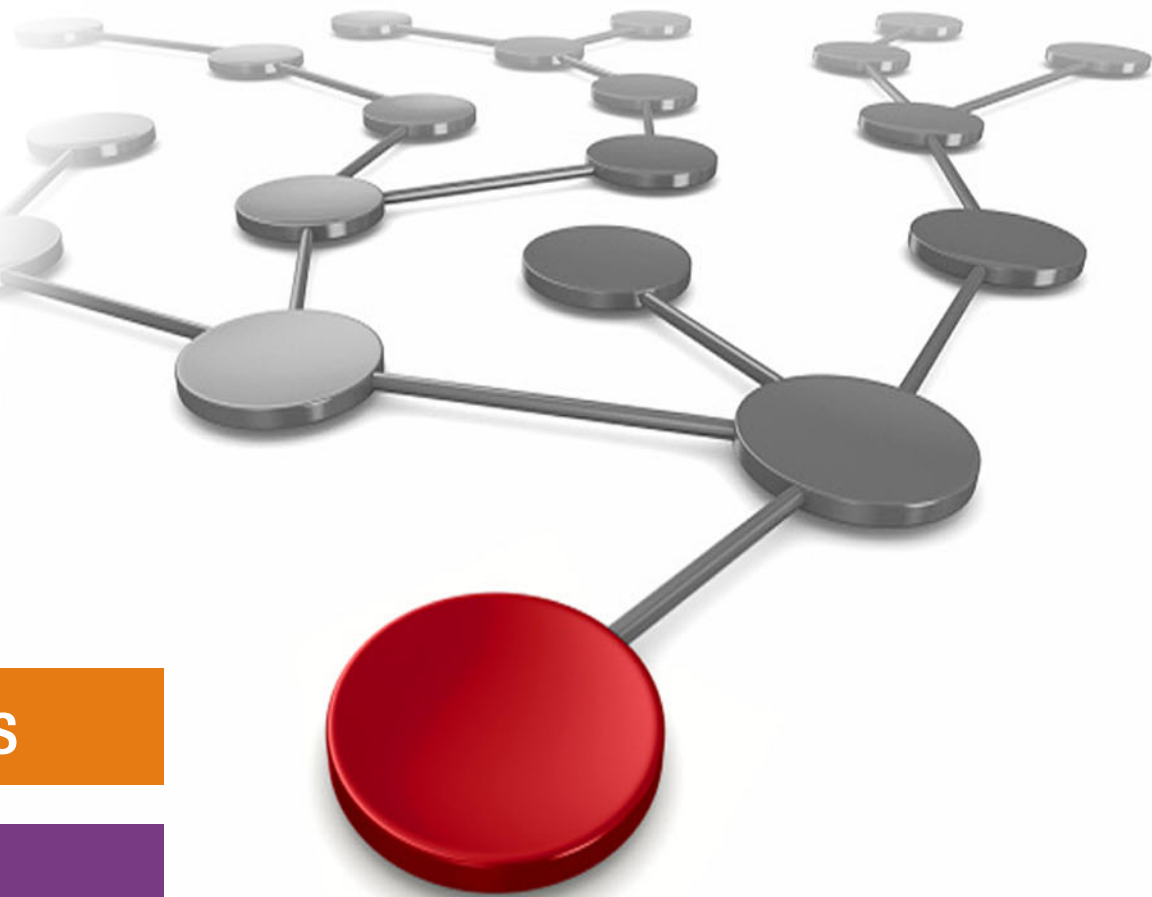


Systems of Insight Overview

Hector H. Diaz Lopez



 **Analytics**

Big Data

Systems of Insight Overview

Decision making is a critical function in any enterprise. The quality of decisions has a significant impact towards the success or failure of the business. Decisions based on knowledge, experience, and sound logic have a much higher probability of delivering success. Analytics is all about improving the quality of decisions by gathering, filtering, transforming, analyzing, and mining data to gain sound knowledge and insight in to trends, patterns, and anomalies based on past experience, and applying this insight and logic to the decision-making process. The decision-making process that is enhanced by analytics can be described as consuming and collecting data, detecting relationships and patterns, applying sophisticated analysis techniques, reporting, and automation of the follow-on action. The IT systems that support decision making are composed of the traditional “systems of record”, “systems of engagement”, and the “systems of insight”. See Figure 1.

This IBM® Redbooks® Solution Guide introduces the concept of systems of insight based on what is detailed in the IBM Redbooks publication “Systems of Insight for Digital Transformation,” SG24-8293, found at:

<http://www.redbooks.ibm.com/redpieces/abstracts/sg248293.html?0pen>

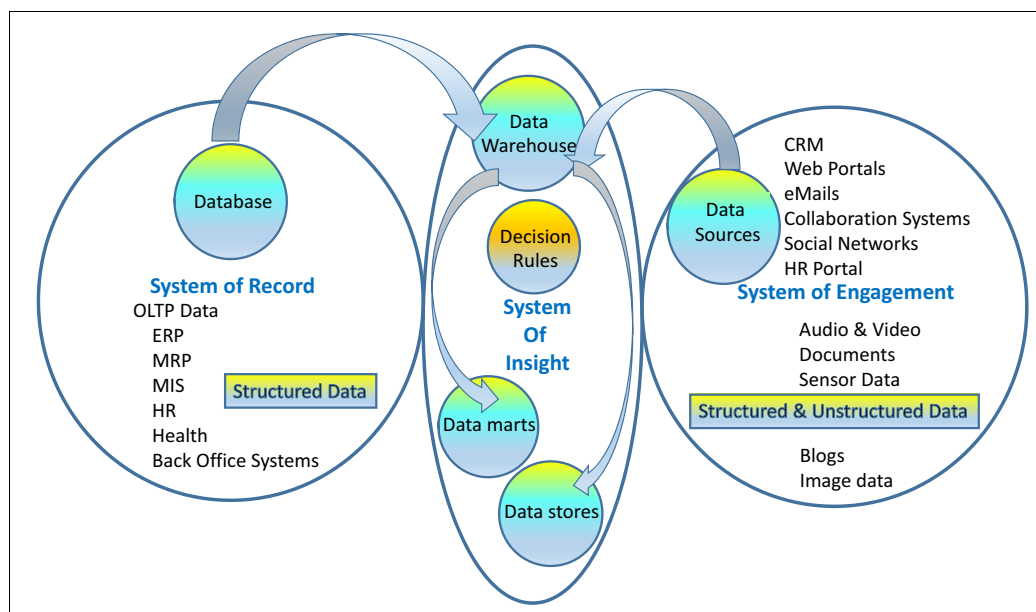


Figure 1 Decision making with systems of record, systems of engagement, and systems of insight

Now, in most enterprises, decisions are based on the information provided by the systems of record and systems of engagement. Systems of insight bring the data in systems of record and systems of engagement together, analyze it, apply business policies and rules to the combined data, derive insight, and make recommendations to improve the quality of decisions.

Did you know?

Every day, quintillion bytes of data are created. Most of the data in the world today was created in the last two years alone. This data comes from sensors used to gather climate information, posts to social media sites, digital pictures and videos, purchase records, and cell phone GPS signals to name a few. How can an organization bring value from all this data during and after it is being consumed and collected. What type of decisions must be made to prevent chaos in organizations? Or, how do we know that we are not missing taking some actions proactively to prevent losses?

Organizations cannot rely on their existing systems of record and systems of engagement solely. They must be able to implement an efficient system of insight.

Business value

Taking decisions at the correct time is one of the biggest challenges organizations are facing these days. The amount of data that is ready to be analyzed is growing every second, minute, hour, days, or years. We are not only talking about data in rest waiting to be analyzed, but also data in motion coming from different sources such as social media or Internet-connected devices.

How can organizations use all this data to address their decisions needed to create better products or increase their profits? What type of decisions are required to accomplish these goals?

- ▶ Strategic decisions taken at the highest level of the organization and usually based on historical data analysis or reports.
- ▶ Tactical decisions based on data mining to identify patterns, which can be compared against key performance indicators to analyze results.
- ▶ Operational decisions focused on granular transactions to define specific behavior during the transactional operation of every business.

A system of insight is able to support organizations in the decision-making process helping them to identify patterns in near real time from all types of data (data in rest and data in motion).

A system of insight enhances the decision-making process with different ways of collected data analysis, which can be in the following forms:

- ▶ Descriptive analytics
- ▶ Predictive analytics
- ▶ Real-time analytics
- ▶ Prescriptive analytics
- ▶ Cognitive analytics

Organizations can use systems of insight to remain operating in efficient and profitable ways to differentiate themselves from their competitors.

Solution overview

Systems of insight integrate data in the systems of engagement and systems of records to find new relationships and patterns by analyzing historical data, assessing current situation, applying business rules, predicting outcomes, and proposing the next best action. Systems of insight are analysis systems that facilitate gathering, mining, organizing, transforming, consuming, and analyzing diverse sets of data with statistical modeling tools to detect patterns, report on what has happened, predict outcomes with a high degree of confidence, apply business rules and policies, and provide actionable insight.

Systems of insight require a cross-functional model for converging and analyzing the data from systems of record and systems of engagement. Systems of insight allows businesses to employ new and sophisticated analytic technologies to the data far beyond the old ways where data from systems of record and systems of engagement were examined separately for retroactive decision making.

Systems of insight begin where data is collected and stored or where a transaction creates a record or a stream of records. These data and records are usually retained and provided by the traditional systems of records and systems of engagement. It supports the entire decision-making process and ends with input to the Action phase. These inputs range from simple alerts to execution commands automatically sent to a system that is capable of executing an action.

Figure 2 shows the building blocks of a system of insight.

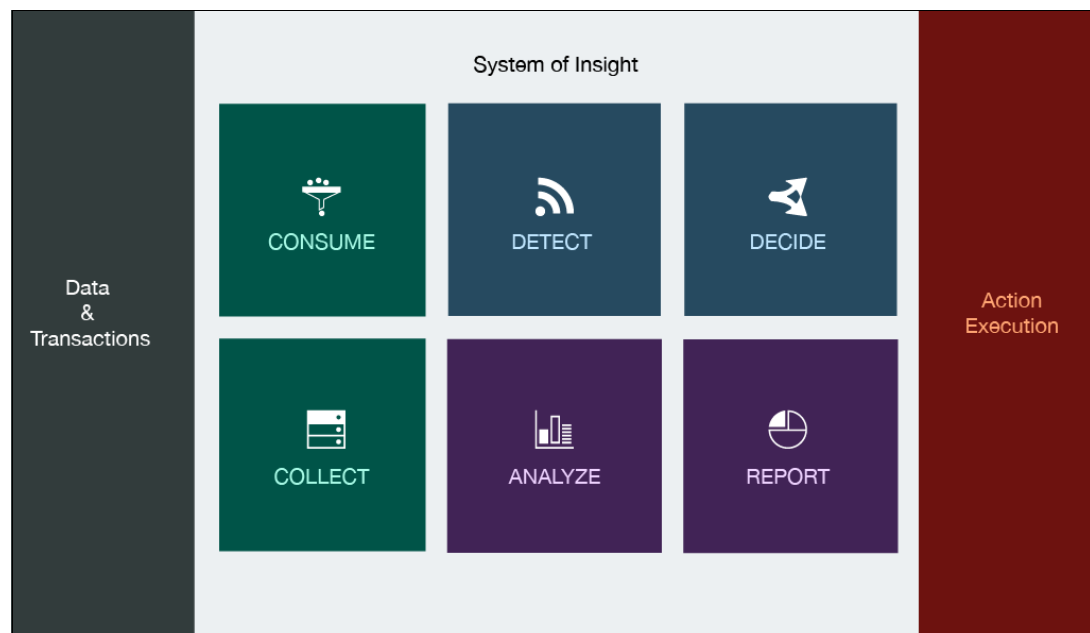


Figure 2 System of insight building block

The system of insight capability model includes the following components:

- ▶ Consume: Ability to ingest structure, unstructured, and transactional data in the form of events.
- ▶ Collect: Ability to collect data for business analytics to gain new insights and drive better business decisions.

- ▶ **Analyze:** Ability to perform analysis of data to answer questions such as why it happened, what is the trend, what happens next. Analysis helps to generate insights that can improve quality of business decisions.
- ▶ **Report:** Ability to see what happened, how many times, and so on. It includes querying, batch, and real-time reporting.
- ▶ **Detect:** Ability to identify a situation based on certain patterns using correlation with things that have or are happening to determine when to decide.
- ▶ **Decide:** Ability to implement logic associated to business policies to dictate how to deal with certain situations. Business policies can be derived from the results of analysis, company best practices, or the need to adhere to industry regulations.

For more information about these capabilities, see Chapter 3 of *Systems of Insight for Digital Transformation*, SG24-8293.

Solution architecture

From a system of insight perspective, we consider that there is not a single solution architecture. The main reason is because as we have described in our model, there are multiple capabilities that can be mixed together to provide a complete system of insight solution.

From a high-level architecture perspective, we identify different type of solutions, described here, with a brief description of what these patterns cover.

Real-time solutions

We describe real-time solutions as those that provide analytic or deterministic actions in response to what is currently happening.

For clarity, in this section “real-time” is used to describe actions taken within a few seconds after the detection of a situation, sometimes referred to as *human-real-time*, where the reaction time is imperceptible to a human or is dominated by the time it takes a person to interact.

We identify multiple patterns applicable to real-time solutions:

- ▶ *Event-driven situation detection:* Mainly concerned with detection of situations based on received events from multiple sources. This category of technology solution is sometimes referred to as *complex-event processing* (CEP) or *business-event processing* (BEP).
- ▶ *Decision automation:* This pattern can include deterministic and analytical decisions across multiple use cases such as pricing, eligibility, validation among others across all industries. Decision automation relies in the implementation of decision services, which encapsulate all decisions in the format of business rules.
- ▶ *Business activity monitoring:* Focuses on monitoring and visualizing the operation of a business. Typically, it is realized through the correlation of events from a system (often multiple systems) to determine a real-time status of a business process.
- ▶ *Stream processing:* Pattern based on stream computing, which continuously aggregates and analyzes data in motion to deliver real-time analytics. This capability enables organizations to detect risks and opportunities in high-velocity data, which can only be detected and acted on at a moment’s notice. High-velocity data from real-time sources, such as market data, unstructured data, Internet of Things, mobile, sensors, click stream, and even transactions are common targets for stream-processing.

- *Next best action*: Patterns that strive to answer the question “What is the best course of action given the current knowledge about a customer?”. This is often applied in call-center operations where a recommended action can be provided to a call-center agent for offering to improve customer satisfaction. The background about the customer comes from their profile, interaction history, and can even include speech and tone analytics. This technology is also in use to make highly customized product recommendations.
- *Advanced patterns*: Cases where multiple patterns apply to a single solution. Figure 3 illustrates an advanced pattern where situation detection is extended with other capabilities to provide continuous insight.

The diagram represents an event-driven architecture with events coming from many heterogeneous event sources; message transformation is handled by the integration layer. Some event streams are pre-processed through the streaming analytics component before passing events on to the situation detection component. The Scoring and Decision Service components are used during situation detection to perform more complex decision logic. Finally, the Business Activity Monitoring component is configured to listen to all events of interest that pass through the system of insight and provides reports and dashboards.

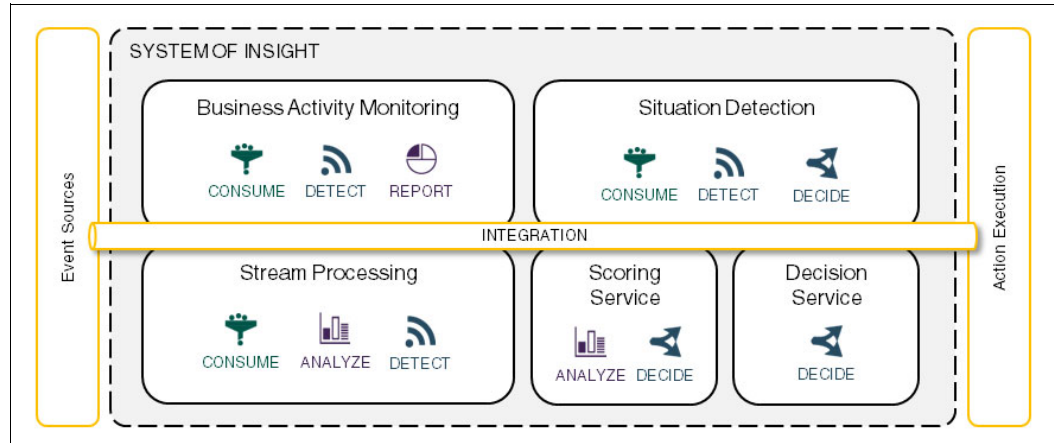


Figure 3 Continuous insight through an advanced situation detection solution

Retroactive solutions

Refer to scenarios where computational constraints might require different use of human and analytic insight to respond to a situation that has occurred in the past and cannot be detected any earlier.

The following patterns are applicable to retroactive solutions:

- *Manual analytic investigations*: This class of action relates to the application of analytics in a user-driven context, where an analyst uses numerous analytics tools to perform investigative work to test a hypothesis or respond to uncertainty.
- *Big Data analytics*: Big Data analytics platforms such as Apache Hadoop and Apache Spark allow for efficient analytics of large structured and unstructured data sets. This is achieved through high-levels of parallel processing across many distributed systems. Figure 4 on page 6 shows how actionable insights are the result of the collection, analysis, and decision making through a Big Data solution.

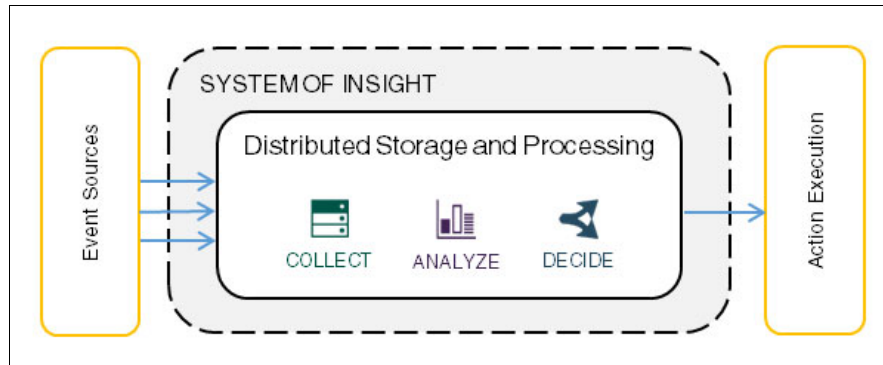


Figure 4 Big Data analytics as a system of insight

Although usually restricted to analysis of static data sets, Big Data analytics can be combined with other real-time analytic techniques, such as stream-based processing to extend the computation to data in motion too.

Proactive solutions

Describe classes of systems where the insight is anticipatory of a future occurrence.

The following patterns are applicable to proactive solutions:

- Predictive analytics: Solutions where a commonly automated action is to expose a predictive model through a scoring service. The scoring service might be invoked through a system of engagement (such as a business process and portal), batch process, or an event-driven solution like IBM Decision Server Insights. Figure 5 represents this connection between the analytical modeling and scoring service.

Typical scoring services compute a segmentation score, churn scores, risk scores, or propensity scores. For example, to answer questions of the form “What is the likelihood that...?” or “With what certainty will...?”.

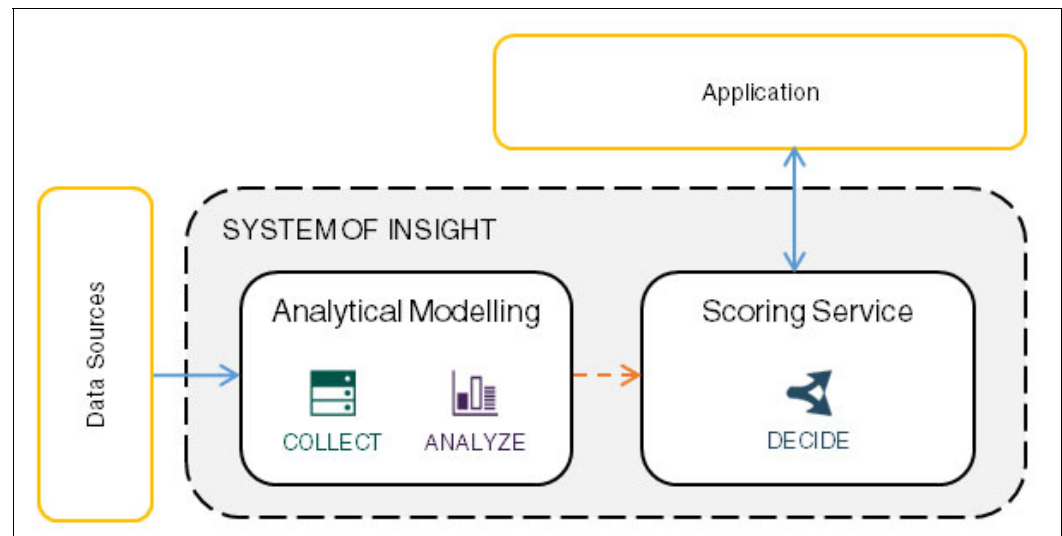


Figure 5 Predictive analytics as a system of insight

- ▶ Prescriptive analytics: Two common implementations of prescriptive analytics are mathematical optimization and machine learning.

With optimization software, a solution aims to find an optimal set of outcomes for a given situation. From a systems of insight perspective, the optimization becomes actionable when it is used to inform business decisions or as part of system design.

Usage scenarios

There are multiple scenarios where a system of insight can be used. The following list describes some business use cases:

- ▶ Banking

- Fraud detection in real time: Systems of insight can calculate a “score” and apply business rules to the transaction and determine the probability of the transaction being fraudulent. Further investigation or action can then be taken based on business requirements. Where necessary, the identification can be done in real time to prevent the fraud.
- Anti-money laundering analytics: Systems of insight specifically designed for this purpose helps reduce exposure to money laundering and terrorism activities. The systems of insight solution can effectively monitor customer transactions on a daily basis, and using customers’ historical information and account profile can provide an enterprise-wide picture of money laundering and other adverse activities.

- ▶ Insurance

Insurance claims fraud detection: During claims intake, systems of insight solutions designed to collect and analyze streaming data, such as social media posts or geospatial data, can help insurers discover fraud for example, whether policyholders are being honest about accident details or if services rendered are legitimate. Also, the predictive analytics component of systems of insight can help categorize risk and deliver fraud propensity scores to claim intake specialists in real time so they can adjust their queries and route suspicious claims to investigators. Systems of insight can also perform analysis of fraudulent claims and their impact on the business through reports and visualizations of data patterns.

- ▶ Energy and Utilities

Asset management and preventive maintenance for transmission and distribution equipment: Systems of insight, through analytics and visualization can improve situational awareness through which utilities can better understand factors affecting asset performance and more accurately project the remaining useful life of the asset or what other points in the grid are susceptible to outages. When integrated with an Asset Management solution, such as IBM Maximo®, systems of insight can use the historical equipment performance, repair and lifespan data to predict potential component failures to initiate preventive maintenance actions.

- ▶ Retail

- Customer behavioral intelligence: Cross selling and up selling: Systems of insight can analyze business data and social feeds, such as social networks, customer service interactions, web click stream data to predict potential customer behavior and preferences and determine the next best action that could include upselling, cross selling, or highly targeted promotions.

- Social media and sentiment analytics: Systems of insight can analyze public sentiment the results of which retail business can use to customize incentives, promotions, and offerings. IBM has advanced analytics solutions that can track spread of trends geographically, chronologically, and culturally. One such example is the IBM “Birth of a Trend” project that is a unique effort dedicated to understanding the science behind predicting online trends that can revolutionize an industry. By studying how online trends spread globally, IBM provides deep insights into whether the trending on social networks is, or is likely to become, commercially viable.
- ▶ Manufacturing process
 - Supply chain management and optimization: Today’s supply chains are global, interconnected, fast, and lean. That also means the supply chains are vulnerable to shocks and disruptions from various sources around the world. Systems of insight with advanced analytics and modeling capabilities can help decision makers evaluate alternatives against the incredibly complex and dynamic set of risks and constraints and make the best decisions possible. The highly complex global supply chain management of IBM heavily relies on systems of insight based on IBM advanced analytics solutions.
 - Asset management and preventive maintenance for manufacturing equipment: Systems of insight can complement asset management solutions, such as IBM Maximo to reduce unplanned downtime, and improve asset performance and efficiency. Using advanced analytics systems of insight can analyze structured and unstructured data including equipment history, sensor data, maintenance records, external data, such as weather and geographical data to predict potential failure of components or systems and feed the prediction in to the asset management solution to schedule preventive maintenance. The needed spare parts and skilled labor can be planned and managed based on the predictions.
- ▶ Government
 - Crime prediction and prevention: Systems of insight can integrate numerous data sources with structured and unstructured data to provide alerts in real time based on newly discovered patterns, variables, and event correlations for improved situational awareness. The discovered patterns are used to anticipate risks and identify potential repeat offenders. Depending on the identified risks proactively deploying resources for crime prevention, IBM SPSS® Crime Prediction and Prevention Solution is easy to use and a powerful solution for the police and law enforcement.
 - Fraud detection and prevention: Many federal agencies are faced with fraud in different forms. Systems of insight can calculate a “score” and apply business rules to the transaction and determine the probability of the transaction being fraudulent. Further investigation or action can then be taken based on business requirements.

Integration

Based on the system of insights model described in this solution guide, multiple capabilities need to be addressed to provide actionable insights. For this reason, we cannot talk about a single product that can cover all capabilities. Instead, we need to work with different products depending on the business use-case needs.

In this section, we provide a simple business scenario that was documented and implemented in Chapter 8 from *Systems of Insight for Digital Transformation*, SG24-8293.

The business scenario corresponds to an airline check-in application to demonstrate how a systems of insight solution helps an airline company to improve their customer satisfaction during the check-in process and the system ability to predict if a passenger or group (for example, a family) is able to board their flight on time.

Customers can check in to their flights in multiple ways (that is, mobile phone, kiosk, or bag-drop desk). At the moment of checking in, the system uses information about the security check-point queues to determine if the customer has enough time to get to the departure gate or not.

Actionable events exit the system as actions to alert passengers, or trigger additional business processes, for example, to reschedule a booking.

Figure 6 shows the integration between components and protocols used to communicate between them.

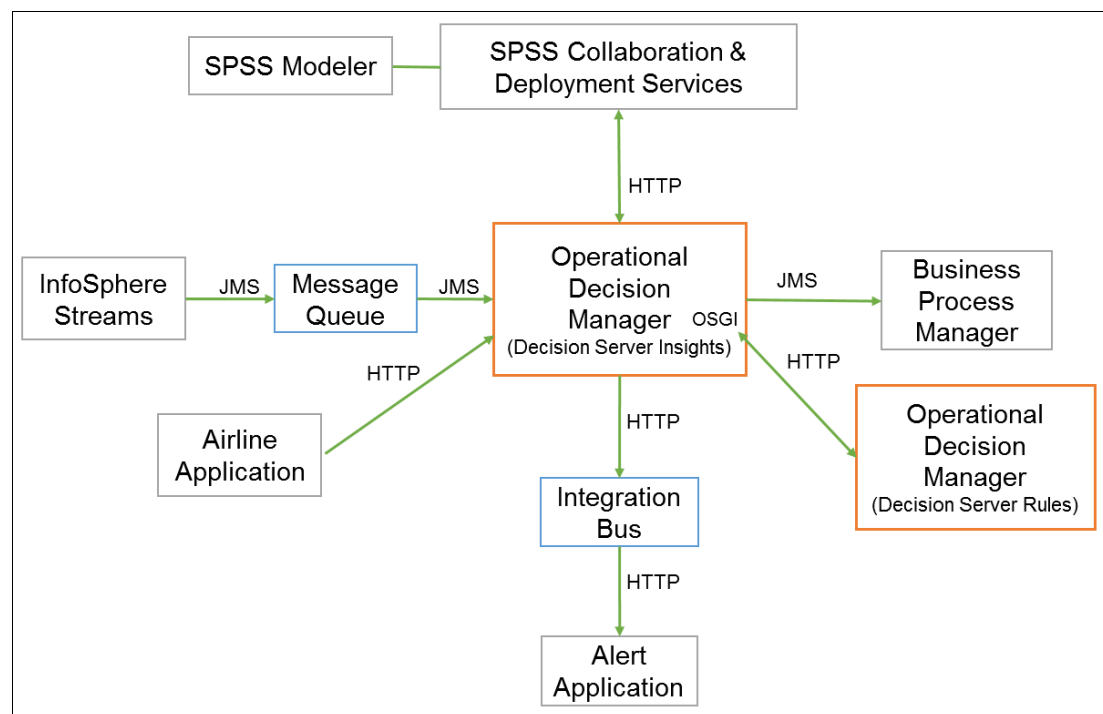


Figure 6 System of insight sample scenario architecture

In this scenario, Decision Server Insights (DSI) is used to manage the events coming from two main sources through JMS and HTTP protocol connectors:

- IBM InfoSphere® Streams: Monitors the video streams from the security check point queues and sends derived events with information about the depth of these queues to a WebSphere MQ queue.
- Airline application: Sends events that are related to the passenger check-in and bag-drop at the ticket counter using an HTTP endpoint.

The system needs to predict the length of time that a passenger requires to get to their gate. For this prediction, a call to SPSS Scoring service is used, with parameters of queue depths, type of passenger, and current passenger location. The scoring service then uses a predictive model to determine the length of time that is required to get to the gate in the current conditions. Connectivity between DSI and SPSS Scoring service is through a Predictive Agent, which is built in DSI.

DSI compares time to gate with the flight departure time, and where passengers will be late, it requests a decision from Decision Server Rules (DSR) to recommend an action based on the passenger's loyalty status.

Based on this decision, DSI takes actions through different channels:

- ▶ Trigger a reschedule process through BPM (automated or manual).
- ▶ Send notifications to an alerting application with JMS messages through IBM Integration Bus.

A step-by-step guide about how to implement a previously described solution, see Chapter 8 of *Systems of Insight for Digital Transformation*, SG24-8293.

Supported platforms

IBM products described in the Integration section support multiple operating systems. Details might vary from product to product, but in general they include IBM AIX®, Linux, Linux on IBM z™ Systems, and Microsoft Windows.

For the latest information about supported operating systems and prerequisites, see the product-specific system requirements websites at the following links:

- ▶ IBM Business Process Manager Standard detailed system requirements:
<http://www.ibm.com/support/docview.wss?uid=swg27023007>
- ▶ IBM Integration Bus system requirements
<http://www.ibm.com/support/docview.wss?uid=swg27038798>
- ▶ InfoSphere Streams system requirements
<http://www.ibm.com/support/docview.wss?uid=swg27036140>
- ▶ IBM Operational Decision Manager detailed system requirements
<http://www.ibm.com/support/docview.wss?uid=swg27023067>
- ▶ SPSS Collaboration and Deployment Services (search for the product in the following link)
<http://www.ibm.com/software/reports/compatibility/clarity/softwareReqsForProduct.html>
- ▶ SPSS Modeler detailed system requirements (search for the product in the following link)
<http://www.ibm.com/software/reports/compatibility/clarity/softwareReqsForProduct.html>

Ordering information

Table 1 shows the ordering information of various products that can be included in a systems of insight solution.

Table 1 Ordering information

Program name	Program number	Version
IBM Business Process Manager	5725-C94 5725-C95 5725-C96 5725-C97	8.5
IBM Integration Bus	5724-J05 5725-B71 5725-B72	9.0
InfoSphere Streams	5724-Y95	4.0
IBM Operational Decision Manager	5725-B69	8.7.1
SPSS Collaboration and Deployment Services	5725-A72	7.0
SPSS Modeler	5725-A64 5725-A65 5725-L19 5725-M48 5725-M49	17.0

Related information

For more information, see the following documents:

- ▶ IBM Offering Information page (to search on announcement letters, sales manuals, or both):
http://www.ibm.com/common/ssi/index.wss?request_locale=en
On this page, enter systems of insight, select the information type, and then click Search. On the next page, narrow your search results by geography and language.
- ▶ IBM Redbooks publication: *Systems of Insight for Digital Transformation*, SG24-8293
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- ▶ IBM Business Process Manager product web page:
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- ▶ IBM Operational Decision Manager product web page:
<http://www.ibm.com/software/products/en/odm>

- ▶ SPSS Collaboration and Deployment Services product web page:
<http://www.ibm.com/software/products/en/spss-collaboration>
- ▶ SPSS Modeler
<http://www.ibm.com/software/products/en/spss-modeler>

Author

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