

Using XML, J2EE, Relational Databases, and Internet Standards for Optimizing Healthcare IT

An introduction to the Medspective Healthcare Informatics Platform



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An Introduction to Medspective

Netspective's healthcare informatics platform/framework, called *Medspective*, allows companies to build and deploy dynamic healthcare applications using fewer programmers, in less time, with higher-quality, and better documentation. Using Medspective, healthcare IT groups can stop building applications from scratch each time and leverage existing talent, databases, and components to reduce time to market, improve quality, and cut costs.

Why Medspective?

Developing and delivering healthcare applications is a time-consuming, complex, and costly endeavor. IT groups in healthcare organizations are struggling with competing demands from clinical users, business users, and financial users. Healthcare applications demand high quality, easy accessibility, good privacy, excellent security, and simplified user interfaces all at a low price point. Most organizations opt for commercial-off-the-shelf (COTS) solutions but find out that customization and new applications remain a necessity to keep up with competitive and cost-cutting measures.

Medspective was designed as a healthcare and medical informatics *platform or framework* that would allow web services, information transparency, legacy integration, data consolidation, customer relationship management, enterprise reporting, and knowledge management applications *to be built on top of an existing infrastructure*.

What types of applications can Medspective support?

- ◆ Web-based self-service applications residing on top of legacy systems and existing databases.
- ◆ Online interactive disease management applications.
- ◆ Next-generation practice management systems.
- ◆ Next-generation hospital information management systems.
- ◆ Healthcare and pharmaceutical workflow systems that help reduce medical errors and improve clinical efficiency through outcomes analysis.
- ◆ Healthcare-focused portals that integrate existing applications.
- ◆ Next-generation adjudication engines
- ◆ XML and legacy data integration engines.
- ◆ Healthcare-focused e-procurement engines and applications.
- ◆ Wireless, hand-held, and mobile applications for clinical notes, charge capture, and laboratory order and review

- ◆ Online patient and hospital scheduling and event tracking systems.
- ◆ Healthcare-focused single sign-on, secure personal ID systems, and HIPAA-compliant privacy and security engines.
- ◆ Healthcare-focused real-time image distribution for diagnostic-quality images.
- ◆ Wireless and internet solutions for generating alerts and communications of critical healthcare data and news.
- ◆ E-prescribing systems.
- ◆ Master patient indexes.
- ◆ Master organization and services indexes.
- ◆ Integrated multi-enterprise patient folders and records.
- ◆ Managed care information management systems.
- ◆ Claims processing for medical reimbursements.

Types of customers that Medspective-based applications can target

- ◆ Healthcare organizations
- ◆ Clinicians
- ◆ Employers
- ◆ Consumers/patients
- ◆ Government

Types of business models that Medspective-based applications can support

- ◆ Direct sale
- ◆ License
- ◆ Royalty-based
- ◆ Lease
- ◆ Outsourced
- ◆ ASP

Types of accessibility that Medspective-based applications can offer

- ◆ Speech-based access
- ◆ Wireless access
- ◆ Touch-screen access
- ◆ Web-based access
- ◆ Computer telephony integration
- ◆ Paper/scanning

What is Medspective?

Medspective is an *enterprise framework* built specifically to support healthcare and medical informatics applications. Medspective provides healthcare IT groups, independent software vendors, consulting groups, and systems integrators with a set of tools that simplify the development of healthcare applications to help improve programmer productivity, increase quality, and reduce costs.

Medspective uses XML, Java, J2EE, web servers, and standard application servers to help construct platform- and database-neutral medical applications for all healthcare customers. It includes pre-built objects, data models, web services, and process models that are used in most healthcare applications.

Types of general healthcare objects included

Data Management Layer

- ◆ Data dictionary with patients, providers, insurance, billing, managed care, clinical, and other important medical informatics content.
- ◆ Interface objects that provide implementations of the healthcare data dictionary.
- ◆ Hundreds of pre-built and optimized tables (using standard SQL) that works in any relational database.
- ◆ Database design documentation describing all tables, columns, indexes, and the complete data dictionary.
- ◆ Complete object-oriented lightweight Java data access objects that can read and write data.
- ◆ Complete XML-based web services to get data in and out of databases with very little code.

Presentation Layer

- ◆ Forms and controls with data entry objects for patients, patients, providers, insurance, billing, managed care, clinical, and other important medical informatics content.
- ◆ Client- and server-side validation designed for medical informatics content.
- ◆ Navigation and workflow engine.
- ◆ Wireless, PDA, multiple-browser Support.
- ◆ Multiple skins support to allow full customization.

HIPAA-compliant Security and Personalization Layer

- ◆ User Login Forms
- ◆ User Management Objects
- ◆ Access Control Lists
- ◆ Permissions Management
- ◆ Roles Management
- ◆ Forms/Controls Conditional Security
- ◆ Reports Conditional Security

Process & Methodology

- ◆ Administration console for managing hundreds of pre-built objects.
- ◆ Unit Testing of Common Components.
- ◆ Automated functional specifications.
- ◆ Automated metrics (function points, SLOC).
- ◆ Automated implementation documentation.

Medspective objects enable practice management systems

- ◆ Appointment scheduling
- ◆ Audit trails
- ◆ Billing/accounts receivable
- ◆ Clinical data repository
- ◆ Clinical encounter management
- ◆ Coding support
- ◆ Contract management
- ◆ Customer Relationship Management
- ◆ Decision support tools
- ◆ Electronic claims processing
- ◆ Enrollment and eligibility
- ◆ HIPAA-compliant formats and code sets
- ◆ Incoming/outgoing referral tracking
- ◆ Integration clinical and financial system
- ◆ Integrated formulary with decision support
- ◆ Interface to electronic image processing
- ◆ Interface to speech recognition
- ◆ Interface to wireless or handheld devices
- ◆ Inventory control
- ◆ Multiple access security levels and access controls
- ◆ Online lab orders/results reporting
- ◆ Online prescribing
- ◆ Outcomes measure analysis and reporting
- ◆ Patient demographics
- ◆ Patient education/guidelines
- ◆ Special practice management systems
- ◆ Transcription
- ◆ Treatment referral authorization
- ◆ Utilization management

Medspective objects enable clinical systems

- ◆ Administrative/management reporting
- ◆ Clinical documentation
- ◆ Clinically driven billing
- ◆ Decision support
- ◆ Interface engine
- ◆ Outcomes management
- ◆ Patient access
- ◆ Patient disease registry
- ◆ Patient education
- ◆ Physician order entry (prescribing)
- ◆ Registration eligibility referral
- ◆ Scheduling
- ◆ Specialty clinical software
- ◆ Workgroup tools and workflow solutions

Medspective objects enable managed care systems

- ◆ Automated workflow
- ◆ Benefits management
- ◆ Case management
- ◆ Claims management
- ◆ Contract/pricing management
- ◆ Credentialing
- ◆ Customer Relationship Management
- ◆ Data warehouse
- ◆ Data mining
- ◆ Decision support
- ◆ Disease management
- ◆ Document imaging/management
- ◆ E-business/EDI
- ◆ Eligibility, benefits, referrals
- ◆ Fee-for-service Encounters
- ◆ HEDIS Reports
- ◆ Management Reports
- ◆ Medicaid/Medicare
- ◆ Medical equipment/supplies
- ◆ Membership enrollment
- ◆ Pharmaceuticals/pharmacy services
- ◆ Population health management
- ◆ Quality assurance

- ◆ Risk management
- ◆ Systems integration/consulting
- ◆ Utilization management/review

Medspective objects enable financial systems

- ◆ Accounts receivable
- ◆ Activity-based costing
- ◆ Allocations
- ◆ Budgetary control
- ◆ Claims management
- ◆ Contract management
- ◆ Cost accounting
- ◆ Decision support tools
- ◆ Fixed asset management
- ◆ General ledger
- ◆ Inventory control
- ◆ Modeling and risk management
- ◆ Patient accounting
- ◆ Payment processing/billing
- ◆ Payroll
- ◆ Project accounting
- ◆ Purchase order
- ◆ Report tools
- ◆ Time/attendance

Medspective objects enable consumer informatics

- ◆ Wellness
- ◆ Resource/reference
- ◆ Disease management
- ◆ Consumer education

Medspective's Technologies

Java/J2EE

The Java 2.0 Platform Enterprise Edition (J2EE™), “manages the infrastructure and supports the Web services to enable development of secure, robust and interoperable business applications.”¹ Most healthcare enterprises develop some custom software and Java is one of the most popular languages for application development today. It's

¹ Introduction to J2EE, Sun Microsystems: <http://java.sun.com/j2ee/>

object-oriented model, long list of available libraries, and highly available and plentiful programming talent have made it an important tool in the healthcare IT toolbox.

Medspective runs on common web servers like IIS and Apache, industry-standard application servers like BEA WebLogic, IBM WebSphere, and JBoss.

XML

The eXtensible Markup Language (XML) plays a huge role in Sparx's ease of use, extensibility, and code generation. Medspective object declarations are performed using XML -- all dialogs, fields, validation rules, some conditional processing, all SQL statements, dynamic queries, configuration files, database schemas, and many other resources are stored in XML files that are re-usable across applications. Although XML is the preferred method for creating resource files, almost anything that can be specified in XML can also be specified using the Medspective Java APIs. If you are not familiar with XML, please visit <http://www.xml.com/> for some training materials. Sparx uses the JAXP, W3C Document Object Model (DOM), and SAX standards for parsing and processing XML files.

Medspective utilizes XML in a *declarative*, not *algorithmic* capacity. What this means is that XML is **not** used to define yet another programming or expression language. Instead, it is used to declare classes, rules, specifications, and other application requirements that are automatically parsed, read, understood, and executed by Medspective. The dynamic aspects of Medspective applications comes from Java through the use of a simple Value Source interface (an implementation of the Value design pattern), not a new programming language.

Relational Databases

Relational databases are common in the healthcare environment. Vendors such as ORACLE, IBM, Sybase, and Microsoft lead the industry with general-purpose databases. Medspective provides SQL data definition language (DDL), data manipulation language (DML), and queries that will run on ORACLE, DB2, SQL Server, Sybase, and many other relational databases. Deploying Medspective does not mean having to replace any database -- in fact, Medspective can help integrate and aggregate data from multiple data sources from disparate vendors.

Web Services

The general topic of *web services* refers to the ability of applications and systems to speak to each other over Internet protocols. The "normal" case of web applications has a patient accessing a medical portal site and learning more about a disease online or scheduling an appointment. This interaction is quite common but sometimes it's preferable to have a *computer system* automatically place an order with *other* computer systems. For example, suppliers could provide web services to hospitals so that they could automatically, without human intervention, place orders to the supplier when their inventory runs low.

Medspective supports both web applications (where a *human being* is interacting with an application or computer system) and web services (where a service is being created for use by *other computers*). Medspective allows the web services to automatically become applications and applications to automatically become services with very little work on the part of analysts or programmers. For example, every Medspective form or dialog automatically provides the capability for becoming a web service. Additionally, any table or SQL query defined using Medspective automatically has the capability to run in both “application” and “service” modes.

Benefits of Medspective technologies

- ◆ Application developers spend time on real features significant to end-users of their application instead of infrastructure issues.
- ◆ Technical managers can better manage their application development projects by utilizing the built-in project management, application documentation, unit-testing, and artifact-generation tools.
- ◆ Most of the user interface and database logic is coded in a declarative style using XML instead of a programmatic style using Java. This significantly reduces the amount of code (as much as 50-75% of code can be eliminated), increases re-use, maintains consistency across multiple projects, and improves code quality.
- ◆ Analysts can use the declarative user interface features to create prototypes that can later be completed by programmers (no more throw-away prototypes).
- ◆ Applications are built by assembling declared UI (forms/dialogs) and database (SQL) components combined with application-specific business logic using single or multiple distributed application tiers.
- ◆ Implementation can be done using XML, Java, or both.
- ◆ Implements common design patterns like MVC and factories. Skins infrastructure allow identical business logic to be used across different user interfaces for a variety of browsers and platforms like handhelds.
- ◆ Medspective enhances and works equally well with all project development methodologies including waterfall, RAD, OOAD, and the agility of methodologies like eXtreme Programming (XP).

Medspective and its Relationship to your Application

Medspective is a set of Java libraries, HTML components, and JavaScript libraries that reside *inside your application*. Medspective is interoperable with other frameworks and libraries and is designed as an enterprise framework that can stand-alone or enhance other COTS or in-house frameworks.