

# ZOTECA™

PUTTING RAPS™ INTO THE NETWORK:  
RELIABILITY, ACCESSIBILITY, PRIVACY, SECURITY

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## HIPAA and Zoteca White Paper

*Zoteca and RAPS are service marks of Zoteca, Inc.*

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# 1 HIPAA and Patient Record Data Flow

## 1.1 Introduction

Today's health providers are facing the urgent need to update and modernize their patient management information technology systems. For many years, two major issues dominated this sector's IT agenda: efficiency and privacy. The New England Journal of Medicine estimates that up to 24% of US healthcare costs are administrative. Some estimates of the annual dollar amount wasted in health care administrative inefficiencies are as high as \$250 billion! In the last US election, privacy was cited as the electorate's number one concern, particularly in the area of health-related information.

The new HIPAA regulations have created a regulatory environment that forces the industry to finally address these two core issues of efficiency and privacy in a serious fashion. Failure to comply will result in heavy fines and the possibility of jail sentences. Zoteca's technology plays a key role in assuring compliance with HIPAA regulations.

## 1.2 What is HIPAA?

The main goals of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) were to allow for insurance plan portability and the reduction of insurance fraud. To help achieve these goals a third goal was added — administrative simplification. Each time a patient sees a doctor, is admitted to a hospital, goes to a pharmacist or sends a claim to a health plan, a record is made of their individual health information. HIPAA aimed to create a private, secure, integrated, and efficient computerized patient record data-flow infrastructure; this infrastructure would be an IT backbone through which data can flow between patients, employers, health providers, pharmacies, labs, and insurance agencies, all of whom must share parts of the patient record.

The HIPAA regulations, which are still evolving, only partially address the original goals. Nonetheless, they mandate strict standards, within the framework of computerized information systems, for:

- how patient records are formulated,
- how they must be stored in a secure fashion, and
- how they are to be exchanged between the various players in the system in a secure and private fashion.

## 1.3 The HIPAA Challenge

### 1.3.1 The Challenge

Any organization required to be HIPAA compliant immediately faces numerous challenges, both organizational and technical:

- Changes required by HIPAA in organizational practices and IT infrastructure are far more comprehensive and are even more difficult to implement than solving the Y2K problem;

- Organizations have large existing investments in heterogeneous IT systems which cannot be replaced overnight;
- Multiple organizations that need to share information almost always have different and incompatible IT systems;
- Providing increased security almost always reduces efficiency.

No off-the-shelf solution can or will provide HIPAA compliance. Rather, a comprehensive, ongoing system-integration effort must be undertaken within each organization, in terms of both organizational procedures and IT solutions.

### 1.3.2 Domain Requirements

Any IT solution that allows providers to meet HIPAA standards must meet the following requirements:

**Immutable Data:** All data created in a patient record must be permanently stored, without deleting or losing any data, or permitting data to be tampered with.

**Audit Log:** An audit log must be kept of all transformations on the patient information.

**Disaster Recovery:** Data must be automatically restored in case of a physical or technology disaster.

**Local Access:** Data must be accessible as close as possible to where it is actually used;

**Record Routing:** Specific information must go to the correct place and only to the correct place — e.g. lab test results go to the doctor who requested them and nowhere else in the system.

**Record Lock-up:** Information is not accessible to anyone who is not authorized to see it.

**Evolutionary Integration:** The system must integrate with the organization's existing software, policies and network infrastructure, and not require an expensive redesign of the complete IT system. An evolutionary, future-compatible integration is needed, allowing the piece-by-piece modernization of the organization's data management systems without causing upheaval and disruption.

**Interoperability:** Each organizational unit, and each external organization, has its own custom policies, and in some cases custom software that needs to be interfaced with.

**Intra/Inter-Organizational:** The patient information must be shared both across the organization's various units, and with external organizations.

## 2 Zoteca RecordFlow

### 2.1 Zoteca Technology

Zoteca offers a software workbench for the rapid development of efficient, safe, robust and scalable applications used in distributed, networked environments. Zoteca combines open source technologies with our unique extensions, offering powerful frameworks for information technology in the Internet

age. The Zoteca Workbench has three main components. Our base toolkit is the Zoteca Back End (ZBE), a middleware framework for rapidly developing asynchronous, multi-protocol, event-driven, distributed applications. Using the ZBE, extended by patent-pending technology, Zoteca offers data sharing frameworks (ZDS) which provide Reliable, Available, Private and Secure ("RAPS") data sharing. Finally, Zoteca Application Tools (ZAT) is a set of open-source, object-oriented programming tools, that together with the ZBE and ZDS make for an unrivaled distributed programming workbench.

## **2.2 ZDS Frameworks**

### **2.2.1 Zoteca and RAPS**

We use a zoteca, which means "private room" in Latin, as a metaphor for data entities and their associated computing processes:

- **Reliable:** zotecas never get lost or destroyed, and are automatically recoverable;
- **Available:** zotecas can be locally accessed by their owners anywhere in the world, and are not tied to a specific physical device or location;
- **Private:** only the zotecas' owners know they exist, and only their owners can let others enter them;
- **Secure:** a zoteca can't be broken into or stolen, and it is impossible to access any data which is not in the zoteca.

ZDS transforms this metaphor into concrete reality, creating spaces where individuals and groups share data in a RAPS environment. The core of ZDS' innovation involves decoupling computing entities (processes, files, etc.) from specific physical computers or locations, thereby eliminating single point of failure. By addressing the problem at the infrastructure level, using distributed protocols, redundant data, sophisticated authentication schemes and encryption techniques, Zoteca offers guaranteed levels of service in terms of the four RAPS dimensions.

Most importantly, unlike other products, ZDS easily integrates with the way people and organizations work. To use these services, one need only save data within applications, as one normally does. ZDS guarantees that the data is backed up and that it migrates to the people authorized to share. No push and no pull actions are necessary. ZDS preserves the server-centric model of organizations while allowing peer collaboration. ZDS' two-level authentication protocols leverage existing authentication infrastructures. ZDS can integrate and work with most encryption technologies.

As a result, Zoteca provides customers with computing services that are radically more RAPS than those currently available, while allowing people to work the way they always have.

### **2.2.2 ZDS RecordFlow**

Zoteca has developed a family of ZDS frameworks that integrate into customized versions of data-sharing applications. One such framework is ZDS RecordFlow. Recordflow is a layer of software that sits between the application and the back-end DBMS and serves as the RAPS data transport and repository for data records. Recordflow can be integrated with existing applications without requiring extensive re-writes. It can also be used as the core of newly developed customized RAPS-based applications. RecordFlow meets all the domain requirements noted above, while having some distinct advantages over competitive platforms.

## **2.3 ZDS Recordflow Advantages**

### **2.3.1 RAPS Advantages**

RecordFlow allows each organizational unit, and each external organization, to have a local server through which it can access the records. RecordFlow's distributed architecture has multiple advantages in terms of Reliability, Availability, Privacy and Security:

- R: No data can be lost or tampered with;
- R: Automated data disaster recovery, even at the edge of the organizational network;
- R: An audit log of all data transformations;
- A: Serves the records locally, speeding access to data;
- R,S,P: Ensures that the records are stored and transferred in such a way so that each unit gets the records and only the records it is allowed to access;
- S: Integrates with the local unit's access control, users and groups, allowing the access policies to be matched to the local unit's operation methodologies;
- S,P: Assures that there is no need to open up the firewall to other organizations. Only the relevant data is available to outside organizations/units. RecordFlow handles the migration of the records across organizational boundaries, assuring only the correct data flows outwards.

### **2.3.2 Inter-operable, Programmable, Scalable**

The RecordFlow framework is highly inter-operable. It supports and can be readily integrated with:

- Multiple operating systems, including Unix, Windows, MacOS and Linux.
- Multiple DBMS, network protocols and system architectures.
- Multiple application servers and systems used to create the organization's local IT systems.
- Standard network servers and workstations, as well as next generation network hardware such as Internet appliances and wireless PDAs.

RecordFlow is a programming framework, not a shrink-wrapped package. As such, it:

- provides highly customizable operations, that can easily be modified as organizational needs evolve;
- supports rapid application development, allowing applications to be built according to the way people and organizations work;
- feeds data into each organization's custom services and policies, integrating with their existing tools and methods of operation.

Finally, the RecordFlow back-end is a high-performance system, that can readily scale to large data needs and integrate with high-performance database management systems.

## 3 Zoteca and HIPAA

### 3.1 Zoteca Services

We noted earlier that HIPAA compliance requires a complex, comprehensive and ongoing system-integration project. The project requires top-level commitment within the organization and a multi-disciplinary team to plan for, implement and monitor HIPAA compliance. The team must include employees from within the organization as well as outside expertise, including legal counsel, auditors, and IT personnel. The project must begin with the development of a HIPAA plan which lays out the organizational path to HIPAA compliance.

Zoteca can be of help from the very beginning of the HIPAA project, by joining the HIPAA team (and if necessary helping put one together) and providing our expertise regarding the complex IT issues surrounding HIPAA. Once the plan is in place we can work on the implementation with the organization's internal IT department, outside system integrators or serve as the integrators ourselves. Zoteca Workbench software can and should be an integral part of the HIPAA IT solution.

### 3.2 The Zoteca Advantage

While HIPAA is a huge challenge, it is also an opportunity for health care organizations to streamline and modernize service to patients. By taking a systems approach to the HIPAA project, and integrating Zoteca RecordFlow technology into the HIPAA IT solution mix, organizations can most effectively achieve HIPAA compliance. Moreover, this approach should not be seen as an unavoidable expense. A Zoteca-based HIPAA solution will help organizations *provide more effective health care, eliminate organizational waste, cut costs and make revenue collection more effective*. Zoteca Workbench software helps achieve these benefits by:

- Assuring **data efficiently flows only to those who should access it**,
- Providing an **audit log** and making sure that there is **no data lost** in the patient records,
- Providing **automatic disaster recovery** of patient data,
- Guaranteeing **secure operation across and inside organizational boundaries**, while at the same time **keeping firewalls intact**,
- Supporting **rapid, custom development**, allowing the applications to be built according to the way people and organizations work,
- Supporting **evolutionary integration** with **existing infrastructure** and **practices**, making it possible to achieve HIPAA compliance without rebuilding the IT infrastructure from scratch,
- Providing a **scalable, high-performance** solution.

### 3.3 Example Uses of Zoteca Technology

#### 3.3.1 Provider Communication with Various Organizations

Primary responsibility for HIPAA compliance rests with health service providers, health plans etc. which are referred to as Covered Entities. However, in today's outsourced world, there are many other

organizations that may have or need access to the patient record, and so have secondary compliance requirements. HIPAA provides for communication of patient data between various Covered Entities and Business Associates. On occasion this data relates to specific patients, at other times these are aggregate data. Because of HIPAA's privacy regulation, extreme caution must be taken to ensure that only the appropriate data is shared. Moreover, within each organization, access to information must be based both on a person's role in the organization and the current activity she is performing. The same role may have different access rules for different activities.

While some of the issues involved must be addressed by appropriate manual procedures, Zoteca's technology can be of great help. First, our ZBE technology can be used to extend the organization's existing authentication system to provide role and workflow based authentication. Second, by installing ZDS Recordflow servers at each sharing entity, our data migration technology can ensure that only the data that needs to be shared will be, and only with authorized personnel.

Given the heavy penalties associated with HIPAA violations, the patient data repository is somewhat of a hot potato. ZDS mitigates this, since no one really ever has access to the repository itself. The data repository will always be encrypted and behind a firewall, which need not be opened up to allow the patient data to be properly stored. Any organization, and any individual within the organization only has access to the data he needs. Moreover, this access is provided not by opening up the repository, but by having the need to know data migrate to the appropriate individual. As an added benefit, audit trails are always provided. Zoteca's distributed technology also ensures that if there is a physical or technology disaster, a backup copy of the patient data repository can be immediately accessed by health-care providers, ensuring uninterrupted care.

### **3.3.2 Provider and Patient Communication**

One way to enhance patient care is to increase patient communication with the health care provider. HIPAA requires that the patient have access to his health information and that he have the ability to amend it if necessary. Providers face an incredible challenge to ensure that this is possible in an efficient and safe manner. Beyond the regulatory requirements, patients with chronic or critical diseases, should be able to electronically transmit vital information to their doctor. Some of this data may come from monitoring devices, for example. Once again it is difficult to provide such data communication that is both efficient and meets HIPAA privacy/security regulations. Web-based forms or email just aren't secure enough.

ZDS Recordflow can provide a two-way communication platform that guarantees that the data properly migrates between the patient and the patient record data repository, in an absolutely secure and private fashion. The patient never has direct access to the data repository so she can never see anything but her own information. An audit trail will always be available, to track data entry.

### **3.3.3 Doctors on the Go**

Recent studies show that only 3% of patient order entry is computerized, an incredibly low figure. And yet not only would computerization save huge sums of money, it would also save lives. Wrong administration or provision of medicines due to transcription errors is one of the leading causes of patient death.

One source of the problem is that doctors are constantly on the go, see patients at different venues, and have little time to sit in front of a computer and enter information.

Portable computer-pads or PDAs have been touted as one possible solution to encourage direct and correct entry of patient data. One problem with these devices is it is difficult to properly synchronize the data on these devices with the core patient record database, in a private and secure fashion. We also want to assure that the doctor always has the most up-to-date information locally on the device, while guaranteeing that it is reliably stored in the centralized system.

Zoteca technology has several advantages over alternative methods. In a Zoteca-based system the doctor's pad can be loaded up every morning with the appropriate patient information. As the doctor sees the patient, at whatever venue, she can enter patient information, order lab tests, write prescriptions and so forth.

The doctor doesn't have to worry about the connection to the centralized patient data repository. The Zoteca-based system will automatically send the records to the data repository when there is a connection. An automatic audit trail is created of all the doctor's activities. If data is erroneously entered, and then corrected, all entries are saved for future reference. Moreover, the lab test order is sent to the lab, and the prescription to the pharmacy, without giving unnecessary patient information, guaranteeing compliance with HIPAA regulations. The pharmacy and lab never have direct access to the patient data repository.

Similarly, when the test is complete, the results are automatically sent to the central patient data repository and from there to whatever health-care providers need that information. The doctor(s) will always have the most up-to-date information about the patient. No one can access that information if they don't have appropriate authorization to view it. The insurance providers will also be notified of the tests or prescription, without having to have access to the patient record data repository, all in strict compliance with HIPAA's privacy provisions.

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