



# SanteDB Briefing

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OVERVIEW OF OPENIZ, SANTEDB, AND OTHER  
SANTESUITE SOLUTIONS

# Agenda

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1. History of OpenIZ & SanteDB
2. Comparing OpenIZ & SanteDB
3. Platform Extensibility
4. Deployment Models
5. Information Flow & Information Model
6. Privacy & Security Architecture
7. CDSS & Business Rules Engines
8. MDM Functionality
9. Integration & APIs
10. Roadmap

# OpenIZ & SanteDB

PLATFORM EVOLUTION AND COMPARISON

# What is OpenIZ / SanteDB?

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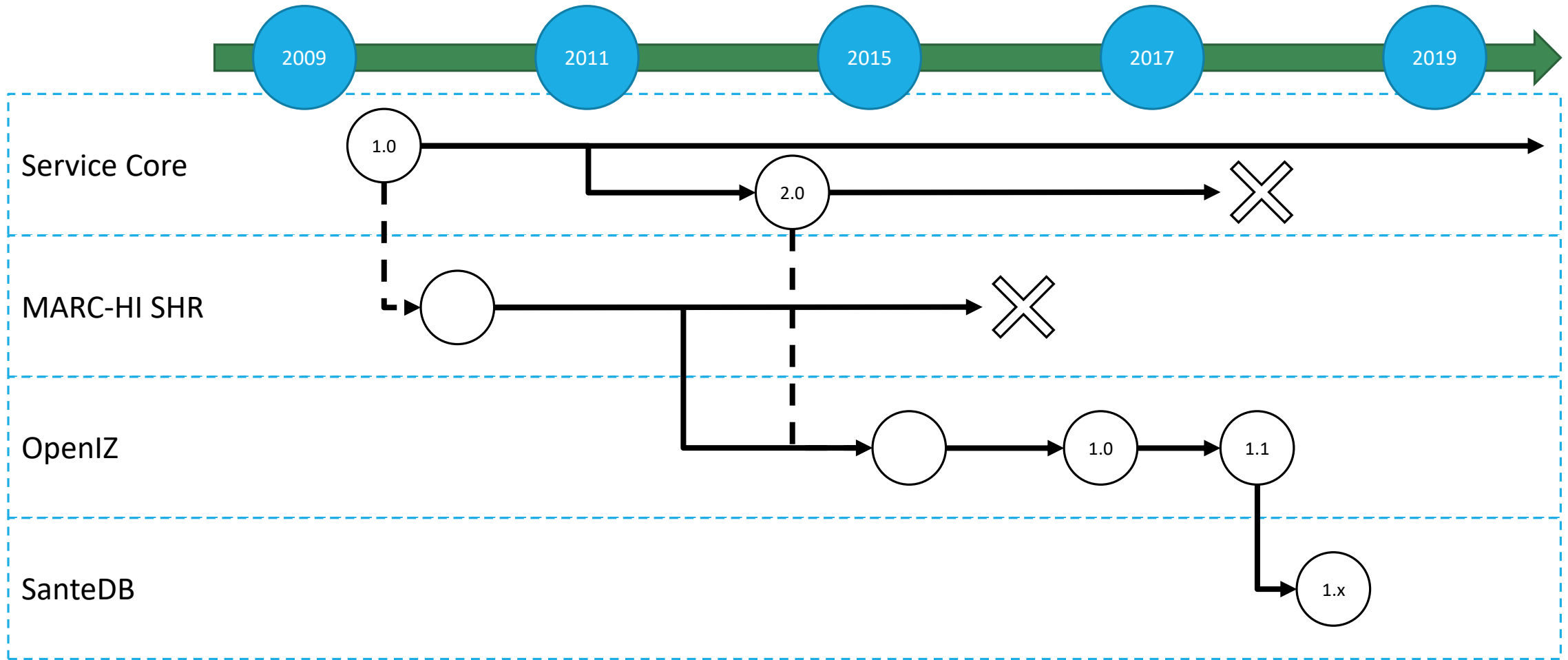
## Open Immunize (OpenIZ)

- Started in 2015 to address lack of good open-source EIR solutions
- Built upon MARC-HI Service Core & Shared Health Record platforms
- Implemented a subset of the HL7 Reference Information Model (RIM)
- Deployed in Tanzania as TImR (2016 – present)

## SanteDB

- Started in 2018 to modernize MEDIC open source assets onto a single platform
- Piggyback MEDIC CR, AVIC 4.0, and OpenIZ functionality (offline, triggers, MDM, reporting, etc.)
- Broadened the scope of OpenIZ's implementation of the RIM (added: Clinical Procedures, Invoicing, Accounts, etc. to RIM model)
- Goal: Provide a coherent PHC (primary health care) platform and transition away from disease vector applications.

# History / Evolution of OpenIZ & SanteDB



# Feature Comparison

Feature	MARC-HI SHR RI	OpenIZ	SanteDB
Original Release Year	2011	2016	2019
MARC-HI Service Core Generation	V1	V2	N/A
Technologies / Frameworks	.NET 2.0	.NET 4.0, Xamarin, AngularJS 1.5	.NET 4.5, Xamarin, AngularJS 1.7
Primary Role(s)	Clinical Data Repository (CDR)	Electronic Immunization Record (EIR)	Clinical Data Repository (CDR)
Server Environment(s)	Windows Server 2003+	Windows Server 2008R2+	Windows Server 2008R2+, Linux, MacOS
Client Environments		Android 4.4+, Windows 7+, Linux, MacOS 10.9+	Android 5.0+, Windows 8+, Linux, MacOS 10.9+
RDBMS Support	PostgreSQL	PostgreSQL, SQLite, MSSQL 2008+	PostgreSQL, FirebirdSQL, SQLite
Scale-Out	DB: Streaming Replication App Server: Round-Robin DNS	DB: Streaming Replication App Server: Round-Robin DNS	DB: Streaming Replication App Server: Round-Robin DNS, Role-Based Scale-out
Information Model	Component Model	HL7 RIM	
Policy Enforcement		Policy Based	Policy Based w/Override
Caching / Scale-out	Memory Cache	Memory Cache or REDIS	
Compression / Bandwidth Optimization	None	Bi-Directional BZ, GZ, LZMA, or DF	
Master Data Management (MDM)	None		X

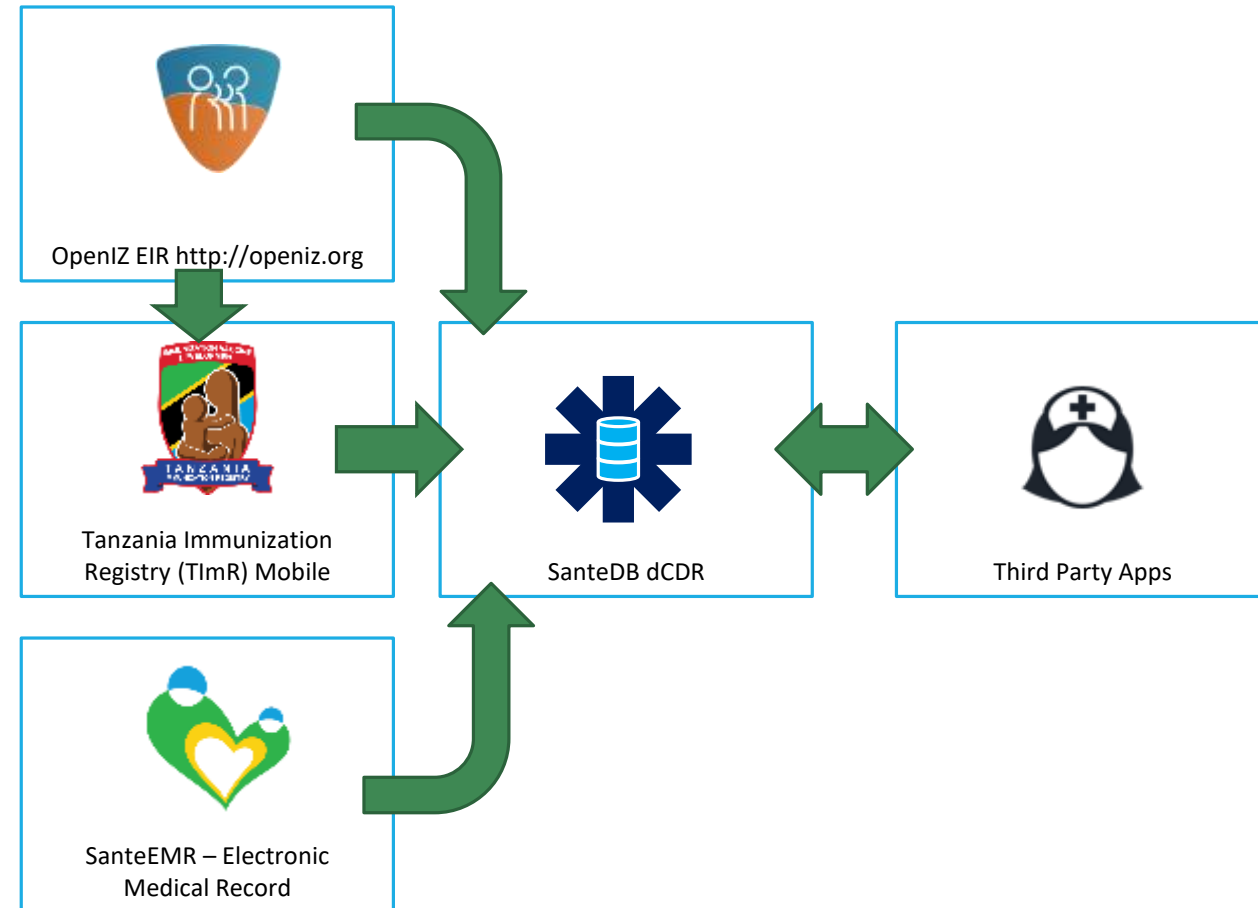
# SanteDB iCDR – Extensibility

## Easily Customizable

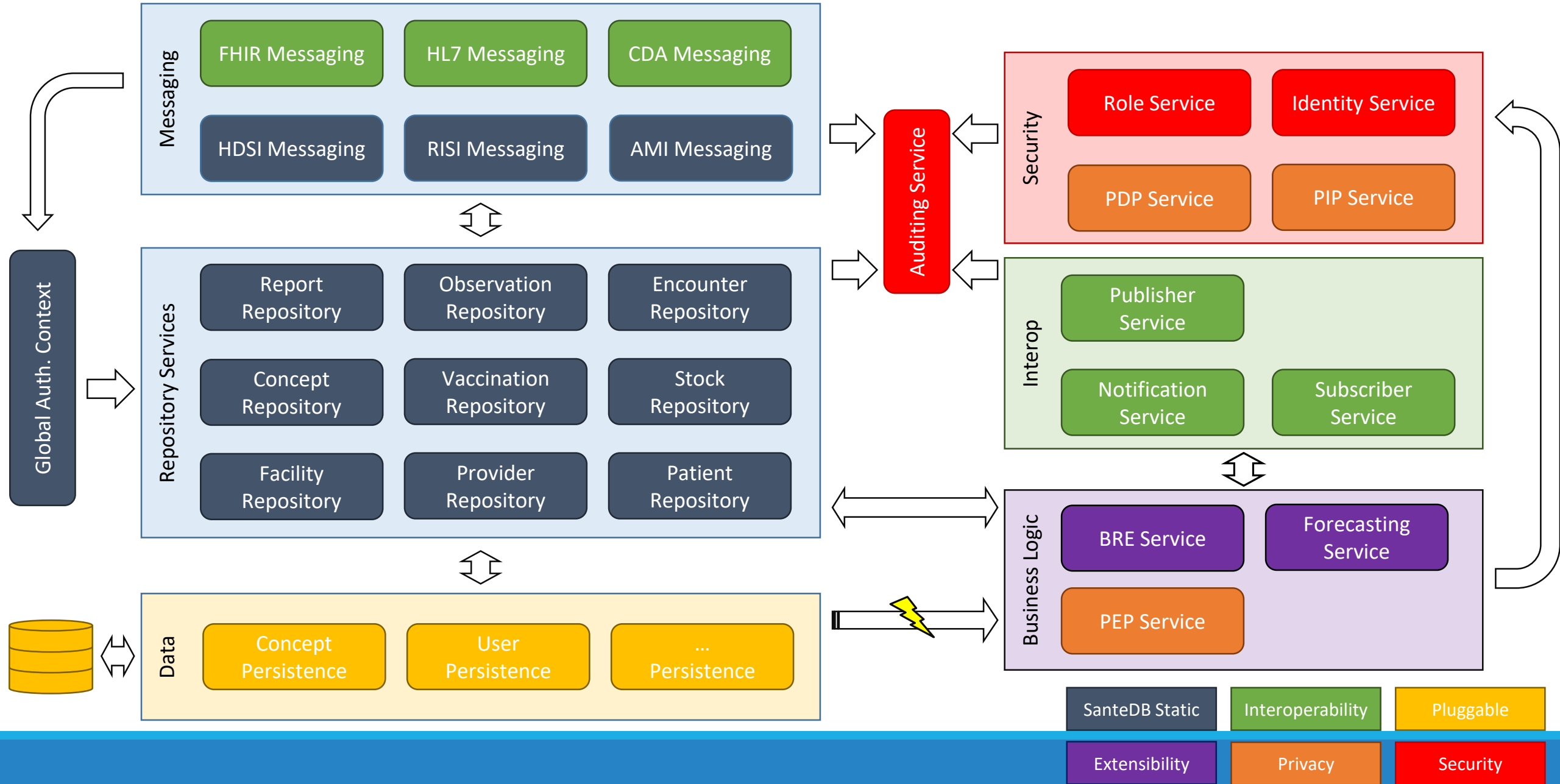
- All customizations are done via simple web-development tools.
- Programmers don't worry about online/offline or network speeds.

## Methods of Extension:

- Applets
  - Packages which encapsulate a clinical function such as immunization, ANC, HIV, TB care
- Plugins / Services
  - Implementing one of the C# / .NET service contracts to perform a function.
- Solutions
  - Combination of applets and plugins which are bundled to produce an instance of a product.

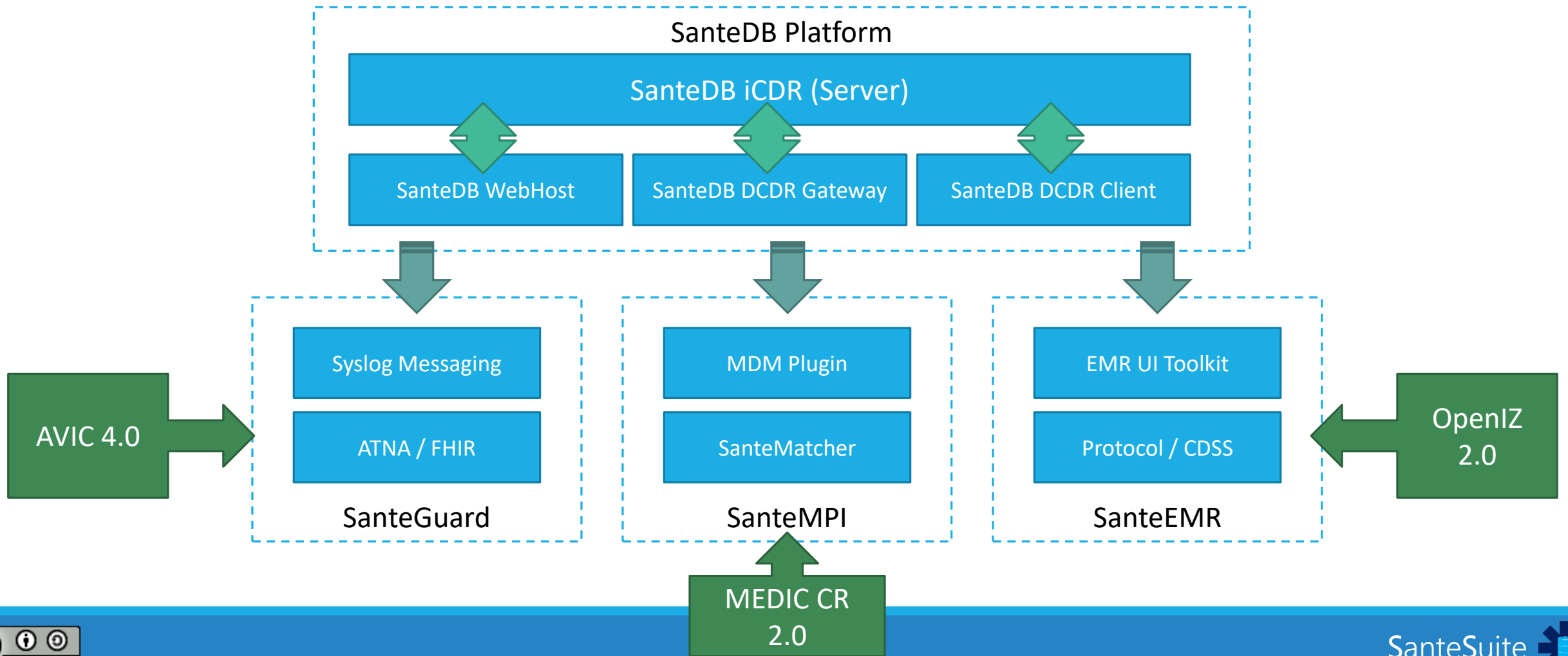


# SanteDB HDS Solution Architecture – SanteDB Service Providers

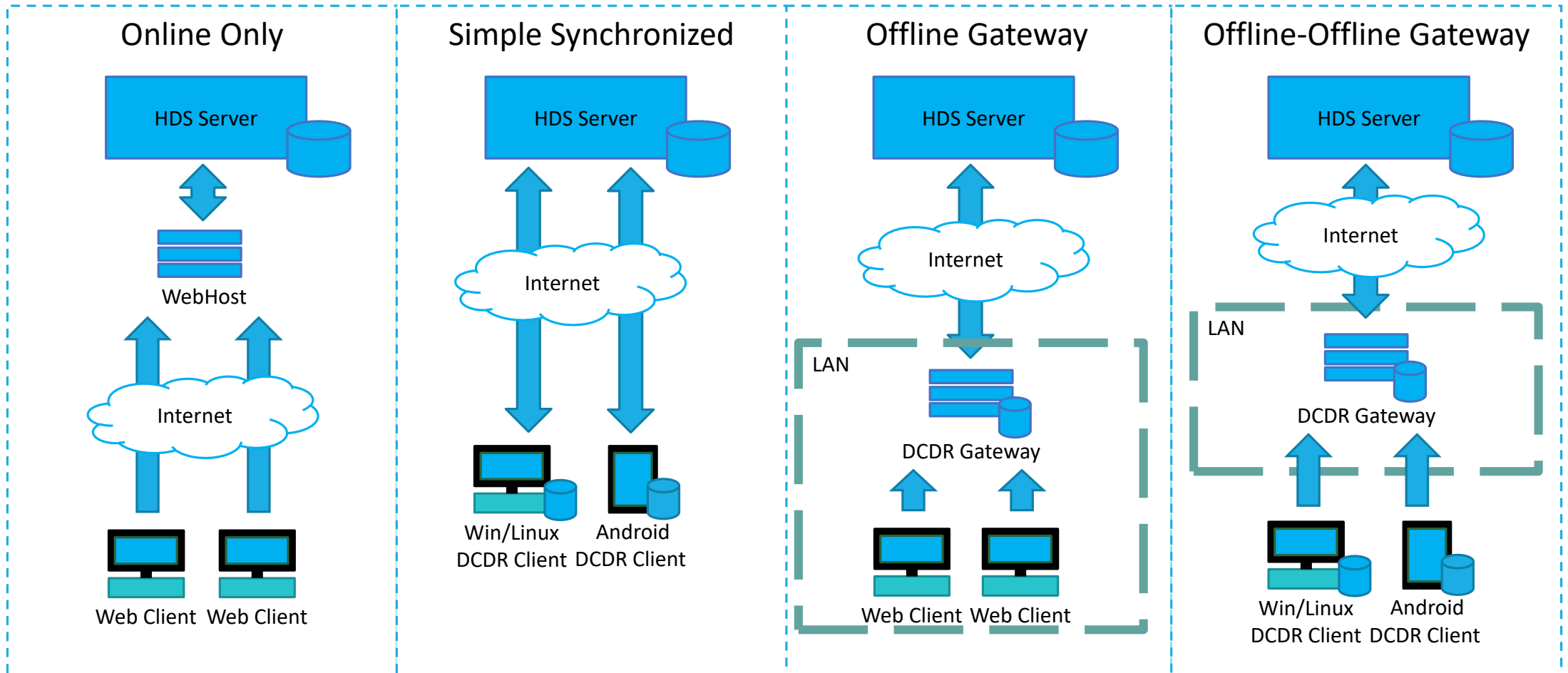




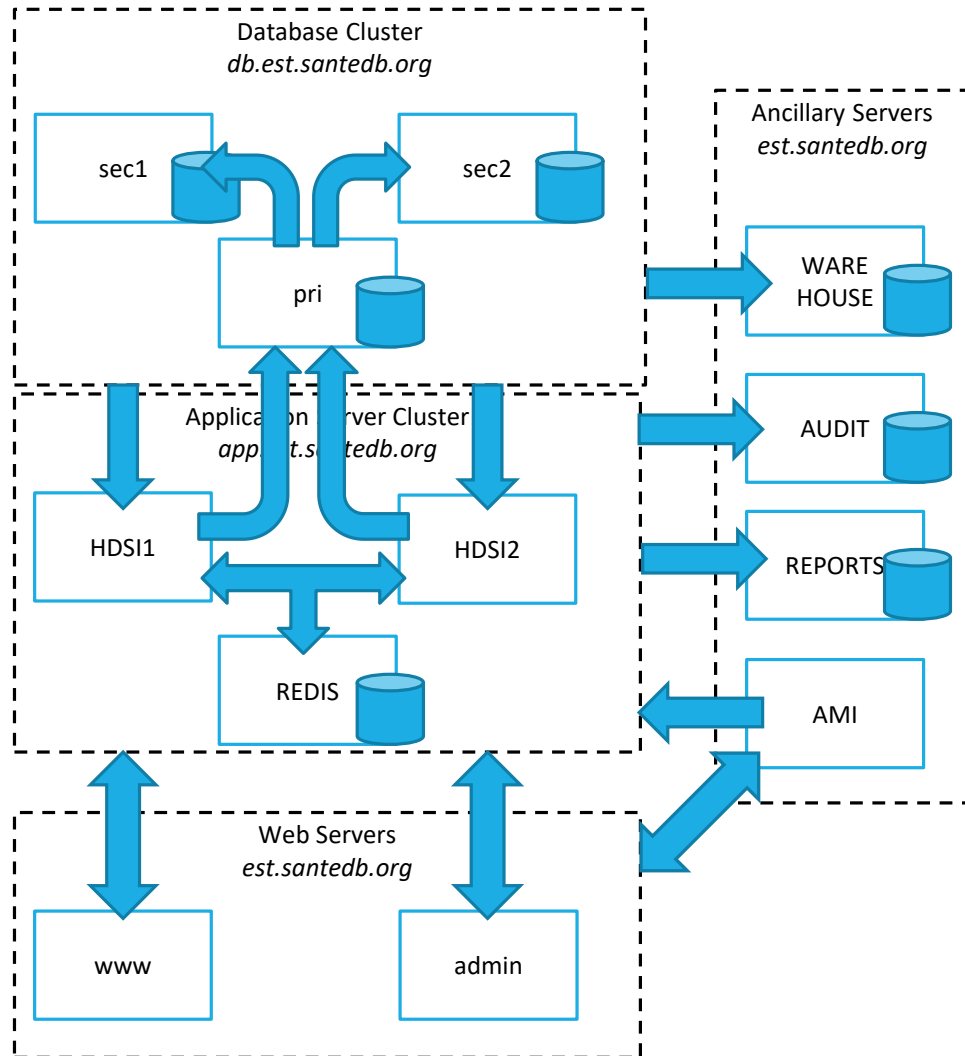
# SanteDB and SanteSuite Components



# SanteDB Deployment Models



# Server Infrastructure Scale-Out



## Extreme Stress Test Environment (ESTE) at MEDIC

- Database layer is scaled out to primary/secondary architecture
- Application layer is scaled across two servers
  - Shared memory caching so they don't use DB as much
- Ancillary services each on their own server
- Web portal on its own server
- Admin portal on its own server

# SanteDB Architecture

HIGH-LEVEL SOLUTIONS ARCHITECTURE OVERVIEW

# SanteDB Information Flow

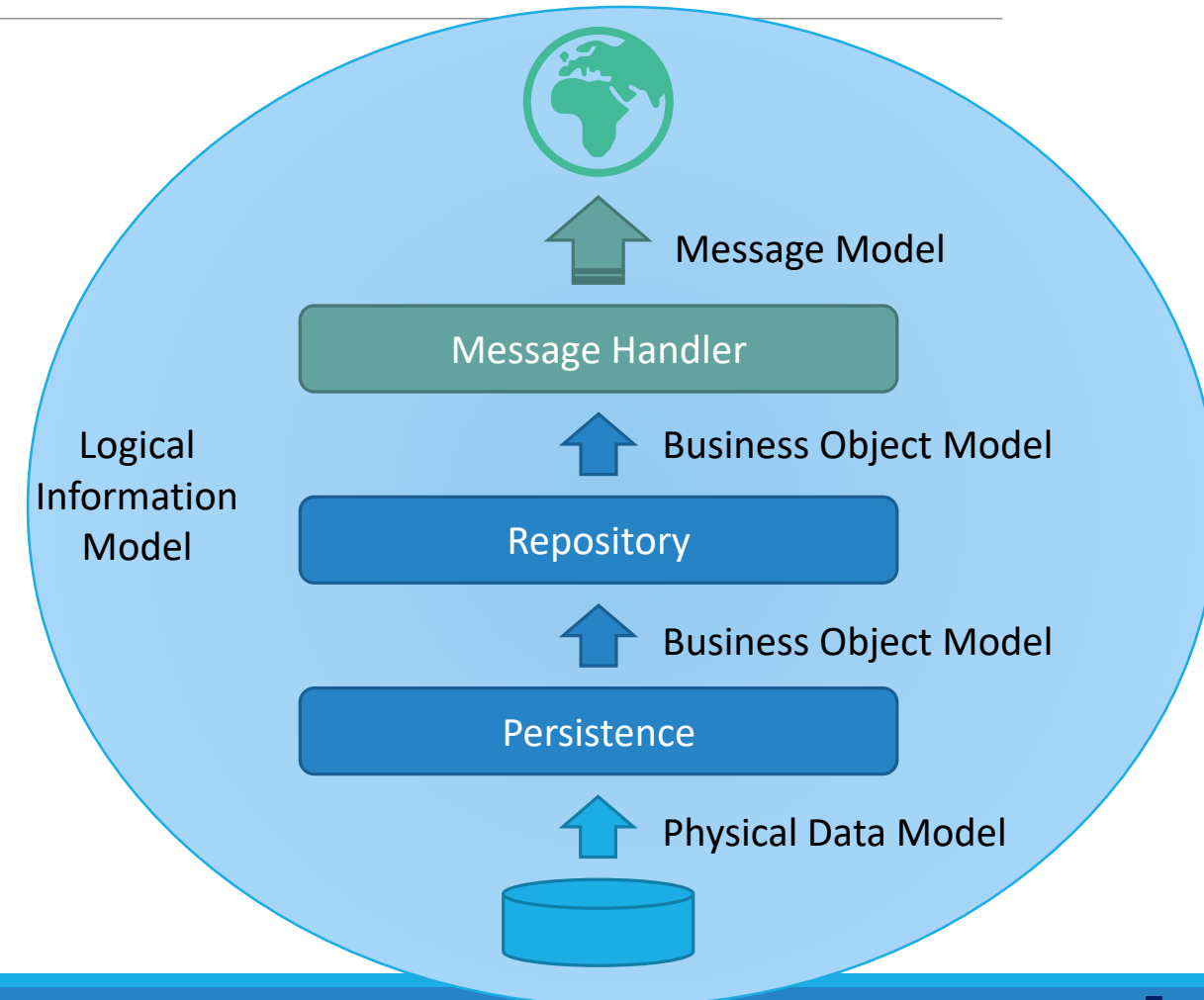
SanteDB sports a robust data model

Consists of three layers:

- Logical Information Model
- Physical Data Model
- Business Object Model
- Message Model

Broken into 4 sub-categories

- Privacy & Security
- Clinical Data
- Protocol / Workflow
- Concept Dictionary

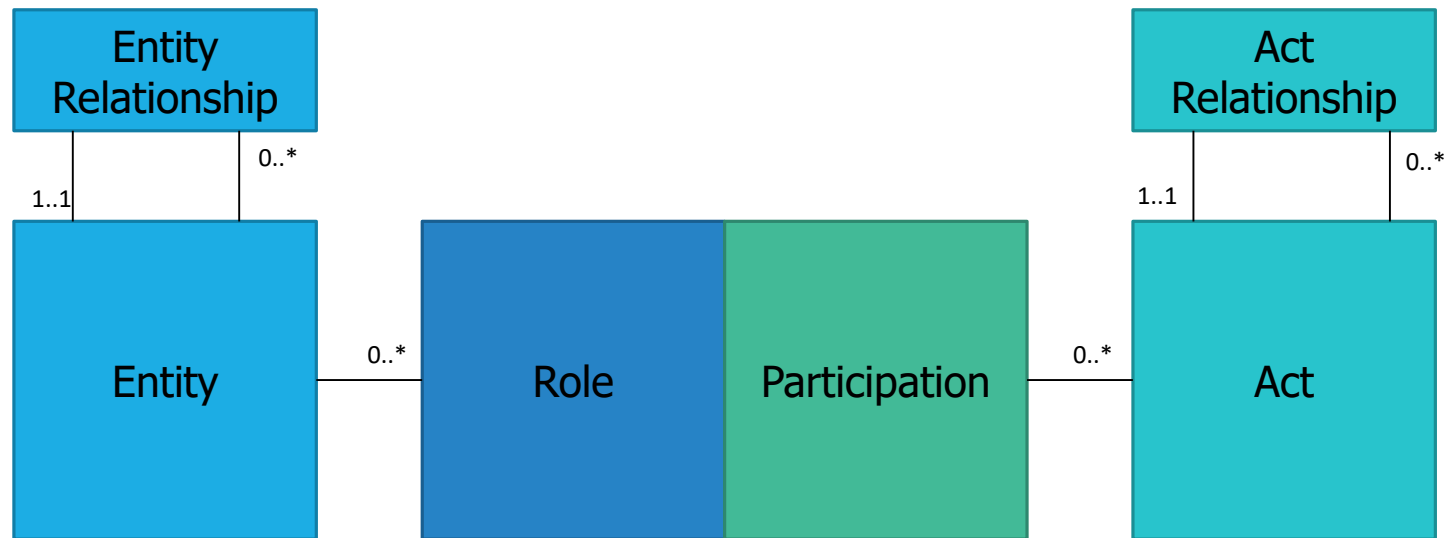


# SanteDB Logical Information Model

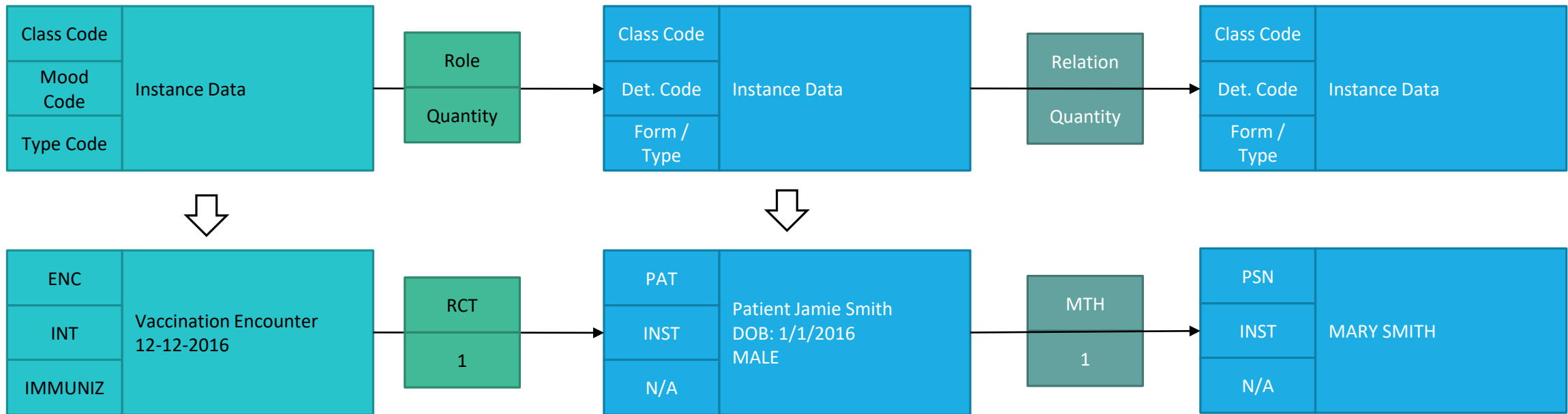
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Clinical data model is loosely based on the HL7 RIM

- Entities playing roles participating in acts.
- Complexities are handled by the API layer



# Information Modeling - Cards



Read: Intend to have an encounter with patient Jamie Smith whose mother is Mary Smith

# SanteDB Authentication

Supports HTTP BASIC and BEARER tokens

Primary authentication service OAUTH2 + JWT Identity Tokens

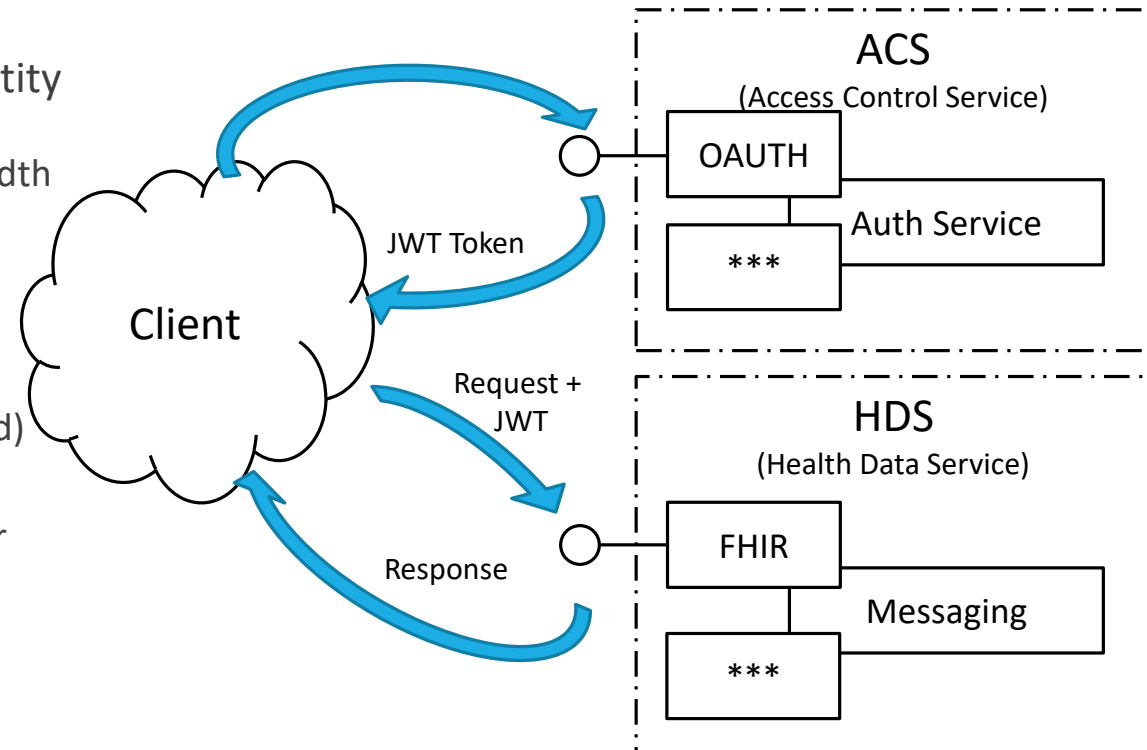
- Signed session token also provided for smaller bandwidth footprint

TFA via E-Mail & SMS (Twilio) Supported

Creates a security “Principal” from identities:

- User Identity – Username & Password + TFA (if enabled)
- Application Identity – Client ID + API Key
- Device Identity – Using X.509 Certificate (if enabled) or HTTP device auth header

All data modifications / disclosures stored using Provenance object (User + Device + Application + Session ID)





# SanteDB Authorization

Uses XACML architecture (but not XACML messaging)

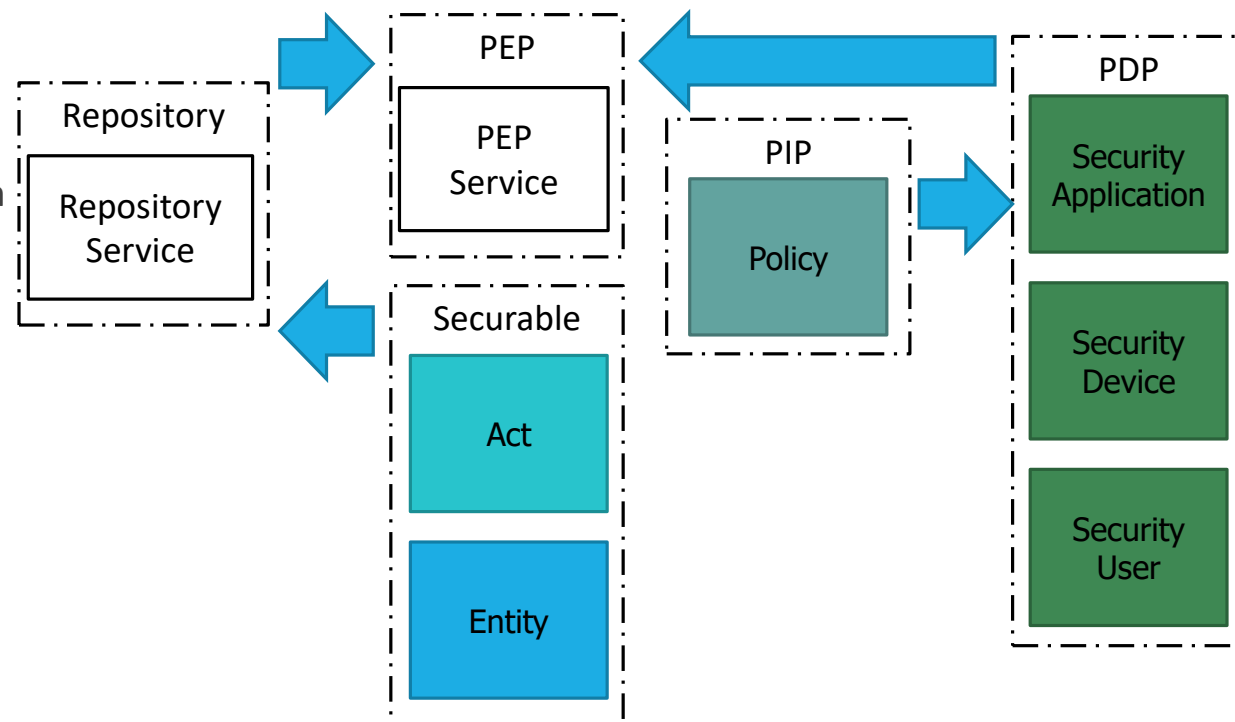
Consists of three security services:

- PIP – Policy Information Provider – Stores policy definitions and applications of which policies are active for which principals
- PDP – Policy Decision Provider – Uses applied policies from current principal and makes a makes a authorization decision (Grant, Deny or Elevate)
- PEP – Policy Enforcement Provider – Given the decision from the PDP, takes appropriate actions (auditing, disclosure, redacting, etc.)

Policy Types:

- Permission Policies – Allow an action to be taken (example: Create Role, Alter Identity, Read Clinical Data)
- Data Policies – Added to a securable at persistence to tag data (example: TABOO, HIV CARE ONLY, etc.)

Policies can be tagged to allow an opportunity for users to elevate their credentials (providing Purpose of Use)



# SanteDB CDSS

Protocols are defined using WHEN/THEN logic

- Executed in real-time
- Whenever requested, performs an assessment on the current status of the patient.

Multiple protocols are combined into a generated care-plan (mood code: PROPOSE)

- New in SanteDB: Clinicians may save generated care plans.
- Appointments use a simple periodic hull function to propose best appointment times for future actions.

Clinical Protocol 1

WHEN (Protocol Entry)

RULE #1

WHEN (Rule)

THEN (Conclusion)

RULE #2

WHEN (Rule)

THEN (Conclusion)

# SanteDB BRE

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## Business rules expressed in JavaScript

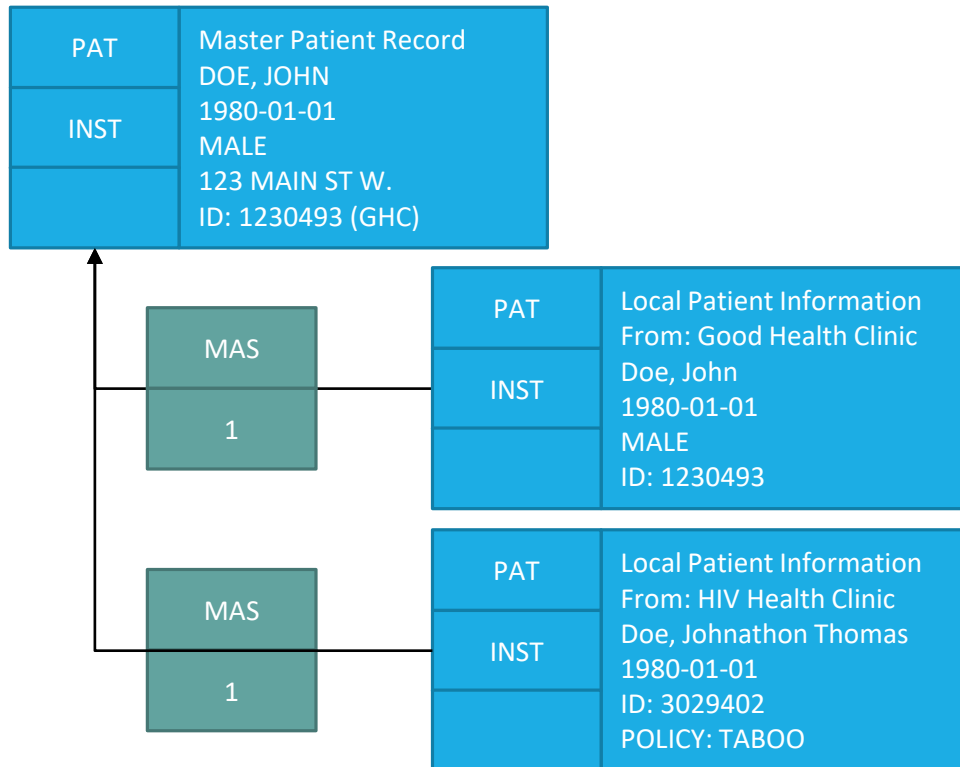
- Written once and executed on iCDR Server in addition to dCDR clients.

## Can subscribe to persistence layer event:

- Before/After Insert, Update, Obsolesion, Query, and Retrieve
- Inject server-side validators
- Executed regardless of how the information was received (HL7v2, v3, FHIR, etc.)

```
/**
 * Simple business rule that adds a custom tag to the patient based
 * on some other data
 */
SanteDBBre.AddBusinessRule(
    "Patient",
    "AfterInsert",
    { statusConcept: StatusKeys.OBSOLETE },
    function (patient) {
        var save = SanteDBBre.GetService("ITagPersistenceService");
        if (save) {
            var tag = new EntityTag({
                key: "mytag",
                value: "myvalue"
            });
            save.Save(patient.id, tag);
        }
        return patient;
    }
);
```

# SanteDB's MDM Model



- Each “Create” or “Update” received by an application domain (from the API Key) results in a “local” copy of a record being created
- When queried:
  - A master record is synthesized based on data which the current principal has access (for example: IZ application may not see HIV diagnosis)
  - If a record was elected as master (by an administrator or application with MDM policy applied) the elected master is returned.

# Integration / APIs

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## NON-STANDARD (PROPRIETARY) APIS

### Health Data Services (HDS)

- REST based API, JSON or XML
- 1:1 mapping to underlying clinical data-model (RIM)

### Administrative Management Interface (AMI)

- REST based API, JSON or XML
- 1:1 mapping to security resources

### Reports Integration Service Interface (RISI)

- REST based API, XML only
- Abstracts reporting engines (Jasper, SRSS, etc.) and data-warehouse tables
- Being replaced in SanteDB for BIS

### Business Intelligence Service (BIS)

- REST based API, JSON or XML
- Replaces RISI

## STANDARDS-BASED APIS

### HL7 FHIR R3

- Supports JSON or XML format resources
- Resources supported depend on available plugins implementing IFhirResourceHandler contract.

### HL7 Version 2.5

- Supports node-authentication (2-way TLS) or using HL7 MSH-8
- Implemented triggers depend on available plugins implementing IHl7MessageHandler

### GS1 Business Messaging Standard (BMS) XML 3.3

- Supports AS.2 (mime-encoded HTTP) and REST (nonstandard)
- Supports logistics inventory reports, order request/response, dispatch advice and receiving advice.

### OAUTH 2.0 + JWT

Swagger 2.0 / OpenAPI (<https://santedb.santesuite.net:8443/api-docs>)

### IHE ATNA

- Receiving or sending either RFC3881, NEMA DICOM or FHIR format audits over UDP, TCP, or HTTP

# 2019 - Roadmap

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## OpenIZ 1.x – Fredericton

- Maintenance of platform expected until mid-2020.

## SanteDB 1.3x.x – Halifax (Q2 2019)

- Implementation of SanteGuard distributable
- Server installation & update tooling
- Basic administration tooling & reporting
- Transition to BIS from RISI for reporting engine

## SanteDB 1.4x.x – Iroquois (Q4 2019)

- Update to offline/mobile reporting engine to support graphing and charting
- First alpha release of SanteMPI
- Final implementation of MDM & matcher