

Administrative Data Repository

System Design Document

Version 1.6



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1. Introduction

This System Design Document (SDD) for Administrative Data Repository (ADR) project has been reviewed and approved by the Architecture Engineering Review Board (AERB). ADR will continue to operate its database operations under the approved system and architecture. ADR will not make any system or architectural changes in the upcoming deployments.

ADR makes updates with this version of the SDD only to reflect Veteran-Focused Integration Process (VIP) languages and applicable new dates for future ADR releases. There is no change in the content of this version of the SDD, no change in the system, and no change to architectural structures. If any major system or architectural changes are required for future ADR development and release, ADR will seek appropriate review and approval in advance prior to making any such changes.

This SDD for ADR VIP Build #2, #3, #4, and #5 (formerly ADR Increment 28, 29, 30, and 31) describes the ADR database system and associated architecture. The ADR project is part of the Department of Veterans Affairs (VA) Repositories program. ADR is a repository that hosts two major data storage components: a Relational Database Management System (RDBMS) based data store and a file system based data store.

RDBMS Based Data Store

ADR uses the Oracle RDBMS as the data store for persistence of the data for supported client applications. Currently, the ADR database hosts the following data sets:

- Identity management information for Identity Services (IdS) applications, such as Person Service Identity Management (PSIM)
- Demographic information for IdS applications, such as Master Veteran Index (MVI)
- Enrollment and eligibility information for the following:
 - Veterans information—through Enrollment System (ES) applications under the Health Eligibility Center (HEC)
 - Dependents information—hosted through Eligibility and Enrollment System Improvements (ESI) under the Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA) project under the Health Administration Center (HAC)
- Veterans Benefit Handbook (VBH) project under the Enhance the Veteran Experience and Access to Health Care (EVEAH) Major Initiative 8.
- Requests and responses of Patient Protection Affordable Care Act (PPACA) transactions
- Patient issues, complaints, and compliments of Patient Advocate Tracking System (PATs)
- Caregivers health service data for Caregiver Support Program (CPS) via ES
- Business Event Notification Service (BENS)/Veterans Information and Eligibility Reporting System (VIERS) under Veteran Relationship Management (VRM)
- Contact Information Management/Customer Data Integration (CDI)

File System Based Data Store

ADR offers a file system based data store to support file based data such as images, flat files, Word documents, and PDF files. See section 2.2.7 Data Flow between ADR Benefits Handbook Repository and ES.

A special note: The ADR business/functional requirements are a combination of all the ADR supported individual business needs. ADR FY17 requirements combine all the annual business requirements of all the separate business projects for the entire period of FY17. During each specific ADR quarterly release, the business projects may or may not make requests to ADR for database enhancements and/or maintenance tasks in support of their business needs. Therefore, in any given ADR quarterly release, the ADR or the ADR clients' database enhancement and maintenance tasks to be delivered are not always equally matched, usually they are less than, the total number of all the business/functional requirements for the entire year. Each ADR quarterly release tasks generally meet a subset of the total business/functional requirements, but not necessarily all the business requirements in a single release because of the rapid development cycle—quarterly and agile/iterative development methodology the ADR project adapts. From the entire perspective, the total business/functional requirements are usually met via iterative development in the ADR's four quarterly enhancement releases and twelve monthly maintenance releases in a calendar year.

In addition, some projects' business requirements provided to ADR are high level and intended for multi-year period of performance. The business requirements based on the business epics and/or stories provided by the ADR clients are intended to be met via many ADR increments over multiple years. An ADR build/quarterly release is intended to cover phased functionalities to fulfill some of the business needs in a quarter, and later increments can continue delivering new features on top of those delivered in the current quarter.

These aforementioned scenarios made ADR unique as a service-like/infrastructural project providing the common repository/database support to many upstream application projects and hence do cause questioning often by various release management reviewers, and thus cause multiple delays to normal ADR project progress. The reviewers generally believe that each ADR release/build should meet the entire ADR business/functional requirements scoped for the entire year or multiple future years in the ADR epics/stories and other related documents. In fact, the total business requirements are to be satisfied by multiple ADR releases through the period of one year, in some special cases even span over multiple years of projects lifecycles.

To further clarify the uniqueness of the ADR project, the ADR operation is similar to a Help Desk like service to its business clients. At the beginning of the period of the business scope analysis—usually the start of the fiscal year, ADR creates a set of VIP required documents/artifacts such as requirements and epics/stories in the Rational Tools Concert (RTC) for the entire year. However, at the time ADR artifacts are created, the ADR project does not know the exact number of change requests, their precise contents of the change requests, and even the exact requestors of the change requests prior to the time that these change requests are actually made.

Therefore, ADR cannot provide the precise information about the actual change requests and hence requirements, epics/stories in advance of the submission of the change requests. ADR can only provide the information about the actual change requests after the change requests have been made to the ADR project during the development lifecycle of each increment.

For this Help Desk like operation ADR provides, it frequently causes questioning and even holdups by the multiple release management offices. They require ADR team to provide the documents at the beginning of the year during the process of document creation that these documents offer actual description of the change requests for all the future ADR increments during the entire year.

1.1. Purpose

The purpose of this document is to describe in sufficient detail how the ADR database is constructed. It translates the various ADR requirements specifications into a single document that ADR analysts, data modelers, database administrators/developers, configuration managers, and others can refer to when working with the system. It describes the top-level system architecture, along with the hardware, software, communication, and interface components.

1.2. Identification

This section identifies the systems and software to which this document applies. It also lists the standards that the ADR project adheres to.

1.2.1. Systems

The information in this document applies to the following systems/applications:

- ADR 3.x.x - quarterly enhancement releases to production
- Enrollment System applications
 - ES 4.x releases to production
 - Veterans Online Application (VOA)
 - Camp Lejeune (CL)
 - Health Benefit Plan (HBP)
 - Preferred Language supporting Meaningful Use (MU)
 - Veterans Benefit Handbook
 - Community Care Program
- Identity Service and its subsystems:
 - PSIM 2.2.x
 - Healthcare Identity Management (HC IdM) Toolkit
- Standard Data Service (SDS) IR18dux – Interim releases and data updates
- PPACA/VIERS 1.0.x.x
- Financial Services Center (FSC) for Millennium Bill (Mill Bill) data

Note: FSC Mill Bill is a temporary solution to provide the Millennium Bill-related data hosted in the ADR database to the FSC without going through the service applications.

- ESI/CHAMPVA

- Veterans Information/Eligibility Reporting System (VIERS) under Veterans Relationship Management (VRM) – Database storage for Contact Information Service (CIS) and Business Event Notification Service (BENS)
- Patient issues, complaints, and compliments of Patient Advocate Tracking System (PATS)
- Caregivers health service data for Caregiver Support Program (CPS)
- Business Event Notification Service (BENS)/Veterans Information and Eligibility Reporting System (VIERS) under Veteran Relationship Management (VRM)
- Contact Information Management/Customer Data Integration (CDI)

1.2.2. Software

The following table shows the software used for the ADR Production (ADRP) and Disaster Recovery (DR) systems. This software is mainly used to set up the ADR Production databases at the Austin Information Technology Center (AITC). Appendix E shows the software used for ADR operation and development.

1.2.3. Standards

The standards which the ADR project adheres to are listed below:

- Office of Product Development (PD) ProPath; reference at [REDACTED]
- VistA Application Structure and Integration Services; reference at [REDACTED]
- Office of Enterprise Architecture Management (OEAM) - Data Architecture Service (DAS) practices and standards:
 - DAS Data Modeling Standards
 - DAS Architecture Methodology
 - VA Directive 6064 Data Architecture and Data Management Program
- Reference at [REDACTED]
- IBM Rational Unified Modeling Language (UML); reference at <http://www-01.ibm.com/software/rational/uml/>
- ANSI SQL; reference at <http://www.ansi.org>

1.3. Scope

The following tables describe the scope of requirements that are included in and excluded from the ADR system.

Table 1: ADR Scope Inclusions

Includes
ADR database enhancement requests in support of ES and IdS applications

Includes
1. New ADR database enhancement requirements are planned for EHBD/ES Modernization (ESM), Veterans' Access Choice and Accountability project (VACAA), CareT, Contact Information Management (aka Contact Information Service) under CDI, CHAMPVA, BENS, and Patient Advocate Tracking System (PATS)

Table 2: ADR Scope Exclusions

Excludes
New customer requirements beyond what has been identified for FY18 will not be addressed until ADR receives VIP approval and additional resources, if necessary, for the added requirements.

ADR Project Scope of Work:

ADR manages the back-end production databases, development databases, staging databases, and pre-production databases for its client application systems, and also implements the database enhancements for the business projects.

For the clarity of ADR project's scope of work on the database enhancements, ADR data enhancements are generalized into following major categories:

1. Create new data tables or modify existing data tables
2. Create new table columns or modify existing table columns
3. Create new data values or modify existing data values
4. Create new data set for report or modify existing data set for report
5. Create new data extraction or modify existing data extraction

During the period of performance of each increment, ADR clients will make a number of requests that contain one, or, more of aforementioned database enhancements. ADR project performs only these database enhancements for the business application systems. All these described database enhancement activities are strictly conducted within the boundary of an Oracle database system. There is no change to be made to the existing system architecture, network system, nor security posture. Any potential impact to the database capacity or network traffic is also assessed. Based on the business requirements presented to ADR project so far, there is no performance impact or system impact to be produced by the expected database activities.

Any business request outside of the scope of work for ADR database enhancement is outside the scope of ADR project, and will not be considered for ADR project.

1.4. Relationship to Other Plans

The following documents on the [REDACTED] website are related to this document:

- *ADR Database Standards and Guidelines*
- *ADR Database Security Guide*
- ADR Requirement Epics/Stories in Rational Team Concert

1.5. Methodology, Tools, and Techniques

The following shows the software tools used for performing database design tasks and for managing change requests made during the development phase. Appendix E shows the software used for ADR operation and development.

1.6. Constraining Policies, Directives, and Procedures

The ADR design team follows several policies, directives, and procedures:

- No direct access to the ADR database. All data in the ADR database must be accessed via the applications/services in the service layer.
- No Oracle-specific implementation. Oracle-specific features, such as triggers, should not be used.

1.7. Design Trade-Offs

Two trade-offs were made in designing the ADR system. One involves the implementation of an ADR Reporting database (ADRRP); the other is using Oracle-specific triggers for auditing.

1.7.1. ADR Reporting Database

The ADR Reporting database is a daily snapshot of the ADR Production database. This replica of the Production database can then be queried to produce various reports. The design and implementation is based on the requirements identified by the ADR consuming application teams to avoid any performance impact to the ADRP database.

The current design of the ADR Reporting database is based on disk replication. As illustrated in the following figure. One of the mirrored disks for ADRP is taken offline and put into the ADRRP disk group; other disks in the group are synchronized after rebuild based on the disk from ADRP. Once the ADRRP rebuild process is completed, the offline ADRP disk is joined back into the ADRP disk group and is rebuilt from other online ADRP disks.

The advantages of this approach are:

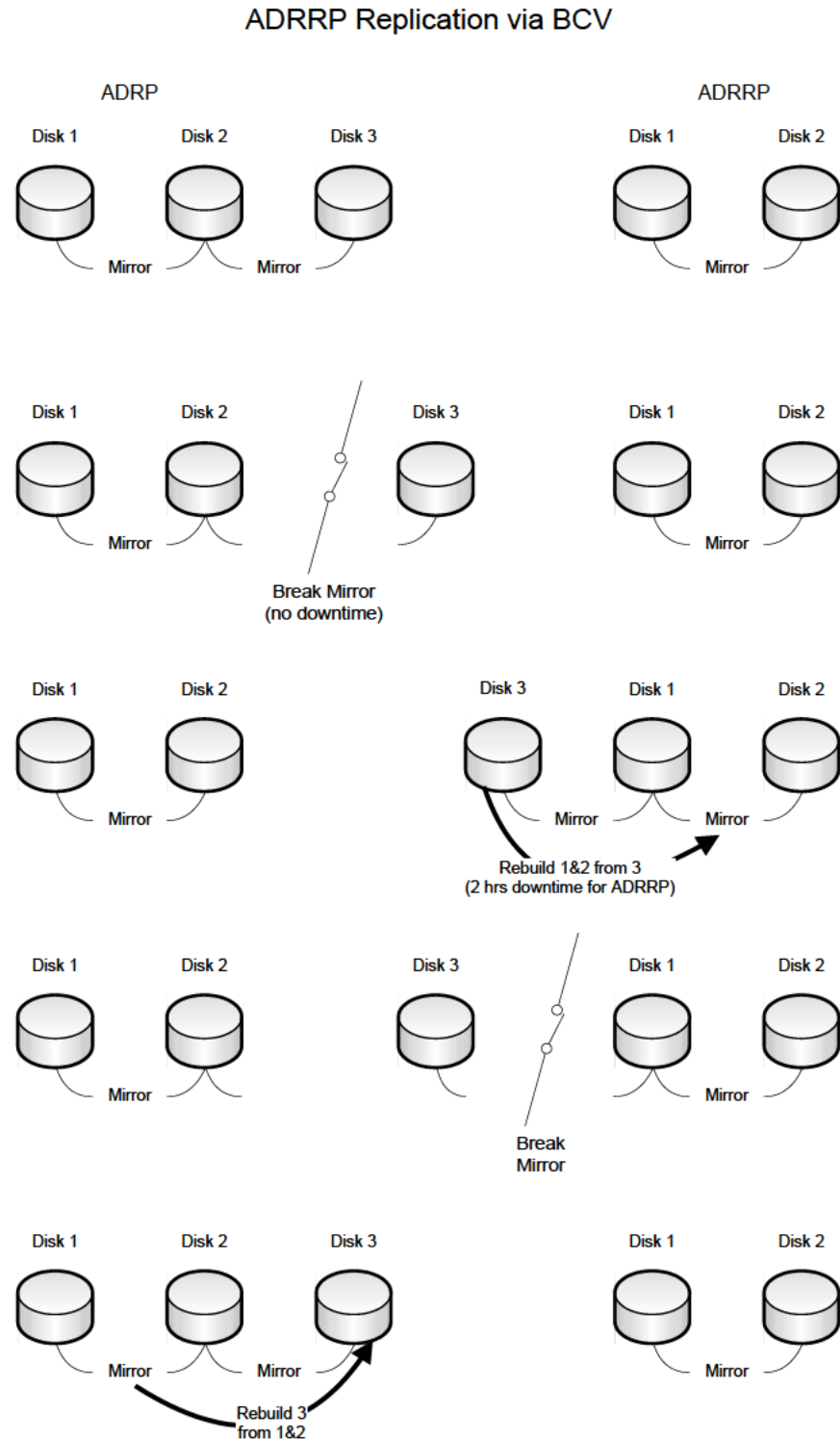
1. No impact to the ADR Reporting database. Compared to Oracle replication and other customized Extract, Transform and Load (ETL) processes, there are no data extraction processes which will impact the workload of the ADR database supporting online transaction processing (OLTP) applications such as ES and IdS.
2. Simplicity. The configuration and setup for disk mirroring is relatively simple compared to the setup and maintenance for another Oracle database dedicated for reporting activities.

The disadvantages of this approach are:

1. Reduces the availability of the reporting database. Disk replication requires downtime of the ADR Reporting database ranging from 2-5 hours depending on the number of changes made to the ADR Production (OLTP) database in the previous day.

2. Limited use of the ADR Reporting server. The disk replication replicates the entire database every night, so any work implemented on the Reporting database will be lost after the replication.

Figure 1: ADR Reporting Database Replication Process



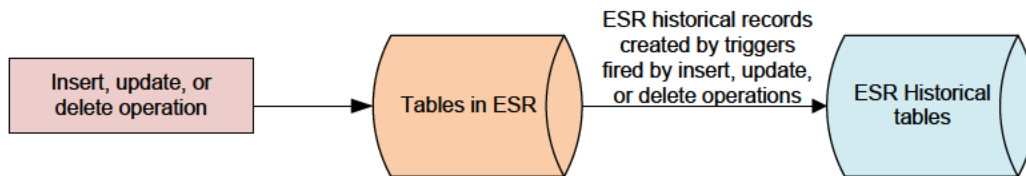
According to observations, the ADRRP rebuild process requires downtime ranging from 2-3 hours, depending on the number of changes made in the previous day.

1.7.2. Using Oracle-Specific Triggers for Auditing

For historical purposes, any change or insert actions performed in the ADR database must retain a copy of the pre-change state of the record for auditing purposes.

When data changes occur to ES data stored in the ADR database, the triggers provide a common mechanism for the capture and recording of the changes made. As shown in the following figure, the triggers create historical records when data is changed in ES. Database triggers execute or *fire*, creating a copy of the pre-change state of the record and inserting the copy into the historical tables.

Figure 2: Retaining ES History for Auditing Purposes



There is a business need for HEC staff working registration, eligibility, and enrollment cases to be able to view data changes which can impact the outcome of a case. Because a number of tables are associated with a person record, a number of copies will be made using this process.

The triggers are an integral part of a solution which addresses this business requirement. ES must retain a copy of all changes made to a person's demographic information. For historical purposes, any change or insert actions must retain a copy of the pre-change state of the record. The database triggers intercept these actions and store them in a separate historical database.

There are two places the initiation of creating the auditing records can start: in the application or in the database.

- **Application** - In this approach, the creation of an audit record is started by the application. The main advantage of this approach is that the business logic specific for the auditing is managed by the service layer. The main disadvantage is that it requires significant design and implementation effort to fulfill this requirement for the existing project.
- **Database** – In this approach, the creation logic is imbedded in the database. The main advantage is simplicity: using Oracle triggers for those tables required to be audited is a clean approach. Another advantage is performance. Because the audit records are being created within the ADR database along with updates to the main record, this approach yields significantly better performance compared to the updates being executed in the service layer by applications.

There are two disadvantages. (1) The auditing records are created by the ADR project in the data service layer and reviewed by applications at the service layer. This requires tight coordination and coupling between ADR and the applications which use this approach for auditing. (2) The VA's Architecture and Engineering Review Board (AERB) does not allow the use of vendor-specific features, such as Oracle triggers which are specific to the Oracle system, because it locks in VA production systems with specific vendors.

The current implementation of auditing for ES is based on the database approach because of its advantages. A waiver from ES is currently being prepared and will be submitted to the ARB for approval.

1.8. User Characteristics

For information about user characteristics for the applications that consume ADR data, refer to the project repositories for each upstream application on the VA's [REDACTED] website.

1.9. Relationship to Other Documents and Plans

The information and/or content in this ADR SDD are also used and/or reference to other ADR documents shown below.

- ADR POM

2. Background

Key development efforts in the early stages of the ADR project included the Data Migration Initiative (DMI). DMI was implemented in ADR Phase I for migration of the legacy data from the Master Veteran Index (MVI) and Health Eligibility Center (HEC) into the ADR database to support the ES and Person Service Identity Service (PSIM) applications.

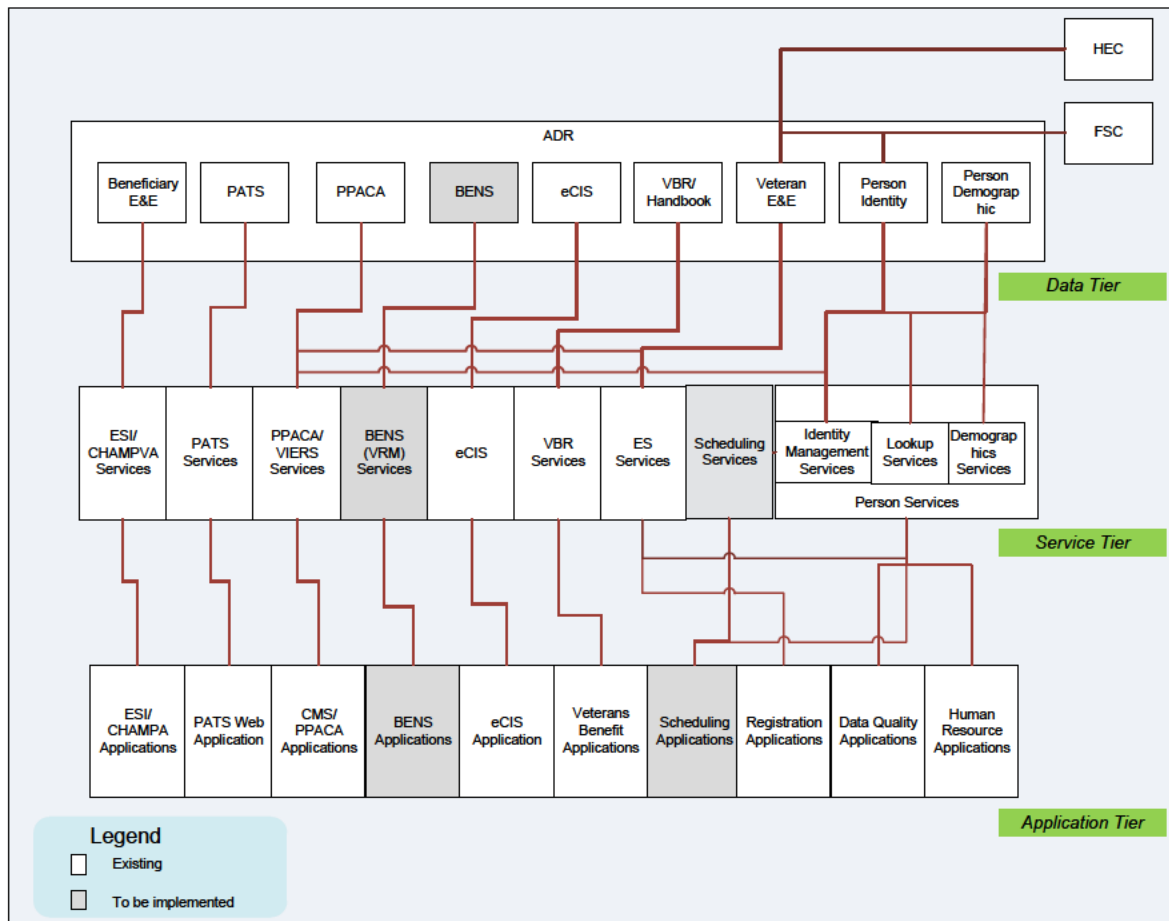
Note: PSIM is a component of Identity Services (IdS).

ADR Phase II began in October 2007 to continue support for the ES and IdS projects. Along with ES, ADR is now part of the VA's System of Systems (SoS) System of Record. On a quarterly release schedule, ADR has added support for additional client applications, such as VOA and Veterans Benefit Handbook.

2.1. Overview of the System

ADR constitutes the data layer of the n-tier architecture. The interaction between ADR and the service and application tiers is shown in the following figure.

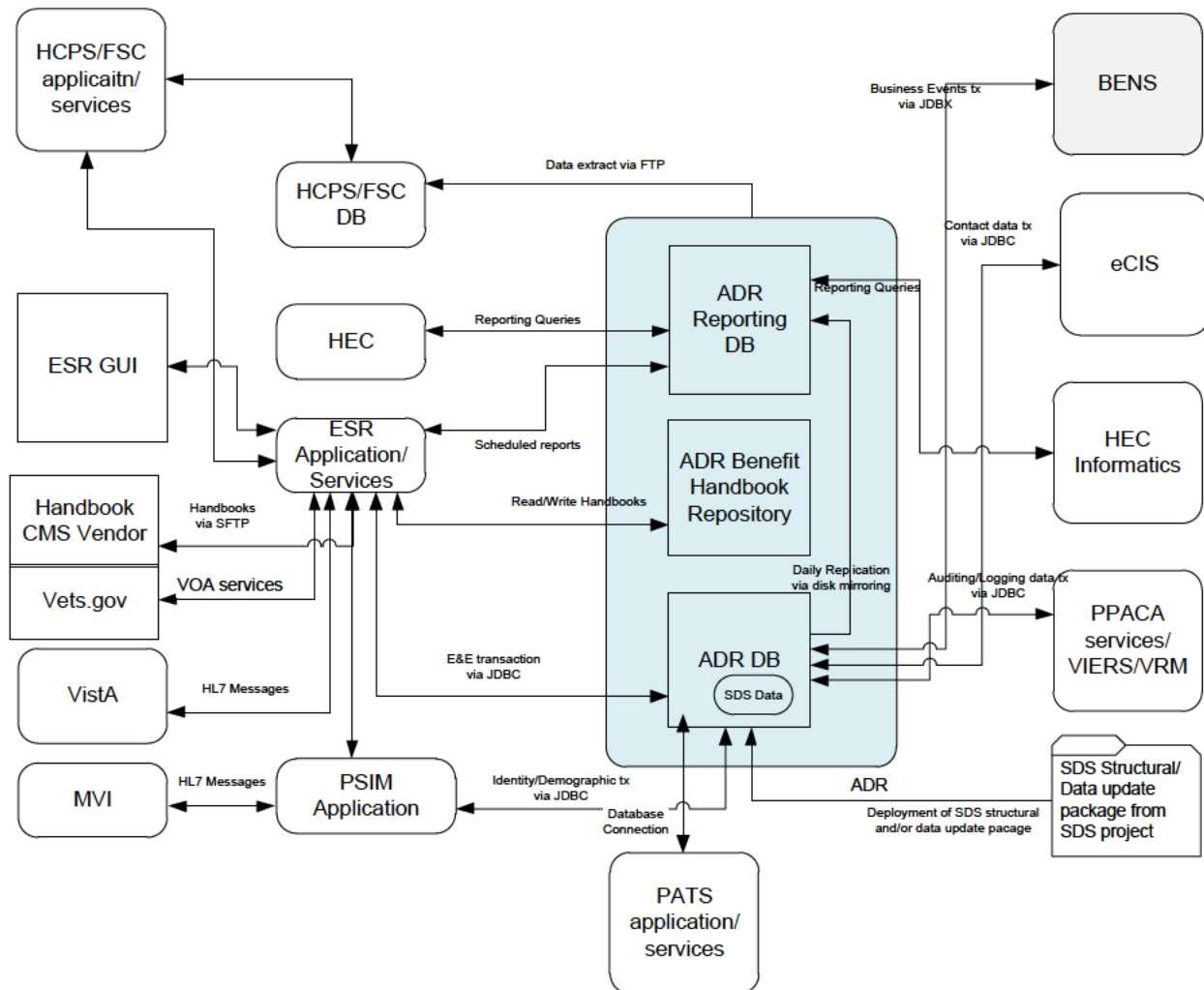
Figure 3: Interaction between ADR and the Service and Application Tiers



2.2. Overview of the Business Process

This section documents the data flows to and from the ADR databases. The following figure illustrates the business processes of ADR, summarizing the data flows between ADR and its consuming applications. The sub-sections after the graphic describe the individual data flows in greater detail.

Figure 4: Data Flow between ADR and Consuming Applications



2.2.1. Data Flow between ADR DB and the ES Application

One of the primary functions of the ADR project is to support the ES application. ES accesses the ADR Production and Reporting databases via the Java Database Connectivity (JDBC) connection. There are three data flows between ADR and ES:

- ES online transaction data flow for Enrollment and Eligibility data. This data flow is between the ES application and ADR database for ES online transactions, which usually require quick response time.
- ES report/batch job dataflow for scheduled reports. This data flow is between the ES application and ADR Reporting database for ES reporting/batch job queries, which could take significant time (from minutes to hours) to retrieve the results from the ADR Reporting database.
- Veterans Benefit Handbook location and Veteran Benefit Plan data flow. This data flow is between the ADR database and the ES application for persisting and retrieving handbooks and Veteran benefits information for the Veterans Benefit Handbook.

2.2.2. Data Flow between ADR DB and IdS Applications

The data flow between ADR and the IdS applications is primarily for the IdS online transactions, which include the transactions necessary to synchronize Master Veteran Index (MVI) and ADR.

2.2.3. Data Flow between ADR DB and the SDS Master DB

This data flow represents the refresh of Standard Data Services (SDS) data hosted locally in the ADR databases. It is performed whenever a new SDS update package is deployed to the ADR database by the ADR Production DBA at the AITC.

2.2.4. Data Flow from ADR to Healthcare Claims Processing System (HCPS)/Financial Service Center (FSC)

This data flow was implemented in 2009 with a waiver granted to HCPS/FSC for direct access to the ADR database without passing through applications in the service layer. The data extracted from ADR is used for processing requests related to the Mill Bill project. The data extraction occurs periodically against the ADR Reporting database according to the needs of the FSC. The ADR team developed the extract script and delivered it to the AITC.

2.2.5. Data Flow from ADR Production to ADR Reporting DB

This data flow describes the nightly replication from the ADR Production (OLTP) database to the ADR Reporting database via disk mirroring. The ADR Reporting database is static for read-only activities such as ES reports and batch jobs, HEC reports, and the data extraction for FSC Mill Bill.

2.2.6. Data Flow from ADR Reporting DB to Health Eligibility Center (HEC)

This data flow describes the communication between the ADR Reporting database and HEC for reporting activities.

2.2.7. Data Flow between ADR Benefit Handbook Repository and ES

This data flow describes the read and writes processes of handbooks from the ES application to and from the ADR Handbook Repository.

- Handbook Write Process
 - Retrieve the specific location used to store the VBH via the ES and ADR data flow.
 - Save the handbook's ES application received from handbook CMS vendor to the ADR Handbook Repository at a specified location.
- Handbook Read Process
 - Use the document ID obtained from Handbook Write Process to find out the location of the VBH to be read via the ES and ADR data flow.
 - Retrieve the VBH from ADR Handbook Repository based on the file location.

2.2.8. Data Flow between ADR DB and Identity and Access Management (IAM) Application/Services

This data flow describes ES account/user (records) creation/update/deletion via the ADR database stored procedures according to the user/account related information sent by IAM services/applications.

2.2.9. Data Flow between ADR DB and Business Event Notification Services (BENS)/Veterans Identity Eligibility Reporting System (VIERS)

This data flow describes BENS creation/read/update/deletion business event notification data stored in the ADR database to fulfill the service requests from its end customers.

2.2.10. Data Flow between ADR DB and Contact Information Services (CIS)/VIERS

This data flow describes CIS creation/read/update/deletion person contact data stored in the ADR database to fulfill the service requests from its end customers.

2.2.11. Data Flow between ADR DB and PPACA/VIERS

This data flow describes PPACA/VIERS creation/read/update/deletion auditing/logging data stored in the ADR DB.

2.2.12. Data Flow between ADR Reporting DB and HAC Informatics

This data flow describes the data/reports generated by queries issued from HAC Informatics to ADR Reporting DB.

2.2.13. Data Flow between ADR DB and PATS

The data flow between ADR and the PATS application is primarily for the PATS online transactions for patient issues, complaints, and compliments collected from VA medical centers.

2.2.14. Data Flow between ADR DB and CPS

The data flow between ADR and the PATS application is primarily for the CPS online transactions for general caregiver support services.

2.3. Business Benefits

The business benefits of ADR to the VistA applications community are:

- Facilitates the migration of demographic, identity management, and eligibility/enrollment data from the legacy systems, such as HEC to the ADR database
- Maintains synchronization of the administrative data between HEC and ADR until the decommissioning of the legacy systems
- Avoids the creation of redundant islands of administrative information for the needs of individual projects
- Enhances integration of administrative data/information shared across multiple systems

- Reduces/avoids the common overhead of maintenance to the infrastructure of multiple isolated repositories
- Enables the application/service development teams to focus on delivering the core functionality of the business requirements
- Delegates database design/implementation/maintenance to a specialized team with extensive knowledge in database administration

ADR provides value in other areas as well:

- Coordinates and communicates database changes across customers/consumers
- Documents all changes made to the ADR database schema
- Insures that changes are implemented under a single set of standards/guidelines
- Provides internal quality assurance for database changes before they are released to the customer testing environments

In addition, ADR and other services such as Health Data Repository (HDR) and Standards and Terminology Services (STS) are under the same program within the VA organization: Health Data Services. The resources, knowledge, and experience from these related repository projects enhances the level of service that the ADR team can provide to its consuming applications, as well as for database architecture and maintenance.

2.4. Assumptions and Constraints

2.4.1. Design Assumptions

The design of all ADR database objects should follow the standards described in the *ADR Database Standards and Guidelines* document on the [ADR Phase II](#) website, unless there is a special need approved by the ADR team.

2.4.2. Design Constraints

One design constraint for the ADR database is that there should be no reviews on top of SDS Materialized Views. This is to avoid any data modification/manipulation to the SDS data, which potentially results in a data integrity issue between applications supported by SDS.

Another design constraint specified in the requirements for the ADR Reporting (OLAP) database was to avoid imposing any performance impact to the online transaction processing being performed by the ADR Production (OLTP) database. See Section 1.7.1 for more information on the ADR Reporting database design trade-offs.

2.5. Overview of the Significant Requirements

The following sections provide an overview of the significant requirements.

2.5.1. Overview of the Significant Functional Requirements

The following table lists high level business/functional requirements to the ADR project

Table 3: ADR Business/Functional Requirements

ID	Requirement	Synopsis
1	ES Modernization (ESM) DB Development	Perform the following tasks to support the ESM project: <ul style="list-style-type: none">• Create/modify database objects.• Perform data migration resulting from database modification.• Modify the data hosted in the ADR database to support application upgrades.• Allocate ADR database-related resources to ensure the operation and performance of the ESM application.• Conduct ADR database maintenance.
2	IdS Development Support	Perform the following tasks to support the IdS project: <ul style="list-style-type: none">• Create/modify database objects.• Perform data migration resulting from database modification.• Modify the data hosted in the ADR database to support the application upgrades.• Allocate ADR database-related resource to ensure the operation and performance of the IdS applications.• Conduct ADR database maintenance.
3	ADR Reporting Database for ES and HEC Reporting	The data should be replicated from the ADR Production (OLTP) database nightly. There should be no performance impact to the ADR Production database.
4	HCPS/FSC Data Extract	Develop the data extraction scripts.
5	Veterans Benefit Handbook/EVEAH	Perform the following tasks to support the Veterans Benefit Handbook project: <ul style="list-style-type: none">• Create/Modify database objects to store information for:<ul style="list-style-type: none">○ Veterans Benefit Plan Information○ Location of the stored Veteran Benefit Handbook/Benefit at a Glance files in PDF• Perform data migration resulting from database modification.• Modify the data hosted in the ADR database to support the application upgrades.• Allocate ADR database-related resources to ensure the operation and performance of the Veterans Benefit Handbook applications.• Conduct ADR database maintenance.

ID	Requirement	Synopsis
6	VIERS/PPACA	Perform the following tasks to support PPACA project: <ul style="list-style-type: none"> • Create/Modify database objects to store information for PPACA auditing/logging. • Provide storage for PPACA • Perform data migration resulting from database modification. • Modify the data hosted in the ADR database to support the application upgrades. • Allocate ADR database-related resources to ensure the operation and performance of the PPACA applications. • Conduct ADR database maintenance.
7	Enterprise Contact Information Service (eCIS)	Perform the following tasks to support the eCIS project: <ul style="list-style-type: none"> • Create/modify database objects. • Perform data migration resulting from database modification. • Modify the data hosted in the ADR database to support application upgrades. • Allocate ADR database-related resources to ensure the operation and performance of the eCIS application. Conduct ADR database maintenance.

2.5.2. Functional Workload and Performance Requirements

The ADR system was designed and implemented to support multiple applications accessing data hosted in the ADR database, so its workload and performance requirements are inherently defined by the performance requirements of its supporting applications (ES and IdS). Thus one of the ADR design and implementation goals has been to provide satisfactory performance of a set of database queries corresponding to one application online transaction. Currently, the collective performance of the ADR system at the data tier and the ES/IdS applications at the service tier has continued to provide satisfactory performance to meet the specified application online transaction response time.

2.5.2.1. Performance Requirements for Veterans Benefit Handbook

1. Handbook Read Transaction

The required response time for asynchronous read transaction for a typical handbook in PDF is 10 seconds from the application perspective, which includes ADR database response time. Derived I/O requirements for the SAN storage is 30 MB per second.

2. Benefits at a Glance Read Transaction

The required response time for asynchronous read transaction for Benefits at a Glance in PDF is 10 seconds from the application perspective, which includes ADR database response time. Derived I/O requirements for the SAN storage is 21 MB per second.

3. Handbook Read and Write Transaction

The required response time for an asynchronous write transaction for a Veterans Benefit Handbook and Benefits at a Glance in PDF is 10 seconds from the application

perspective, which includes ADR database response time. Derived I/O requirements for the SAN storage is 0.85 MB per second.

The following table provides the performance details.

Table 4: Performance Requirements for Veterans Benefit Handbook and Benefits at a Glance

Transaction Type	Concurrency	Document Type	Document Size (MB)	Total of Document Size to be Processed Concurrently	Response Time (seconds)	Bandwidth	
						MB per second	MB per 1/1000 sec
Read (sync)	300	Handbook	1	300	10	30	0.03
Read (sync)	300	Benefits at a Glance	0.7	210	10	21	0.021
Write (async)	5	Handbook & Benefits at a Glance	1.7	8.5	10	0.85	0.00085

2.5.2.2. Performance Requirements for BENS

The following table shows the BENS performance requirements to the ADR database at the SQL (table) level.

Table 5: Performance Requirements for BENS

ID	Table Name	Max. Transactions (Insert, Delete, Update) per Hour	Max. Concurrency (Concurrent Active Sessions for DML)	Max. Database Response Time for Insert, Delete, Update (Seconds)	Record Retention Time	Online Aggregated Queries						Notes
						Query Type (OLTP, OLAP)	Query	Frequency	Scheduled Start Time	Max. Response Time	Estimated Average Size of the Results	
1	Taxonomy	10/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet, but when asking for a full taxonomy view of the data, we would join Taxonomy, TaxonomyVersion, EventClass, Contact, Registrant, and Code.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~500K	
2	TaxonomyVersion	10/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~100 bytes	Might just want to see an individual taxonomy version.
3	EventClass	100/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet, but consider browsing one event class at a time in drill down view. This would result in a join between EventClass, Registrant, Contact, and Code.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~500 bytes	
4	Contact	100/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~ 2K	Might want to look at details of a contact separately.
5	Registrant	100/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet, but may want to look at details of registrants separately resulting in a join between Registrant and Contact.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~2.2K	Might want to look at details of registrants separately.
6	Code	100/week	10	0.1	10 years per Create_Date	OLTP	We have not defined the SQL yet, but may want to browse all codes at once, resulting in a join with EventClass, TaxonomyVersion and Taxonomy.	200/day	Friday, Dec 14, 2012 8 00am EST	0.2	~10K	May want to browse all codes at once.

2.5.2.3. Performance Requirements for PPACA

In this section, performance and workload of PPACA are detailed.

Performance Requirements

The overall transactional requirements from CMS perspective was not detailed as shown in 0. Currently, ADR DB provides sub-second response time to application layer in logging required processing data into ADR DB.

As of August, 2014, the average DB insert transaction performance (SQL elapsed time) is 0.0019760 second. Per limited interpretation from ADR DB perspective, this DB response time meets the performance requirements for application including DB described in 0

1. ACA configuration for concurrent connection to ADR DB
 - o Maximum DB connection concurrency:
maxConnectionPoolSize='30'
2. Current ACA SQL Performance (elapsed time)

SQL Text	Execution time (seconds)		
	Min.	Max.	Average
INSERT INTO AFFORDABLE_CARE_REQUEST (AFFORDABLE_CARE_REQUEST_ID,VA_BUSINESS_RES PONSE_R_ID, EXCHANGE_TRANSACTION_CODE, SSN, FIRST_NAME, MIDDLE_NAME, LAST_NAME, SUFFIX, DATE_OF_BIRTH, GENDER_CODE, COVERAGE_REQUEST_START_DATE, COVERAGE_REQUEST_END_DATE, RECORD_CREATED_BY, RECORD_CREATED_DATE, RECORD_MODIFIED_BY, RECORD_MODIFIED_DATE, RECORD_MODIFIED_COUNT, DEATH_DATE) VALUES(AFFORDABLE_CARE_REQUEST_S.NEXTVAL,:1 , :2, :3, :4, :5, :6, :7, :8, :9, :10, :11, :12, SYSDATE, :13, SYSDATE, :14, :15) RETURNING AFFORDABLE_CARE_REQUEST_ID INTO :16	0.00113	0.00140	0.00113

1. Storage Usage: 12 GBs
2. Inserts / minute per statistics before 10/06/2016:
Max: 11099
Min: 1
Average: 101
3. Concurrent DB connection
Max: 6
Min: 1

Workload Estimate

The tables below display the expected workload estimates provided by PPACA project in 2013. The first table defines the request window from CMS to the entire PPACA services including ADR DB. The second table is the estimated FY17

Table 6: Primary Request and Process Windows

	Days in a Week	Start Time (EDT)	End Time (EDT)	request window (hours)
Primary CMS Request Window	5	8:00	17:00	9:00
Primary VIERS Process Window	5	8:00	17:00	9:00

Table 7: FY17 Minimum Essential Coverage Transaction Volume

Month (YY-YY-MM)	2015-10	2015-11	2015-12	2016-01	2016-02	2016-03	2016-04	2016-05	2016-06	2016-07	2016-08	2016-09
Actual Request Count	4,596,925	8,595,418	11,012,267	8,054,702	5,183,163	5,970,308	4,813,609	4,918,560	5,544,746	5,079,843	7,443,037	6,838,623
Projected Request Count (with 10% growth)	5,056,618	9,454,960	12,113,494	8,860,172	5,701,479	6,567,339	5,294,970	5,410,416	6,099,221	5,587,827	8,187,341	7,522,485

2.5.2.4. Performance Requirement for PATS

The PATS database consolidation into ADR database is scheduled for FY15Q3. Information of performance, workload, and storage usage will be provided once the requirement analysis and capacity planning are completed after the consolidation effort starts.

The performance requirement analysis will be conducted in FY15Q3 and documented under [REDACTED]

2.5.2.5. Performance Requirement for Contact Information Management Services/application under CDI

- High Availability (HA)
Long Target: 99.99% excluding the planned downtime
Provided by AITC: 99.9% excluding the planned downtime
 - Primary Site Failover for unexpected downtime
- Required**
- eCIS Storage Requirements

Without Oracle Advanced Compression saving

eCIS Storage Estimate						
Data Type		Fiscal Year				
		2017	2018	2019	2020	2021
Active	Growth Rate	NA	10%	10%	10%	10%
	Estimated Size (GBs)	100	110	121	133.1	146.41
Historical	Growth Rate	NA	20%	20%	20%	20%
	Estimated Size (GBs)	400	440	484	532.4	585.64
Total size (GBs)		500	550.2	605.2	665.7	732.25

With Oracle Advanced Compression Saving (35%)

eCIS Storage Estimate with Oracle Advanced Compression
--

Data Type		Fiscal Year				
		2017	2018	2019	2020	2021
Active	Growth Rate	NA	10%	10%	10%	10%
	Estimated Size (GBs)	100	110	121	133.1	146.41
	Oracle Advanced Compression Saving	35%	35%	35%	35%	35%
	Estimated Size with OAC saving (GBs)	65.00	71.50	78.65	86.52	95.17
Historical	Growth Rate	NA	20%	20%	20%	20%
	Estimated Size (GBs)	400	480	576	691.2	829.44
	Oracle Advanced Compression Saving	35%	35%	35%	35%	35%
	Estimated Size with OAC saving (GBs)	260.00	312.00	374.40	449.28	539.14
Total size (GBs)		325.00	383.50	453.05	535.80	634.30

eCIS Workload Estimate

5 Year projection with 20% growth rate for new persons added into the eCIS system

Workload Projection (transactions per month)						
Transaction Type	Fiscal Year					
	2017	2018	2019	2020	2021	2022
Growth Rate		20%	20%	20%	20%	20%
Address	900000	1080000	1296000	1555200	1866240	2239488
Phone	750000 0	9000000	10800000	12960000	15552000	18662400
Email	150000 0	1800000	2160000	2592000	3110400	3732480
Total per Month	9900000	11880000	14256000	17107200	20528640	24634368

ADR provides the mission critical operations required by the ES and IdS applications. The following table lists the operational requirements which drive the ADR database software, hardware, and configuration design and implementation.

Table 8: ADR Operational Requirements

ID	Requirement
1	Provide database management systems to support the operation of ES (including related projects for Enrollment & Eligibility), VIERS/PPACA, PATS, CSP system and IdS
2	Provide computing resources to host the data for supporting applications
3	Provide storage resources to host the data for supporting applications
4	Provide high availability of the ADR system to the supporting applications
5	Provide a redundant ADR system for disaster recovery purposes
6	Provide an ADR OLAP database for reporting activities

The ADR infrastructure has been ratified through the Technical Analysis Review-Technical Analysis Summary (TAR-TAS) process. ADR is in compliance with the VA's IT Infrastructure Standards in that it allows database access to the applications only at the service tier, unless a waiver is granted to access the ADR data directly.

2.5.3. Overview of the Technical Requirements

The following table describes the major technical requirements since the project inception to support all ADR supporting applications/systems. Requirements 1 and 2 were completed via the DMI effort in ADR Phase I. Requirements 2-6 are ongoing to support the existing ADR customers.

Table 9: ADR Technical Requirements

ID	Requirement
1	Support development and maintenance of the ES applications under EHBD/ES Modernization
2	Support development and maintenance of the IdS applications
4	Support development and maintenance of the PPACA
6	Support development and maintenance of ESI/CHAMPVA
6	Support development and maintenance of Veterans Access, Choice, and Accountability Act (VACAA)
9	Support development and maintenance of PATS
10	Support development and maintenance of CSP
11	High availability (see Section 3.3.1)
12	Disaster recovery (see Section 2.5.6)

The Oracle database is used for the ADR DBMS, which is one of the approved database management systems according to the [REDACTED]. Hence, ADR is in compliance with the PD Software Engineering Technical Reference Model ([REDACTED]).

ADR is in compliance with the VA Enterprise Architecture as being a data repository for access only from the applications in the service tier.

2.5.4. Overview of the Security/Privacy Requirements

The security requirements of the ADR database cover the set of processes that protect ADR from unintended activity, including unauthorized access, malicious attacks, or inadvertent mistakes made by authorized users. These security features have either been designed into the ADR database or configured on the host ADR server to fulfill required VA data access security requirements described in the VA Handbook 6500. Refer to the *ADR Database Security Guide* for details.

ADR completed the VA Certification and Accreditation process in May 2012. The ADR team has properly documented within the project artifacts how compliance with this process will be maintained.

2.5.5. Overview of System Criticality and High Availability Requirements

ADR is the database for ES and IdS, two of the mission critical applications in the VA's System of Systems (SoS). The ADR system is therefore inherently mission critical and requires high availability, with a Disaster Recovery (DR) system standing by should a fail-over become necessary.

The ADR Production database is hosted at AITC with three servers clustered for the ADR servers to support high availability and a SAN for the file system to support storage redundancy.

The ADR DR system hosted at the Hines Information Technology Center (HITC) is configured with Virtual Machine (VM) server farms with the same SAN storage as the Production system.

The ADR high availability requirements are:

- Availability: 00:00 to 23:59:59
- Percentage of Availability: 99.95 % (excluding planned outages and scheduled replication specific to ADR reporting DB only)

These requirements are set forth in various ADR RSDs on the [REDACTED] website.

The ADR DR requirements are:

- DR Recovery Time Objectives (RTO): 12 hours
- DR Recovery Point Objectives (RPO): 2 hours

These requirements are described in the *ADR Application Contingency Plan*.

2.5.6. Single Sign-on Requirement

ADR provides application DB accounts to client applications/services so single sign-on requirement from end user is not applicable to ADR system. Also, single sign-on for application account in all environments such as development, staging, preproduction (preprod), and production is not suitable for maintenance operation. It is intended to have applications to sign in ADR DB with awareness of the specific environment to avoid unexpected environment specific modifications and potential security risks related to PHI and PII.

2.5.7. Requirement for Use of Enterprise Portals

N/A

ADR is a data source infrastructural system with no GUI and hence Enterprise portals

2.5.8. Special Device Requirements

N/A

2.6. Legacy System Retirement

N/A

3. Conceptual Design

The following sections cover the ADR conceptual design.

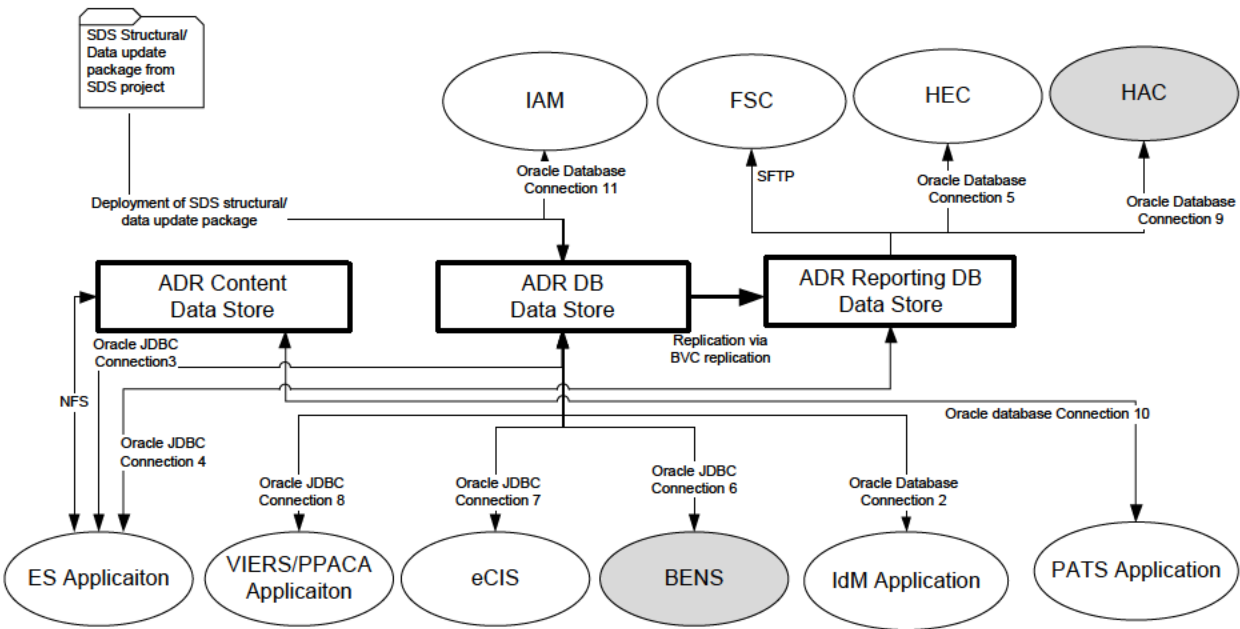
3.1. Conceptual Application Design

This section provides the conceptual application design of ADR as detailed in the following sections.

3.1.1. Application/Database Context

The ADR database's interactions with other systems/applications are described in the following figure. All interfacing from external applications/systems to the ADR system is through the Oracle database connections. Currently ES, IdS (including IDHub), SDS, and HEC reporting applications/ systems have direct interfaces with the ADR system. FCS Mill Bill uses table extracts taken twice a month and replicated to an FSC database.

Figure 5: ADR Context Diagram



The following tables provide a context description for each interface.

Table 10: ADR Context Description (Objects)

Objects				
ID	Name	Description	Interface Name	Interface System
1	SDS Structural/data update package	Standard Data Services	Deployment of SDS Structural/data update package	ADR
2	ES	Enrollment System Redesign application	Oracle JDBC Connection	ADR
3	IdM Applications	Identity Management application	Oracle Database Connection	ADR
4	HEC	Health Eligibility Center	Oracle Database Connection	ADR
5	FSC	Financial Service Center	SFTP	ADR
6	BENS	Business Event Notification Services	Oracle JDBC Connection	ADR
7	CIS	Contact Information Services	Oracle JDBC Connection	ADR
8	IAM	Identity and Access Management	Oracle JDBC Connection	ADR
9	PPACA	Patient Protection Affordable Care Act	Oracle JDBC Connection	ADR
10	HAC	Health Administration Center	Oracle Database Connection	ADR
11	VCIS	Contact Information Services	Oracle JDBC Connection	ADR
12	BENS	Business Event Notification Services	Oracle JDBC Connection	ADR
13	VIERS	Veterans Identity Eligibility Reporting System	Oracle JDBC Connection	ADR
14	PATS Application	PATS Web application providing data of patient issues, complaints, and compliments at each medical center.	Oracle Database Connection	ADR
15	CSP application	CSP COTS software processing caregiver health service related online transaction	Oracle Database Connection	ADR

Table 11: ADR Context Description (External to OIT Interfaces)

Interfaces External to OIT					
ID	Interface Name	Related Object	Input Messages	Output Messages	External Party
1	Oracle DB connection 1	ADR DB Data Store and SDS DB Data Store	Create, Read, Update, Delete (CRUD) SQL/DDL statements	SQL returned result (such as queried data and status of the CRUD operations)	SDS DB Data Store
2	Oracle DB connection 2	IdS applications and ADR DB Data Store	CRUD SQL statements for online transaction processing	SQL returned result	IdS
3	Oracle DB JDBC connection 3	ES application and ADR DB Data Store	CRUD SQL statements for online transaction processing pertaining to Enrollment and Eligibility and Veterans Benefit Handbook persistence information	SQL returned result	ES
4	Oracle DB JDBC connection 4	ES application and ADR Reporting DB Data Store	Read SQL statements for reporting	SQL returned result	ES
5	Oracle DB connection 5	ADR Reporting Data Store and HEC	Read SQL statements for reporting	SQL returned result	HEC
6	Oracle DB JDBC connection 6	BENS and ADR DB Data Store	CRUD SQL statements for online transaction processing	SQL returned result	VRM
7	Oracle DB JDBC connection 7	CIS and ADR DB Data Store	CRUD SQL statements for online transaction processing	SQL returned result	VRM
8	Oracle DB JDBC connection 8	VIERS/PPACA and ADR DB Data Store	CRUD SQL statements for online transaction processing	SQL returned result	PPACA
9	Oracle DB connection 9	ADR Reporting Data Store and HAC	Read SQL statements for reporting	SQL returned result	HAC
10	SFTP	ADR Reporting Data Store	Read SQL	SQL returned result	FSC
11	Replication via BVC replication	ADR Reporting Data Store, and ADR Reporting DB Data Store	No message involved. The replication is completed via disk mirroring.	N/A	N/A
12	NFS	ES Applications and ADR Content Data Store	Save and read Veterans Benefit Handbooks	Fail or success in OS code for reading and saving a file	ES
13	Oracle DB connection 10	PATS Application and ADR DB Data Store	CRUD SQL statements for online transaction processing	SQL returned result	PATS

Interfaces External to OIT					
ID	Interface Name	Related Object	Input Messages	Output Messages	External Party
14	Oracle DB connection 11	IAM Application and ADR DB Data Store	Read via PL/SQL	PL/SQL returned result	IAM

Table 12: ADR Context Description (Externally Shared Data Stores)

Externally Shared Data Stores				
ID	Name	Data Stored	Owner	Access
1	ADR DB Data Store	Enrollment and Eligibility Person Demographic Person Identification	ADR	CRUD
2	ADR Reporting DB Data Store	Enrollment and Eligibility Person Demographic Person Identification	ADR	R
3	Deployment of SDS Structural/data update package	Standardized Data	SDS	R
4	ADR Content Data Store	Veterans Health Handbook and Benefits at a Glance	EVEAH	R/W

3.1.2. High Level Application Design

N/A

3.1.3. Application Locations

N/A

3.1.4. Application Users

N/A

3.2. Conceptual Data Design

The following sections cover the conceptual data design.

3.2.1. Project Conceptual Data Model

The data model for the ADR system has been fully designed and implemented. It is being modified on an ongoing basis to support the latest new features of the consuming applications. The details of the implementation of the ADR data model are described in the physical data model reports on the [\[redacted\]](#) website.

3.2.2. Database Information

The ADR Production system consists of two Production databases for OLTP and reporting purposes, as shown in the following table. By having both of these database instances, the system supports the online transactions and reporting needs of the consuming applications.

Table 13: ADR Database Inventory

Database Name	Description	Type	Steward
ADR OLTP DB (ADRP)	Production database supporting ES, PPACA, and IdS OLTP applications	Create the database instance and all schemas	ES, PPACA, and IdS/ADR
ADR OLAP DB (ADRRP)	Reporting database supporting ES HEC, and HAC reports, and FSC Mill Bill process	Create the database instance and all schemas	ES /HEC and PPACA/HAC

3.2.3. User Interface Data Mapping

N/A

3.2.3.1. Application Screen Interface

N/A

3.2.3.2. Application Report Interface

N/A

3.2.3.3. Unmapped Data Element

N/A

3.3. Conceptual Infrastructure Design

The following sections cover the conceptual infrastructure design of ADR.

3.3.1. System Criticality and High Availability

The ADR system is mission critical and thus requires high availability of the ADR databases to support the upstream mission critical systems/applications.

The approach taken by the ADR project to meet the system criticality and high availability requirements is to adopt the latest Oracle Real Application Cluster (RAC) technologies to provide failover from one node/server to other nodes/servers in the Production system.

The RAC is a key component of the Oracle High Availability Architecture, which provides direction to architect the highest availability for its supporting applications. Oracle RAC provides the ability to prevent the server from being a single point of failure in any database application environment. At the same time, it provides options for scaling applications beyond the capabilities of a single server. By using Oracle RAC technology, ADR provides the high availability and scalability to the applications/systems at the service tier from the DBMS perspective.

The actual hardware and software implementation of the Oracle RAC technology within the ADR system is further detailed in Section 6.







3.3.2. Special Technology

N/A

3.3.3. Technology Locations

The ADR project has multiple environments to support internal development and ADR customer needs. The following table details the components of the ADR system and their locations.

Table 14: ADR Technology Locations

Technology Component	Location	Usage
Production		
ADR OLTP DB Servers		Support application OLTP
ADR Reporting DB Servers		Support the reporting service for applications and end users
Hitachi Storage		Provide storage for ADR OLTP and Reporting databases, and documents for Veteran Benefit Handbooks
Disaster Recovery		
ADR OLTP DB Servers		Support application OLTP
ADR Reporting DB Servers		Support the reporting service for applications and end users
Hitachi SAN Storage		Provide storage for ADR OLTP and Reporting databases, and documents for Veteran Benefit Handbooks

Pre-Production		
ADR OLTP DB Servers		Support application OLTP
ADR Reporting DB Servers		Support the reporting service for applications and end users
Hitachi SAN Storage		Provide storage for ADR OLTP and Reporting databases, and documents for Veteran Benefit Handbooks
Staging 1A/1B		
ADR OLTP DB Servers		Support application OLTP
ADR OLAP DB Servers		Support the reporting service for applications and end users
Hitachi SAN Storage		Provide storage for ADR OLTP and Reporting databases, and documents for Veteran Benefit Handbooks
ADR Development		
ADR OLTP DB Servers		Support application OLTP and documents for Veteran Benefit Handbooks
Clariion SAN Storage		Provide storage for ADR OLTP and Reporting databases, and documents for Veteran Benefit Handbooks
ADR SQA		
ADR OLTP DB Servers		Support ADR Testing
Clariion SAN Storage		Provide storage for ADR OLTP, and documents for Veteran Benefit Handbooks
ADR Sandbox		
ADR OLTP DB Servers		Support application OLTP
Clariion SAN Storage		Provide storage for ADR OLTP, and documents for Veteran Benefit Handbooks
ADR Unit Test		
ADR OLTP DB Servers		Support ADR Development
Clariion SAN Storage		Provide storage for ADR OLTP and documents for Veteran Benefit Handbooks

The following list provides information about the various ADR environments.

1. Production Environment

All Production systems for ADR and its supporting systems are located at AITC. These systems are dedicated to Production operations of the ADR database and its consuming applications.

2. Disaster Recovery (DR) Environment

All DR systems for ADR and its supporting systems are located at HITC (Hines Intranet Technology Center). Production systems will fail over to the DR systems when they are not operational in the event that a disaster occurs at the AITC Production site.

3. Pre-Production Environment

All Pre-Production systems for ADR and its supporting systems are located at AITC. These systems are dedicated for performance testing and the application user acceptance testing (UAT).

4. Staging 1A/1B Environment

All Staging systems for ADR and its supporting systems are located at AITC. These systems are dedicated to software quality assurance (SQA) testing conducted by the ADR consuming projects.

Currently, staging 1A is dedicated to Production maintenance, and Staging 1B is dedicated to enhancement development.

5. Development Environment

All Development systems for ADR and its supporting systems are located at AITC. These systems are dedicated to the development of fixes and enhancements to be promoted to the Staging 1A and 1B environments.

6. SQA Environment

All SQA systems for the ADR systems are located at AITC. These systems are dedicated to ADR internal SQA testing of fixes and enhancements to be promoted to the corresponding development and staging environments.

7. Unit Testing Environment

All Sandbox systems for ADR system are located at AITC. These systems are dedicated to ADR internal DBA development and testing of the fixes and enhancements to be promoted to the corresponding SQA, development, and staging environments.

8. Sandbox Environment

All Sandbox systems for ADR system are located at AITC. These systems are dedicated to requirement analysis to finalize the requests to ADR team from ADR customers. Once the requirements are confirmed by ADR customers for the target development phase, they are sent to ADR team to be implemented according to ADR development process.

3.3.4. Conceptual Infrastructure Diagram

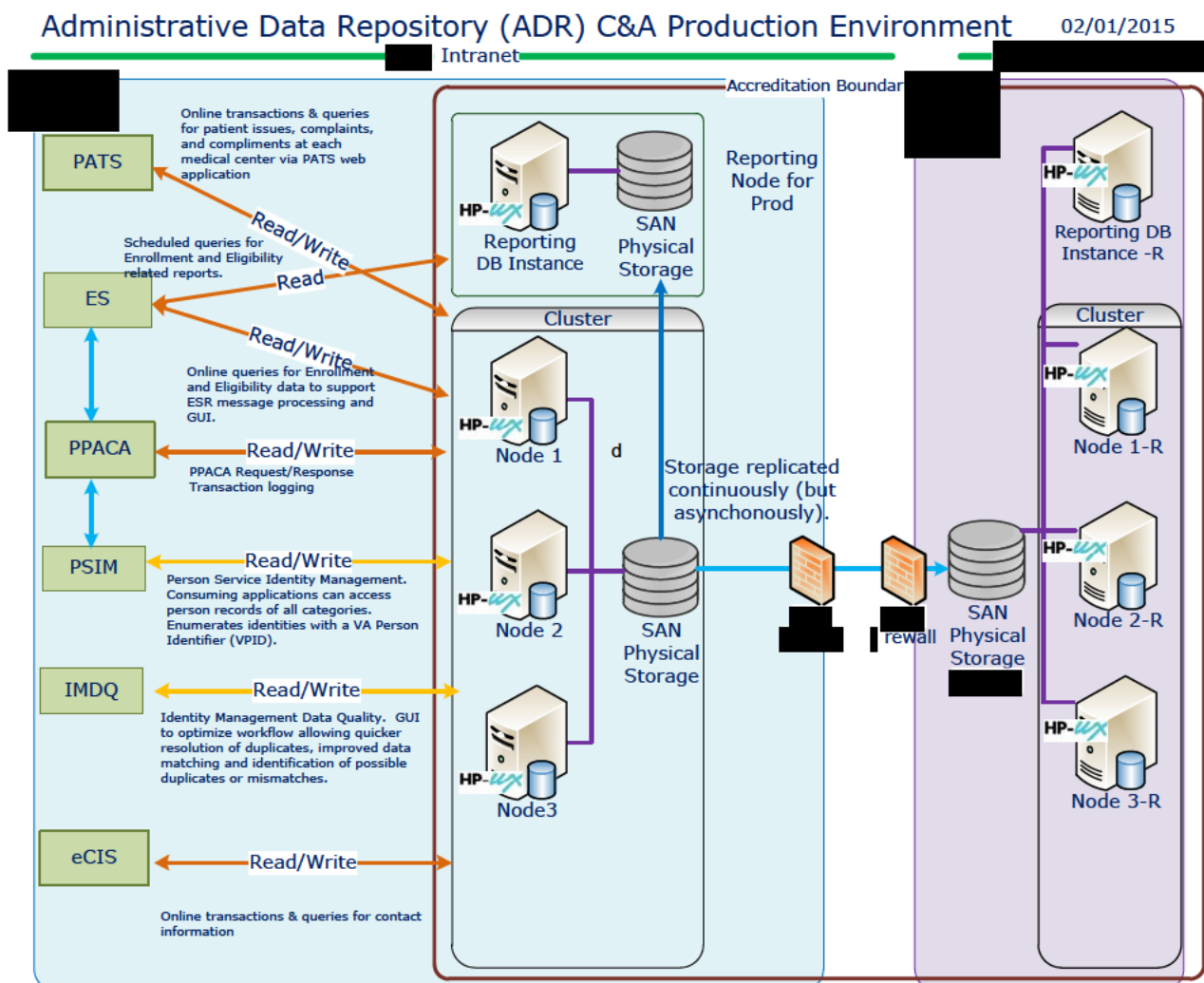
The following sections provide conceptual infrastructure diagrams for ADR.

3.3.4.1. Location of Environments and External Interfaces

ADR Production and DR environments are described in the ADR Connection Services diagram shown in the following figure. The ADR Production environment is located at AITC and the ADR DR environment is located at HITC. Both are connected via WAN for disaster recovery.

The ADR supporting applications shown in the ADR Connection Services diagram are also hosted at AITC as Production systems and at HITC for DR. These applications/systems are connected to the ADR database via LAN.

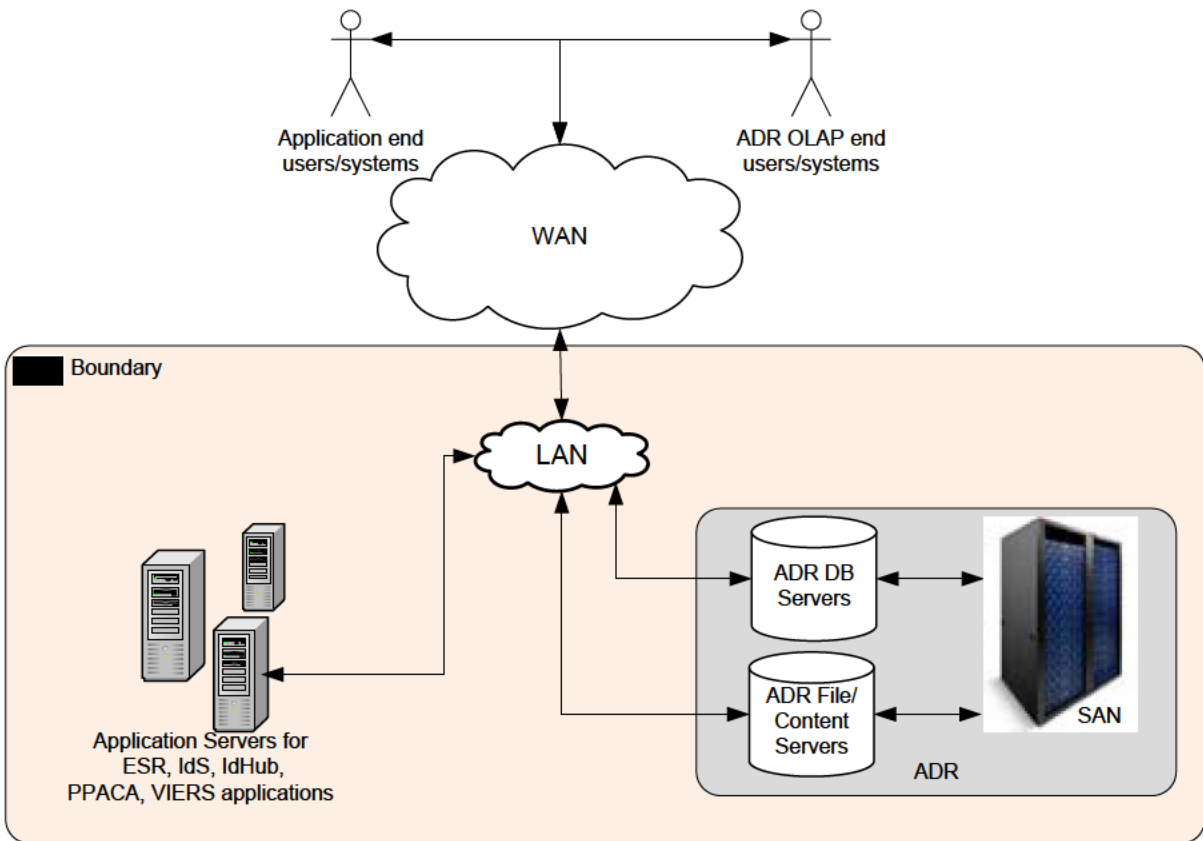
Figure 6: ADR Connection Services Diagram



3.3.4.2. Conceptual Production String Diagram

The following figure provides the ADR conceptual production string diagram.

Figure 7: ADR Conceptual Production Diagram



All ADR supporting applications are connected to the ADR database servers via LAN within AITC. The applications and ADR Reporting (OLAP) end users/systems access data hosted in the ADR database directly and indirectly via WAN.

Note: A waiver is required from the ARB to grant direct access to the ADR database.

The SDS data hosted in the ADR database is refreshed via the LAN connection to the SDS Master database.

ADR also comprise storage repository for documents which are tracked by the ADR database. At this point, it is used as a repository for the Veterans Benefit Handbook and Benefits at a Glance PDF files for EVEAH.

4. System Architecture

The following sections cover the system architecture.

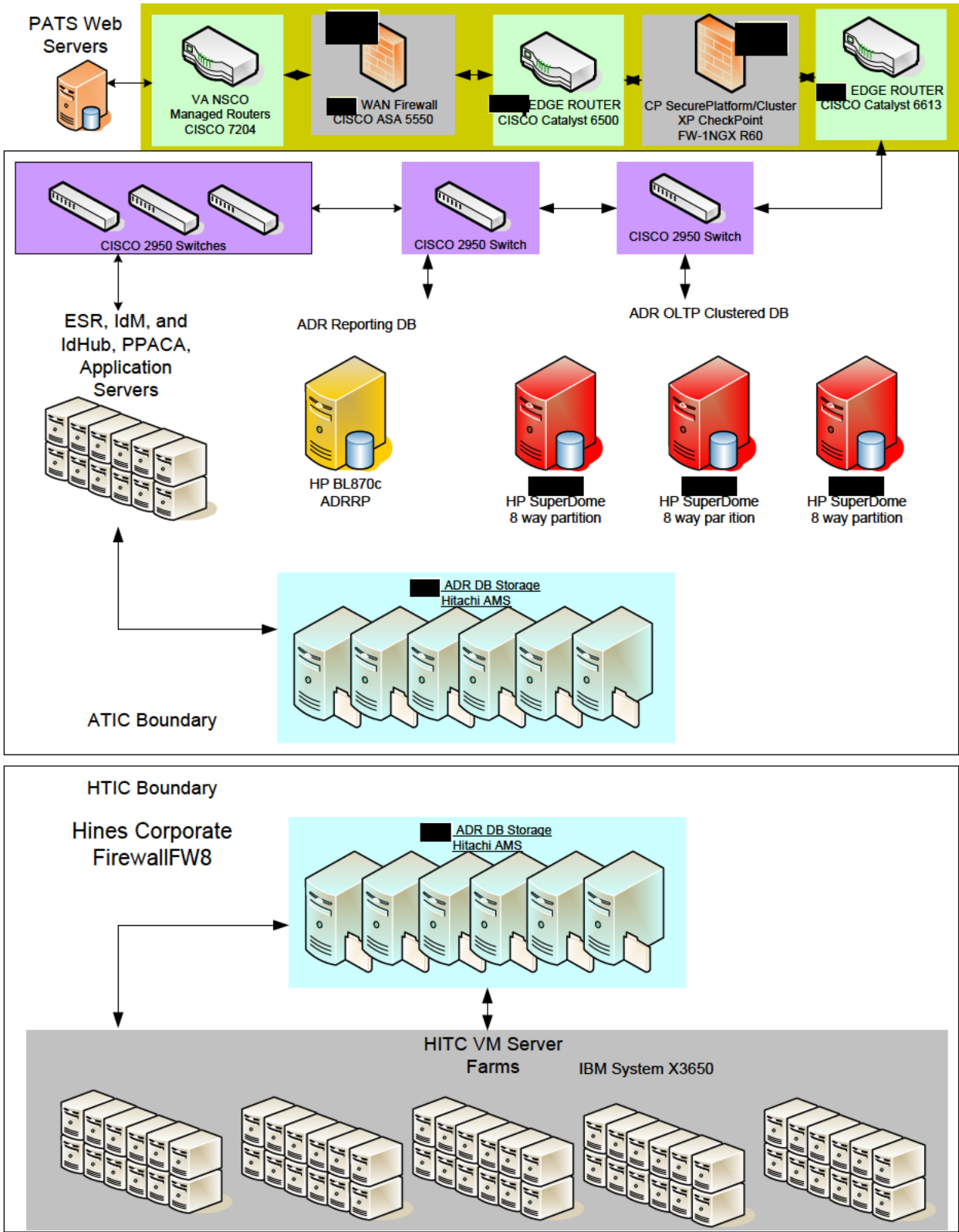
4.1. Hardware Architecture

The following figure shows the ADR hardware architecture, including the servers for the current ADR customers at the service layer (ES, IdS, Id Hub, PPACA/VIERS, PATS, and CSP applications/software). The ADR Production (OLTP) database is clustered with three servers for high availability.

The ADR Reporting database is a single-node database with separate storage from the ADR Production database. Its purpose is to provide a replica of the AD RP database for reporting activities. Currently, the replication from the AD RP database to the AD RRP database occurs nightly at 8:00PM CST via disk replication.

The DR system for ADR is located at [REDACTED] and consists of Virtual Machine (VM) Server Farm and SAN storage. The synchronization between the Production system and DR system is via Hitachi replication technology.

Figure 8: ADR Hardware Architecture Diagram



4.2. Software Architecture

The following table provides information about the software and development tools used for the ADR project.

ADR operation and development software is listed in Appendix E.

The Oracle-related software is for setting up Oracle databases on the clustered servers and for handling storage usage and allocation for the database, as shown in the following figure.

Oracle CRS enables servers to operate together in a cluster. Each server runs a unique instance of the database. It also runs additional processes that communicate with the other servers in the cluster so that the separate servers appear as if they are one server to applications and end users.

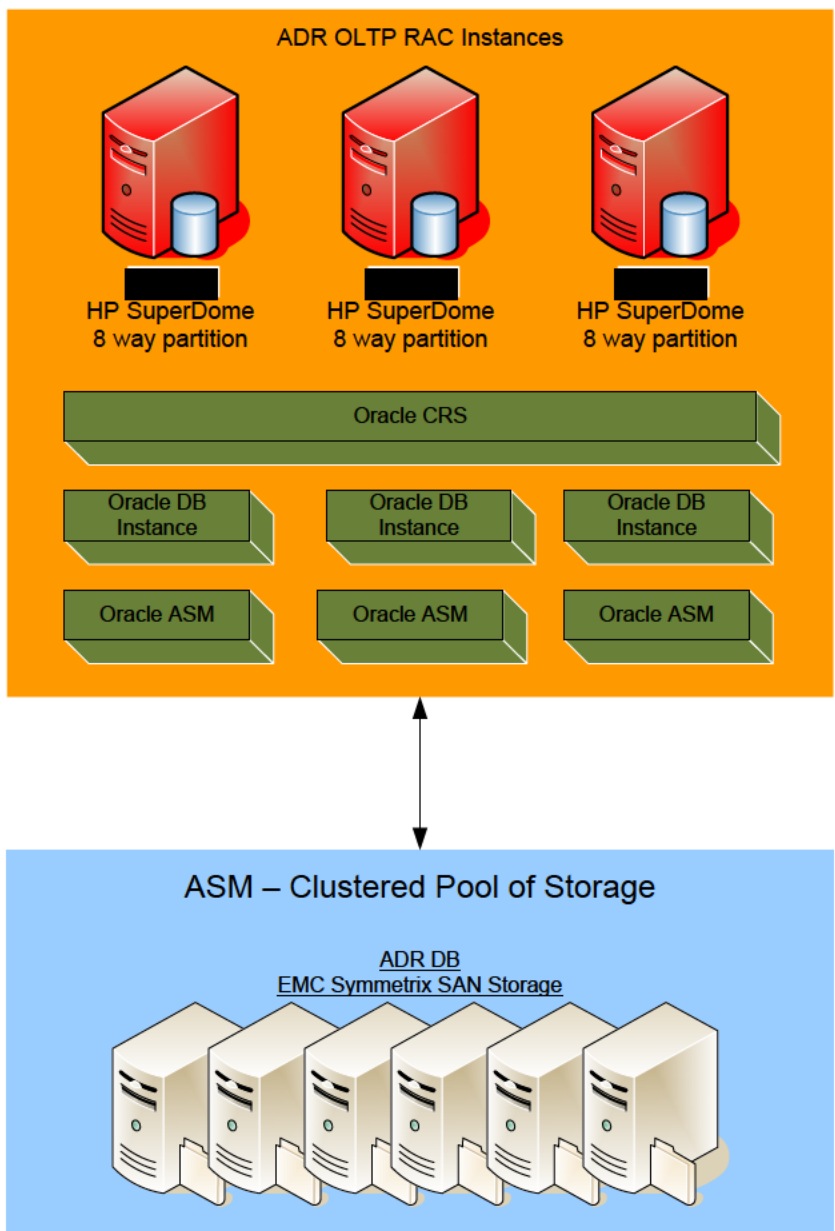
Automatic Storage Management (ASM) is a feature in Oracle Database 10g/11g that provides the database administrator with a simple storage management interface that is consistent across all server and storage platforms. As a vertically integrated file system and volume manager for

Oracle database files, ASM provides the performance of asynchronous I/O with the easy management of a file system. ASM provides capabilities that save the DBAs time and provide flexibility to manage a dynamic database environment with increased efficiency.

Oracle RAC is the relational database management system (RDBMS) software responsible for storing and retrieving application data. It is a clustered implementation of the database with a shared cache architecture that overcomes the limitations of traditional shared-nothing and shared-disk approaches to provide highly scalable and available database solutions for business applications. Oracle RAC is a key component of Oracle enterprise grid architecture.

TOAD for Oracle and TOAD Data Modeler are database development tools for coding and modeling.

Figure 9: ADR DB Software Architecture Diagram



4.3. Network Architecture

See Figure 8 for communication paths between ADR system and applications/services. Network connections from ADR system to ADR client applications are within AITC boundary/LAN.

4.4. Service Oriented Architecture/Enterprise Shared Services

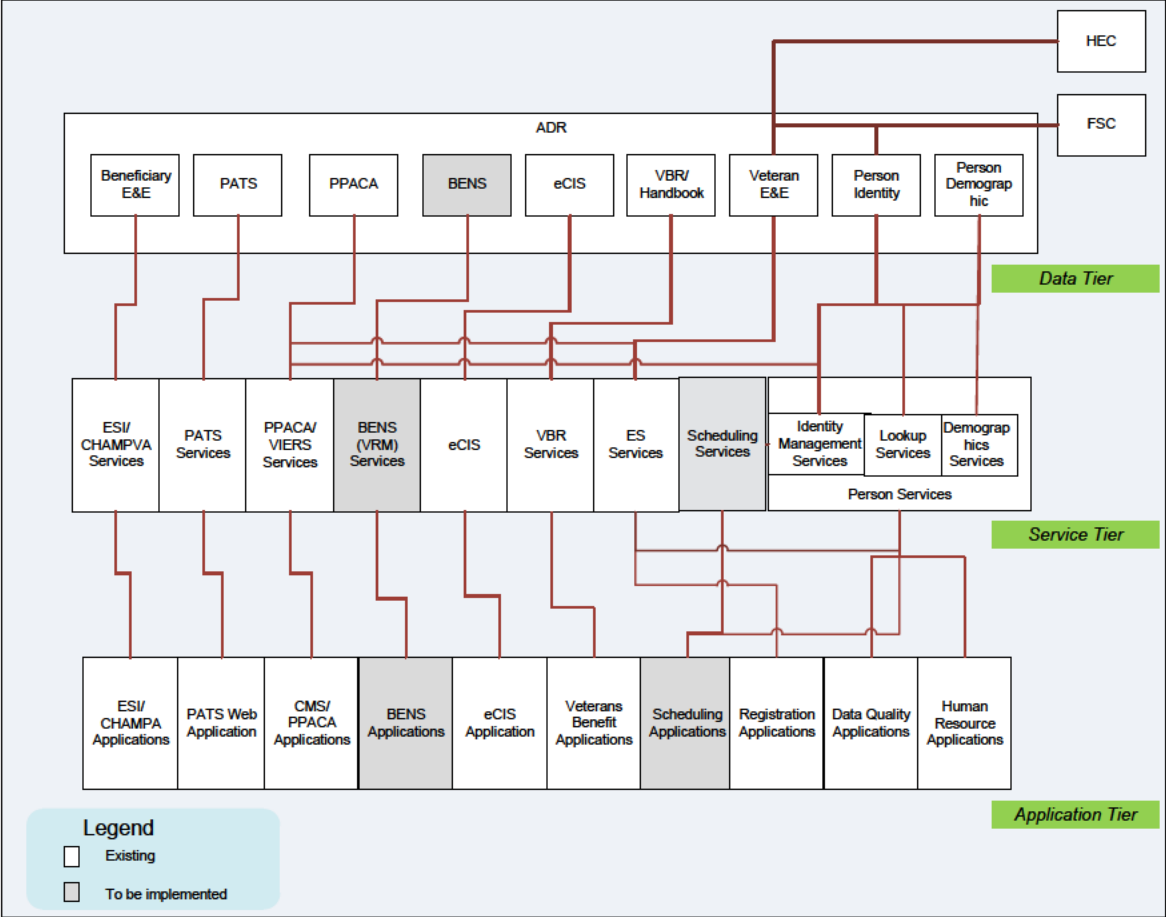
Service Oriented Architecture (SOA) and Enterprise Shared Services (ESS) are the architectural design/implementation for applications/services layers. As mentioned in the previous sections, ADR is an infrastructural DBMS system in persistent layer so ADR does not provide any SOA/ESS interfaces to other applications/services.

4.5. Enterprise Architecture

All ADR development and operation software/tools as shown in Table 32 in Appendix E were TRM compliant as of August, 2016.

The figure below shows the ADR’s role in Enterprise Architecture as a data stores in persistent layer.

Figure 10: ADR as Data Stores in a Persistent Layer



5. Data Design

The following sections cover the data design for ADR.

5.1. Database Management System Files

The following sections cover the database management system (DBMS) files.

5.1.1. Entity Relationship Diagram

The following figure shows an example of an ADR Entity Relationship Diagram (ERD) supporting the ES and IdS applications. These tables span multiple schemas. Refer to the Product Design section of the [\[redacted\]](#) website for the latest ADR logical/physical ERDs and Data Dictionary, which provides physical implementation details for the database objects such as sequences, tables, columns, tablespaces, and so on.

The PERSON table highlighted in yellow was designed as the primary table to link the eligibility/enrollment and identity management data across multiple schemas used by different applications.

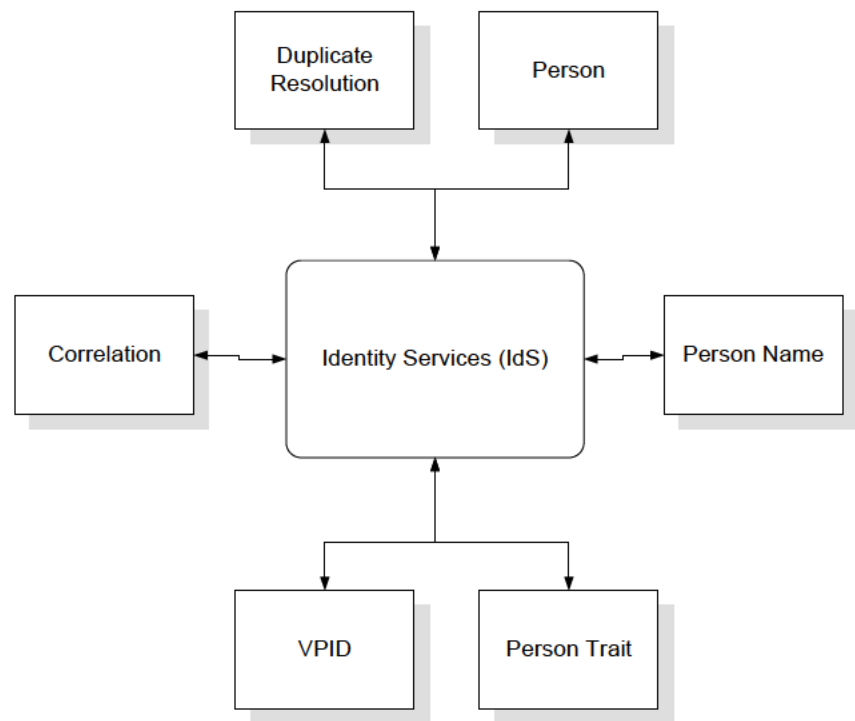
ADR System Design Document



October 2016

ADR System Design Document

Figure 12: PSIM Data Categories

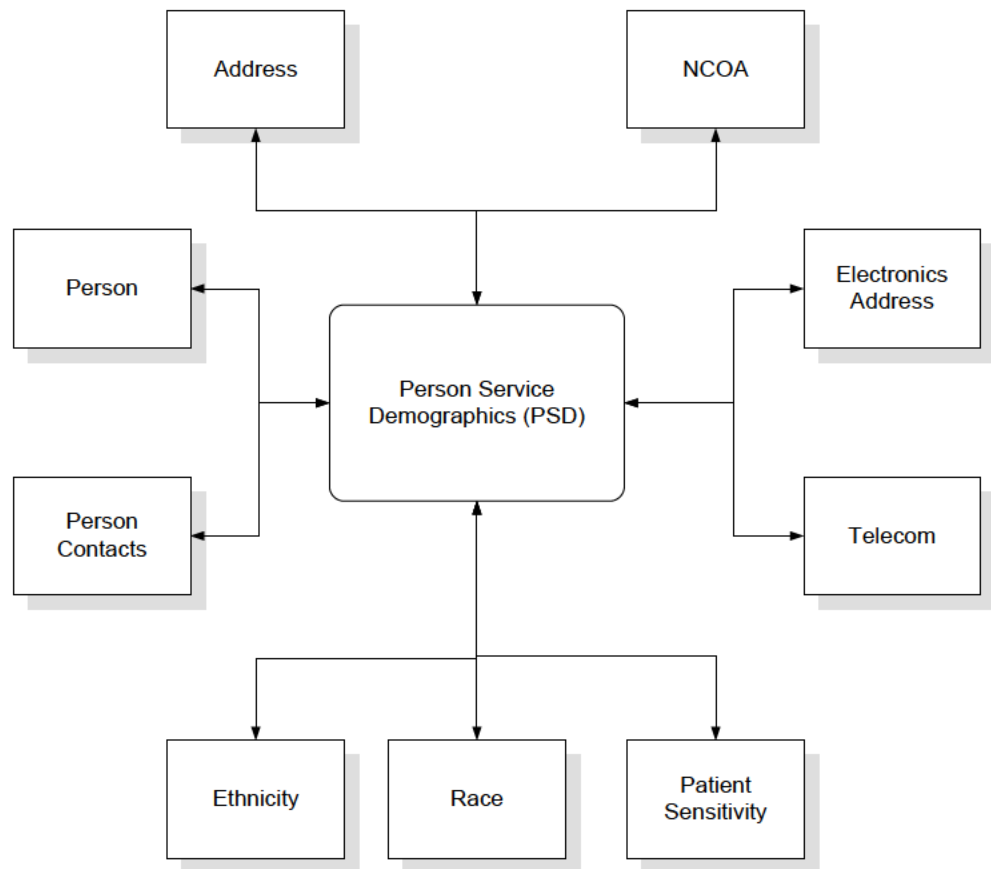


- Person Name includes the name components used for name standardization.
- Person Trait includes data elements closely related to identity such as social security number, date of birth, and date of death.
- ICN contains the components of the Integration Control Number (ICN).

5.1.1.2. Person Service Demographics

The following figure displays the data categories included under PSIM. Each item in the diagram is explained in the bullets below.

Figure 13: PSD Data Categories



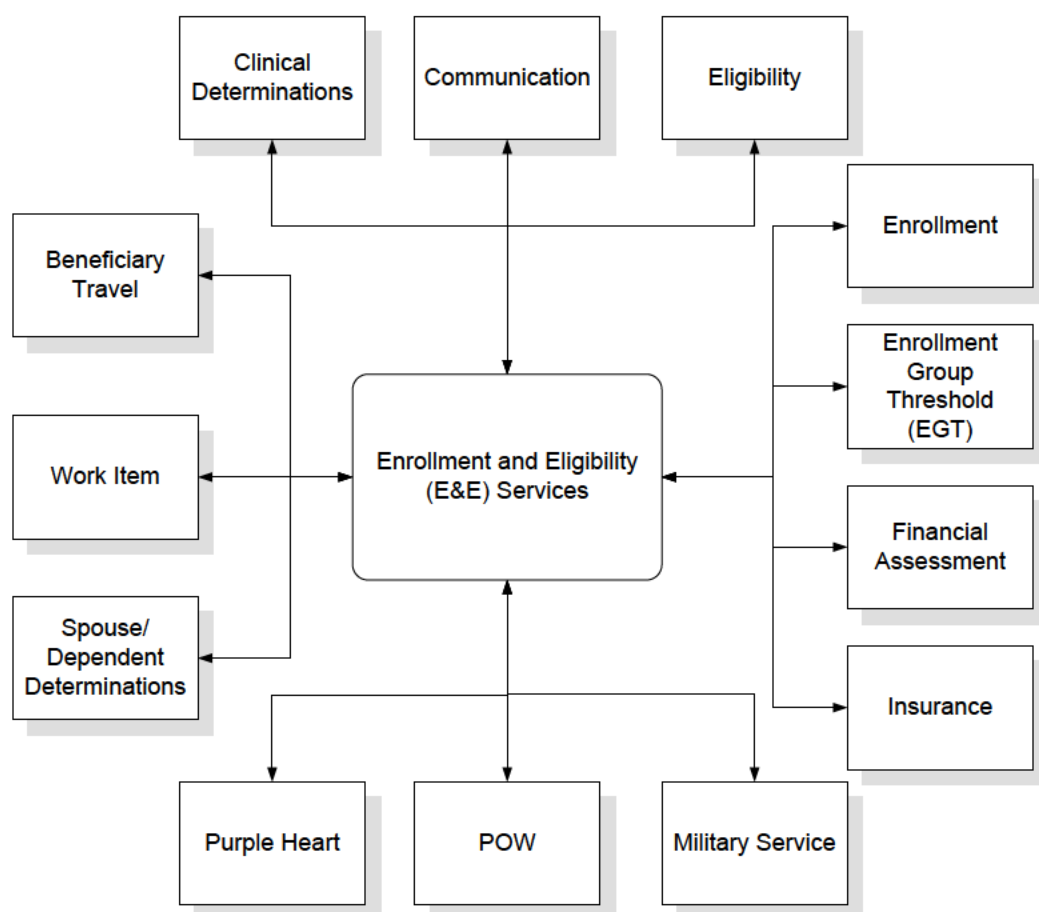
- Address includes address components for Permanent, Correspondence, Temporary, and Confidential addresses for persons. Address can accommodate both U.S. and non-U.S. address components.
- NCOA includes the data stored in conjunction with the National Change of Address verification.

- Electronic Address includes email address for persons and allows expansion for other types of electronic addresses in the future.
- Telecom includes all telephone numbers, as well as fax and pager numbers for persons.
- Person Contacts includes name, address, phone number and relationship descriptions for person contacts: Next of Kin, Emergency, Designee, Power of Attorney, Guardian, and Beneficiary Representative.
- Patient Sensitivity includes data on a person's sensitivity level and on anyone who accesses that person's data.
- Person includes demographic information that does not fit into any of the above categories, including marital status, occupation, and religious preference.
- Race Information contains data on a person's race.
- Ethnicity Information contains data on a person's ethnicity.

5.1.1.3. Enrollment and Eligibility

The following figure shows the data categories included under Enrollment and Eligibility. Each item in the diagram is explained in the bullets below.

Figure 14: Enrollment and Eligibility Data Categories



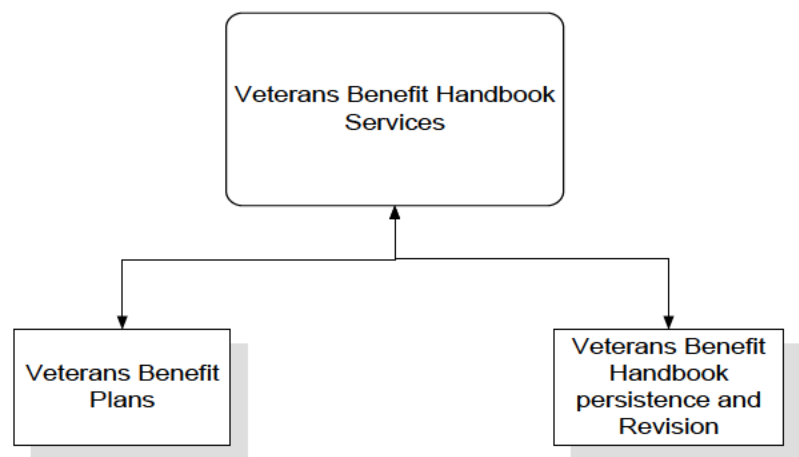
- *Beneficiary Travel* includes data needed to issue beneficiary travel pay. Travel reimbursement is provided to specified categories of eligible veterans and their attendants. It may also cover special modes of travel (such as ambulance or handicapped van).
- *Clinical Determinations* includes data needed to record whether any of the following determinations apply to a person for purposes of eligibility determination:
 - Catastrophic Disability (CD)
 - Military Sexual Trauma (MST)
 - Nose/Throat/Radium (NTR)
- *Communications* includes data used by the system to trigger applicable letters and email bulletins.
- *Work Items* include data need for the system to manage workload.

- *Spouse/Dependent Determinations* includes information used to verify whether a spouse or child is a person’s dependent. It also includes demographic and possibly financial information for spouses and dependents.
- *Financial Assessment* includes data used to evaluate person’s financial status. Subcategories of data include:
 - Financial tests (including income, asset, expense and debt info used for means, copay, and other tests)
 - Income verification matching (IVM)
 - Consent/Authorization
- *Enrollment Group Threshold (EGT)* includes data used for EGT management and statistics. EGT settings are used to determine which priority groups (and/or subgroups) shall be eligible for enrollment into the VA healthcare system.
- *Eligibility* includes a wide variety of data collected to determine eligibility.
- *Enrollment* includes a wide variety of data collected about a person’s enrollment status.
- *Insurance* includes information about insurance companies and plans.
- *Military Service* includes information about a person’s service record, including service dates, duty type, discharge type, and combat/conflict related data.
- *POW* includes information about a person’s prisoner of war experience.
- *Purple Heart* includes information about a person’s reception of the Purple Heart and their injuries.

5.1.1.4. Veterans Benefit Handbook

The following figure shows the data categories included under VBH. Each item in the diagram is explained in the bullets below.

Figure 15: VBH Data Categories

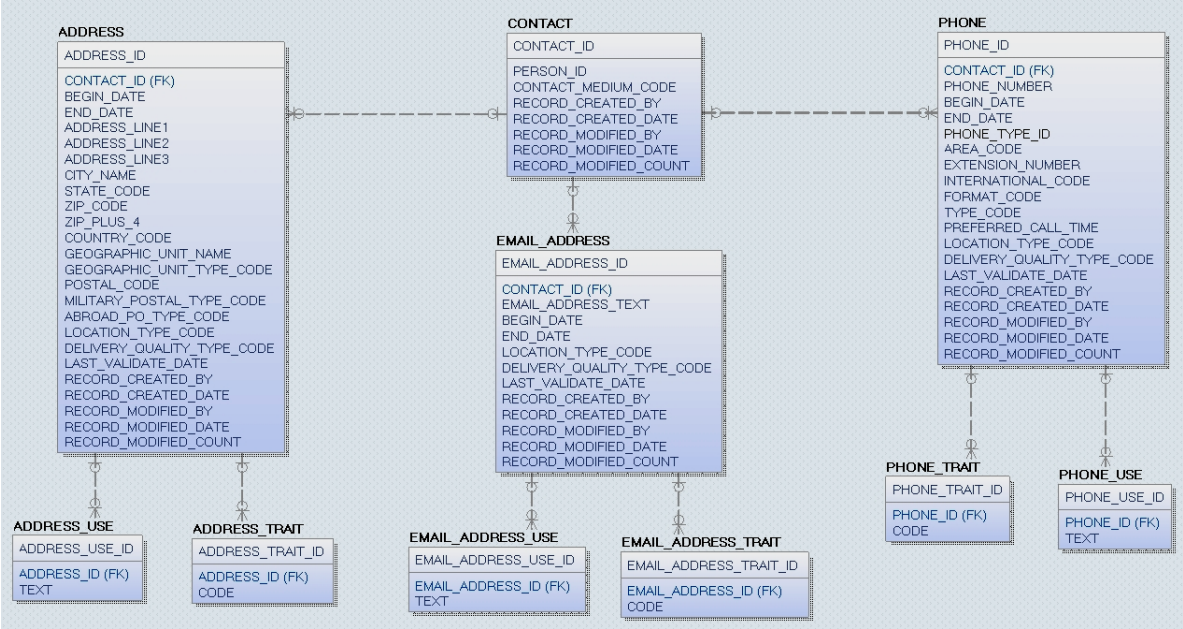


- *Veterans Benefit Plan* includes information related to veteran identifier types, and veteran health benefit plan
- *Veterans Benefit Handbook Persistence and Revision* includes information to retrieve the stored handbooks and their revision

5.1.1.5. Contact Information

The following figure shows the logical contact information and the relationship between Contact, Address, Email Address and Phone tables in the data model.

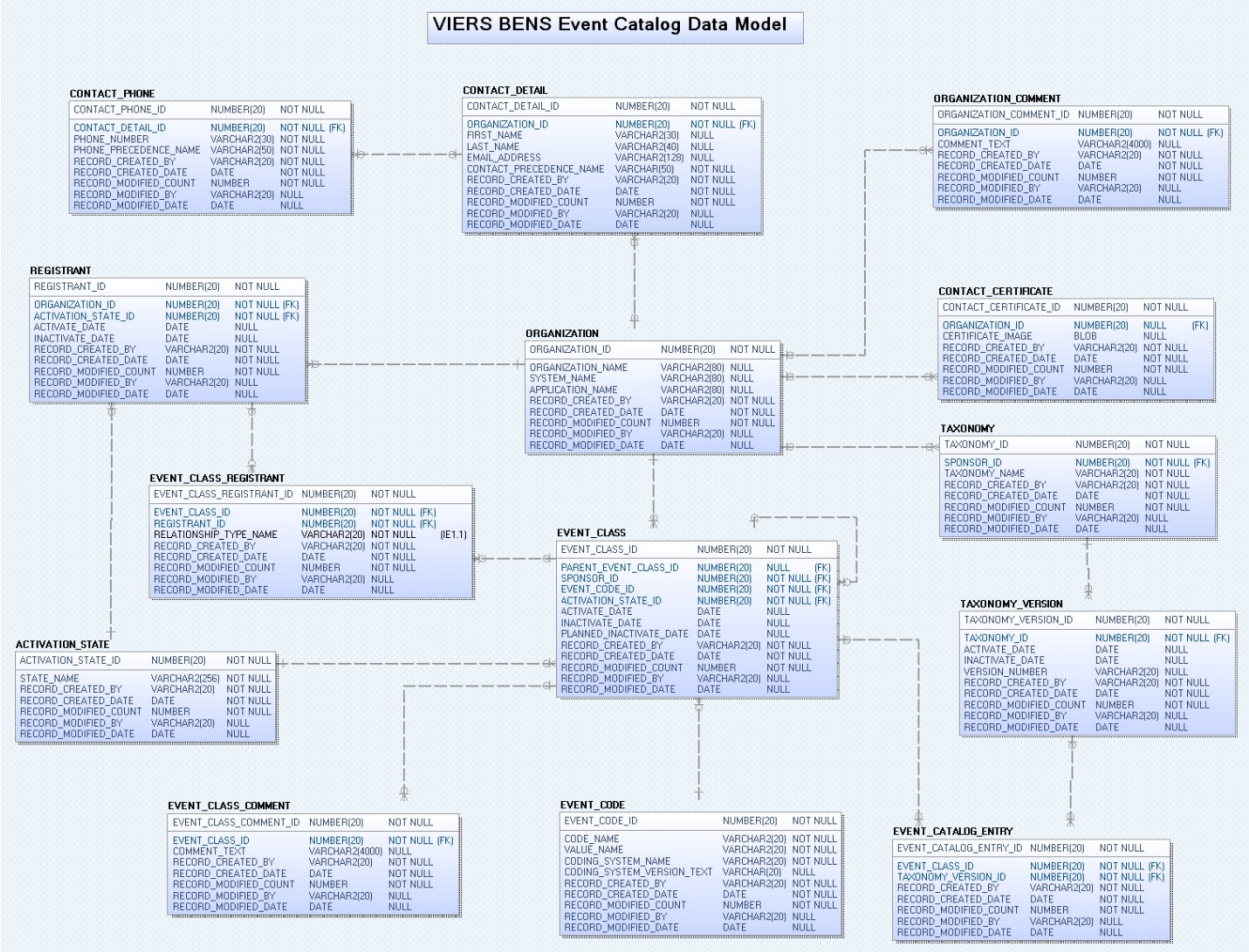
Figure 16: Contact Information



5.1.1.6. Business Event Notification Services (BENS)

The following figure shows the VIERS BENS event catalog data model and their relationships to one another.

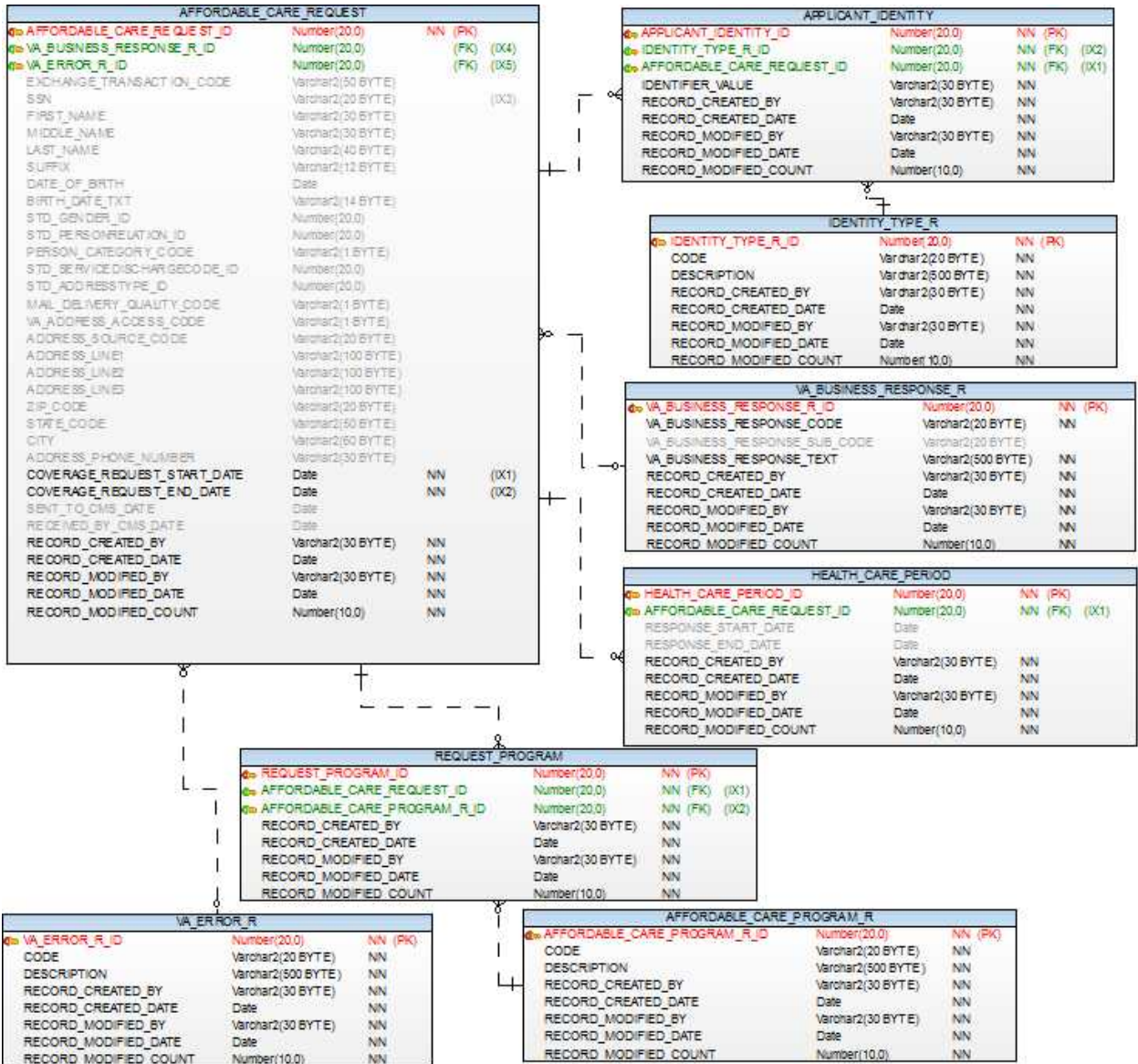
Figure 17: VIERS BENS Event Catalog Data Model



5.1.1.7. PPACA

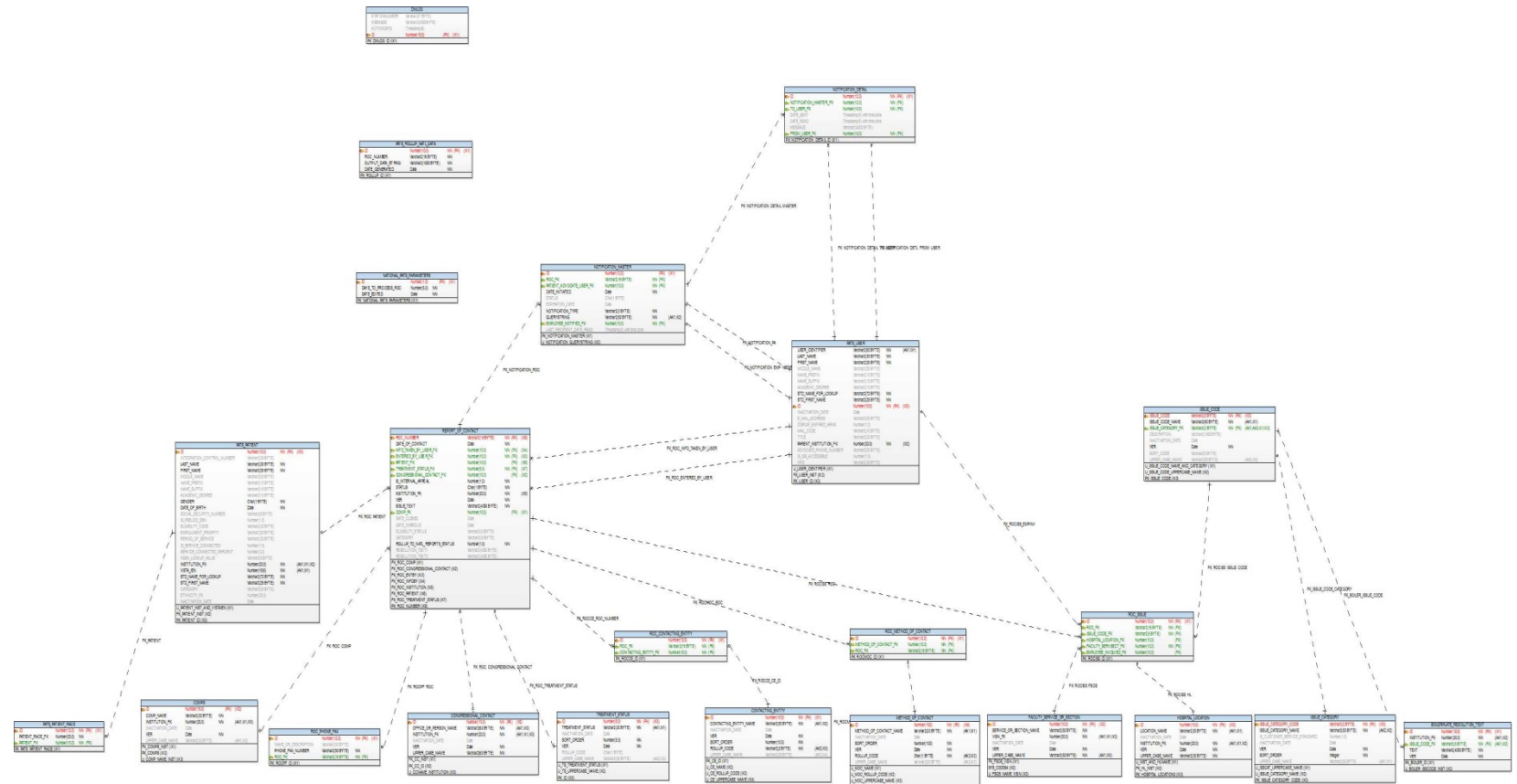
The following figure shows PPACA data model designed and implemented for transaction logging.

Figure 18: PPACA Data Model



5.1.1.8. PATS

The following figure shows PATS data model designed and implemented for tracking patient issues, complaints, and compliments at each medical center.



5.1.1.9. CSP

The ERD will be available when the COTS is identified and implemented by CPS team and if disclosure of the COTS ERD is allowed by the COTS vendor.

5.2. Non-DBMS Files

N/A

6. Detailed Design

The following sections provide a detailed design of ADR.

6.1. Hardware Detailed Design

The hardware design is primarily to fulfill the requirements for high availability of the ADR system described in section 2.5.6. The details of the ADR hardware design are described in Figure 8 above.

In order to achieve high availability, ADR database servers are clustered to enable failover in case one of the nodes in the cluster fails. From the storage perspective, the high availability is covered by the redundancy provided by the Hitachi SAN storage. These two hardware design implementations ensure that the ADR database can provide 99.95% availability to supporting applications.

6.2. Software Detailed Design

New section from the template fill in as needed then reject the changes.

NOTE: The following changes in sections and layout are all from the SDD template. Reject these change notes and any other instructional notes as needed.

6.2.1. Conceptual Design

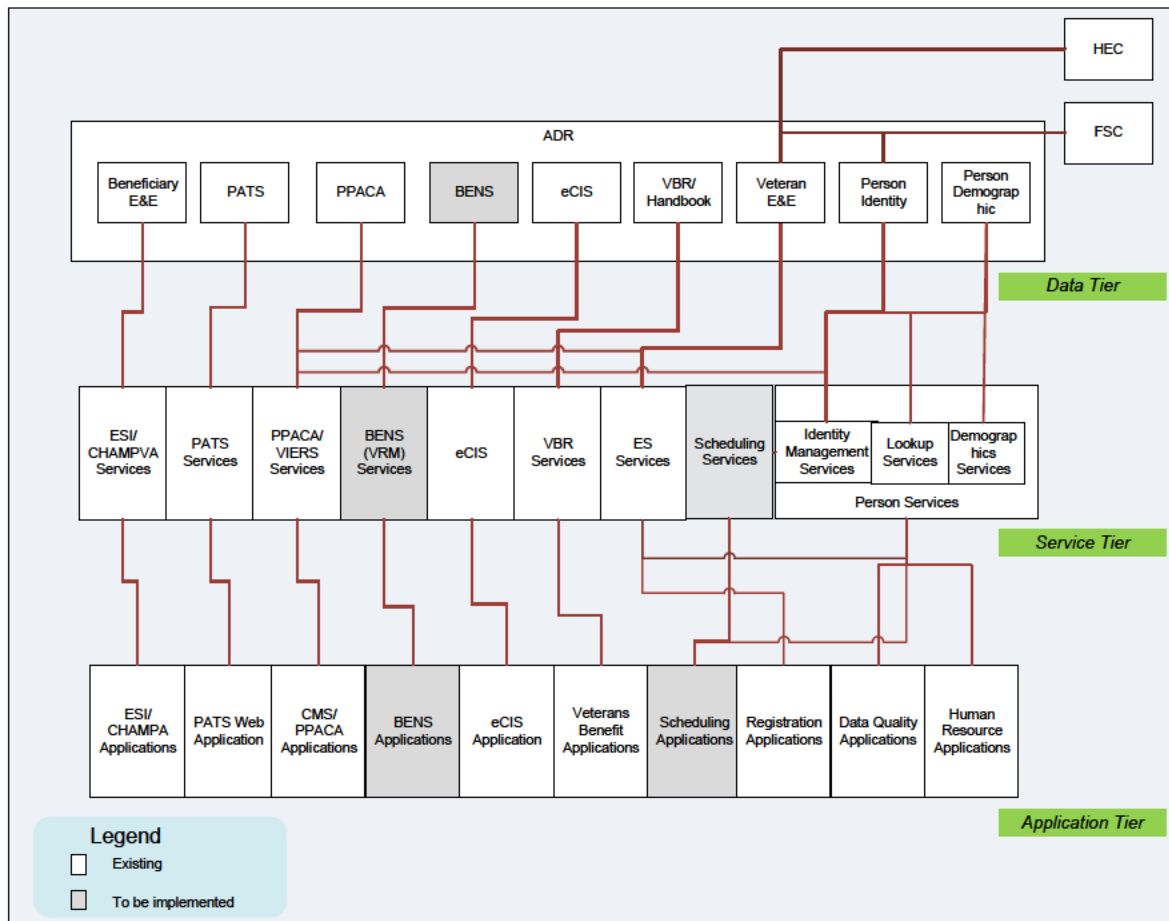
This section introduces the conceptual information that establishes the basis for how the software will be built.

6.2.1.1. Product Perspective

This subsection of the SDD should put the product into perspective with other related products.

The following figure displays the ADR infrastructural role in the persistent lay from an overall VA production perspective. ADR serves ADR client applications/services as data store allowing OLTP and/or OLAP processing to store and/or retrieve data into/from ADR database.

Figure 19: ADR Infrastructural Role in the Persistent Lay



User Interfaces

ADR is a data store infrastructural system with no user interface.

Hardware Interfaces

ADR interfaces to clients' applications via database connections over LAN using TCP protocol on top of network infrastructure. Refer to Appendix D and Figure 8 for ADR hardware configuration, and related network and other infrastructural devices supporting ADR DB.

Software Interfaces

ADR system interfaces with client applications/services via database connections established by the software production used by ADR clients. The following table shows the COTS software used by clients for deployment of the project development software to establish connections to ADR database.

Table 15: Software Information interfacing with ADR

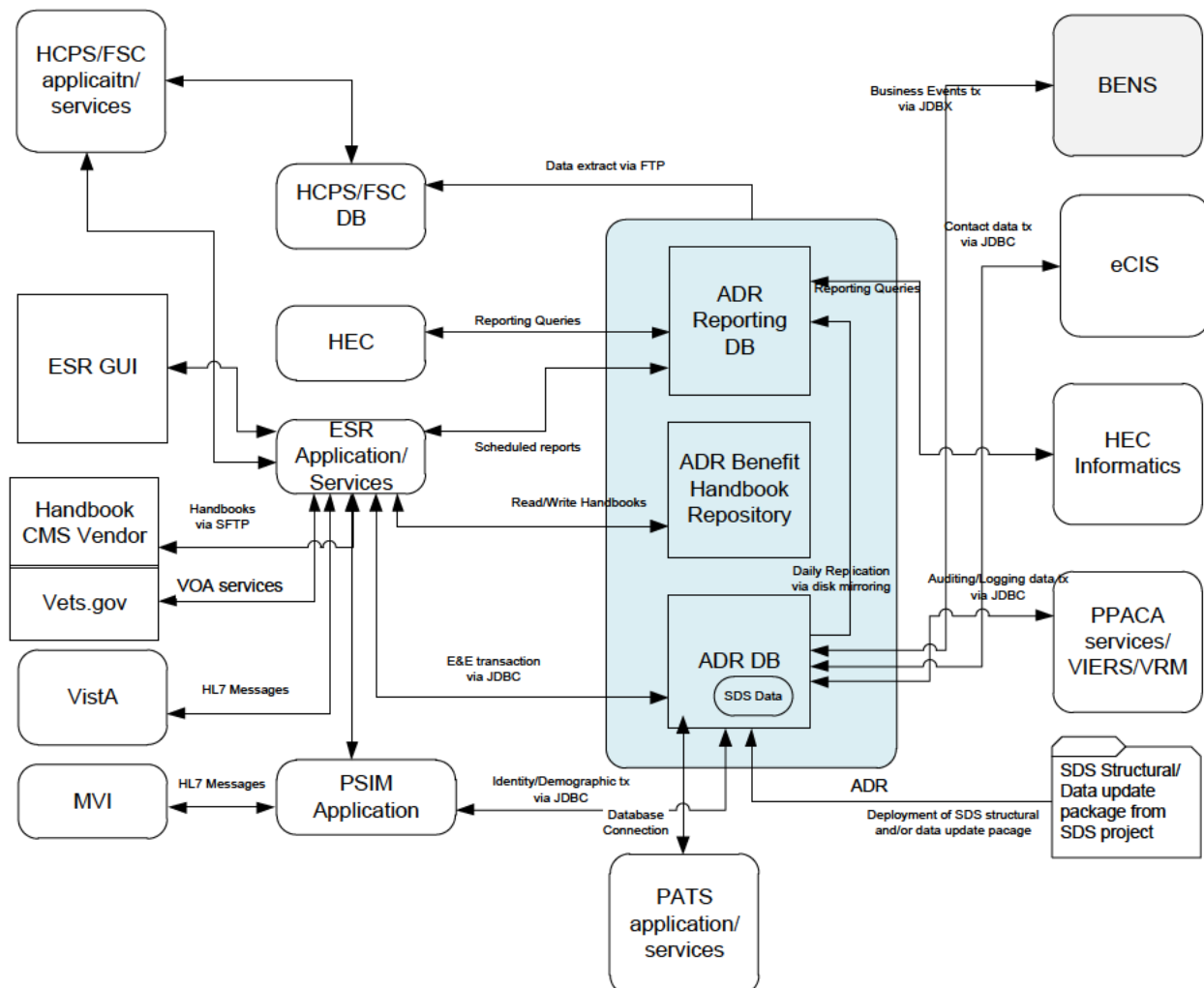
Client Software	Software Type	Project Application	Version	Interface protocol
Oracle WebLogic	Application Server	ES	10.3.x.x	JDBC thin DB connection

Client Software	Software Type	Project Application	Version	Interface protocol
Apache Tomcat	Web Server	Bizflow	7.x.x.x	JDBC thin client DB connection
Oracle WebLogic	Application Server	PSIM	10.3.x.x	JDBC thin client DB connection
IBM Identity Management	COTS	IdHub	9.5.x.x	ODBC DB connection
IBM WebSphere	Application Server	PPACA/VIERS	1.x.x.x	JDBC thin DB connection
TBD after PATS database consolidated into ADR database	Web Server	PATS	1.x.x.x	DB Connection

Communications Interfaces

The diagram below shows ADR clients' communication interface with ADR database. See Section 2.2 for more details.

Figure 20: ADR Client Communication Interface



Memory Constraints

192GB as the maximum configuration of each ADR production server, HP Integrity BL870c server blade (Intel Itanium 9100 series 2 core processors supported by up to 192GB memory (24 DIMM slots).

Special Operations

ADR RDBMS is Oracle specific using ADR Recovery Manager (RMAN) which uses for ADR DB backup and recovery. General RMAN backup and recovery information is available at [Oracle RMAN website](#). Oracle RMAN configuration and operation details specific to ADR DB is detailed in ADR POM available in the source repository of ADR Rational Team Concert under ADR TSPR

6.2.1.2. Product Features

ADR does not development applications/services. As an infrastructural repository to VA applications, ADR project provides common services show below to clients' application/service development.

- Business Requirements Document and Requirements Specification Document analysis
- Application and DB Workload/Performance Analysis
- Capacity Planning Analysis
 - Storage Usage Analysis
 - Server Usage Analysis
- Logical and Physical Data Modeling Analysis/Implementation
- Data archiving/retention Analysis and Implementation
- Data Migration Analysis and Implementation
- Production Operation Monitoring
- DB Tuning specific to application

6.2.1.3. User Characteristics

ADR is intended to be used by VA applications/services. The common characteristics of client applications/services are

1. Retrieve and/or store data into ADR DB for online transactional processing
2. Retrieve and/or store data into ADR DB for offline/online analytical processing/reporting.

6.2.1.4. Dependencies and Constraints

This subsection should provide a description of any other items that will limit ADR design and implementation options. The following list includes items that limit the options.

- Regulatory policies
 - PHI and PII retention time

- Hardware limitations
See the current configuration of ADR hardware.
- Interfaces to ES, IdM, PPACA applications

Parallel operation

Parallel operation is highly related to the availability of CPU/cores and memory, and/or cluster servers of ADR DB. See the current configuration of ADR hardware in Appendix E.

Audit functions

- Criticality of the application

All high level ADR DB design and implementation are detailed in ADR DB changes requests and Version Description Documents (VDDs) for each ADR release which is tracked under Rational Team Concert with unique change request number.

ADR resides in the lowest layer in the enterprise architecture and depends no other applications/systems in operation,

6.2.2. Specific Requirements

The following sections detail specific requirements for ADR.

6.2.2.1. Database Repository

See 5.1.1 for ADR Entity relationship diagrams (ERD) for ADR client applications and their description. The latest ERDs and data dictionary are available at [REDACTED]

6.2.2.2. System Features

Refer to the ADR Requirement Specification (RSD) at [REDACTED] and ADR **IBM Rational Requirements Management (RM)** for traceability to requirements.

6.2.2.3. Design Element Tables

N/A

Routines (Entry Points)

ADR does not modify/create any VistA routines.

Templates

ADR does not have implementation with impact to templates.

Bulletins

ADR does not use bulletins.

Data Entries Affected by the Design

ADR architectural design is specific to ADR DB design and implementation related to database management system. The data entries to be modified by ADR releases especially for new features will be required by ADR clients and most likely are for lookup data or data migration. The details of the data entries are documented in ADR database change request documents

tracked Rational Team Concert and corresponding VDDs. ADR clients' change requests and SDD should details of new/modified data and their business needs.

Unique Records

Records created in ADR DB are associated or identified by unique primary key(s) which are generated by

1. Database Sequence
2. Manual managed lookup table

File or Global Size Changes

ADR does not have implementation with impact to file size transmitted between applications.

Mail Groups

ADR does not have implementation with impact to mail groups.

Security Keys

ADR does not have implementation with impact to mail groups.

Options

ADR does not have implementation with impact to OPTION files.

Protocols

ADR does not have implementation with impact to existing protocols.

Remote Procedure Call (RPC)

ADR is a data store infrastructural system with no RPC interface.

Constants Defined in Interface

Not applicable ADR is a data store infrastructural system with no API/RPC interfaces to client applications.

Variables Defined in Interface

Not applicable because ADR is a data store infrastructural system with no API/RPC interfaces to client applications.

GUI

Not applicable because ADR is a data store infrastructural system with no GUI to end users.

GUI Classes

Not applicable to ADR because ADR is a data store infrastructural system without GUI

Current Form

Not applicable to ADR because ADR is a data store infrastructural system without GUI

Modified Form

Not applicable to ADR because ADR is a data store infrastructural system without GUI

Components on Form

Not applicable to ADR because ADR is a data store infrastructural system without GUI

Methods

Not applicable because ADR is a data store infrastructural system with no API/RPC interfaces to client applications.

Special References

Not applicable because ADR is a data store infrastructural system with no API/RPC interfaces to client applications.

Class Events

Not applicable because ADR does not use any class events.

Class Methods

Not applicable because ADR does not use any class methods.

Class Properties

Not applicable because ADR does not use any class properties.

Uses Clause

ADR does not use any other units/components.

Forms

ADR does not implement any GUI forms.

Functions

ADR does not have impacts to application functions.

Dialog

None

Help Frame

ADR does not implement any help frames.

HL7 Application Parameter

ADR does not create HL7 related messages/applications.

COTS Interface

ADR system does not create and modify COTS interface.

6.3. Network Detailed Design

This section describes ADR and its interfacing systems from network perspectives with details of ADR production system hardware and software configuration.

- Details of servers and clients to be included on each area network
- Details of ADR server information is described in Appendix D on Page 67
- Formats for data being exchanged between components

Oracle protocol support layer is positioned at the lowest layer of the Oracle Net foundation layer. It is responsible for mapping TNS functionality to industry-standard protocols used in the client/server connection. This layer supports the following network protocols:

- Transmission Control Protocol (TCP)/Internet Protocol (IP), IPv4 and IPv6
- TCP/IP with Secure Sockets Layer SSL
- Named Pipes
- Sockets Direct Protocol (SDP)

ADR clients' applications connect to ADR DB and retrieve/store data from/to ADR DB via Oracle JDBC/ODBC protocol over TCP network protocol.

Please see [Oracle document](#) for communication layers

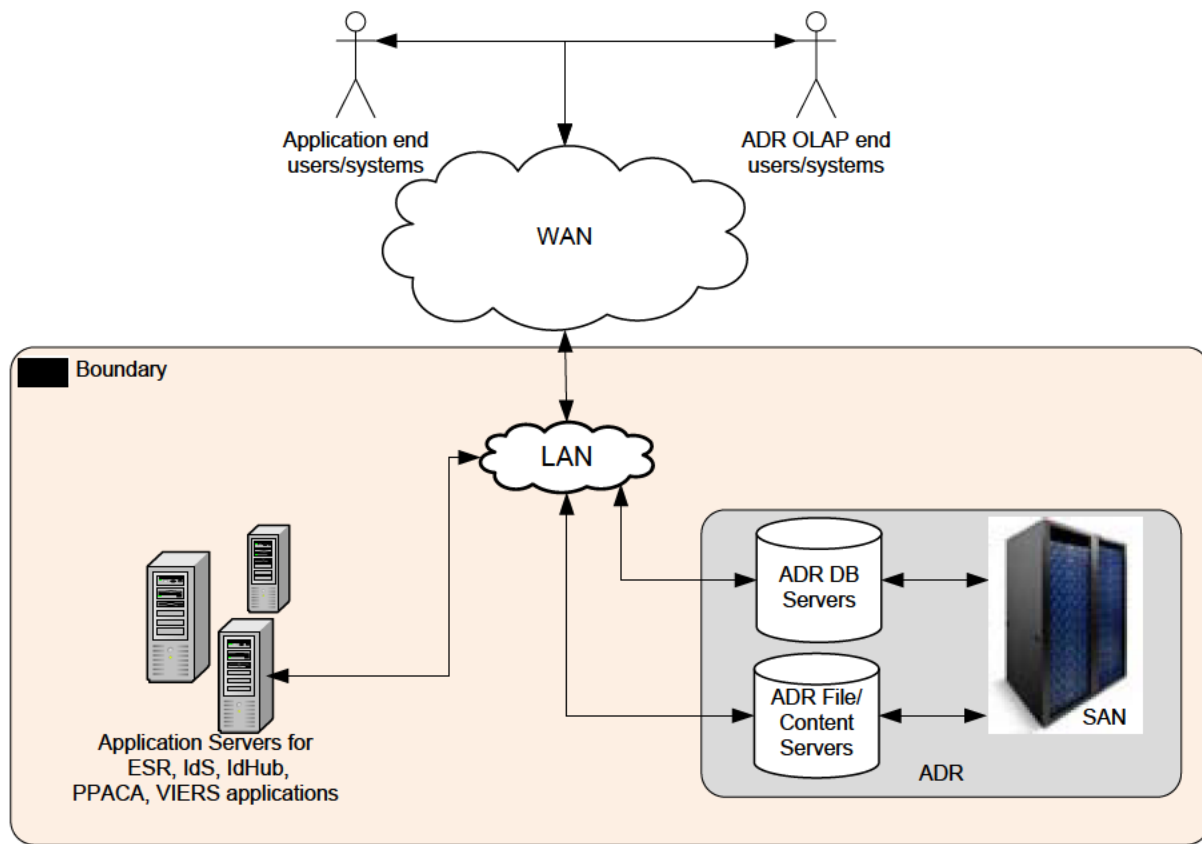
- Diagrams showing connectivity between components, data flow (if applicable), and distances between components

ADR connectivity to other systems is shown in Figure 6 and Figure 8. ADR and interfacing systems all are located at the AITC.

- LAN topology.

The diagram below shows the LAN topology of ADR and clients' systems at AITC. All ADR supporting applications are connected to the ADR database servers via LAN within AITC. The applications and ADR Reporting (OLAP) end users/systems access data hosted in the ADR database directly and indirectly via WAN.

Figure 21: LAN Topology of ADR and Client Systems



6.4. Service Oriented Architecture/ESS Detailed Design

Service Oriented Architecture (SOA) and Enterprise Shared Services (ESS) are the architectural design/implementation for applications/services layers. As mentioned in the previous sections, ADR is an infrastructural DBMS system in persistent layer so ADR does not provide any SOA/ESS interfaces to other applications/services.

6.5. Communications Detailed Design

The communications design of the ADR system is described in the connection services diagram in Figure 6.

7. External System Interface Design

As the authoritative data store for cross cutting administrative person data, the ADR establishes and manages this data as a corporate asset. It is implemented as a centralized deployment.

The person oriented data which forms the content of ADR comes from multiple disparate systems including the Master Veteran Index (MVI), legacy VistA, and the Health Eligibility Center (HEC).

The ADR service tier applications include the following:

- Business Event Notification Services (BENS)
- Contact Information Service (CIS)
- Enrollment System Redesign (ES)
- Financial Services Center (FSC)
- Identity Management (IdM) previously known as Person Service Identity Management (PSIM) applications
 - Person Service Lookup (PSL)
 - Identity and Access Management (IAM)
 - Person Service Demographics (PSD)
 - Identity Hub (IDHub)
- Veteran Benefit Handbook (VBH) under Enhance the Veteran Experience and Access to Health Care (EVEAH)
- Veterans Online Application Redesign (VOA)
- Veterans Relationship Management (VRM) for the Business Event Notification Service (BENS) and the Veteran Identity Eligibility Reporting System (VIERS) Enterprise Contact Information Service (eCIS)
- Patient Protection Affordable Care Act (PPACA)
- Patient Advocate Tracking System (PATS)

In addition, ADR utilizes reference data from Standard Data Services (SDS).

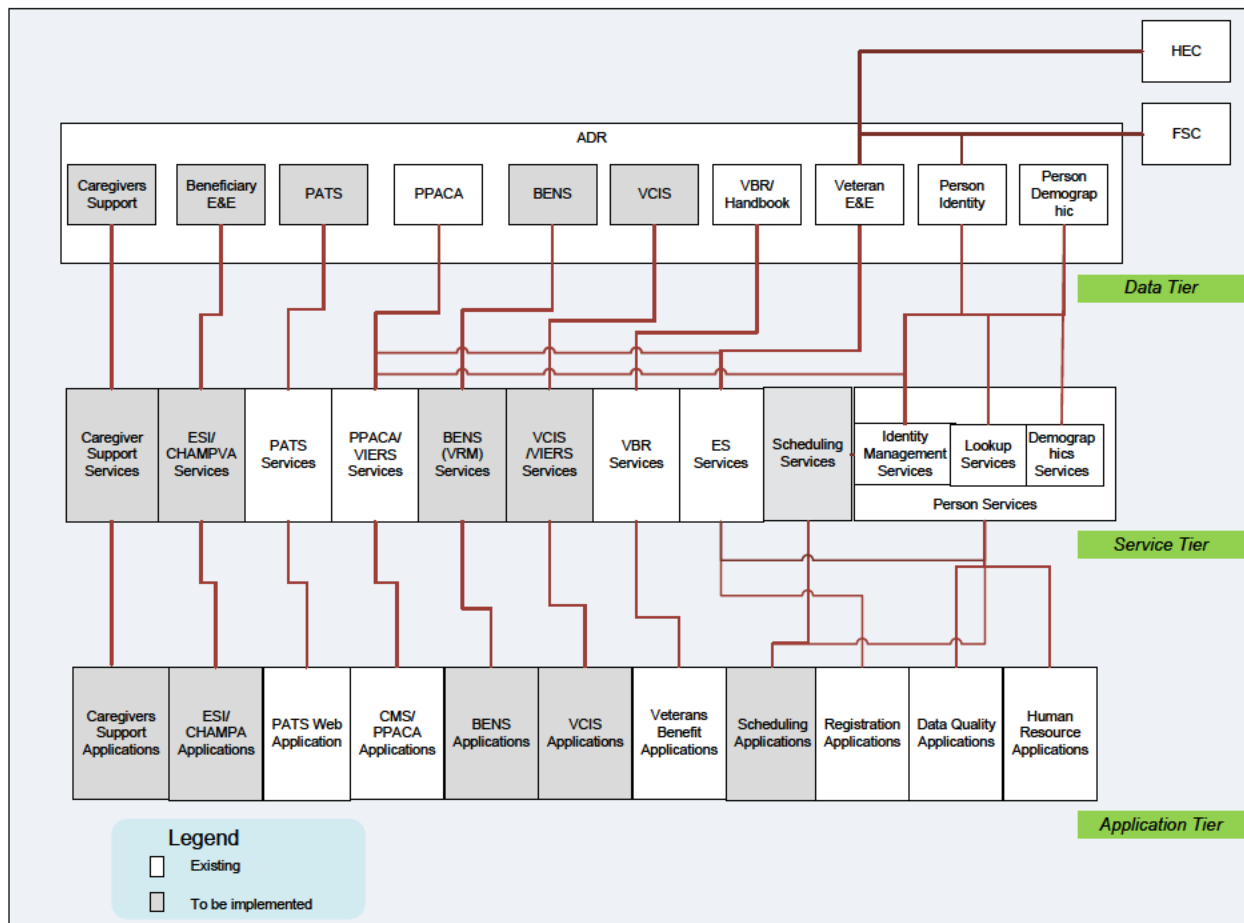
Where applicable, this ICD describes data items and messages passed, protocols observed, and the timing and sequencing of events.

7.1. Interface Architecture

This section identifies interfaces between ADR and systems/applications that use or are used by ADR.

The major interfaces between ADR and its servicing applications are diagrammed below. Note that interfaces from the service tier to the application tier are not covered in this ICD.

Figure 22: ADR Interfaces with Servicing Applications



7.1.1. Interface Enumeration

This section summarizes the systems involved in interfacing activities, with special emphasis placed on the functionality related to each interface.

There are two internal (between VA systems) SFTP interfaces. These transfer data from the ADR database to other databases and applications. There are no regularly scheduled SFTP interfaces transferring data into the ADR database.

7.1.1.1. Business Event Notification Services (BENS)

BENS provides a service for Business Event Publishers to publish business events. Consuming Service/Application Administrators then register their services/applications to receive notifications of these business events.

BENS stores and retrieves registered application's business event data in the ADR database.

Table 16: BENS Information List

System	Details
Identification number	
Title	Business Event Notification Service
Abbreviation	BENS

System	Details
Version number	1.x
Release number	1.x.x.x
Point of Contact	Tolley, Fred VBAVACO (Project Manager)

The BENS architecture includes a data tier (the BENS database itself) and a service tier (see Section 2 diagram below). BENS is one of the applications in the ADR service tier.

7.1.1.2. Enterprise Contact Information Services (eCIS)

CIS provides a service to rationalize email address, phone number and postal address data that is currently maintained in different configurations in multiple systems.

CIS stores and retrieves access to a standard, enterprise view of contact data (email address, phone number and postal address data).

Table 17: ADR Information List

System	Details
Identification number	
Title	Administrative Data Repository
Abbreviation	eCIS
Version number	1.x
Release number	1.x.x.x
Point of Contact	Migliore, Deborah (Project Manager)

The CIS architecture includes a data tier (the CIS database itself) and a service tier (see Section 2 diagram below). CIS is one of the applications in the ADR service tier.

7.1.1.3. Enrollment Services (ES)

ES is the Common Service Business Service application which is the authoritative source for Enrollment and Eligibility and the co-authoritative service for VHA Person Demographics (along with PSD).

ES stores and retrieves enrollment and eligibility data in the ADR database. ES is one of the applications in the ADR service tier.

Table 18: ES Information List

System	Details
Identification number	
Title	Enrollment System Redesign
Abbreviation	ES
Version number	3.12.x.x
Release number	
Point of Contact	Wigton, William (Project Manager)

7.1.1.4. Financial Services Center (FSC)

The FSC receives a weekly data push of Millennium Bill data that is extracted from ADR. This information is then stored in an FSC SQL Server database and used to process payments for medical services outside the VA.

Table 19: FSC Information List

System	Details
Identification number	
Title	Financial Service Center
Abbreviation	FSC
Version number	
Release number	
Point of Contact	Wynn, Michael (Program Manager)

7.1.1.5. IdM

IdM enables consuming applications to access person records of all categories, including an external ID domain correlation (thru the Electronic Data Interchange Person Identifier (EDIPI)). IdM supports data quality management, maintains the systems of interest list, provides the foundation for MVI re-engineering efforts, and enumerates person identities with an Enterprise Person Identifier the Integration Control Number (ICN) and VA Person Identifier (VPID).

IdM stores and retrieves identity and demographics data in the ADR database. IdM is an application in the ADR service tier.

Table 20: IdM Information List

System	Details
Identification number	
Title	Identity Management
Abbreviation	IdM
Version number	2.2.x.x
Release number	
Point of Contact	Podolec, Jeff (Project Manager), Reed, Danny (Architect)

7.1.1.6. SDS

ADR utilizes copies of reference data from Standard Data Services (SDS).

Table 21: SDS Information List

System	Details
Identification number	
Title	Standard Data Services
Abbreviation	SDS
Version number	
Release number	
Point of Contact	Spendlove, Merrill (Project Manager)

7.1.1.7. VBH/EVEAH

ADR stores the most recent 3 versions of the Veteran Benefit Handbook for each Veteran.

Table 22: VBH/EVEAH Information List

System	Details
Identification number	
Title	Veteran Benefit Handbook
Abbreviation	VBH
Version number	
Release number	
Point of Contact	Magoon, Keith

7.1.1.8. VOA

VOA captures enrollment data that is input by Veterans using application forms 1010EZ and 1010EZ/R found on the Internet. The information is captured in the VOA database schema residing in the ADR database.

VOA captures enrollment data input by Veterans utilizing Internet online application forms 1010EZ or 1010EZ/R. The information is captured in the VOA schema stance residing in the ADR database. VOA is an application in the ADR service tier.

Table 23: VOA Information List

System	Details
Identification number	
Title	Veterans Online Application
Abbreviation	VOA
Version number	
Release number	
Point of Contact	Torres, Alexander (Project Manager)

7.1.1.9. PPACA/VIERS

PPACA/VERS determines every individual taxpayer in the United States must maintain minimal essential health care coverage or face a tax penalty. Enrollment in Veterans health care meets the minimal essential coverage threshold under 26 Code of Federal Regulations (CFR) 1.36B-2 (c)(2)(ii) of the Treasury Notice of Proposed Rulemaking (NPRM). PPACA/VIERS is required to log requests from CMS and its response details into ADR DB to meet auditing and reporting requirements.

VIERS/PPACA stores and retrieves the request and response data into ADR DB for logging/auditing and reporting purposes.

Table 24: PPACA/VIERS Information List

System	Details
Identification number	
Title	Patient Protection Affordable Care Act

System	Details
Abbreviation	PPACA/VIERS
Version number	2.x
Release number	2.5.x.x
Point of Contact	Bradley, Shamika

7.1.1.10. PSL

PSL provides an enterprise-wide standard patient lookup in the VistA GUI to utilize the common VistA business rules for performing a patient lookup. The Patient Lookup service utilizes all of the business rules that are employed for patient lookups in the VistA DPTLK.

The Patient Lookup service is designed in a GUI format that all Java 2 Enterprise Edition (J2EE) and Java 2 Standard Edition (J2SE) applications can utilize in their respective applications.

The AuthN project (Identity and Access Management) will provide Single Sign-On (SSO) integration, Credentialing Services and E-Signature Services. IAM involves verifying the identity of a user, process, or device, often as a prerequisite to allowing access to resources and information systems.

7.1.1.11. PSD

PSD has been developed to enable consuming applications to add and update demographics data in person records. PSD is the authoritative source of person demographic data, and provides synchronization between VistA and the ADR. It supports the following categories of Person types:

- Patient
- IT User
- Practitioner
- Employee

7.1.1.12. PATS

The Patient Advocate Tracking System (PATS) tracks patient issues, complaints and compliments at each medical center. The VA selected PATS as an early candidate for reengineering because it's relatively few data integration points, and its data, while important to ensuring quality patient care, serves as neither a clinical nor a mission-critical application. In addition, no other applications depend on PATS for functionality.

PATS maintains the functionality of Patient Rep with the following enhancements:

- National-level application with a central database to serve site users, VISN-level users, and National Program users
- Security process that ensures each user only has access to the data appropriate to the individual's location and job
- Direct access for timely updates of standard information such as Hospital Locations and Congressional Contacts

- Accessible, intuitive, graphical user interface within your web browser
- Reports available in a variety of formats—Word, Excel, and PDF files
- New National reports

Table 25: PATS Information List

System	Details
Identification number	
Title	Patient Protection Affordable Care Act
Abbreviation	PPACA/VIERS
Version number	1.x.x.x
Release number	
Point of Contact	David Foster

7.2. Interface Detailed Design

ADR provides the required storage and server performance to ensure client applications are functional. To minimize adverse impacts on any involved systems, it is the responsibility of the interfacing application's Project Manager to notify ADR and any other affected applications/databases of potential or planned changes to data feeds, structures, or data instances as these changes become known.

7.2.1. Detailed Interface Enumeration

This section describes the operational interface between ADR and each interfacing party.

7.2.1.1. BENS

In the ADR/BENS interface:

- BENS populates/updates records in the BENS schema of the ADR database.
- BENS utilizes data in the BENS schema of the ADR database to perform its functions.

7.2.1.2. CIS

In the ADR/CIS interface:

- CIS populates/updates records in the CIS schema of the ADR database.
- CIS utilizes data in the CIS schema of the ADR database to perform its functions.

7.2.1.3. ES

In the ADR/ES interface:

- ES populates/updates records in the ADR database immediately as business rules require.
- ES utilizes data in the ADR database to perform its functions.
- ADR populates the ADR_DATA_EXTRACT_MONTHLY table and notifies ES when the complete month's data is ready to be extracted. ES then utilizes the data from this table for the Office of Policy and Planning (OPP) Extract monthly report.

- While the OPP Extract is processing, the ADR Reporting database instance is not updated from ADR Production. After processing completes for the monthly report, the updating of the ADR Reporting database is turned back on.
- ES maintains management information and document text for VBH/EVEAH in the ADR database. Handbook text specific to each individual veteran is passed through SFTP from ADR to ES for printing/distribution. This includes data for:
 - Veteran benefit handbook & benefit at a glance file information such as location of the files and their versions
 - Veteran benefit plan data
 - Veteran benefit handbook file & benefit at a glance files to the ADR content repository

7.2.1.4. FSC

In the ADR/FSC interface, monthly full-table extracts of the ADR data required for Millennium Bill (Mill Bill) are pushed from the ADR database to the FSC. The data is used to determine Veteran eligibility for coverage of emergency medical claims for non-VA, unauthorized care.

There is a Memorandum of Agreement (MOA) in place between FSC and ADR for this temporary solution until ES, as the authoritative service layer, can develop the service.

7.2.1.5. IDHub

In the ADR/IDHub interface, ADR provides space in its database for Identity Hubs schemas. IDHub manages the structure, content, and maintenance of these tables without involvement from the ADR team.

7.2.1.6. IdM

In the ADR/IdM interface:

- IdM populates records in the PSIM schema of the ADR database.
- IdM utilizes data in the PSIM schema of the ADR database to perform its functions.

7.2.1.7. SDS

Standard Data Services provides updates to current version of standard reference data tables which ADR updates in its database.

7.2.1.8. VBH

See 7.1.1.8 for details.

7.2.1.9. VOA

In the ADR/VOA interface:

- VOA populates records in the VOA schema of the ADR database.
- VOA transmits the application data directly to ES for processing and shares processed data with the site.

7.2.1.10.PPACA/VIERS

In the PPACA/VIERS interface:

- PPACA VIERS populates/updates PPACA logging records via the assigned instance of ADR DB for PPACA/VIERS.
- PPACA Informatics uses ADR Reporting DB for reporting.

7.2.1.11.PATS

In the PATS interface:

- PATS populate records in the PATS schema of the ADR database.
- PATS utilize data in the PATS schema of the ADR database to perform its functions.

7.2.2. Data Transfer

Data exchanges are managed from the service tier applications that utilize the ADR database.

Data is transferred using Oracle Call Interface (OCI) and SFTP. There is no messaging or packaging of data sent to or from the ADR database. The processing of the ADR database stored messages is managed by the application (not the database).

Service tier applications use the Oracle Call Interface (OCI) to connect to the Oracle database server. This is referred to as connecting in Client Mode, and it is the usual way to develop Oracle applications with a third-generation language. All OCI routines are stored in external libraries, so the executables for applications that work through OCI are small. However, working through OCI requires Oracle client software to be installed on target workstations.

It is also possible to connect to Oracle database servers directly over the network using TCP/IP protocol. This is referred to as connecting in Direct Mode. Connecting in Direct Mode does not require Oracle client software to be installed on target machines. The operating system includes the TCP/IP software that supports Direct Mode.

When a client application issues a DML/DDDL query to the ADR database, ADR will perform the data retrieval, deletion, update, or population as required.

ADR is a transactional database where write transactions on the database are able to be rolled back if they are not completed properly.

A transaction might consist of one or more data-manipulation statements and queries, each reading and/or writing information in the database. [Consistency](#) and [integrity](#) of data are highly important. A simple transaction is usually issued to the database system in a language like [SQL](#) wrapped in a transaction, using a pattern similar to the following:

1. Begin the transaction
2. Execute a set of data manipulations and/or queries
3. If no errors occur then commit the transaction and end it
4. If errors occur then rollback the transaction and end it

If no errors occur during the execution of the transaction then the system commits the transaction. A transaction commit operation applies all data manipulations within the scope of

the transaction and persists the results to the database. If an error occurs during the transaction, or if the user specifies a [rollback](#) operation, the data manipulations within the transaction are not persisted to the database. In no case can a partial transaction be committed to the database since that would leave the database in an inconsistent state.

As a database, ADR stores data that is retrieved by the service tier applications according to that application's requirements at the time of retrieval. The service tier applications determine the frequency and variety of information retrieved. Thus the content and format of every message, file, record, array, display, report, etc. are determined by the service tier applications. The Technical name (e.g., record or data structure name, Priority, timing, frequency, volume, sequencing, and other constraints are determined by the application.

7.2.3. Precedence and Criticality

Production uptime, emergency recovery, and decisions on maintenance windows are managed through the Austin Information Technology Center (AITC). The Point of Contact is [REDACTED]

ADR participates in the ADR Integrated Project Team (IPT). The IPT process combined with other communications among stakeholders coordinate requirements and schedules with all stakeholders. VA leadership determines the priority and criticality among competing interests.

A maintenance calendar is maintained as a MS Outlook resource for ADR database environments. Activities are scheduled by stakeholders and conflicts managed by AITC.

Precedence includes a mix of the following in mostly priority order. Priority refers to a natural order of one activity taking precedence over another and not the relative importance of an activity.

1. Nightly mirroring down time
2. Maintenance windows
3. OLTP
4. Scheduled reports
5. Ad Hoc reports
6. Exports

7.2.4. Performance

The performance of data transfer over the application to database interfaces falls well within accepted industry standards. This transfer is limited by processing load on the database server and not by the interface.

Performance of data transfer over the SFTP interfaces is easily within accepted industry standards. The load on these is minor.

1. The ADR database stores various message formats (HL7, HL0, error, audit) as VarChar, BLOB or CLOB data types after they are processed by the application that sends/receives/creates them. ADR only receives message content as data elements and is not involved in processing the sending or receiving of the messages.

7.2.5. Security

Security requirements for the data being transferred are described as follows.

1. Access security is managed thru the Oracle database (see security management details in the *ADR Database Security Guide* available on the VA Rational RTC Source Control
2. The AITC manages system communications to ensure the systems are communicating with each other.

Safety, security, privacy, encryption, compartmentalization, and auditing are handled as follows;

1. ADR database access security is defined by the needs of the end user system, agreed to by the ADR database administrators and maintained on the ADR database.
2. SFTP security is managed on the SFTP server by [REDACTED].
3. Application security is managed on the application systems.

7.2.6. Data Elements

ADR data structures, data elements and all their properties are maintained in ADR data models available on the [REDACTED] Data models and data dictionaries will be maintained using Rational Data Architect (aka. Infosphere Data Architect).

8. Human-Machine Interface

N/A

8.1. Interface Design Rules

N/A

8.2. Inputs

N/A

8.3. Outputs

N/A

8.4. Navigation Hierarchy

N/A

9. Security and Privacy

9.1. Security

Per the National Institute of Standards and Technology Special Publication 800-53, Revision 4, there are 18 control families as shown below with corresponding measures from ADR project.

Table 26: Security Control Identifiers and Family Names

ID	Family	Description
AC	Access Control	All database access accounts needs to be reviewed and approved per ADR Database Security Guide available under [REDACTED]
AT	Awareness and Training	ADR team is required to take Privacy and HIPAA Focused Training and VA Privacy and Information Security Awareness and Rules of Behavior via Talent Management System(TMS) on annual basis
AU	Audit and Accountability	The auditing of database user actions is configured at the database server level. Database parameters control which Data Definition Language (DDL) and Data Manipulation Language (DML) statements are monitored, and which actions are recorded in the audit log. Audit logs are expected to be Operating System (OS) files and are controlled by database server system administrators. The logs will be secured and backed up on a daily basis. All reporting on user activities will come from the OS audit logs. Please see Auditing Section in ADR Database Security Guide available under [REDACTED]
CA	Security Assessment and Authorization	See Auditing Section in ADR Database Security Guide available under [REDACTED]
CM	Configuration Management	ADR packages and source codes are stored in Rational SDLC software hosted at HITC in secure network.
CP	Contingency Planning	ADR Contingency Planning covers DR security from site specific perspective. ADR DR site is located at HITC in secure network. Replication from ADR production system at ATIC to ADR DR system at HITC via secure network
IA	Identification and Authentication	All database access accounts needs to be reviewed and approved per ADR Database Security Guide available under [REDACTED]
IR	Incident Response	This is addressed by AITC
MA	Maintenance	ADR production system is upgraded on a regular basis to address the potential security issues or thread.
MP	Media Protection	Storage and related media of ADR databases resides in secure network at AITC
PE	Physical and Environmental Protection	ADR databases resides in secure network at AITC
PL	Planning	
PS	Personnel Security	All personnel in product development and product support are subject to background investigation and, if passes, given security identification to access building, IT systems supporting ADR system.
RA	Risk Assessment	ADR Risks and Issues manager reviews, reports, and follows up existing risks covering security aspect to ADR system.

ID	Family	Description
SA	System and Services Acquisition	All ADR systems are TRM compliant at the time of acquisition for tech refresh.
SC	System and Communications Protection	All communication between ADR and client applications are within secure network/environment at AITC
SI	System and Information Integrity	ADR System and Information Integrity are secured by allowing access to ADR hardware and software to those who have been authorized by ADR management. A 9957 form has to be submitted to AITC to gain access to ADR systems in GSS
PM	Program Management	Program/project manager supervises ADR projected and are provided with updates related to ADR security via ADR Risks and Issues management

Describe specific security mechanisms at the application level, as guided by NIST 800-53 revision 4 (or most current version). Also, summarize the security mechanisms to be provided by the VA GSSs. Reference the Security Risk Assessment.

The following information will be provided to address security controls:

A high-level description of the security controls, grouped according to the 18 control families identified in NIST 800-53 revision 4 (or most current version). A description of all 18 control families must be addressed; if a control family is not applicable, then state that control family does not apply and explain why it does not apply.

A description of the specific security controls will be provided by existing VA infrastructure or VA GSSs.

Describe the planned use by the application of the infrastructure's centralized security mechanisms and VA GSSs (in particular, the identification and authentication, access control, and audit mechanisms), and infrastructure mechanisms, (e.g., Directory Services) to store user account information. Sufficient detail should be provided to show the feasibility of the integration and/or inter operation of application security mechanisms with infrastructure security mechanisms.

9.2. Privacy

PHI and PII information in ADR system are accessed directly by clients' applications within AITC secured network within AITC boundary. ADR clients' applications are responsible for secured communication between end users and their applications outside AITC boundary over WAN.

10. System Integrity Controls

10.1. Data Integrity Control

The implementation & deployment of database (including database objects and data) change requests of ADR follows the defined tight SDLC process to addresses and avoid data loss, misuse, modification or unauthorized access to the data/information hosted in the ADR database.

Data integrity for online transactions is designed and implemented via constraints wherever possible during entity/model modeling and physical model implementation.

10.2. Verification Processes for ADR Data Modification

All modifications to the ADR Production database go through the established ADR SDLC process, which includes requirements analysis, data modeling, change request development, and release deployment. The ADR team follows the guidelines defined by VA's Rational Tools team.

The ADR team has also created internal development task lists and release development task lists to ensure the quality of the change requests delivered to the ADR database.

Appendix A. Additional Materials

Requirements Traceability Matrix

All ADR RTMs are located on the VA ADR Rational RTC Source Control.

Packaging and Installation

The deployment packages and their instructions are referenced in the ADR Version Description Documents (VDDs) which are delivered to the Production DBA at AITC for deployment. Completed ADR VDDs are located on the VA ADR Rational RTC Source Control. The deployment packages, which include the instructions for execution of the deployment steps, are delivered by the ADR DBAs in a compressed format.

Design Metrics

The ADR database designs are based on requirements documented in the ADR RSDs, which are located on the VA ADR Rational RTC Source Control.

Acronyms and Abbreviations

Acronyms defined in this document can be found in the *Repositories Acronym List*. A Portable Document Format (PDF) version of the *Repositories Acronym List* is stored in the ADR Phase II Project Notebook on Technical Services Project Repository (TSPR) and will be updated or revised whenever the master list is updated or revised.

[REDACTED]

Required Technical Documents

The following documents must be submitted for review to support proper approval:

- Product Architecture Document - Not applicable, since the ADR system is an infrastructure subsystem to the application projects which actually deliver the final product to the end users
- Disaster Recovery Plan - [REDACTED]
- Interface Data Mapping – Not applicable to the ADR project since there is no UI
- Security Assurance Strategy - *ADR Database Security Guide*
- Due to the sensitive information contained within the Repositories System Security Plan, for secure access contact the Salt Lake FO ISO Larry Skrabut [REDACTED]

Appendix B. PPACA Requirements

The following table answers some questions about the PPACA performance, capacity, and availability requirements.

Table 27: PPACA Performance, Capacity, and Availability Requirements

If this is a system modification, how many users does the current system support?
It is unknown if the developed solution will be a system modification at this time. Primarily, this would be a new service that may use existing VA systems through a yet to be determined integration layer. Additional modifications to existing VA systems may be required. This will be assessed during the design/development phase as well as whether performance load testing will be necessary.
How many users will the new system (or system modification) support?
Interaction with the Exchange is a new web service. This enhancement requests the ability to receive a query from an external system and return the appropriate response. The ADR will be used to receive and provide responses to this query. CMS estimates between 8.9 million and 30 million applicants will utilize the Exchange in 2014. It is unknown how many applicant queries will be submitted for VA verification if CMS elects to only submit queries for Veterans or Veterans' beneficiaries (approximately 7% of the estimated number of applicants). Additionally, it is unknown if the VA systems affected (once identified) would be able to handle this volume of usage (queries and subsequent IRS Form 1099 or equivalent communication submissions). Once a final decision is made regarding what will be developed, these responses would be updated.

Appendix C. References

Locate the artifacts referenced in this document in the *ADR Documentation Reference Library* section in the TSPR at the following link:



Users who lack VA network or TSPR access, contact the author of the document or your Repositories point of contact to request access to the Abbreviations, Acronyms, and References libraries.

Appendix D. ADR Hardware and Software Configuration

The following table displays the ADR hardware and software configuration.

ADR Environment			Production (GSS)			Production (GSS)
DB name			ADRP			ADRRP
DB Server and Oracle Configuration	Server Model		HP Integrity BL870c server blade	HP Integrity BL870c server blade	HP Integrity BL870c server blade	HP Integrity BL870c server blade
	CPU Information	Model	Intel Itanium 9100 series 2 core processors supported by up to 192GB memory (24 DIMM slots).	Intel Itanium 9100 series 2 core processors supported by up to 192GB memory (24 DIMM slots).	Intel Itanium 9100 series 2 core processors supported by up to 192GB memory (24 DIMM slots).	Intel Itanium 9100 series 2 core processors supported by up to 192GB memory (24 DIMM slots).
		Unit x Core	2x4	2x4	2x4	2x4
	Memory (GB)		192	192	192	192
	DBMS/RAC version		11.2.0.4	11.2.0.4	11.2.0.4	11.2.0.4
	OS		HP-UX ia64.11.31	HP-UX ia64.11.31	HP-UX ia64.11.31	HP-UX ia64.11.31
	GI version		11.2.0.4	11.2.0.4	11.2.0.4	11.2.0.4
	Applications Failover to this server					
	Storage Tier		VSP Tier 1	VSP Tier 1	VSP Tier 1	VSP Tier 1
	Storage Vender		Hitachi	Hitachi	Hitachi	Hitachi
	Disk Drive Type		Internal VSP SAS	Internal VSP SAS	Internal VSP SAS	Internal VSP SAS

Appendix E. ADR Operation and Development Software

Table 28: ADR Operation and Development Software List

Software/Tool used by ADR Development/system	Type	Version	Location
Oracle RDBMS	Database	11.2.0.4	████
Oracle Real Application Clusters	Database clustering	11.2.0.4	████
Oracle Enterprise Manager/Grid Control	Database Management	11.1.0.1	████ EO team is in the process to upgrade OEM to 12.x version. the upgrade should be completed by the end of CY17Q1 if not earlier
Oracle Automatic Storage Management	Oracle specific storage management	11.2.0.4	████
Rational Quality Manager	SQA software	6.0.1	████
IBM Rational Unified Modeling Language (UML)			ADR is a database centric project and does not used IBM Rational UML in design/development/implementation/operation
Toad Data Modeler	Data Modeling	5.3.4 (transition to 5.5)	Local to developer
Toad for Oracle	Oracle Database Development	12.6.0.53	Local to developer ADR PD team plan to upgrade to 12.8 by the end of CY17Q1 if not earlier.
Reflection	Reflection Suite for X is a PC X server, an NFS client, and terminal emulation software. The product also includes an SSH client to tunnel and TCP traffic.	14.0.6	Local to developer ADR PD team plan to upgrade to 15.6x or 16.x by the end of CY17Q1 if not earlier.
HP-UX	Operating system	ia64 11.31	████/████ ADR, under the Repositories Program, received the waiver from AERB for continuing the use of HP-UX in operation until the ADR Tech Refresh which will replace HP-UX with other OS approved by TRM

Rational Team Concert	Rational Team Concert is a collaborative software development/delivery environment based on International Business Machines` (IBM) Jazz technology platform. Team Concert provides software version control, workspace management and supports parallel development. IBM`s Jazz technology platform is a framework that is the foundation for a suite of development and collaboration products.	6.0.1	
Red Hat Enterprise Linux Server release GNU/Linux x86_64 x86_64	Operating system	6.x.x	
P-UX	Operating system	ia64 11.31	<p>Unapproved-Divest (decision made in 9/10/2013) (Approval decision of `Unapproved - divest` is granted, Current systems may continue to utilize this operating system, however should consider migration to other approved operating systems well before vendor/version support expires for this product.) Also, in 2014 ADR and HDR received the waiver for using HP-UX.</p> <p>ADR currently has transition plan to upgrade to TRM and AERB approved software replacements during the upcoming Repositories Replatform. This Repositories Replatform is in the process of making. The SDD for Repositories Replatform may have been or will be submitted to TRM and AERB review and approval.</p> <p>Once TRM and AERB approve the Repositories Replatform, all software designed to be utilized will be TRM and AERB compliant one. Therefore, ADR will be transitioned to the TRM and AERB approved Repositories Replatform, and all software will be TRM and AERB approved.</p> <p>ADR, under the Repositories Program, received the waiver from AERB for continuing the use of HP-UX in operation until the ADR Tech Refresh which will replace HP-UX with other OS approved by TRM</p>
Red Hat Enterprise Linux Server release GNU/Linux x86_64 x86_64	Operating system	Red Hat 5.11 Linux 2.6.18	<p>Approved w/Constraints. This Technology can be used within the specified constraints.</p> <p>ADR team plans to complete the transition from version Red Hat 5.x to 6.x/7.x before CY16Q1 to be TRM compliant in CY16</p>

Attachment A. Reviews and Approval

This section contains the reviews and approval signatures for the *ADR System Design Document*.

Peer Review completion: 10/20/2016

IPT Review completion:

The signatures below indicate agreement and acceptance of the declarations contained in this document.

Bill Wigton	Date
Program Manager of Enrollment System, and Enrollment Health Eligibility Determination	

Dave Collins	Date
Director of Data Architecture	

Baron Woods	Date
Repositories Program Manager (Acting)	

//es// Preston Wang	11/01/2016
Ying Preston Wang	Date
Project Manager, Administrative Data Repository	

Attachment B. **Signature Verification**

The Signature Verification section is used to verify and document the electronic signatures, concurrence and approval of the *ADR System Design Document*.

