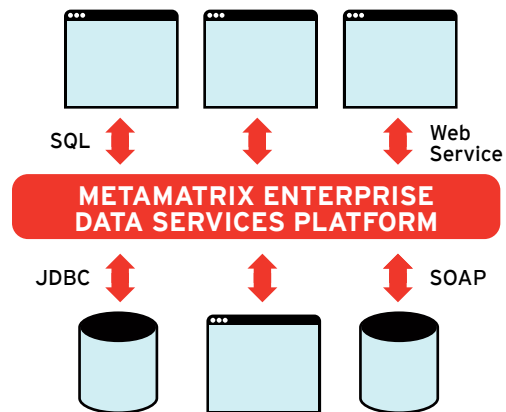# METAMATRIX ENTERPRISE DATA SERVICES PLATFORM

BRIDGE THE GAP — WITH DATA SERVICES

Leaders of high-priority application projects in businesses and government agencies are looking to complete projects efficiently, meet complex requirements, and build a solid foundation for the future. Service-oriented architecture (SOA) is an emerging piece of the strategy, enabling a loose coupling between components that promises to streamline development and maintenance. But project data require-ments are growing in complexity, demanding more work to mediate between existing data sources and the new or revamped applications. Developers are saddled with the task of transforming data formats, resolving technical dif-ferences and semantic differences, and aggregating and integrating data from multiple systems. It can be difficult to accomplish all this and produce systems that are easy to maintain and reuse. SOA may change the interface, but not the data challenge. Whether the goal is conforming to a mandated XML schema, aggregating data for decision support, crafting a single view of the customer, or simply enabling a more effective end-to-end business process, project teams need better ways to work with data across diverse systems.

Data services can bridge the gap. Data services are key components of a flexible architecture that provide appli-cations with the data views they need while hiding data source details and managing exchange with data stores be-hind the scenes. Creating data services (rather than custom coding data manipulations into each application) enables developers to bridge semantic gaps more efficiently and create reusable modules that isolate the impact of changes in data structures. MetaMatrix Enterprise is a powerful data service management system that enables rapid, model-driven creation, deployment, and management of data ser-vices. A data services platform insulates applications and developers from details of physical data sources by creat-ing virtual data structures that meet the needs of the ap-plication and the business. MetaMatrix Enterprise provides declarative tools for creating a wide range of data services, a repository for storing data service definitions

with relevant metadata, and a robust execution environ-ment that provides enterprise performance, data integrity, and security. MetaMatrix Enterprise offers a faster, better way to meet the SOA data challenge.

SQL   Web Service

METAMATRIX ENTERPRISE DATA SERVICES PLATFORM

JDBC   SOAP

MetaMatrix Data Services Platform supports di-verse data sources. Applications access data services through SQL or Web service interfaces.

BRIDGE THE GAP WITH A MODEL-DRIVEN SOLUTION

You know the data you need. You know the data you have. They're different. Today resolving these differences re-quires too much development time and effort. MetaMatrix helps you quickly define the path from existing data sourc-es to target formats, and then deploy the data services that make it happen at runtime. You start by importing metada-ta for your physical data sources, and importing or defin-ing the schema for the target data formats you need. Then it's a matter of mapping—to identify which data elements really represent the same data, resolve differences in data type or column length, transform data formats into the structures you need, integrate data from multiple systems, and aggregate data from different groups. The MetaMatrix graphical approach makes these operations easy to define

and understand without requiring custom code. The design process is declarative; you use graphical models, menus, and point-and-click mappings to define new virtual data structures. These definitions are active metadata – they determine how data will be manipulated at runtime. But they can also:

- Help you communicate easily about project data structures

- Capture relationships among the data sources

- Facilitate change management and impact analysis

- Streamline data service discovery, development, and maintenance

With a streamlined design process, new projects are completed more efficiently, while each effort adds incrementally to the organization's collection of reusable, maintainable data services.

DATA FEDERATION UNIFIES DATA ACROSS THE ORGANIZATION

MetaMatrix data federation capabilities provide the ability to access and update data across multiple, heterogeneous systems through a single query. This avoids both writing custom code to reconcile the data, a time-consuming process resulting in code bound to specific data sources, and establishing a new data mart, a costly, complex undertaking. Through data federation, you can quickly respond to business users' needs by creating virtual data marts and single views of key entities (e.g. Customer, Product, Account, etc.) for reporting, and operational applications while leaving data in their sources of record.
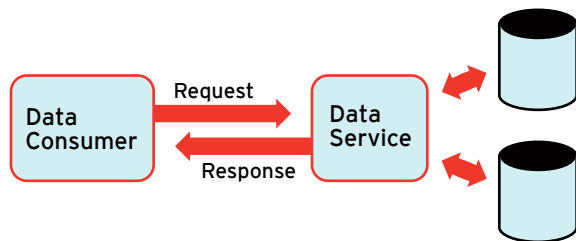
"MetaMatrix query optimization incorporates rule-based and cost-based decisions about where to perform certain types of processing."

FLEXIBLE DATA ABSTRACTION PROMOTES REUSE, DATA STANDARDS

With MetaMatrix Enterprise you create virtual data structures at any level of abstraction that makes sense for the project. Design metadata is automatically imported from existing data sources, enabling you to map existing data elements to new reference data models or XML schemas. You can map data from physical sources to a physical target, or you can take it up a level, defining or importing a logical model to create business-level data entities and relationships that hide the complexity of the diverse participating data sources while offering a coherent business view of data. With a logical model defined in MetaMatrix, you can map from data sources to that model, and map from the logical layer to the target data structures needed for your application. You can start at the logical level for the next project or maintenance cycle, reusing connections to the data sources and all the integration work that has already been done. This logical view also makes it easier to standardize data structures across your project or across the enterprise.

Even without a logical model, you can create layers of data views that are useful to your application development projects. For example, suppose your developers work with data type standards that come from a standard reference model, and a data source doesn't conform to those data types. You can create virtual data structures that simply resolve the data type differences. MetaMatrix is flexible enough to support any workflow you prefer. How you use abstraction is entirely up to you.

METADATA STREAMLINES DATA SERVICE DEFINITION

The MetaMatrix Repository stores all the metadata you need for your data service development including information about your physical data sources, extended metadata attributes and target schemas. To further integrate the knowledge that supports your project, you can store Word files, PowerPoint presentations, or related materials in the Repository along with your models and metadata.

In addition to streamlining project efforts, MetaMatrix Enterprise can also be used to facilitate the process of developing and disseminating enterprise data models or mandated XML standards across a large project or an entire enterprise. If your company is embarking on enterprise data architecture standards you can easily use MetaMatrix to work from or work toward a standard data model. Work bottom-up, creating virtual data structures and data services one project at a time, and gradually build a reference architecture, or work topdown, importing a standard data model at the start of the project. Support for multiple users, including checkin/check-out, versioning, reporting, and printing of large diagrams makes it easy to manage even the largest data architecture projects and to coordinate creation of a standard set of enterprise data services.

THE RIGHT CONNECTIONS

Data services begin with enabling access to the right data sources. MetaMatrix connects to a wide array of sources, including relational database systems (through JDBC or ODBC), Web services, files (such as XML files, spreadsheets, or comma-delimited files), business applications such as SAP and Salesforce.com, and other types of sources. Any data source that is accessible programmatically—either through an API, JDBC, or direct file or Web access—and that yields results in a relational or XML format, can be integrated into MetaMatrix and joined with other sources.

MetaMatrix Enterprise provides a set of standard connectors to common relational database management systems, including Oracle, Microsoft SQL Server, IBM DB2, Sybase, MySQL, and others. MetaMatrix can integrate a wide range of enterprise data sources including databases, packaged applications, messaging systems, third-party data feeds, and other sources. The MetaMatrix connector architecture
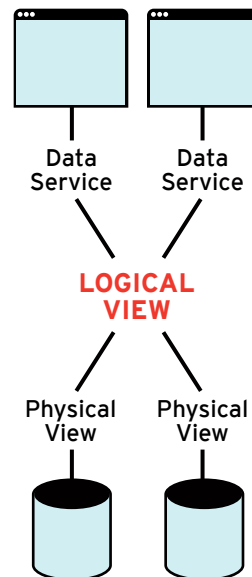
MetaMatrix Data Abstration. Starting with physical views of existing data sources, create logical views and application-specific views without programming.

is robust and standardized so Red Hat Global Services professionals or your technical staff can use the MetaMatrix Connector SDK to create custom connectors for any data source not already available. In addition to enabling data access, a MetaMatrix connector supports connection pooling, transaction management, logging, and security. If you are interested in connecting to a data source not mentioned here, please discuss your requirements with your Red Hat representative.

DATA DELIVERY—SQL OR WEB SERVICES

MetaMatrix simplifies your application's access to data by providing a single point of access—virtually a single driver for any project and any data. But bridging the data gap also means using the paradigms and protocols native to that application. MetaMatrix provides data through a variety of interfaces to meet the needs of diverse applications:

- **Web service interfaces.** MetaMatrix Enterprise provides multiple Web service interfaces to meet a variety of application requirements. Web servicesbased applications interact with MetaMatrix using SOAP. Model and deploy your own Web services that provide any type of interface your application requires. Or issue ad-hoc SQL queries against a specialized Web service and receive XML-encoded result sets in return. These Web services can be used by client applications with or without the aid of a registry. MetaMatrix supports SOAP over JMS or SOAP over HTTP.

- **SQL interfaces**. MetaMatrix Enterprise can provide a "virtual relational database" interface to applications that issue standard SQL via JDBC or ODBC. Standard CRUD operations are supported, as are calls to stored procedures. If desired, MetaMatrix can also provide data services in the form of XML views that can be queried via XQuery.

Web services created with MetaMatrix can be much more powerful than data sources that are simply "wrapped" with a Web service interface. You can define the data structures that will be available to your applications and also the operations that will be enabled as part of the Web service. Most importantly, you bridge the semantic gaps to deliver the data with the exact form and semantics needed by the application, assembling and transforming data from multiple, diverse data sources. With both a SQL interface and a Web service interface available you can reap the benefits of SOA today. Whether or not your organization is using Web services, MetaMatrix Enterprise provides a bag of tricks deep enough to create the right data services for your applications. Design and deploy SQL services, Web services, or a combination—it's up to you.

EFFICIENT EXECUTION
WITH ENTERPRISE PERFORMANCE

The data services accessed by your applications must perform well under tough enterprise conditions. The MetaMatrix Server addresses a variety of factors that enable data services to perform.

Optimized query planning and processing

MetaMatrix Enterprise incorporates a proven, state-of-the-art query planning and processing engine optimized for executing operations against remote, heterogeneous data sources. Query optimization incorporates rule-based and cost-based decisions about where to perform certain types of processing. In many cases it makes sense to use the processing efficiency of a relational DBMS, pushing joins, sub-queries, or scalar functions down to the data source. Optimization features include taking table cardinalities and data statistics into account when creating a query plan, selecting from a range of join algorithms depending on data and query characteristics, use of cursors, buffer management, and the ability for developers or administrators to define standard access patterns, describe the capabilities of sources, or override query processing default behavior.

Optimized delivery of data: Caching and data staging

MetaMatrix Enterprise includes performance features such as:

- Materialized views that enable staging of certain transformed or integrated data

- Dynamic caching of result sets at multiple levels

- The ability to cache frequently-used lookup tables or other reference data

Developers and data owners have full control of which data is staged and cached and under what circumstances. These features help to minimize the number of new requests against data sources while optimizing access to data for users and applications. MetaMatrix also maximizes the efficiency of connections to data sources by pooling connections wherever possible.

SECURE ACCESS TO DATA THROUGH DATA SERVICES – A DATA FIREWALL

When applications work with enterprise data, security and integrity of data are key requirements. MetaMatrix Enterprise provides a variety of features to help ensure data integrity and security when data is accessed through data services.

User authentication

MetaMatrix Enterprise provides for multiple approaches to user authentication, including integration with your existing LDAP-based authentication system.

Data authorizations

Application developers and data source owners are both responsible for preventing unauthorized access to data. MetaMatrix Enterprise provides for fine-grained data authorizations down to the data element level if desired. Administrators establishing roles can authorize the various CRUD operations separately.

Metadata authorizations

MetaMatrix also provides for careful control of access to the metadata in the MetaMatrix Repository. Administrators can establish fine-grained authorizations to the various models and metadata as needed.

Encryption

MetaMatrix supports SSL for secure communication, and encrypted data sources and repositories can be used. All passwords maintained by the system are encrypted.

Auditing

Through its logging facility, MetaMatrix Enterprise can provide a complete audit trail of command executed, data accessed, system usage, and exceptions.

"Whether or not your organization is using Web services, MetaMatrix Enterprise provides a bag of tricks deep enough to create the right data services for your applications. Design and deploy SQL services, Web services, or a combination – it's up to you."

TRANSACTION MANAGEMENT

While some applications will simply read data and present it to users, others will need to write data, potentially to multiple distributed data stores. These applications can take advantage of the MetaMatrix Enterprise XA-compliant transaction management system to ensure data integrity through even very complex operations involving many data sources.
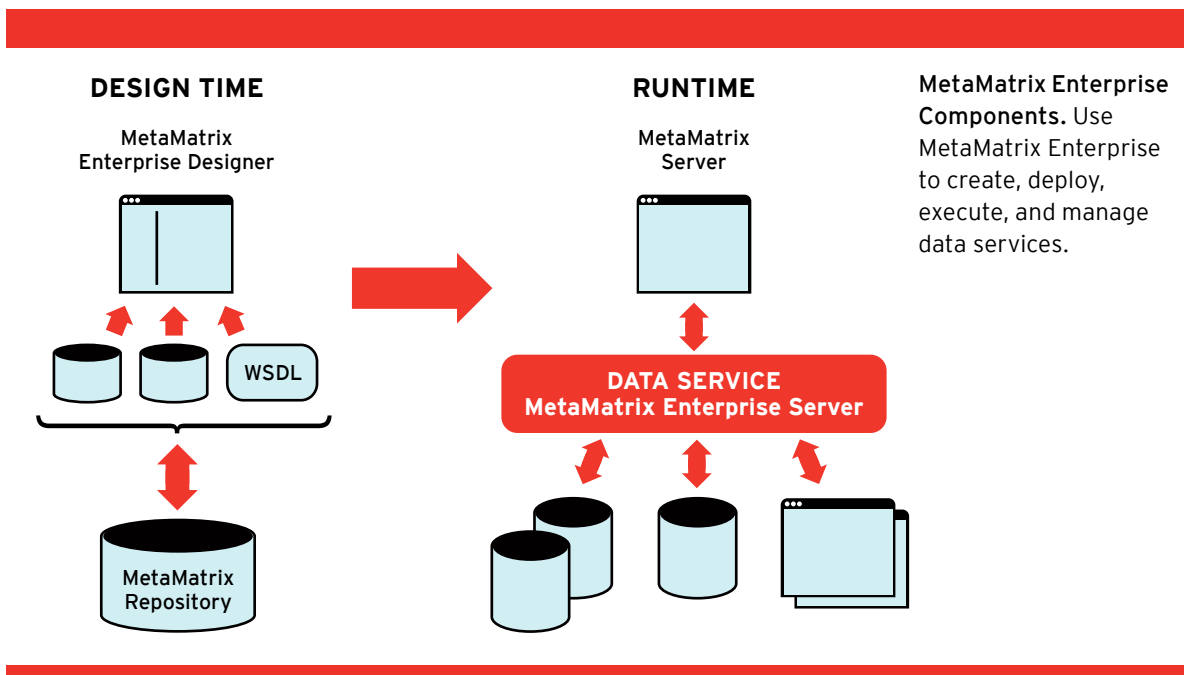
STANDARD, SCALABLE ARCHITECTURE AND STRAIGHTFORWARD ADMINISTRATION

MetaMatrix Enterprise is architected for extensibility and developed using Java technology. MetaMatrix Server and MetaMatrix Repository run on multiple platforms including Microsoft Windows, Red Hat Linux, and Sun Solaris. MetaMatrix Enterprise Designer is an Eclipse-based application. Modeling and metadata management are based on industry standards including OMG and UML standards as well as XML Metadata Interchange (XMI) standards. MetaMatrix

Enterprise also supports a variety of Web service standards including WSDL 1.1, SOAP 1.2, HttpBasic, WS-Security, and WS-I Basic Profile.

MetaMatrix Enterprise is easy to install and configure, fits easily into your IT environment, and provides a variety of productivity tools for administrative tasks such as system monitoring, logging, session and query management, connector and connection management, extension management, MetaMatrix Repository management, and management of users and entitlements. Multiple administrative interfaces are provided to maximize productivity.

MetaMatrix employs a distributed service architecture that is inherently scalable to support increases in workload, number of data sources, and number of applications or users. Additional MetaMatrix Server instances can be deployed to increase the number of services available on either a single physical host or on distributed hosts, for scalability, fault tolerance, and load balancing. MetaMatrix

DESIGN TIME

MetaMatrix
Enterprise Designer

WSDL

MetaMatrix
Repository

RUNTIME

MetaMatrix
Server

**DATA SERVICE
MetaMatrix Enterprise Server**

MetaMatrix Enterprise Components. Use MetaMatrix Enterprise to create, deploy, execute, and manage data services.

is compatible with software-based or hardware-based high-availability strategies. The MetaMatrix Repository is hosted on a standard RDBMS platform and can therefore benefit from standard high-availability approaches such as mirrored or replicated database server instances.

EXPERT SUPPORT AND SERVICES

Product support, training classes, and consulting services are provided by the Red Hat professional services organization. Customer support is provided by MetaMatrix product specialists under standard support and maintenance agreements. For customers, prospective customers, and partners, Red Hat offers standard one- and two-day courses as well as customizable education programs to meet your specific needs. Expert consultants can work with your internal staff or your preferred systems integrator, transferring the knowledge that will help you implement best practices for creating, deploying, and managing data services, and supporting your projects where needed. Red Hat consultants have extensive backgrounds in data architecture, data integration, systems administration, application development, and Web service design.

METAMATRIX ENTERPRISE ANSWERS THE SOA DATA CHALLENGE:

- Quickly design, test, and deploy SQL services or standards-compliant Web services to address a wide range of data requirements

- Decouple applications from physical data sources with a layer of data services that interact with diverse enterprise data sources

- Reduce application development time — eliminate custom coding for data access, transformation, integration, and aggregation

- Bridge semantic gaps between new project data requirements, existing data sources, and enterprise standards

- Federate multiple data sources to deliver integrated views of consistent, current data in near real-time with enterprise performance

- Manage data services for easy discovery, maintenance, and reuse — to take full advantage of work already done

- Create data services for one project, across many projects, or throughout the enterprise

KEY CAPABILITIES

- **Bridge the gap — with data services.** Define services to access data from existing sources and mediate semantic differences between existing data structures and new data requirements and standards. Use declarative mapping and modeling tools, not custom coding, to design, deploy, and manage the data services that transform, integrate, and aggregate data. Map schema-to-schema, resolving semantics along the way.

- **Work with data at the right level of abstraction.** With the most powerful visual modeling and mapping tools available today, create the views of data that will best support application design, reuse, and maintenance, while taking full advantage of proven data modeling techniques. Define logical views, layers of abstraction that promote wider reuse and understanding of business objects, or simply map from source to target — it's up to you.

- **Federate across disparate data stores for real-time read/write access to distributed data.** Connect to relational databases, Web services, XML documents, flat files, packaged applications, legacy systems, external data feeds, and more.

- **Provide application interfaces to meet diverse requirements.** Applications connect to MetaMatrix through the interfaces they need: SQL (ODBC/JDBC) or SOAP (over JMS or HTTP). Address a wide variety of application requirements with a single system.

- **Execute data services with enterprise performance and integrity.** Take advantage of a robust and reliable runtime environment, including data caching, security, XA-compliant transaction management, auditing, and query optimization. Apply consistent data security and access control through centralized configuration and enforcement.

- **Store all the metadata you need for data service design efforts.** Import metadata from existing data sources and data modeling tools, store project documents, and define new metadata that will aid your data service definition efforts and capture institutional knowledge about your data and its use.

- **Use the data services platform proven in the toughest shops**. MetaMatrix is playing a key role today in some of the most critical projects in the world. Diverse companies and government agencies use MetaMatrix to efficiently provide standard forms of data required for financial transparency and other regulatory requirements, and enable better intelligence across the organization. Metamatrix meets the demanding scalability and performance needs of these organizations enabling them to achieve their service level goals.

FOR MORE INFORMATION

JBoss Enterprise Middleware is a key to making service-oriented architecture simple, open, and affordable. For more information on JBoss Enterprise Middleware, visit www.redhat.com/jboss or contact your Red Hat sales representative.

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