

Composite Data Virtualization

Twelve Key Reasons to Use Composite Data Virtualization

Composite Software

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DATA DATA EVERYWHERE - TODAY'S COMPLEX BUSINESS AND IT LANDSCAPE

According to IDC, Data is growing by a factor of 10 every five years, a compound annual growth rate of almost 60%.¹ Just keeping up is a huge challenge.

Further this data resides in various silos developed over many years of technology acquisition and business consolidation. Today's business and government agency problems require information from across these silos to address:

- **Revenue growth** – In today's competitive landscape, businesses must strive for customer revenue maximization. Yet, customer information is no longer contained inside a single database or even inside the firewall.
- **Compliance** – New mandates require data combinations that no one could have anticipated when the original systems were developed.
- **Globalization** – Operating globally means leveraging local and corporate data.

Further, business moves faster than ever before. Yesterday's data, tomorrow, is not good enough when trying to solve today's business problem right now. Some examples include:

- **Revenue Management** – Ever-changing sales from transaction systems must be combined with ever-changing forecasts from sales force automation systems to enable sales leaders to guide success.
- **Trial Close** – Financial data from accounting systems and complementary financial analysis tools often located in sources around the world must be combined and evaluated many times before the final close.
- **Risk Management** – Risk changes with every trade in financial services, so determining exposure requires immediate data from equity, debt, options systems, and more.

Finally, complexity reigns.

- **Competitive Landscape** – New products, new markets, and new competitors stretch information demands.
- **Mergers and Acquisitions** – Add to both the supply and demand sides of the information challenge.
- **Application and Data Warehouse Proliferation** – With so many approaches to creating and storing data already deployed, what business believes should be easy, is often complex for IT.

In this paper you will learn how data virtualization, in general, and Composite data virtualization, in particular, have been purpose-built to address these challenges through an agile, high-value approach that overcomes complexity, quickly providing business with the timely data it needs, even if the data required spans multiple silos and multiple geographies. Further you will learn twelve key reasons why businesses and government agencies use Composite data virtualization.

INTRODUCTION TO DATA VIRTUALIZATION

Large enterprises and government agencies face similar challenges:

- Constant business change necessitates rapid IT response
- Growing data volumes and complexity increase risk and reduce agility
- Financial constraints necessitate cost-effective IT solutions

Following virtualization's established path of storage, servers, applications, and now data itself—Composite data virtualization is the proven way to overcome these challenges and fulfill critical information needs, significantly faster with far fewer resources.

Composite Data virtualization integrates data from multiple, disparate sources - anywhere across the extended enterprise - in a unified, logically virtualized manner for consumption by nearly any front-end business solution.

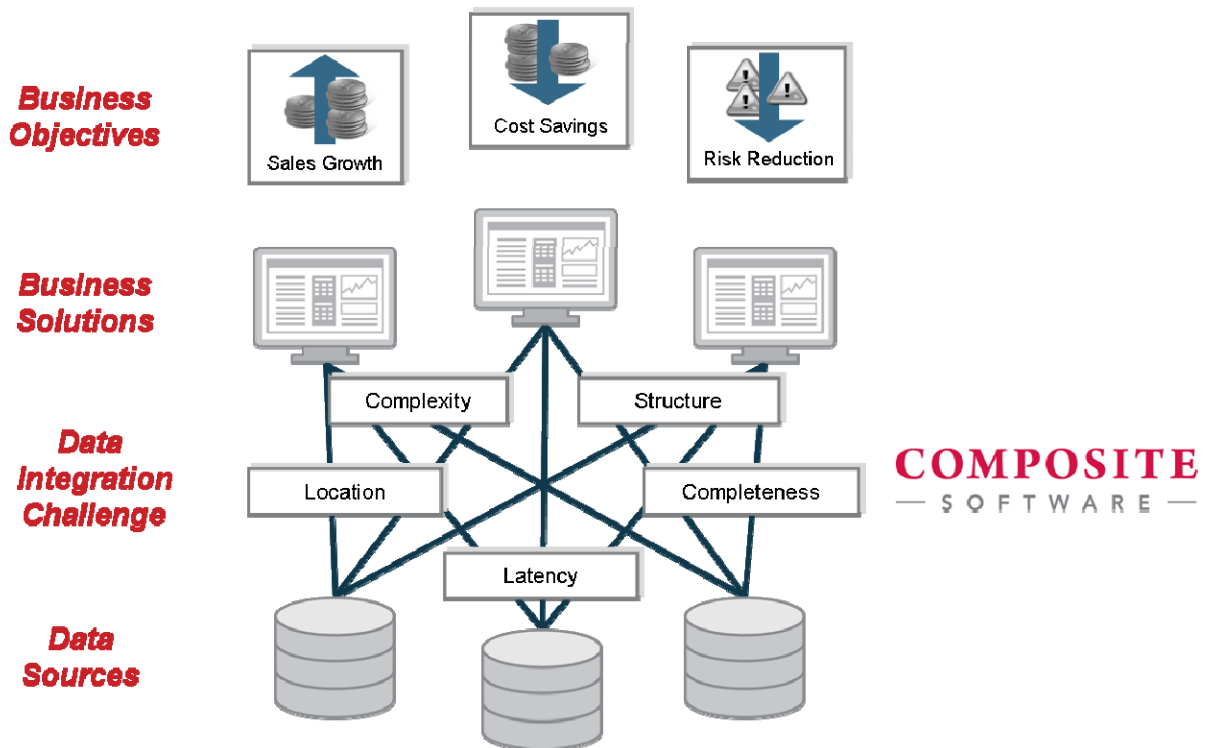


Figure One: Data Virtualization at a Glance.

Composite's data virtualization products form a complete development and runtime platform that addresses the five fundamental challenges of data integration:

- **Data Complexity** – Data is difficult to identify and understand. Composite's data discovery simplifies the complexity challenge by automatically identifying relevant data and relationships and accelerating data model validation.
- **Data Structure** – Data isn't always in the required form. Composite's data abstraction overcomes data structure incompatibility by transforming data from its native structure and syntax into reusable views and Web data services that are easy for solutions developers to understand and solutions to consume.

- **Data Location** – Data resides in multiple locations and sources. Composite’s data access overcomes the location challenge by providing data required by consuming solutions as if it were available from a single virtual location, rather than where it is actually stored.
- **Data Completeness** – Data frequently needs to be combined with other data to have meaning. Composite’s data federation combines data to form more meaningful information, for example producing a single view of a customer or a get inventory balances composite service. Data can be federated from both consolidated stores such as the enterprise data warehouse as well as original sources such as transaction systems.
- **Data Latency** – Up-to-the-minute data is often a key business requirement. Composite’s data delivery provides the timely data required by consuming solutions whenever needed, without impacting source system performance.

Each of these challenges along with Composite’s data virtualization capabilities are addressed more fully in sections that follow.

Additional practical challenges such as how Composite data virtualization provides security, complements existing integration approaches, supports SOA, and scales to enterprise level are also covered. As are the many ways Composite’s easy to learn and use products fit neatly into typical software development lifecycles and IT environments.

TWELVE KEY REASONS TO USE COMPOSITE DATA VIRTUALIZATION

1. Data Virtualization Delivers Value Five Ways

Achieving compelling value from information technology (IT) is critical, especially in a challenging economic environment. Composite data virtualization delivers value to business functions and IT operations in a number of measurable ways and may be categorized as follows:

- **Sales Growth** – An important indicator of an enterprise's success (or, in the public sector, as an indicator of service growth or mission effectiveness), sales growth results from business strategies such as improved offerings, better customer support and faster market response. Composite data virtualization supports these strategies by providing more complete data, fresher data, and faster time to solution so revenue-producing and customer-facing staff can make better sales-related business decisions.
- **Risk Reduction** – Risk reduction has become increasingly important as a result of greater complexity and regulation. Becoming more agile in response to risk, improving predictability in light of risk, and ensuring compliance with changing regulations and reporting mandates are a few of the strategies to reduce risk. Composite data virtualization supports these strategies by providing more complete data and timely data for better risk visibility and faster problem remediation.
- **Time Savings** – New information systems must deliver the data needed while also reducing the latency between business event and response. IT is therefore under constant pressure to provide these new systems and their associated information more quickly. Strategies for saving development and deployment time as well as decreasing data latency are crucial. Data virtualization supports these strategies by automating key modeling, query optimization, and deployment steps, while encouraging greater code reuse.
- **Technology Savings** – Just as storage, server and applications virtualization have demonstrated huge technology savings, Composite data virtualization provides similar savings by requiring fewer physical data repositories along with the systems required to operate and manage them. Many users find these technology infrastructure savings alone justify their entire data virtualization investment.
- **Staff Savings** – Internal and outsourced staff is typically IT's largest expenditure. Substituting automated tools for labor is one strategy for cutting staffing costs. Increasing existing staff productivity by improving SDLC processes is another. Simplifying the work to employ lower-skilled (and therefore less costly) staff is a third. Composite data virtualization supports these strategies via a high-productivity, collaborative development environment, along with automated modeling and development.

For more information on tools and methods to measure the value of Composite data virtualization, see the Composite Customer Value Framework White Paper.

2. Data Virtualization Discovers Complex Data

Today, enterprises and government agencies are overwhelmed by scattered data silos and exponentially growing data volumes. When you have to build new or update existing

applications that require data from across these disparate sources, finding and modeling the data is often times the most burdensome and time-consuming aspect of the project.

The Composite Information Server includes a Discovery option that provides the simplest and fastest way to find and explore enterprise data and prepare the models needed by your downstream data integration and application development processes. Discovery not only finds the data you need, but it also automatically 'discovers' critical relationships across the data including both formal relationships such as primary and foreign key linkages within a single database as well as informal relationships across systems.

You can use this data and relationships, adding and filtering data as appropriate, to build and refine your data model. By accessing and displaying live data in your model, Composite makes it easier for your IT professionals to validate business requirements with end users, accelerating this critical step. And when you are satisfied that you have the model right, the Composite Discovery option can automatically transfer it to the Composite Information Server or other data integration development environments for further development.

3. Data Virtualization Abstracts Source Data

Enterprises and government agencies face a continuous mismatch between how their data is stored (formats, structures, APIs, etc.) and how their data is used in reports, portals and other consuming applications. For example, many Web-based applications assume hierarchical XML data, but the source data may be stored in a tabular relational data store. Similarly, SAP reporting is often SQL based with data sourced from SAP-specific data structures.

Composite data virtualization abstracts source data, resolving structural and semantic issues, so you can overcome this mismatch. With Composite, your data experts can model your data and then generate relational views and/or Web data services that provide exact data required, when and how needed. To the consuming application, these views appear as relational tables easily accessible via ODBC, JDBC, or ADO.NET or as data services easily accessible via SOAP or JMS, and REST. This lets your applications teams develop their new applications using abstracted views of the data, instead of forcing them to learn and keep up with all the complexities inherent in the source data itself.

Furthermore, the Composite Application Data Services option helps unlock data from packaged applications and deliver it as data services or relational views out-of-the-box. Composite Application Data Services abstract the most common business objects, such as Orders, Invoices, Customers, and more, to enable instant access to packaged applications such as SAP, Siebel, Oracle E-Business Suite, PeopleSoft, and salesforce.com.

4. Data Virtualization Accesses Diverse Data

Enterprise and agency data resides in diverse sources across multiple locations, often outside the firewall. These typically include structured data sources such as relational databases, data warehouses, file systems, and more as well as semi-structured data such as XML documents. Access to this source data must be done using a protocol and API that the source prefers (or is capable of).

Composite data virtualization facilitates source data access using standard approaches including ODBC, JDBC, and ADO.NET for relational, JMS and SOAP for Web services, APIs for

packaged applications and legacy systems, Java for procedural interfaces, and adapters for mainframes. These out-of-the-box integration tools simplify and accelerate new development while optimizing run time performance.

Examples of Composite customers using Composite data virtualization to access diverse data are many:

- **Single View of Customer** – A leading personal fitness company uses Composite data virtualization to access and unify customer data from a range of sources including their custom Web services-based member management system, Siebel CRM, and Excel-based personal trainer data.
- **Payroll Variance Analysis** – Using Composite Application Data Services to access budget data stored in a central budgeting application and actual payrolls managed by several SAP instances enables developers to build an advanced payroll variance analysis application.
- **Insider Trading Compliance** – With SEC reporting mandated and fines for non-compliance harsh, Composite data virtualization accesses required data from multiple trading systems, making it easier for applications developers to provide the required compliance reports.

5. Data Virtualization Federates Data Silos

Enterprises have multiple systems of record, multiple complementary applications, multiple consolidated stores, multiple external data sources, and future plans for even more. Each silo has its own unique metadata model, data access toolset, and underlying architecture. Yet, with most of the new data requirements spanning these traditional silos, it is little wonder that aggregating data across them is challenging.

Composite data virtualization lets you federate data silos, thereby adding new meaning and value to isolated enterprise data. Some cross-silo examples include:

- **Customer Portfolio Reporting** – Composite data virtualization combines equity, fixed income, and other investment positions to provide a single view of a customer portfolio.
- **Scientific Research Workbench** – This scientific workbench leverages Composite data virtualization to combine research, clinical trial, FDA submission data, and more.
- **Crew Exploration Vehicle Health Information Portal** – Composite data virtualization captures a range of past and present medical data.
- **IT Performance Management Dashboard** – Combining SLA and other system status metrics from a range of application management systems, Composite data virtualization gives IT operations managers a complete performance picture.

6. Data Virtualization Delivers Timely Information with High Performance

As the pace of business accelerates, waiting until next week or even tomorrow ‘when the reports run’ is often no longer good enough. Business decision making occurs 24x7 requiring the right information at the right time, which often means current information right now!

Traditional physical data consolidation approaches use batch processing in off hours to mitigate load on production systems and only allow querying of the warehouse or mart to ensure query

performance. Trickle feed and changed data capture infrastructure can be added to reduce data latency.

Composite data virtualization uses a different approach that delivers timely information on demand, whenever needed. Rather than move all potential data that might possibly be queried into a second consolidated source, Composite only queries the 'minimum' data required by the consuming application. Further it does this only when the data is actually needed. This mitigates load on the source systems while also providing up-to-the-minute information. To achieve such low latencies while not impacting source systems, Composite leverages patent-pending high-performance query techniques and a number of advanced caching methods.

Examples abound:

- **Interest Rate Sensitivity Analysis** – This analytic application uses Composite data virtualization to deliver up-to-the-minute interest rates and position data to traders and risk managers at an investment bank.
- **Virtual Month-end Close** – Composite data virtualization delivers the latest accounting data from a number of on-line accounting systems enabling financial metrics to be calculated at any time during the period.
- **Global Inventory Balances** – To better manage the supply chain, Composite data virtualization captures inventory balances from across manufacturers, shippers, distributors, and retailers anytime, 24x7.

7. Data Virtualization Secures Data

While putting better information in the hands of business is the goal, security must also be considered. Rather than create a separate security infrastructure, Composite data virtualization leverages LDAP and Active Directory authentication to enforce user-based data security rules already established in source and consuming systems. Composite can also be configured to support Role Based Access Control (RBAC), Attribute Based Access Control (ABAC) and Security Assertion Markup Language (SAML). Composite supports the Intelligence Community Information Security Marking (IC-ISM) requirement by generating row security tags for data from each data source.

Some examples include:

- **Global Headcount and Payroll Analysis** – Composite data virtualization combines personnel data from global PeopleSoft, SAP, and spreadsheets, while maintaining appropriate security on this confidential information.
- **Pharmaceutical District Sales Manager Portal** – Highly sensitive prescription sales, sales compensation, expenses, and physician visits data are combined in a sales management application using Composite data virtualization.
- **Global Clearing Services Reporting** – Composite data virtualization securely combines private financial trades from trading systems around the world.

8. Data Virtualization Complements Physical Data Consolidation and ETL

Leading organizations understand that a portfolio of data integration techniques and technologies are required to effectively meet today's wide range of needs. These include:

- **ETL type tools** such as Informatica PowerCenter enable physical movement and consolidation of the data into a persisted store such as a data warehouse, data mart or operational data store.
- **Data virtualization / data federation / EII type tools** such as Composite Information Server enable virtual integration of the data using relational views or data services. These views and services can be combined to form virtual data marts, virtual operational data stores, and virtual architectural layers.
- **Replication and messaging type tools** such as Tibco ActiveMatrix Service Bus™ for data propagation or GoldenGate Transactional Data Management™ for change data capture.

Gartner confirms this portfolio approach to data integration. (See Figure Two) In a 2008 report on data integration adoption, Gartner VP Distinguished Analyst Ted Friedman included the following key recommendations:

“Enterprises should adopt a portfolio of [data integration] DI tools that support a range of data delivery styles, from bulk/batch physical data delivery, to granular and lower-latency delivery, to federated and virtualized views of data”; and “Information architects and DI designers/developers should acknowledge data federation capabilities as an increasingly important component of a comprehensive data integration strategy.”⁴

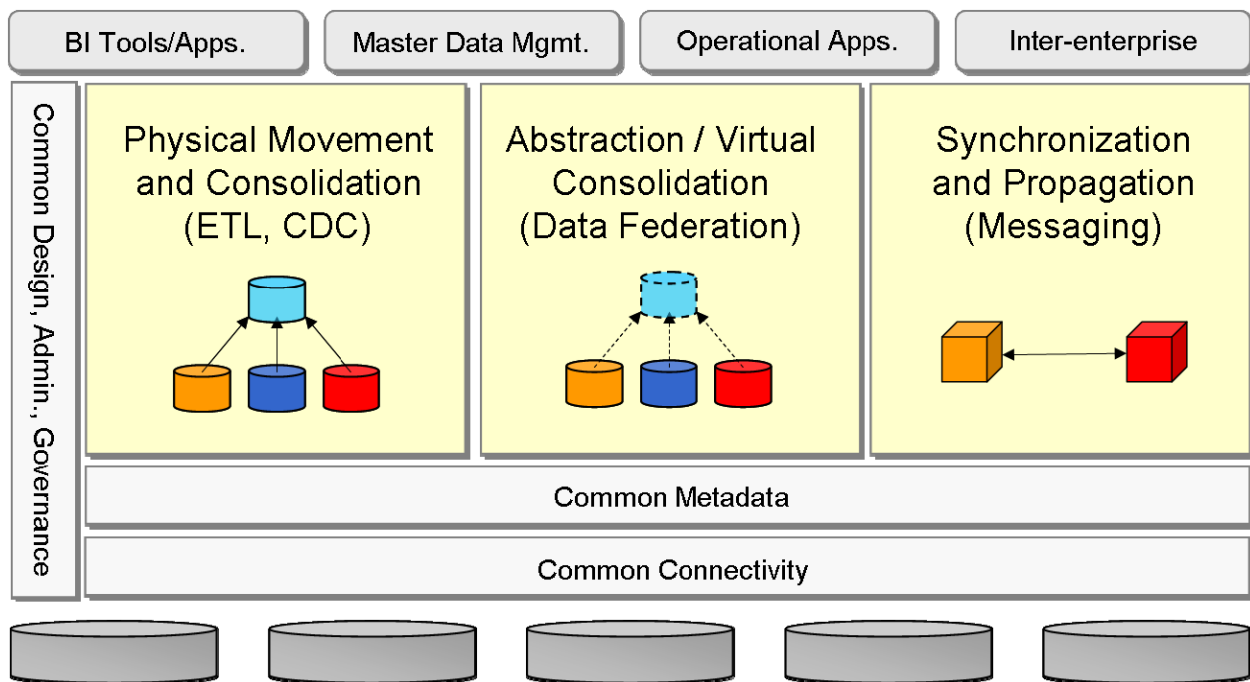


Figure Two: Data Integration Options (Source: Gartner)

Enterprises and government agencies often use Composite data virtualization side-by-side with physical data consolidation to add value to existing data warehouses. Examples include:

- **Extend Existing Data Warehouses** – Data virtualization effectively federates data-warehouse information with additional sources, therefore extending existing data warehouse schemas and data. These complementary views are conducive to adding current data to historical warehouse data, detailed data to summarized warehouse data, and external data to internal warehouse data.
- **Extend Master Data Hubs** – Data virtualization can also combine master customer, product, employee or other data with detailed transaction and other related data scattered across an enterprise. This approach provides a complete 360° view beyond the core master data attributes maintained in the hub.
- **Federate Multiple Data Warehouses** – Data virtualization federates multiple physical warehouses. This approach achieves logical consolidation of warehouses by creating an integrated view across them, using abstraction to rationalize the different schema designs
- **Create Virtual Data Marts** – Data virtualization provides virtual data marts that eliminate, or at least significantly reduce, the need for physical data marts around the data warehouse hubs. This approach abstracts the warehouse data to meet specific consuming tool and user query requirements, while still preserving the quality and controls inherent in the data warehouse.
- **Virtually Integrate Data Warehouses into Enterprise Information Architectures** – Data virtualization integrates data warehouses into an unified enterprise information architecture. The data virtualization middleware forms an enterprise data virtualization layer that is home to a logical schema covering multiple consolidated and virtual sources in a consistent and complete fashion.
- **Preprocess Data for ETL** – ETL tools can leverage virtual views and data services as inputs to their batch processes, appearing as another data source. This integration pattern also integrates data source types that ETL tools cannot easily access as well as reuse existing views and services, saving time and costs. Further these abstractions do not require ETL developers to understand the structure of, or interact directly with, actual data sources, significantly simplifying their work and reducing time to solution.
- **Rapidly Prototype the Data Warehouse to Quickly Meet New Requirements** – Data virtualization middleware serves as the prototype development environment for a new data warehouse. In this prototype stage, a virtual data warehouse is built, rather than a physical one, saving the time to build the physical warehouse. This virtual warehouse includes a full schema that is easy to iterate as well as a complete functional testing environment.
- **Insulate Reporting Users during Data Warehouse Migrations** – Data virtualization removes reporting risk by inserting a virtual reporting layer between the warehouse and the reporting systems. Decoupling these systems enables the reporting to continue before, during and after the migration.

For more information on how Composite data virtualization complements ETL and data warehouses, see the Eight Ways Composite Data Virtualization Adds Value to Enterprise Data Warehouses White Paper.

9. Data Virtualization Meets both Project and Enterprise Level Requirements

Most organizations initially deploy data virtualization to meet project specific integration requirements not well suited for traditional integration methods such as ETL. However, seeking further gains, many have expanded data virtualization adoption across their enterprises.

Composite data virtualization scales to support enterprise level requirements so you can further increase sales, reduce risk, and cut costs. Examples abound across industries including:

- **Energy Company** – Composite data virtualization simplifies access to multiple terabytes of drilling and refinery data in support of variety of business and technical analytical applications. Hundreds of engineers and business analysts now spend less time on access and more time on analysis resulting in higher revenues and lower production costs.
- **Computer Manufacturer** – Composite data virtualization provides an up-to-the-minute, global view of customer demand, distribution and manufacturing data for multiple supply chain planning and order management applications around the world, enabling improved customer service and lower production costs.
- **Intelligence Agencies** – Multiple government agencies leverage a common Composite data virtualization layer so intelligence analysts can share information across agencies and better control threats.
- **Information Provider** – Enterprise-wide Composite data virtualization layer provides hundreds of end customers with faster, easier access to multiple sources of ratings and product data, improving satisfaction and revenue.
- **Investment Bank** – All new SOA-based applications within the investment bank line of business in this financial services company share a common Composite data virtualization layer to accelerate new applications time to market and thereby improving competitiveness.
- **Pharmaceutical** – Multiple analysis and reporting requirements across Sales, HR, Finance and Research Informatics are fulfilled using a common Composite data virtualization layer that integrates source data from back office and research systems, accelerating report development and reducing costs.

10. Data Virtualization Accelerates SOA Transition

When adopting SOA, every organization's experience is unique. Existing legacy architectures, different project priorities, and previous SOA investments are but a few of the factors.

According to many analysts, data services form as much as two-thirds of services projected to be built within a typical enterprisewide SOA deployment. AMR says, "No SOA plan is complete without a data services layer."⁵ Composite helps you accelerate your SOA transition using a practical approach to SOA that focuses 100 percent on this biggest slice of the SOA pie.

Delivered via SOAP, HTTP, JSON, XQuery, REST, and JMS, Composite data services can be combined to form the data services layer within your SOA strategy. By applying these data services to multiple projects, you can achieve your reuse and interoperability objectives.

With Composite, you can migrate to SOA in phases, leveraging existing systems and SOA tools, while supporting mixed SOA and non-SOA environments. You can even repurpose

“non-SOA” code such as relational views into SOA standards-compliant data service in just a few clicks.

Composite data virtualization works in conjunction with other SOA tools such as Enterprise Services Buses (ESBs), Registries, and Application Servers, so you can leverage these technology investments. (See Figure Three)

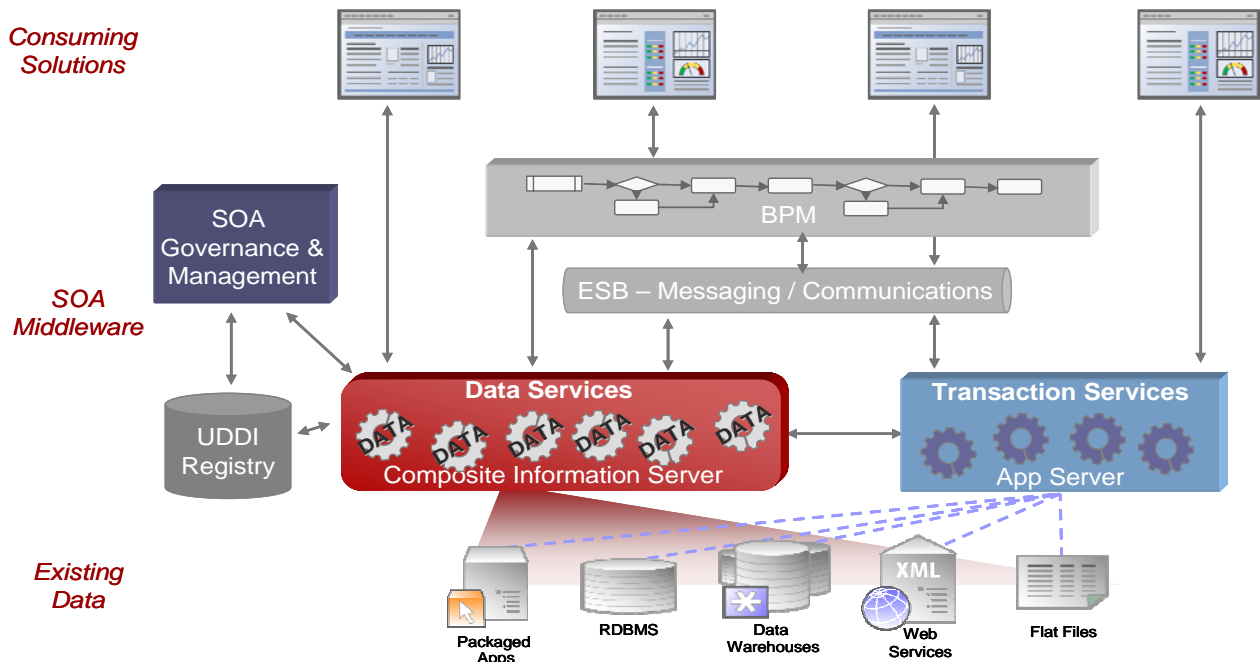


Figure Three: Composite Data Services with Other SOA Tools

Below are several Composite customer examples:

- **Financial Research Data Services Layer** – Composite forms a loosely-coupled, abstracted middle layer between a multi-terabyte financial research database and a variety of Matlabs analytical and custom financial engineering applications.
- **Reporting Data Services** – Multiple reporting requirements including Prime Brokerage, Reconciliation, Risk Management, etc., share a common set of Composite data services.
- **SOA Data Virtualization Layer** – An Investment Bank develops a shareable data services for all new, line-of-business applications using Composite data virtualization.

11. Data Virtualization is Easy to Build and Use

To get broad adoption, data virtualization needs to do more than provide the value and powerful capabilities listed above. Data virtualization needs to be easy to build and use, aligning well with typical software development lifecycles.

Composite’s data virtualization platform simplifies, accelerates, and improves each of the major steps in the typical software development lifecycle process:

- **Gather Requirements**

- **Discover Data and Relationships**
- **Model Data**
- **Build Solutions**
- **Operate**
- **Improve**

For the first steps, Composite Discovery helps you find the data you need if you do not already know exactly where it is located. Discovery also helps you explore relationships among data uncover insight and context about your data. It enables you refine a preliminary model and use that model to obtain immediate validation from your business users that your solution will meet their needs.

Once you have obtained validation, you can transfer the model to the Composite Information Server to continue to build out the model as relational view or data services for use by your consuming applications. If you have already modeled your data in a popular metadata modeling package such as ERwin or ER/Studio, Composite provides integration, so you can save steps and stay in synch.

Within the Composite Information Server, you can author relational views in the Composite Studio and/or data services in the Eclipse-based Composite Designer using point-and-click data modeling techniques. With no programming required, developers, data administrators, and even business analysts can build a view or data service in just a few minutes with little training required.

Further, for packaged applications such as SAP, Siebel, PeopleSoft, salesforce.com and Oracle E-Business Suite, Composite provides pre-built application data services that offer up to 80 percent of what you need out-of-the-box.

Once built, Composite views and data services are easy for your applications developers to use in their consuming applications. At run time, the Composite Information Server accesses, federates, and delivers the data to these consuming applications as requested. And as your requirements change, Composite lets you continuously optimize and improve your solution.

For more information on how Composite data virtualization works in a software development lifecycle, see the Composite Data Virtualization Process White Paper.

12. Data Virtualization Fits Neatly Within Your Existing IT Environment

As data virtualization is broadly adopted across the enterprise, the core challenge shifts from pure technical capability to a mix of technical and operational imperatives. In other words, as data virtualization use scales from project to enterprise, will ease of deployment, reliability, scalability, and manageability keep up?

To ease deployment, Composite utilizes key industry standards such as ODBC, JDBC, ADO.NET, SOAP, JMS, SQL, XQuery, Java, and REST as well as open APIs for metadata and administration. This enables Composite to easily leverage existing metadata, data, hardware, and software assets and to run in any environment without restriction. Further, it allows existing staff to get up and running quickly without having to learn new, unique proprietary content. Composite's use of standards and API's can be seen below. (See Figure Four)

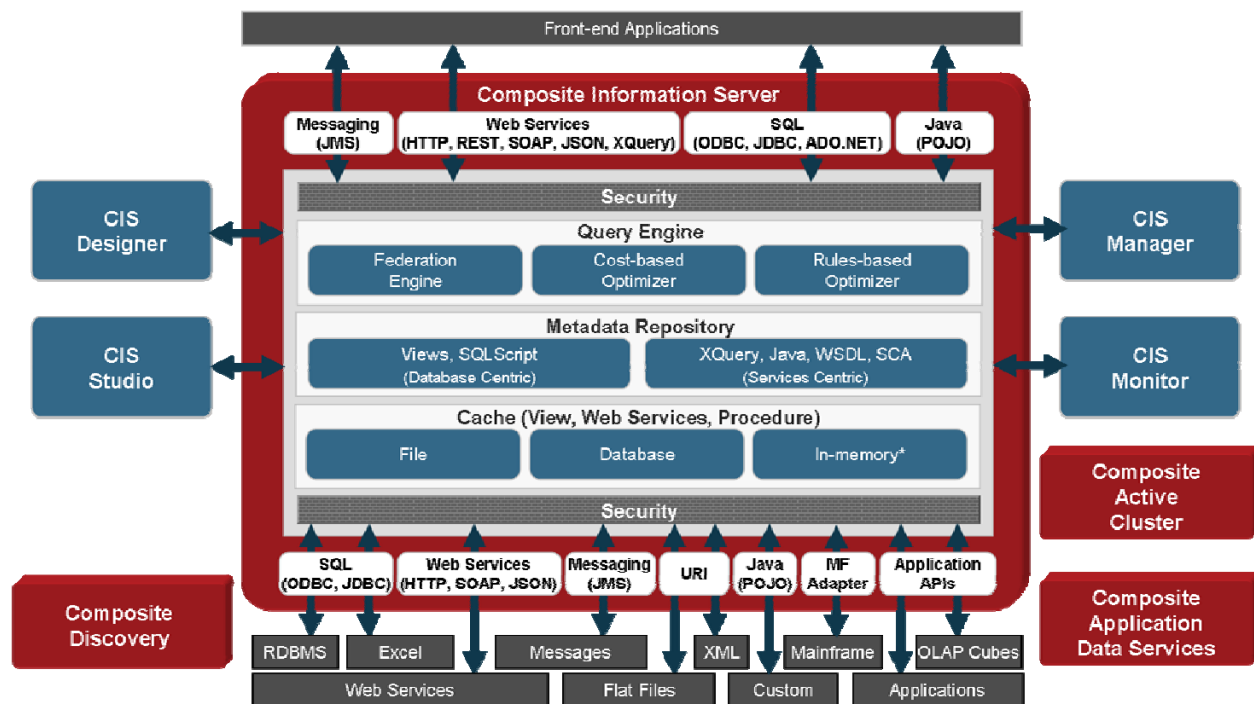


Figure Four: Composite Information Server Architecture, Standards, and APIs

Operationally, Composite data virtualization has been proven at some of the most demanding customers in the world, including top investment banks, pharmaceuticals, and OEMs such as IBM Cognos, BMC, and Informatica.

To ensure SLA performance in operation, the Composite Information Server is a pure, multi-threaded Java application that is designed for ‘24x7’, highly available enterprise service. The Composite Information Server also provides a range of management capabilities that can be controlled by its own management dashboard or by a third party systems management tool from BMC, HP, or IBM to name a few. Further, the Composite Active Cluster Option enables clustering of multiple Composite Information Servers as a way to gain additional scale and reliability.

For more information on how Composite data virtualization fits in an IT environment, see the Composite Data Virtualization Platform Architecture White Paper.

CONCLUSION

Composite data virtualization, as described in this paper, is a proven approach used by enterprises and government agencies to address a range of critical data integration challenges including data complexity, structure, location, completeness, and latency.

Following the established path of storage, server, and applications virtualization, Composite data virtualization saves time, staff and technology costs, so enterprises and agencies can increase revenue and productivity, while reducing risk.

Composite's data virtualization platform provides a complete solution for both project and enterprise level data virtualization requirements, often complementing other data integration methods and tools in both SOA and traditional architectures. Integrating data securely, Composite's easy-to-use products enable the entire software development lifecycle. And by leveraging standards and APIs, Composite data virtualization fits into any modern IT environment.

If your enterprise or government agency faces similar challenges, consider Composite Software, the data virtualization technology leader.

ABOUT COMPOSITE SOFTWARE

Composite Software, Inc. ® is the only company that focuses solely on data virtualization.

Global organizations faced with disparate, complex data environments, including ten of the top 20 banks, six of the top ten pharmaceutical companies, four of the top five energy firms, major media and technology organizations as well as government agencies, have chosen Composite's proven data virtualization platform to fulfill critical information needs, faster with fewer resources.

Scaling from project to enterprise, Composite's middleware enables data federation, data warehouse extension, enterprise data sharing, real-time and cloud computing data integration.

Founded in 2002, Composite Software is a privately held, venture-funded corporation based in Silicon Valley. For more information, please visit www.compositesw.com.