Hippocratic Database Privacy Enforcement and Compliance Auditing

- An Overview

FOAK in the Healthcare Industry

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Executive Summary

Business Problem

Healthcare service providers are required to keep Protected Healthcare Information (PHI) confidential by law. Existing systems are incapable of ensuring it.

Solution

IBM's Hippocratic Database technology (HDB) solution ensures that companies derive the maximum value from sensitive data without violating the law or compromising on privacy or security.

Value Proposition

- Reduces liability costs arising from unlawful disclosure
- Helps companies respond to pressure of being accountable for unauthorized disclosures.
- Responds to rising customer pressure to maintain privacy

II. Industry Background

The Healthcare Industry and HIPAA

BUSINESS OBJECTIVES

- Improve Operational Efficiency
- Improve Employee Productivity
- Reduce Administrative costs
- Comply with regulations
- Improve customer/patient retention

IT OBJECTIVES

- Deploy new applications
- Improve system performance
- Capture customer/patient data
- Protect privacy of customer/patient/employee data
- Improve security of data
- Replace aging applications

Required by HIPAA, satisfied by Hippocratic Database technology

HIPAA, 1996

TITLE 2

2.1 The Privacy Rule

Indicate intention to use Protected Health Information policy regarding sharing of non-public personal information with affiliates and third-parties

To disclose only the minimum amount of Protected Health Information when reporting adverse events to entities outside of the partner system...

*There have been **22,664** privacy-related complaints ever since the privacy rule took effect in 2003….*

- Department of Health and Human Sciences

Challenges faced in implementing HIPAA

Determining the scope of HIPAA rule
determine which regulations are applicable to your organization

Risk assessment
assess existing information systems and determine their vulnerability

Satisfied by HDB technology

Cost of implementation
cost of making all information systems HIPAA compliant

Ease of implementation
minimal disturbance to existing operations of service provider;
time duration required to put new/changed policies into effect

Information sharing
ability to share information without affecting privacy and disclosure policies

Hippocratic Database technology and its value

Technology that

- ***enforces*** data disclosure policy to the cell level of the database
- ***provides detailed audit trials*** to verify compliance

SOLUTION VALUE

- ***Reduces costs***
  - automates manual compliance processes
  - reduces liability arising from unlawful disclosure
- Helps companies ***respond to pressure of being accountable*** for unauthorized disclosures
- Responds to ***industry expectation for open standards***
- ***Helps track disclosure*** of Protected Healthcare Information (PHI)

Technology that allows the creation of a new generation of information systems that protect the privacy, security and ownership of data, without impeding the flow of information.

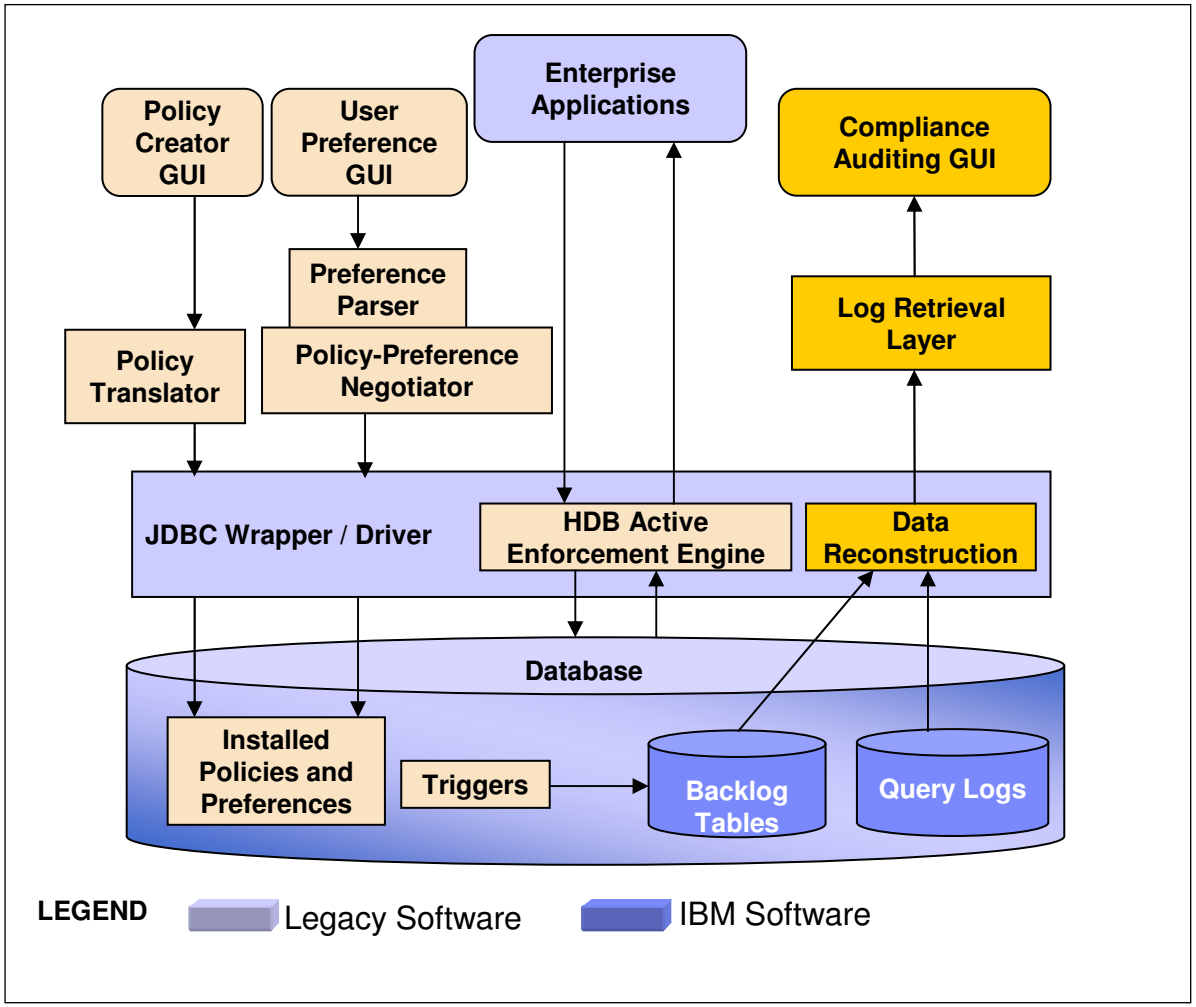
III. IBM's *Hippocratic Database Privacy Enforcement and Compliance Auditing (HDB)* solution

The Hippocratic Database solution

This solution consists of –

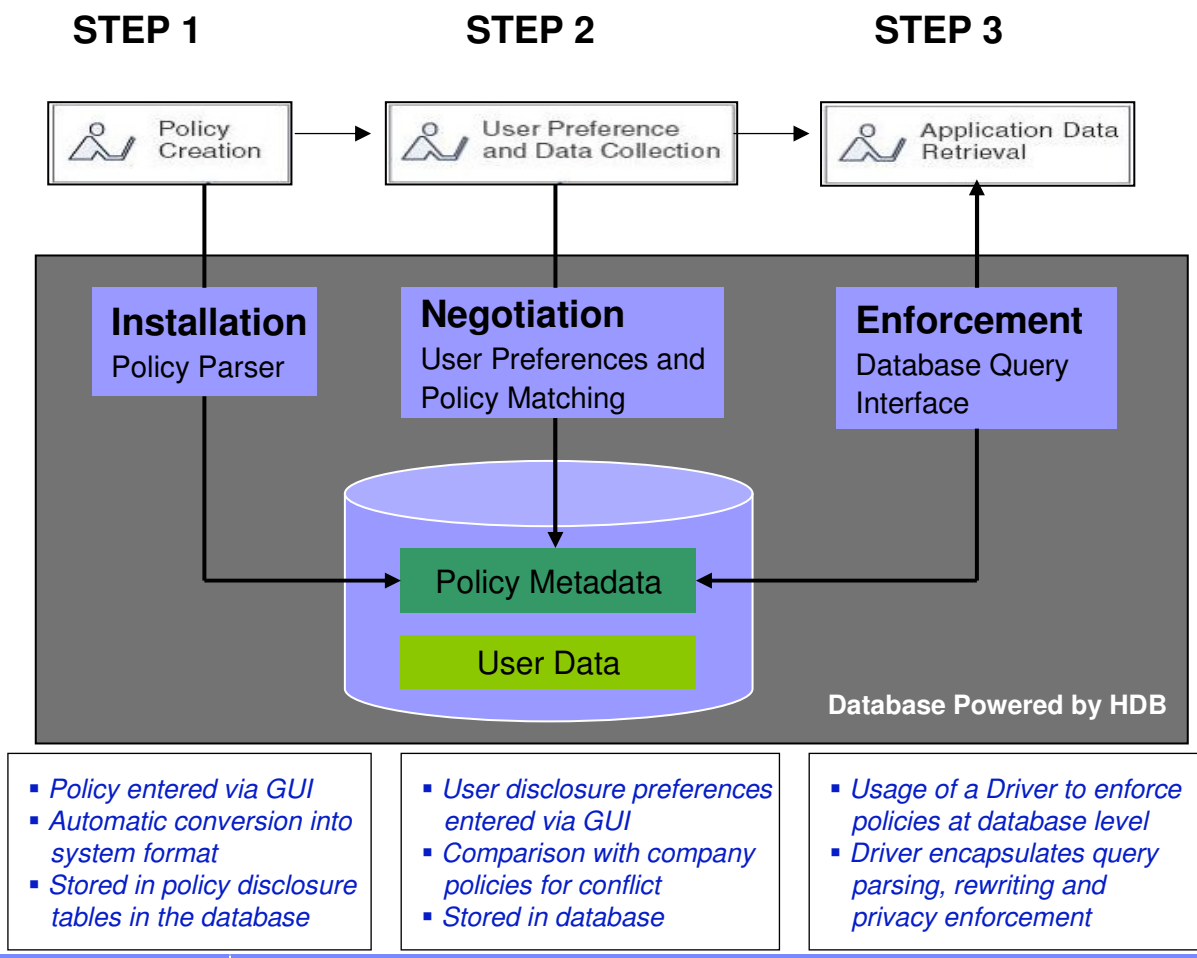
a) **Active Enforcement Component**

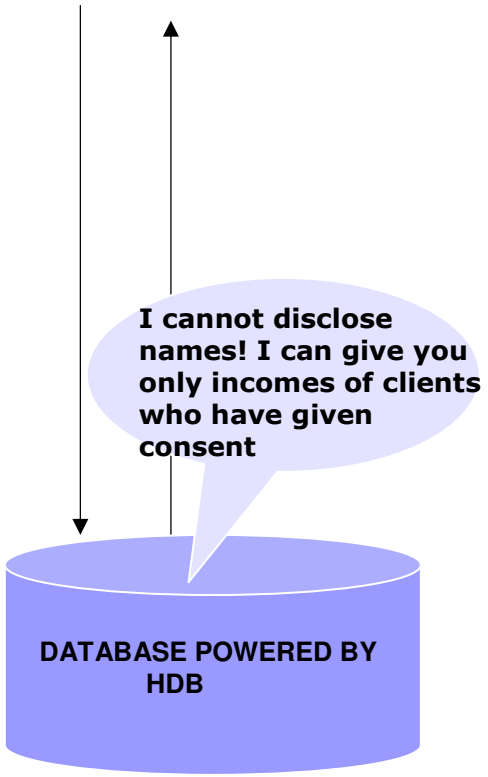
b) **Compliance Auditing Component**



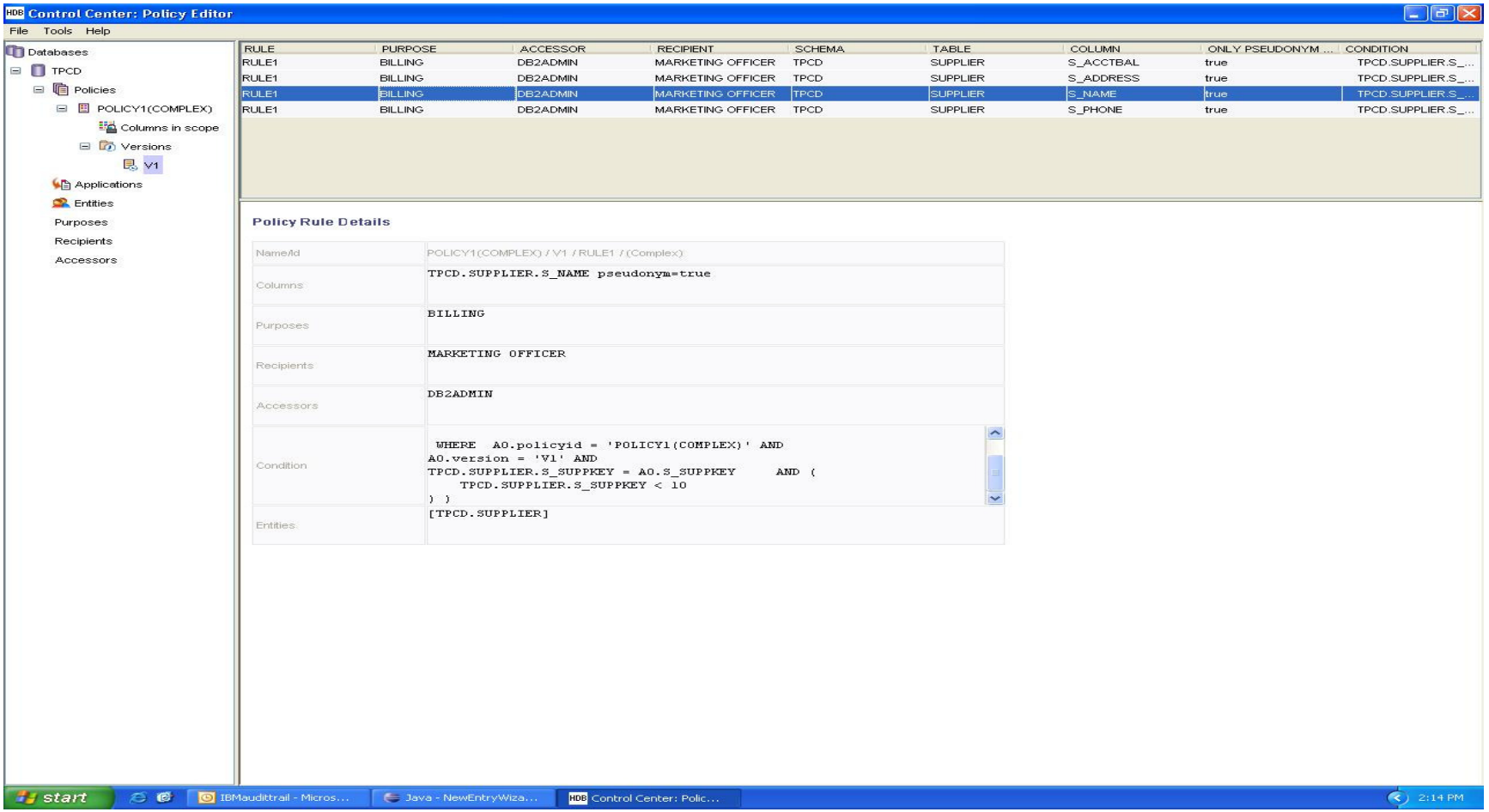
1. Active Enforcement component

Enables the Hippocratic database to reveal only data compliant with policy





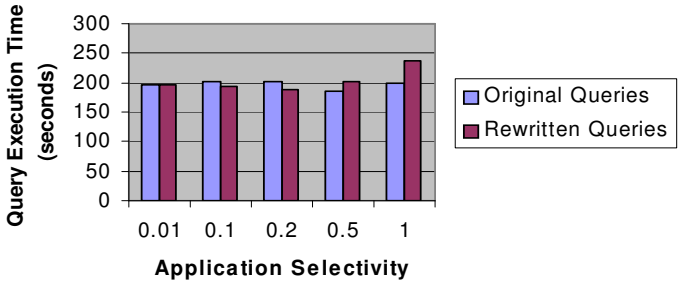
Active Enforcement user interface



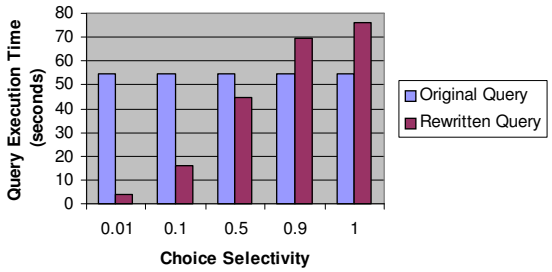
HDB Control Center Main Screen with Rule Display

Active Enforcement value proposition

- **EASE OF INTEGRATION**
  - *Existing applications do not require modifications*
- **DATABASE AGNOSTIC**
  - *Does not require changes to the Database*
- **EASY ENFORCEMENT AFTER POLICY MODIFICATION**
  - *Centralized creation and updating of policies*
  - *User need not be educated of new or changed policies*
- **FINE-GRAINED**
  - *Policy and user disclosure control at database cell-level as against row/column level*
- **PERFORMANCE**
  - *Gives a significant improvement in system performance only in cases where the user has specified disclosure preferences*



WORST CASE: Everyone discloses everything.
Query processing yields no value. The penalty is 5-15% of the execution time of the original query.



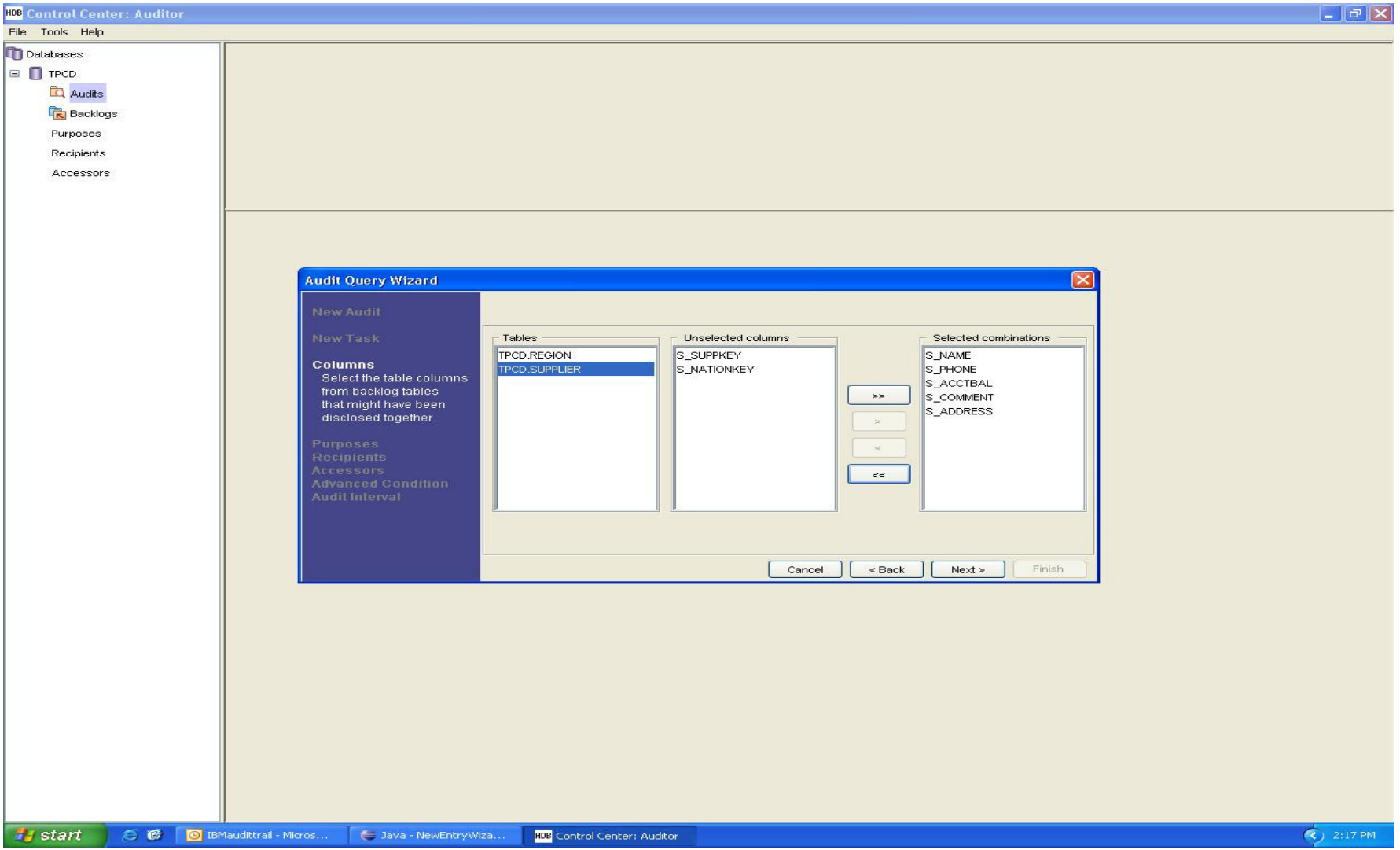
STANDARD CASE: Choice Selectivity varies.
In best case, HDB Active Enforcement gives an order of magnitude improvement.

2. Compliance Auditing component

Enables verification of compliance with policy

- *Determines who accessed* designated data, *for what purpose, when it was accessed* and *what changes were made.*
- *Is agnostic to enterprise applications and database systems*
- *Has minimal impact* on the company's operations.
- *Tracks disclosures down to the cell level* in the database.
- *Has a security advantage* over logging systems.
- *Reduces audit time*.

Compliance Auditing user interface



Compliance Auditing value proposition

- **Cost Reduction**

  Reduces the cost of manual auditing processes

- **Low Impact**

  Can be integrated into the existing architecture without affecting current operations

- **Extensible**

  Enables development of customer insight applications

- **Security**

  Resistant to predicate-based attacks

IV. Value Proposition

This is FIRST-OF-A-KIND!

The Hippocratic Database (HDB) solution

- ***Does not require alteration*** of enterprise applications, relational database systems
- Provides disclosure auditing and ***policy enforcement at Database Level***
- ***Enforcement at Cell-level*** rather than row/column level offered by other solutions
- ***Improves request processing speed***
- Facilitates a ***check for conflicts*** between user disclosure preferences and company's policies at the system level
- Uses ***Logical Logging*** that records the exact response given to a user
- Simultaneous enforcement and auditing ***without significant performance impact***

HDB IS THE FIRST SOLUTION IN THE MARKET TO OFFER ANY OF THE ABOVE MENTIONED FEATURES

Value Proposition

COMPONENT	DISTINGUISHING FEATURES
Overall	▪ Enables companies to be ***accountable for unauthorized disclosures***. ▪ ***Can be used in any environment*** with relational/non-relational* databases
ACTIVE ENFORCEMENT COMPONENT	▪ ***Database agnostic*** ▪ ***Promotes scalability and performance*** ▪ ***Easier enforcement of policies***
COMPLIANCE AUDITING COMPONENT	▪ ***Performance advantage*** over other auditing applications ▪ ***Security advantage*** over other auditing solutions ▪ ***Cost-effective***

*** Note:*** Can be reused in environments with a non-relational database with the help of a compiler to enable the system to interact with the HDB layer

Re-usable Artifacts

The following existing artifacts can be re-used –*

Serial No.	CATEGORY	ARTIFACTS
1	Solution Architecture	- Architectural principles and patterns - Architectural decisions - Functional and non functional requirements
2	High Level Design	- Process flow diagrams - Design document
3	Low Level Design	- Metadata models
4	Implementation/ Code Artifacts	- HDB-enabled JDBC driver - HDB-enabled ODBC driver - HDB Control Center GUI
5	Testing	- Regression test Artifacts

*__Note:__ The percentages of reuse for the above will vary with the type and requirement of the Service Provider. A Fit-Gap analysis will have to be done to arrive at the exact percentages.

V. Implementation Approach

Implementation Methodology

1 Configure *Creating the infrastructure*

2 Integrate *Installing the Data Interface*

3 Test and Use *Testing fully-integrated system*

Phase 0: Preparation and evaluation

Phase 1:	Phase 2:	Phase 3:
Inputs • Disclosure policy requirements, including users/roles, purposes, recipients and the connections to application contexts	***Inputs*** ▪ The data interface points for the target system Micro design	***Inputs*** ▪ HDB-enabled system
Activities • Define the policy rules • Use the HDB Control Center to install HDB metadata policy files for the data source(s) • Use the HDB Control Center to create the auditing infrastructure	***Activities*** ▪ Augment the chosen interface points to perform query rewriting and query logging.	***Activities*** ▪ Perform integration testing ▪ Perform use case testing
Output Data system contains the necessary structures to perform fine-grained enforcement and auditing	***Output*** HDB-enabled data system	***Output*** Executing, policy-compliant system in active state

VI. Client Citations

ACADEMIC MEDICAL CENTER (AMC), AMSTERDAM

Medical centers in the Netherlands have a *wealth of information that can be leveraged to drive breakthroughs* and deliver innovation in healthcare. However, *data sensitivity*, the fragmentation of records *and complexity* in retrieving the same *have inhibited advances* in this area. In order to open up this data to researchers,

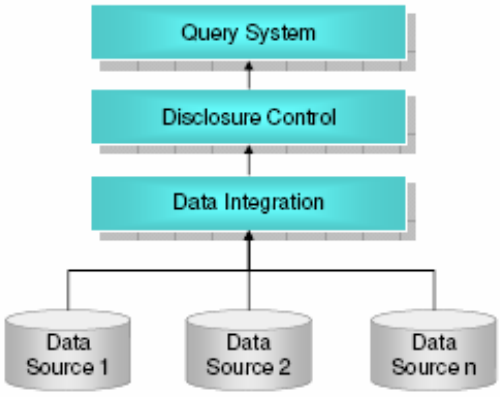
AMC has setup a framework that addresses problems outlined, mitigates risks for practitioners and patients and enables medical innovation to proceed.

ISSUES ADDRESSED BY THE SOLUTION

1. *Data Integration* through WebSphere Information Integrator (WSII)
2. *Disclosure Control* through **Hippocratic database technology**
3. *User Interface to facilitate querying* provided by Data Discovery and Query Builder

SYSTEM BENEFITS

- *Efficient data management*
- *Privacy and security issues enforced* by the system.



Solution Architecture

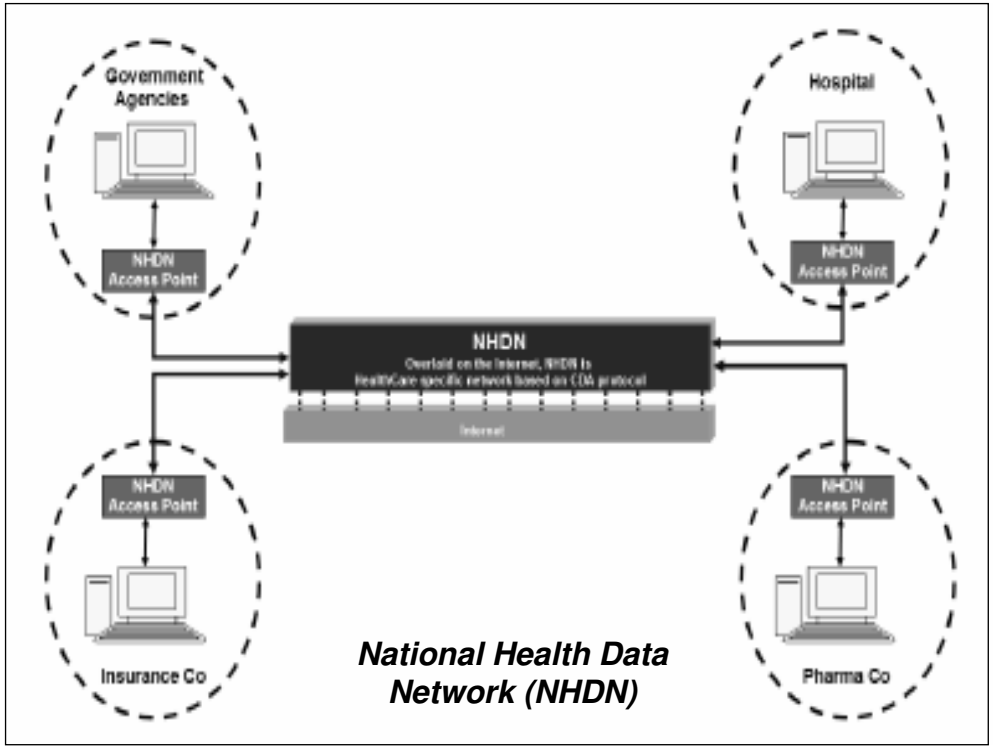
NATIONAL HEALTH DATA NETWORK (NHDN), INDIA

In India, most of the *healthcare records are on paper* and transactions are managed manually. This *invites error, inefficiency and prevents timely analysis of data* to detect health related emergencies. Hence, it became *crucial to establish a standards-based, safe and secure IT backbone* that naturally *collaborates health institutions* nation-wide and enable service providers to form a network *so operational, clinical and financial synergies can be realized*.

DESIGN CONSIDERATIONS FOR NHDN

1. *Safe and secure* using **Hippocratic Database technology**
2. *Standards-based* using Structured Query Language
3. *Facilitate data integration* and federation from disparate systems using WebSphere Information Integrator
4. *Scalable and fault-tolerant* for nation-wide deployment using Grid Technology

This solution is also to be deployed in Taiwan and Israel



National Health Data Network (NHDN)

VII. Additional References

Additional References

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Documents

- ***Managing Disclosure of Private Healthcare Data with HDB***
  A white paper detailing the HDB solution
  Link:
  http://www.almaden.ibm.com/software/projects/iis/hdb/Publications/papers/nc_hdb_white_paper_health.pdf

- ***Enabling Biomedical Research in Europe: Using the Dutch Experience as a Template***
  This document details the HDB solution deployed for Academic Medical Center, Amsterdam
  ***Mail Request to**: tyroneg@us.ibm.com*

- ***A National Healthcare Data Network for India***
  This document details the HDB solution deployed for the National Healthcare Data Network, India
  ***Mail Request to**: tyroneg@us.ibm.com*

- ***HDB User Guides***
  These documents outline how to install and use HDB Active Enforcement and HDB Compliance Auditing solutions.
  Link:
  http://www.almaden.ibm.com/cs/projects/iis/hdb/user_docs.shtml