

SIMATIC IT XHQ™ and SOA

Maximizing Information Value using XHQ and SOA

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SIMATIC IT XHQ plays an important role in a Service Oriented Architecture. In addition to providing real-time and right-time decision support services through Operations Intelligence and management dash-boards, SIMATIC IT XHQ participates in SOA as both a data receiver and data provider.

Service Oriented Architecture

Service Oriented Architecture (SOA) approaches are becoming more and more prevalent due to the ability to extend and greatly enhance business scenarios without the need for major overhauls in IT infrastructure. SOA and the use of Web Services is becoming a common technique to extend applications and provide rich *composite* applications.

The governing objectives of SOA can be summarized as:

- The interoperability between different systems and programming languages to provide the basis for integration between applications and their services that are traditionally hosted on different platforms;
- The desire to create a federation of resources. Establish and maintain high quality and timely data flow.

The guiding principles of SOA can be summarized as:

- Reusability, granularity, modularity, composability, componentization, portability, and interoperability;
- Standards compliance (both common and industry-specific);
- Categorization and identification of services, including the provision and delivery. Stewarding the service provision through monitoring and tracking.

The purpose of this document is to describe how the XHQ platform provides a foundation that can be used to achieve the objectives of SOA and how the guiding principles can be applied to XHQ solutions, thereby enabling participation in SOA.

SIMATIC IT XHQ is SOA ready

XHQ is well placed to participate in an SOA, providing valuable services with respect to Operations Intelligence (OI) and analytics, and also by acting as a data

consumer and provider through loose coupling with other SOA-participating systems and applications. XHQ solutions can be configured to facilitate the automation and optimization of work process without the need for wholesale changes to current IT landscapes. XHQ supports a variety of communication standards and interfaces to third-party systems, thereby providing decision-critical information pertaining to the results and analysis of workflow execution and also providing the decision points to trigger work process events in other participating systems. For example:

- External systems can trigger XHQ data collection and retrieval using flagged events, which in turn populate automated data cubes that provide real-time analysis of current and historical operations;
- A predefined set of decision points can be monitored and significant excursions can be alerted and used to trigger corrective and remedial actions;
- Web Services and workflows such as maintenance Work Order (WO) creation in a third-party system can be invoked and pre-populated with data from within XHQ views;
- Provision of integrated data and OI information for consumption in web-based portals.

Figure 1 displays how XHQ enables interoperability between different systems participating in the SOA. Each system provides its own distinct function and set of services. XHQ, however, provides a unique ability to provide work process triggers and messages based on aggregated data, metadata, real-time data, and truly integrated data from disparate systems. Figure 2 displays the same interoperability as displayed in Figure 1, however, instead of organizing functions by system, functions have been grouped by service. Figure 2 clearly defines the services that are provided by XHQ.

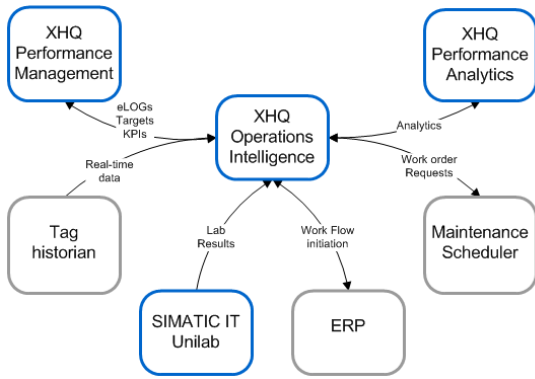


Figure 1: XHQ participating in an SOA by system

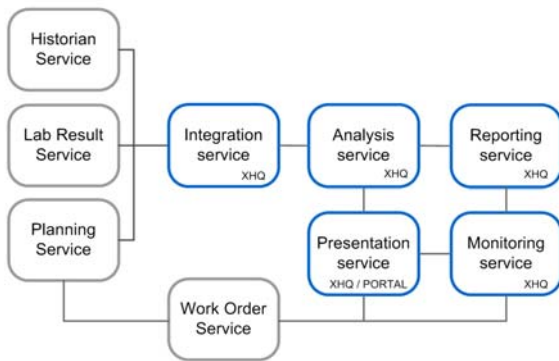


Figure 2: XHQ participating in an SOA by service

A simple example involves the creation of maintenance WOs based on condition monitoring of multiple real-time process values. Real-time values retrieved from a tag historian can be compared to targets and limits defined in the SIMATIC IT XHQ Performance Management (PM) application. Decision points can be alerted and XHQ data providing services can be used to trigger the creation of maintenance WOs in a maintenance scheduling system.

Because of the interoperability and loose coupling of XHQ and the other systems, data and information held with the XHQ cache or dashboard views can be easily shared and transferred to other systems using a variety of industry standard communication protocols. For example:

- Invoking Web Services and initiating workflow processes from within an XHQ dashboard;
- Analyzing target history and issuing an instruction to update the targets in the PM application;
- Issuing a pre-populated WO and change requests based on analysis performed in OI dashboards, and so forth;
- Analyzing real-time operational conditions such as marine terminal berthing, product inventory status, production rates, and berthing schedules to provide early warning of potential demurrage costs and trigger berth shift requests;

- Monitoring real-time production rates and inventory, comparing them with the results of production variance analysis and shipping plans, and issuing production plan changes to the production management system.

XHQ and its enabling technology exhibits and employs many of the guiding SOA principles such as reusability, granularity, modularity, componentization, portability, and interoperability. XHQ also demonstrates compliance with many of the industry standards that are associated with SOA.

Leveraging information value from existing and legacy systems

Different SOA participating systems have different types of data available in different formats. Traditionally, organizations have been encouraged to upgrade or replace their existing systems on the basis that their legacy systems are unable to interface with other systems and provide the required data in the right format.

Existing and legacy systems represent a considerable investment for the customer organization. More often than not, the legacy systems are already providing valuable business functions. Therefore, replacing such systems creates additional cost and inconvenience. The best-case scenario is to use an OI system that leverages the value in these systems and does not mandate a complete overhaul of the customers' IT systems.

SIMATIC IT XHQ has a proven track record in utilizing the valuable information in legacy systems and has a vast array of plug-and-play connectors to retrieve data from most legacy systems. XHQ also has a variety of mechanism for writing data back to third-party systems. This ease of connectivity and level of interfacing often reduces the need for customer organizations to replace their existing systems. There are also many opportunities to improve and automate current work processes without replacing entire systems.

SIMATIC IT XHQ as a data consumer

Any software system that participates in an SOA requires data, messages, and/or instructions from other participating systems in order to trigger its primary functions and services. Therefore, the ease and extent of connectivity and interfacing between systems must be considered when designing the SOA and when selecting system participants.

With XHQ, different types of data can be collected from multiple and disparate systems within the SOA, using its unique connection framework.

This proven and mature connection framework also solves many of the problems experienced when including real-time systems in an SOA. For example, the XHQ connection framework is used to provide integration services, supporting event-driven data collection, relational data collection, and real-time data collection from multiple tag historians.

SIMATIC IT XHQ connection framework

The XHQ connection framework consists of a variety of plug-and-play connectors. Connectivity is simple and data can be retrieved quickly and efficiently. XHQ uses *intelligent* connection processes, and many of the connectors also include built-in protection mechanisms to minimize impact on back-end data sources and to maximize reliability of data retrieval. In addition to the following list of standard connectors (Figure 3), customized connectors may also be developed.

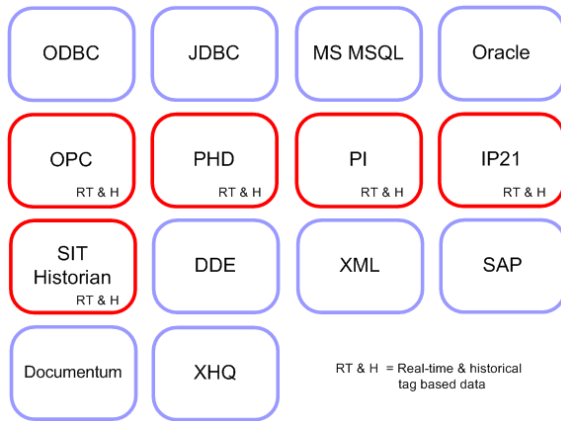


Figure 3: XHQ connectors

The XHQ XML connector is the principal method for consuming data in an SOA environment. The XML connector supports HTTP and file based XML retrieval. Pass-through querying has now been made available, which enables developers to include query string parameters and pass the parameters through using HTTP requests.

Data Access Methods

The SIMATIC IT XHQ Connector Framework and connector plug-ins provide a secure and efficient way to access information from a wide variety of data sources. XHQ intelligent connectors are configurable to support several data access techniques such as:

- Real-time and event-based collections;
- Flag collections (executes each time a value changes);
- Trigger collections (queries only records that have changed);

- Ad-hoc (Pass-through) collections (data retrieval requests are passed to the back-end data source directly without caching).

The method of data retrieval can be selected to minimize the impact on back-end systems and network bandwidth consumption, without compromising the data access requirements of the end-users.

SIMATIC IT XHQ as a service provider

The OI product line aggregates, relates, and presents operational and business data in real-time to improve enterprise performance. Through SIMATIC IT XHQ, you have a single coherent view of information, enabling a variety of solutions in real-time performance management and decision support (as seen in Figure 4). XHQ aggregates operational and business data from multiple disparate sources and presents this to a wide community of different user communities.



Figure 4: Operations and Management Intelligence Dashboards

XHQ fits into a three-tier architectural model. XHQ includes a Connector Framework (for connecting to back-end operational systems), an Intelligence Server, and browser-based Clients. Figure 5 displays an example of how the three tiers are used to retrieve, consume, model, analyze, and visualize information in a series of interactive dashboards.

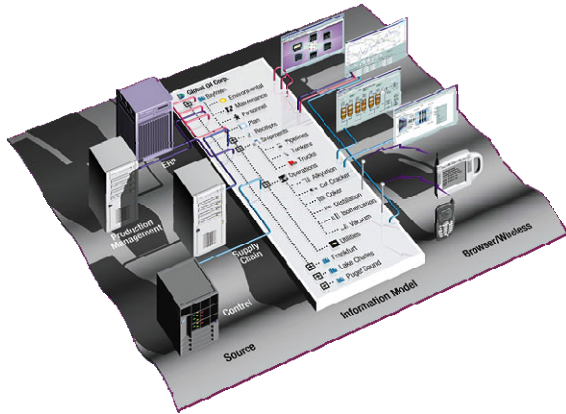


Figure 5: XHQ 3-tier model

The First Tier: Connector Framework

This tier consists of an enterprise’s back-end operational systems (manufacturing applications, databases, data warehouses, and transactional or control systems). In this level, XHQ does nothing but retrieve data efficiently using the Connector Framework.

The Second Tier: Intelligence Server

The second tier is the Intelligence Server, which is the heart of XHQ. The Intelligence Server consists of a number of independent server-side processes: Solution server, Enterprise server, Cache server, and Alert Notification server. A standard web server completes the picture. This tier manages back-end connections and incorporates many functions to simplify client use. The proven scalability of XHQ is possible because of the power of the Intelligence Server.

The Third Tier: Browser-based Clients

This level of the XHQ system consists of *zero-administration*, browser-based clients. You just open your browser and navigate through your solution. You can display views and information from potentially many back-end sources. When you select a view, the server continuously publishes real-time data that updates and animates your display.

SIMATIC IT XHQ as a data providing service

XHQ is a unique provider of truly integrated data, merged from disparate data sources and enabled by its unique data caching feature. XHQ is also a unique provider of other information types as displayed in Figure 6.

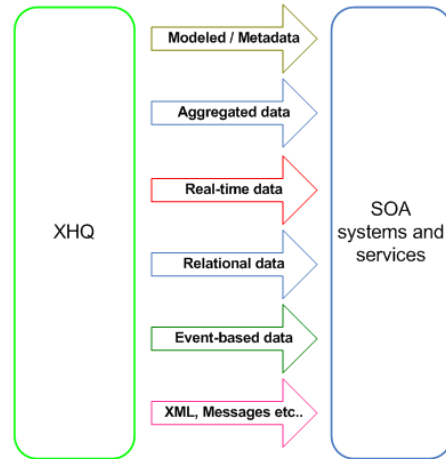


Figure 6: XHQ Data Provision

XHQ fosters openness and communication of data between different SOA services and systems. Loose coupling and interoperability can be achieved using several different mechanisms. Most industry standard communication protocols are supported, enabling data to be provided in multiple formats covering a wide variety of temporal needs. These mechanisms enable data to be made available to other SOA participating systems and services.

XHQ Web Services

The term Web Services describes a standardized way of integrating applications over Internet protocols, such as HTTP or SMTP, using open source standards such as XML, SOAP, WSDL, and UDDI.

In Web Services, XML is used to represent and group data in a series of data, SOAP is used to transfer the data, WSDL is used for describing the services available, and UDDI is used for listing what services are available.

Figure 7 displays an example of how a client application invokes the SIMATIC IT XHQ Web Service.

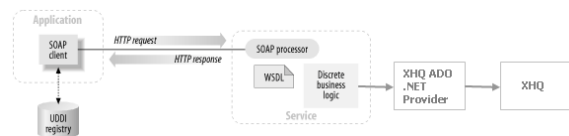


Figure 7: Using a client application to invoke a XHQ web-service

XHQ Client API (Application Interface)

The Client Data API allows developers to connect to the XHQ solution and extract the current value and aggregate values of a component member, collection data, tag data (such as tags), and time-series data. It consists of the following general features:

- Supports Java 1.4 (and later);
- Supports Microsoft .NET Framework 2.0;
- Access to runtime primitive and collection data;
- Access to full namespace;
- Access to model information;
- Includes logging capability;
- Provides metadata access;
- Supports the XHQ security model;
- Is a modular component of the XHQ suite of applications;
- Can be used in stand-alone applications or application servers.

ADO.NET

An ADO.NET data provider adds another important dimension in extensibility. ADO.NET is a standard Microsoft approach that allows client applications and tools from other third-parties and Microsoft to consume content from the XHQ servers. The ADO.NET provider serves as a *natural* database interface to XHQ solution data. For example, the joining of XHQ objects (including tags) and XHQ collection data can now be easily achieved. Because of ADO.NET support, industry standards can be used to join collection data from XHQ to data from other participating systems.

XHQ Relational Data Store and Load

The Relational Data Store and Load (RDSL) module is designed to load data from the XHQ cache server into a Relational Data Store (RDS). The RDSL module provides the ability for SQL or Anonymous PL/SQL blocks to run based on updates to collections within the XHQ cache server. The RDSL module allows the XHQ cache server to be used as a data staging area for an RDS.

The Siemens Advantage

Domain Experience

Siemens has the experience in applying OI and delivering solutions that are relevant to the business needs of today and of the needs of the future. Siemens has many experienced consultants with deep knowledge of the industry and the information technology skills to deliver solutions with proven added value.

Proven Track Record

The SIMATIC IT XHQ platform has been successfully implemented in many national and multi-national oil and gas companies. We have a large number of successful references in implementing intelligence solutions throughout the oil and gas industry.

Technology Partnerships

Microsoft and Siemens have a strong strategic relationship with the intent to drive innovative solutions in manufacturing.

Siemens is working closely with Microsoft to leverage Microsoft client tools and software components, and opportunities for performance improvements and to lower total cost of ownership.

Together with our network of certified solutions partners, we bring a complete solution from project design through architecture through development and deployment.

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