



Sapiens Technology Brief

Sapiens eMerge[™] Product Architecture

Date: October 2008

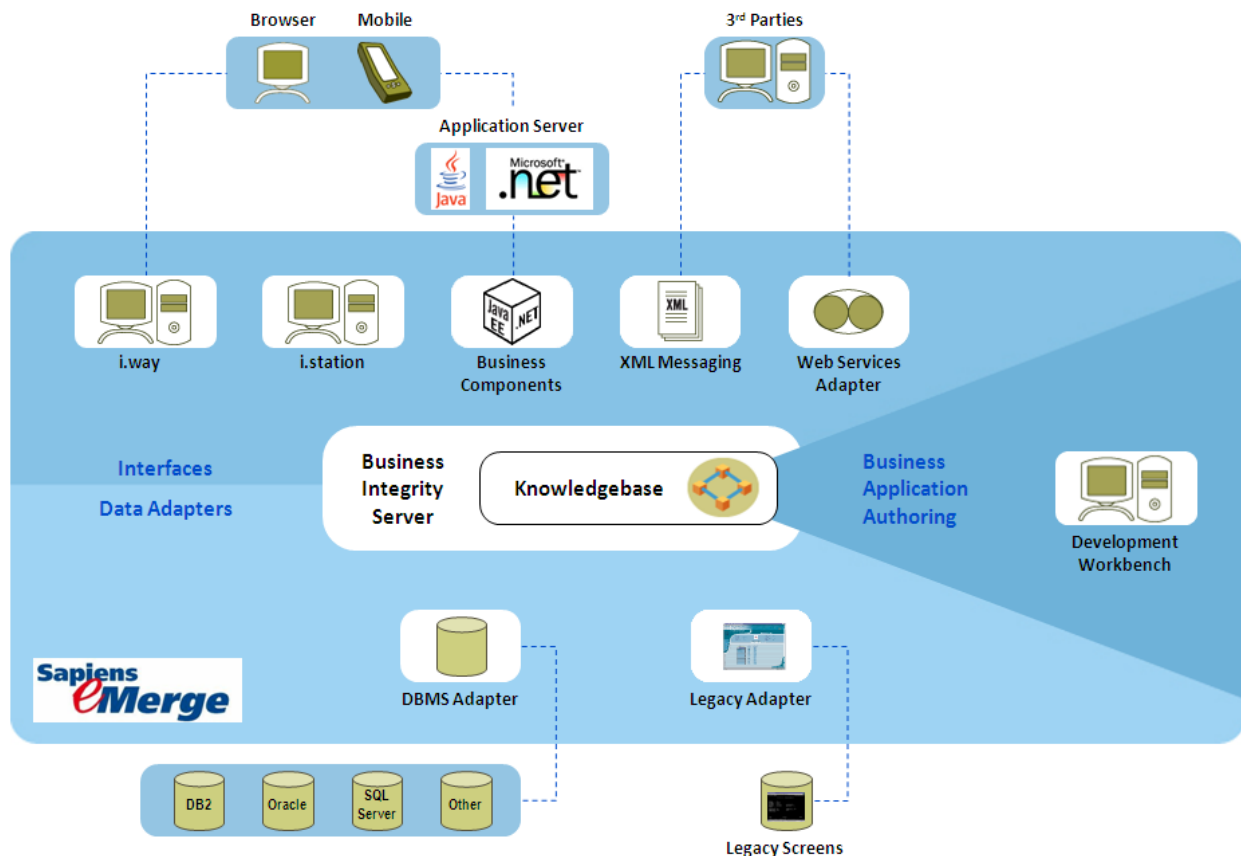


Introduction

The core of Sapiens' technology is the eMerge business rules engine. It includes a range of products combined in an innovative architecture that delivers exceptional business value. Figure 1 illustrates the components of the eMerge architecture:

- The Business Integrity Server (BIS): The eMerge BIS maintains the rules repository and provides a rules-based transaction processing runtime environment that is architected for performance and scalability.
- Business Application Authoring: The eMerge Development Workbench and the RuleScribe rules authoring environment provide users with tools that simplify and accelerate rules authoring and application development.
- Data Adapters: eMerge directly interfaces to popular DBMSs and adapters can be easily added for other data sources. The Legacy Adapter provides access to legacy data directly from the application.
- Interfaces: eMerge provides a variety of methods for connecting to users and systems. They include Sapiens' i.way Web browser interface, Business Components to connect through Java EE and .NET, XML messaging and Web services.

Figure 1: Sapiens eMerge Architecture



The open architecture and robust eMerge components provide a development and execution environment that lead to a host of technical and business benefits:

- The use of eMerge reduces the complexity of application development and maintenance by up to an order of magnitude as compared to conventional programming in COBOL, C++ or Java.
- eMerge has the ability to extend the productive life of legacy systems, while simultaneously providing the basis for using new generation Internet and service-oriented technologies. The authoring and automation of user-adaptable business rules by business analysts allows enterprise-specific enhancements to be made in a shorter time frame and with a greatly reduced maintenance burden than with other technologies.
- eMerge is based upon a multi-tier architecture and operates in multi-platform environments, encompassing many hardware vendors, operating systems and databases. Host-side platforms supported include z/OS, IBM i, Linux, UNIX, and Windows. eMerge supports databases such as DB2, Oracle, SQL Server, IMS/DB and VSAM. Since eMerge exemplifies open systems and cross-platform capabilities, solutions developed can be seamlessly migrated between platforms and databases.
- eMerge has a selection of integration adapters to readily plug into an enterprise's existing application environment. Integration options include loosely-coupled bi-directional message-based capabilities utilizing XML messaging or Web services, tightly-coupled Java EE or .NET components, database adapters, and adapters to legacy systems. Regardless of how an eMerge application is called, centralized business logic within the application provides consistent process and ensures data quality.
- Development, deployment, integration and administration of applications are all accomplished through the technology components of eMerge, providing customers with flexible, scalable and feature-rich systems.
- eMerge solutions, such as the Sapiens INSIGHT™ solutions for insurance, can be deployed as distinct modules to enable an enterprise to selectively implement specific modules of the solution while effortlessly leveraging any of their existing functionality in place of other modules. This architecture promotes reuse of assets and provides a means for incremental implementation of a solution.

eMerge Products

eMerge is a modular, rules based, application development and runtime environment that can be used in a variety of modes. It provides a complete application development environment but can also be used as a service in an online, Web-based or batch environment. The richness of the environment is detailed in the descriptions of the eMerge components below.

Business Integrity Server (BIS)

Business Integrity Server, the core deployment environment of eMerge, is a high performance event-driven rules engine, capable of handling thousands of concurrent users, millions of transactions and billions of rules per day. Application business objects and rules reside on the

Business Integrity Server in a comprehensive knowledgebase repository, providing visibility to the business logic and a “single point of truth”. BIS offers transactional integrity and can act as an integration hub for multiple applications, databases, messaging, languages and presentation standards.

Development Workbench

A powerful application development environment. Using eMerge’s rules-based, object model-driven technology and Rapid Architected Application Development¹ (RAAD) methodology, a developer builds a business application by creating and refining the business application model.

RuleScribe

Delivers the Business Rule Authoring capability by providing the ability to enter textual Business Rules in plain English. Business Terms are stored and managed in a comprehensive Terms Dictionary. RuleScribe also maintains traceability between each Business Rule, its sources and its technical implementation. Any number of Business Rule versions can be maintained and tools are provided to automate the sequencing of Business Rules.

Business Components

Enables eMerge applications to expose Java, Java EE and .NET interfaces. It harnesses the eMerge BIS rules engine for tightly coupled integration with standard Java EE and .NET application server environments and allows the presentation layer to be completely independent of the underlying business logic.

i.way

Is a complete browser-based user interface. i.way handles workflow, presentation, user interaction and local validations for Web browser clients. Application forms are generated automatically as DHTML pages from knowledgebase definitions for display on the Web client. i.way maintains full status and context information for each Web client.

XML Messaging

Enables eMerge applications to expose and invoke a set of XML-based services to/from other parties. It provides platform and protocol support, message exchange, ability to formulate contracts between parties, ability to import message schemas and easy integration. It complies with messaging frameworks and exchange standards such as W3C and ACORD.

Web Services Adapter

Enables publishing of eMerge applications as Web services using stateless interaction via SOAP over HTTP/S or WebSphere MQ as well as consumption of third-party Web services from eMerge applications.

¹ RAAD combines the benefits of iterative and progressive prototyping for the early development of working components with waterfall processes that warrant the structured and formal delivery of solution deliverables.

Legacy Adapter

Allows extension or incremental retirement of legacy applications and provides a rich solution for non-intrusive legacy renewal, while avoiding operational disruption. Legacy data is available for use within eMerge as any other data source – in rules, forms, business components, XML messages, Web services - and is not constrained by the appearance of the legacy system or the distribution of the data across forms. This is achieved by addressing the problems of screen identification, flow and session management, as well as event production. Business logic and components can subsequently be added to the renewed application and new e-business presentation forms created. Development for Legacy Adapter is via a customized user-friendly Legacy Screen Mapper. Legacy Adapter is self-contained on the host server with no network traffic, enabling high performance.

DBMS Adapter

DBMS Adapter separates between the logic and data layers, facilitating portability and reuse at both layers. Its physical implementation is transparent to the logic and presentation layers. Data managed by DB2, Oracle, SQL Server, IMS/DB and VSAM can be accessed using DBMS Adapter. Other DBMSs can easily be accessed using a custom adapter which enables developer definition of non-standard fields and data sources.

eMerge Architecture

The modular nature of the eMerge architecture enables the flexibility of an eMerge solution. An application can interact with end-users, databases and other applications using a variety of methods while executing a single set of rules. Depending upon the host environment, eMerge can provide a complete application solution or be called as a service. It can manage only the logic or can be used to manage the data and user interface, as well.

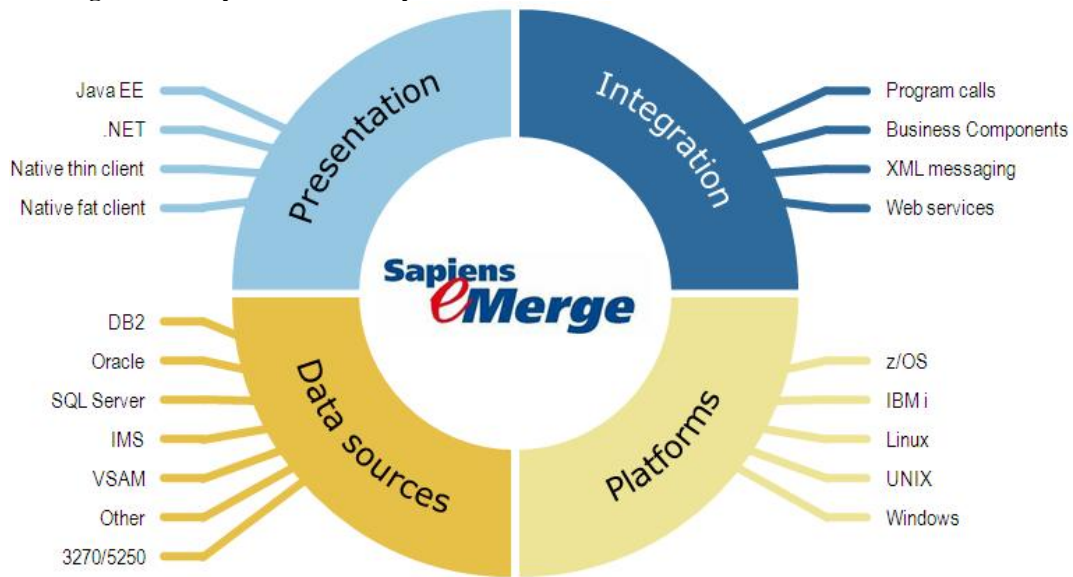
eMerge technology is based on an n-tier architecture, including *data*, *business logic* and *presentation* layers. Each layer is independent and may be replaced or modified without affecting the other tiers. This architecture allows customers to port their applications by simply moving the business logic layer from one server platform to another without affecting the presentation and data layers. This enables the flexible movement of applications within a heterogeneous computing environment. For example, customers may choose to adopt the latest application server in their presentation layer or change their database management systems without impacting the business logic and functionality of their applications.

Data Layer

As a standard feature, this layer includes DBMS software responsible for the storage and retrieval of data. eMerge Business Integrity Server includes adapters to the following DMBSs: DB2, Oracle, SQL Server, IMS/DB, and VSAM. It is possible to connect multiple DBMSs to one logical eMerge database, as befits a truly multi-tier architecture.

The data content layer is comprised of: (1) application data (2) metadata that describes the application, e.g. data mapping, business objects, validations, code tables, (3) control data: tuning and configuration management - versions, users, authorizations, tuning parameters, backup configuration, mapping to external entities and more.

Figure 2: eMerge Flexibility and Portability



Business Logic Layer

At the business logic layer, Business Integrity Server's runtime transaction processor and business rules engine are driven by events applied to the application metadata. Their role is to realize the business logic resident in the metadata, for every external event – regardless of the event's source, format or delivery mechanism. An event may arrive as the output of end-user online interaction, as a file designated for batch update, the result of a rule triggering on a business object or as part of an XML message. The business processing layer has an external component whose role is to receive all forms of input via any delivery mechanism and to transform them into a uniform structure for consistent processing.

Presentation Layer

The presentation layer is responsible for the creation of forms. eMerge technology offers two methods of presentation development:

Java/JSP or .NET forms development, whereby the connection with the backend eMerge BIS objects is provided via Java classes or .NET classes of Business Components. With this option it is possible to use any standard Web authoring tool such as IBM's Rational Application Developer for WebSphere, Microsoft's Visual Studio, Macromedia's Dreamweaver and others. These tools offer almost unlimited flexibility for the development of a personalized graphical user experience, including industry-standard portals.

In order to provide this feature, eMerge publishes .NET or Java classes which externalize the logic embedded in business objects (called "Business Components") that were defined in the metadata. The publishing mechanism includes a Business Components Connector responsible for managing the communications with the business logic processor and a JCA Resource Adapter responsible for establishing a JCA system contract with an application server. These components are installed on any mid-tier server – usually an application server – from which you provide

access to eMerge data objects at runtime, and enable Java EE or .NET developers to view eMerge objects as back-end server classes.

eMerge i.way forms development, whereby baseline Web forms are automatically generated from eMerge application definitions. Metadata definitions in the back-end knowledgebase are used, thereby dramatically shortening the development cycle. Following initial generation, forms may be enhanced with JavaScript and other controls. A feature of i.way allowing the use of dynamic templates for vertical changes after initial form generation, adds further to developer productivity.

Openness Features

Anticipating customer needs in advance, eMerge was conceived as an open system. This openness characterizes all layers, from data access layer to the rules engine and the presentation layer. Multiple expansion options and exit points at the various layers support this concept. For example it is possible to:

- define a custom DBMS adapter for a previously unsupported DBMS;
- override all standard system messages, as well as create multi-lingual messages within one application;
- have user-defined functions that can be invoked from within the rules engine;
- include 3GL programs in the rules engine – as transaction processing logic and presentation logic;
- enhance i.way forms with JavaScripts;
- utilize authentication exits for both i.way sessions operating under a Web server and for host eMerge BIS sessions operating under a back-end server;
- use pre- and post- processing exits before/after processing XML messages;
- utilize a standard API for communication with eMerge BIS to enable external transaction processing by COBOL or C programs.

Batch Processing

eMerge is capable of batch processing. Batch application processing on a back-end server is possible without requiring additional investment in definitions or programs.

All business logic executes as in online mode, providing consistency of results.

Key Features

The combination of robust components and a flexible architecture make eMerge the right solution for many companies. Some of the key benefits our customers have experienced:

- ***Fast Time to Market and High Return on Investment.*** Our combination of a RAAD (Rapid Architected Application Development) methodology, rules-based development tools and high delivery skills results in significant productivity increases at customer sites. Declarative

development with business rules replaces traditional programming methods, addressing the full application life cycle, meaning that no programming code development is required. eMerge also employs a “positive thinking” engine that streamlines application development by requiring only the definition of standard situations, while automatically generating the logic required to handle the non-standard ones. This results in a large reduction in logic specification and application maintenance and greatly enhances the quality of the delivered application compared to conventional development environments where most “bugs” arise in the non-standard logic.

- ***Extension of Value of Legacy Systems.*** Our solutions enable organizations to capitalize on their existing large-scale applications and data by non-intrusively integrating them with modern applications and technologies. While extending the productive life of older computer systems, our solutions simultaneously provide a migration path to next-generation technologies.
- ***Cross-Platform Capability.*** Our solutions are designed for an extensive list of computing platforms and technologies including z/OS, IBM i, Linux, UNIX, and Windows at the host server-side; due to the separation between business logic, data access logic and presentation logic, applications developed for a particular computing platform and database are seamlessly portable to other supported computing platforms and databases.
- ***Scalability.*** The platform-independent nature of our solutions allows them to be scaled according to the needs of the organization. At runtime, eMerge has been proven to be extremely scalable, both horizontally and vertically, allowing the daily execution millions of transactions and billions of rules for thousands of concurrent users.
- ***Service-Oriented Architecture.*** eMerge applications operate in a service-oriented architecture. Through Web Services Adapter, eMerge components can be published as Web services and accessed as on-demand services. eMerge applications also consume Web services published by third parties.
- ***Standards Compliance.*** Through the eMerge Business Components Adapter, Java and .NET developers may include eMerge objects in their applications. Concurrent development of Java EE and .NET – based presentation layers and eMerge-based business rules may be achieved through this method.
- ***XML Messaging.*** Through eMerge XML Adapter, eMerge supports both inbound and outbound XML Messaging. Both synchronous and asynchronous messaging strategies are supported via WebSphere MQ and HTTP/HTTPS transports.

...Result in Benefits to Sapiens Customers

- *IT empowerment in meeting ever-changing business goals*
- *Lower TCO (total cost of ownership)*
- *Robust applications that scale to the extreme*
- *Future-proof architecture that builds on current IT assets and ensures continuity*

About Sapiens eMerge™

Sapiens eMerge technology is the core software infrastructure of Sapiens solutions delivered to customers. It is a development and deployment environment designed to express business logic in a declarative manner with business rules, thereby providing a unified and open infrastructure for complete business software solutions. The use of advanced, rapid application development technology allows enterprise-specific enhancements to be made in a shortened timeframe and with a vastly reduced maintenance burden compared to other technologies.

For more information about Sapiens' eMerge solutions and how we can help, send an e-mail to info@sapiens.com.

About Sapiens

Sapiens International Corporation N.V. (NASDAQ and TASE: SPNS), a member of Formula Group (NASDAQ: FORTY and TASE: FORT), is a pioneer in Business Rules Technology and its application to IT solutions that modernize business processes and enable companies to adapt quickly to change. Sapiens' innovative solutions are widely recognized for their ability to cost-effectively align IT with the business demands for speed, flexibility and efficiency. Sapiens operates through its wholly owned subsidiaries in North America, the United Kingdom, EMEA and Asia Pacific. The Company has partnerships with market leaders such as IBM and EDS and its clients include AXA, Liverpool Victoria, Norwich Union, OneBeacon, Principal Financial Group, Prudential UK, Abbey National, Honda, International Paper, Panasonic UK among others.

For more information, please visit www.sapiens.com.