Non-VA Care Program Integrity Tools

System Design Document

Version 1.19



March 2019

Revision History

The following indicates the versioning process that this document has undergone:

|  |  |  |  |
| --- | --- | --- | --- |
| Version Number | Date  (mm/dd/yy) | Summary of Changes | Author |
| 1.0 | 6/15/2011 | Initial Document | Paul Fernandes / Biren Desai |
| 1.1 | 10/14/2011 | Updated draft version to reflect design approach | IBM Team |
| 1.2 | 11/2/2011 | Updated draft version addressing VA comments sent on | IBM Team |
| 1.3 | 12/22/2012 | Updated detailed design section including data models | IBM Team |
| 1.4 | 02/15/2012 | Multiple updates to the figures and detailed design section to reflect changes to the scope as well as provision of further details. | IBM Team |
| 1.5 | 3/8/2012 | Addressed VA comments and provided further details to fill out Increment 1 documentation. | IBM Team |
| 1.6 | 5/07/2012 | Updated ETL diagrams, enhanced references to all related design documents | IBM Team |
| 1.7 | 8/10/2012 | Responded to VA comments, listed design assumptions & constraints, added details on VA directives | IBM Team |
| 1.8 | 11/5/2012 | Updated reference to Data Model and Data dictionary, updated references and links to key deliverables | IBM Team |
| 1.9 | 1/28/2013 | Added compliance section and responded to ASD questions in the appendices | IBM Team |
| 1.10 | 10/30/2013 | Updated document to reflect CP&E DW and CDW implementation. Updated all figures. | IBM Team |
| 1.11 | 11/01/2013 | Updated document to reflect that the FBCS integration, CP&E X12/EDI integration, as well as scoring implementation were completed and deployed as part of the Non-VA Care Claims Processing increment for PIT. Also updated document to reflect that the CP&E DW and CDW ETL integration to PIT will occur during the Non-VA Care PIT ICD Enhancementss increment. | IBM Team |
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| 1.15 | 12/24/2013 | Updated sections 1.6.1, 1.7.1, 2, 2.2 – 2.3 in response to Clarke/Buck questions | IBM Team |
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| 1.19 | 02/28/2019 | Sowmya Rachaputi – Updated PIT Architecture AlwaysON SQL Cluster | By Light |
|  | 03/22/2019 | Athar Ahmad – Review | By Light |

Artifact Rationale

The System Design Document (SDD) is a dual-use document that provides the conceptual design as well as the as-built design. This document will be updated as the product is built, to reflect the as-built product.

When to Complete Each Section of the SDD

| Section | Completed On or Before PMAS Phase | Rationale |
| --- | --- | --- |
| 1 – Introduction | MS 0 Review; updated thereafter | Conceptual design should inform evaluation of investments |
| 2 – Background | MS 0 Review; updated thereafter | Conceptual design should inform evaluation of investments |
| 3 – Conceptual Design | MS 0 Review; updated thereafter | Conceptual design should inform evaluation of investments |
| 4 – System Architecture | MS 0 Review; updated thereafter | Conceptual design should inform evaluation of investments |
| 5 – Data Design | MS 1 Review; updated thereafter | Design details should be elaborated upon during PMAS Planning phase and prior to development |
| 6 – Detailed Design | MS 1 Review; updated thereafter | Design details should be elaborated upon during PMAS Planning phase and prior to development |
| 7 – External System Interface Design | MS 1 Review; updated thereafter | Design details should be elaborated upon during PMAS Planning phase and prior to development |
| 8 – Human Machine Interfaces | MS 1 Review; updated thereafter | Design details should be elaborated upon during PMAS Planning phase and prior to development |
| Attachments | MS 1 Review; updated thereafter | Design details should be elaborated upon during PMAS Planning phase and prior to development |

A product’s system design should be defined conceptually prior to the allocation of personnel and resources that occur at project initiation. This gives the enterprise an opportunity to evaluate IT investments before project teams are stood up and funding is allocated. Sections 1- 4, which discuss the high-level design, should be completed prior to MS 0. All sections should be completed and updated before MS 1. Projects will need to address all SDD approval constraints prior to the MS 2 review. In addition, the SDD should reflect the as-built product going into the MS 2 review.

| Activity | New Capability (1) | Feature Enhancement (2) |
| --- | --- | --- |
| **Field Deployment (A)** | No | No |
| **Cloud/Web Deployment (B)** | No | No |
| **Mobile Application (C)** | No | No |

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# Introduction

The Non-VA Care Program Integrity Tools system, or PIT, is a comprehensive set of tools to detect Fraud, Waste, and Abuse (FWA) for the Purchased Care (PC) programs at the Department of Veterans Affairs (VA). The system was built, tested, and deployed to the VA production environment in Fall 2012, and has been addressing the claim scoring, centralization of claim data, and related reporting capability needs of PC programs since. The existing solution architecture includes four primary components:

* Program Integrity Data Repository
* Claims Scoring Tool
* Reporting and analytics capability
* Data integration/Extract Transform Load (ETL) services that load claim data from source systems into the repository and posts claim scoring results for use in payments.

## Document Purpose

This document is intended for technical users responsible for managing security, deploying rules, administering the database, performing other administrative tasks, etc, as well as for project management personnel responsible for ensuring the PIT fulfills project requirements.

This document does not provide detailed explanations of the individual ETL processes to be used for each source system – instead, references are provided, where appropriate, to the specific non-VA Care PIT ETL Design Document.

## Project Scope

The Program Integrity Tools currently receives non-VA Care claims data from FBCS, CP&E and FSC scores each claim for the risk of FWA, and stores the claim data in the PITEDR, to allow reporting against the claims data. The FBCS integration, CP&E integration, FSC integration and as well as scoring component were completed.

In essence, while FBCS claims data is currently being used for pre-payment scoring of claims, CDW provides correlated payment data to identify and track payment outflows on the original incoming FBCS claims data. Similarly, CP&E DW payment data provides insight on VA’s payments on the previously-scored CP&E X12 data integrated into PIT. Together, CDW and CP&E DW provide important follow-up data on VA PC’s payment outflows. FSC also provides pre-payment scoring of claims, which are scored.

## 1.3 User Profiles

The Program Integrity Tools was designed with the following primary user groups in mind. Details of different roles have been confirmed with Program Integrity Tools stakeholders.

Table 1: PIT Primary User Groups

| Role | Responsibilities | Business Need from PIT | System Proficiency |
| --- | --- | --- | --- |
| Program Integrity /Informatics team members | CBO Business Analysts responsible for addressing and reporting on FWA | Oversight and Reporting on FWA detection and prevention, as well as communication to Operations Manager | Multiple cube-based data analysis tools |
| AITC System Administrator | Manage configuration of the PIT software in all environments | Manage configuration of the PIT software in all environments |  |

The table below lists the different administrator roles of the Program Integrity Tools. Details of level of support for each role were determined in consultation with Program Integrity Tools stakeholders.

Table 2: PIT Administrator User Roles

|  |  |  |
| --- | --- | --- |
| Role | Tool | Description |
| Fraud and Abuse Management System (FAMS) Admin | FAMS web app  FAMS database  FAMS Administrative Utility | Maintenance of the system that includes maintaining reports, database commands, and sever jobs, as well as users. |
| WODM Architect | WebSphere WODM | Overall deployment organizations of rules and making sure that the execution of rule sets is optimized |
| WebSphere Business Events (WBE) Admin | IBM WebSphere Business Events | Administration of the WBE system management functions and generation of system reports |
| Database Administrator (DBA) | MS Structured Query Language (SQL) Server | Management of the data repository.  Works with the development teams to maintain consistent data structures. |
| InfoSphere Admin | IBM InfoSphere Data Stage | Management of the ETL script. Maintenance of the ETL jobs. |
| WebSphere Admin | IBM WebSphere | Administration of the WebSphere system management functions and generation of system reports |

## 1.3 Relationship to other Artifacts

The Program Integrity Tools SDD is based on the business needs of the customer/business owner described in the following documents.

* Program Integrity Tools Requirement Specification Document (RSD)
* Program Integrity Tools Program Management Plan (PMP)

## 1.4 Methodology, Tools, and Techniques

This SDD was created from the following template from VIP: system\_design\_document\_ template.docx. Per the VIP recommendation, the technical details have been drafted out in this document via conceptual designs. Technical writing and reviews then provide a clean-up service on the document for ultimate submission to VIP Review (as part of a packet of artifacts required to attain the Active state). From that review, changes will be implemented to further refine the accuracy of the document’s technical content. With the input of several program and project peers, the document will be ready for the Formal Review. Any feedback to come from this review will be implemented as well. Any SDD change requests made during the development phase are then addressed as needed and changes captured throughout.

## 1.5 Constraining Policies, Directives, and Procedures

The Veterans Integrated Process (VIP) Process is a Lean-Agile framework that services the interest of Veterans through the efficient streamlining of activities that occur within the enterprise. This document conforms to the Veterans Integrated Process Methodology template for the SDD and is required in the planning phase of a project.

The Program Integrity Tools system will be in compliance with relevant VA directive requirements including VA Directive 6513, which directs VA policy toward securing external connections to the VA network infrastructure, as well as VA Handbook 6500.3, relating to Certification & Accreditation requirements.

The VIP mandates that all new VA IT projects/programs uses an incremental development approach, requiring frequent delivery milestones that deliver new capabilities for business sponsors to test and accept functionality. Implemented by the Assistant Secretary for IT, VIP is a VA-wide IT project effort to better empower the OIT Project Managers and teams to meet their mission: delivering world-class IT products that meet business needs on time and within budget.

Claims and Clinical data fetched from the source systems may contain Protected Health Information (PHI) and Electronic Protected Health Information (EPHI) that is subject to protection under the regulations issued by the Department of Health and Human Services, as mandated by the Health Insurance Portability and Accountability Act of 1996 (HIPAA); 45 CFR Parts 160 and 164, Subparts A and E, the Standards for Privacy of Individually Identifiable Health Information (“Privacy Rule”); and 45 CFR Parts 160 and 164, Subparts A and C, the Security Standard (“Security Rule”).  Pursuant to the Privacy and Security Rules, the system shall be architected to protect PHI and EPHI.

## 1.5.1 Office of Information Security

The Program Integrity Tool (PIT) application is hosted at the Austin Information Technology Center (AITC) and the management and development teams for PIT have collaborated with the AITC management team on all information security matters. A Service Level Agreement was devised and signed asserting that the project would adopt all required security protocol as mandated by VA. The Pre-Production and Production Environments for PIT both currently have a Authority to Operate (ATO). The PIT team has coordinated with the Office of Cyber Security on Certification and Accreditation (C&A) and has followed all applicable processes. This involved running vulnerability scans on three (3) levels: (1) databases (2) operating system, and (3) web application and remediating identified “critical” and “high” vulnerabilities to procure the ATO. As per VA guidelines, all security documentation has been posted to the SMART database. The ATO served as a necessary precursor to an active Production Environment being available for project use. In an effort to remain compliant with C&A regulations, the AITC team runs vulnerability scans on a regular basis to remediate all vulnerabilities (Critical/High/Medium/Low) as they seek to ultimately obtain a (pending) full Authority to Operate (ATO). This document conform to Veterans Integrated Process Methodology templates.

### 1.5.1.1 VA Certification and Accreditation Process

The PIT O&M project had obtained a Authority to Operate (ATO) from the VA Office of Cyber Security. The Office of Cyber Security approved the project’s C&A request, concluded that the Program Integrity Tools was in compliance with relevant VA directive requirements including VA Directive 6513, which directs VA policy toward securing external connections to the VA network infrastructure, as well as VA Handbook 6500.3, relating to Certification & Accreditation requirements.

## 1.5.2 Core Common Business and Infrastructure Services

There are two Core Common Business and Infrastructure Standards which have been published, the Release Architecture and Identity and Access Management. The Program Integrity Tools adheres to the Enterprise Technical Architecture Compliance Guidance, signed August 2012, and aligns with the OneVA EA Global Principles, including: Mission Alignment, Data Visibility and Accessibility, Data Interoperability, Infrastructure Interoperability, Information Security, Enterprise Services.

Further, Program Integrity Tools (PIT) adheres to all established and accepted VA guidelines for identity and access management for all users. The application is hosted at the Austin Information Technology Center (AITC) and the AITC Program Manager is responsible for issuing and regulating access to the AITC environment via VA 9957 forms, which requires sponsorship from the Chief Business Office (CBO). A prerequisite for applicants is a valid VA account in the VHAMASTER domain, thus requiring all users to go through the applicable VA screening processes and regulations. Upon receiving a valid VA ID, the PIT User’s access request must be approved by the VA Project Manager. After gaining entry to the AITC environment, the user then works with the development team and VA Management to gain access and priority within the components of the PIT application. Because PIT is meant to be utilized as a means to reduce fraud, waste, and abuse within VA Purchased Care, only individuals who already have certified training to evaluate healthcare claims from Non-VA providers will be using this tool. This translates to a select group of less than 30 individuals in the Program Integrity Department of the VHA Chief Business Office Purchased Care group. Their level(s) of access and priority are established through the Department of Program Integrity in their Office of Human Resources Management (OHRM) approved Position Descriptions for appointments of public trust. These staff members are specifically hired into federal career positions to perform the type of functions associated with this access. These VA employees currently have rights to view Personally Identifiable Information (PII) and Personal Health Information (PHI) and there will be no change in the type(s) of data they will be reviewing, with the Department of Program Integrity maintaining and managing the list of approved users.

# Background

FBCS is currently comprised of 35 FBCS stations, serving in total approximately ~150 fee stations. Claims processing data also exists within the centralized Repository at the CP&E serving other Purchased Care Programs including CHAMPVA, Spina Bifida, Children of Women Vietnam Veterans (CWVV), Foreign Medical Program. For both of these sources, the integration to PIT was completed during the Non-VA Care Claims Processing increment, and has been working in production since the Fall of 2012. Processed pre-paid claims received from Financial Service Center (VACS) source was integrated to PIT where the claims are scored for fraud, waste and abuse analysis.

PIT Operations & Maintenance requires to measure performance metrics of Servers, Databases and Reports. As part of the PIT maintenance, few of the critical tasks are performed:

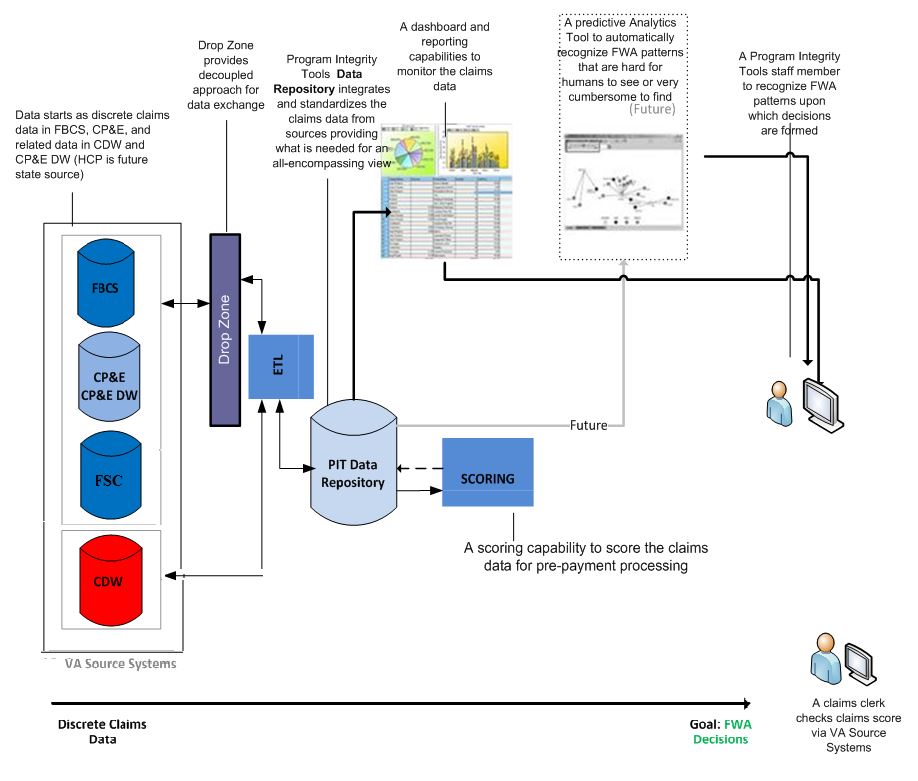
* **To improve Server Performance:** Load balance of the Servers is performed with the other production servers.
* **To improve ETL Performance:** Implement logic in ETL that eliminates duplication of provider data in PITEDR.
* **To improve Claims Scoring Tool Performance:** Performance tuning of Scoring queries is executed.
* **To improve PITEDR Database Performance:** Archiving 6 years prior data, removing unsed tables, indexes and schema objects
* **To Improve Reporting and analytics capability:** Optimize queries used in Reports, enabling data marts for frequent report requests which give snapshots of required data for specific analysis.

The claims processing data contains Personally Identifiable Information (PII) and Personal Health Information (PHI), and as such requires strict security requirements.

## Overview of System:

The following figure depicts the overview of the Program Integrity Tools and its purpose.

Figure 1: Program Integrity Tools - Overview



The Program Integrity Tools is comprised of multiple components, as shown above in Figure 1:

* The PIT data repository is being fed (from FBCS, CP&E X12, FSC and NCPDP D.0) claims data through the drop zone.
* The claims scoring tool implemented during the initial Non-VA Care Claims Processing increment assigns scores based on the risk of fraud/waste and abuse on a pre-payment basis.
* The ETL pushes claim scores to the drop zone where the FBCS,FSC and CP&E systems retrieve and process them accordingly (note: CP&E is not currently setup to automatically process returned information from PIT).

## Overview of the Business Process

The Program Integrity Tools has three major processes:

* Extracting, Transforming and Loading Claims
* Pre-Payment Scoring
* Reporting

The pre-payment scoring and reporting processes have already been implemented in the Non-VA Care Claims Processing Project. The following sections depict the FBCS, VACS, CP&E EDI, CP&E DW, and CDW interfaces current state.

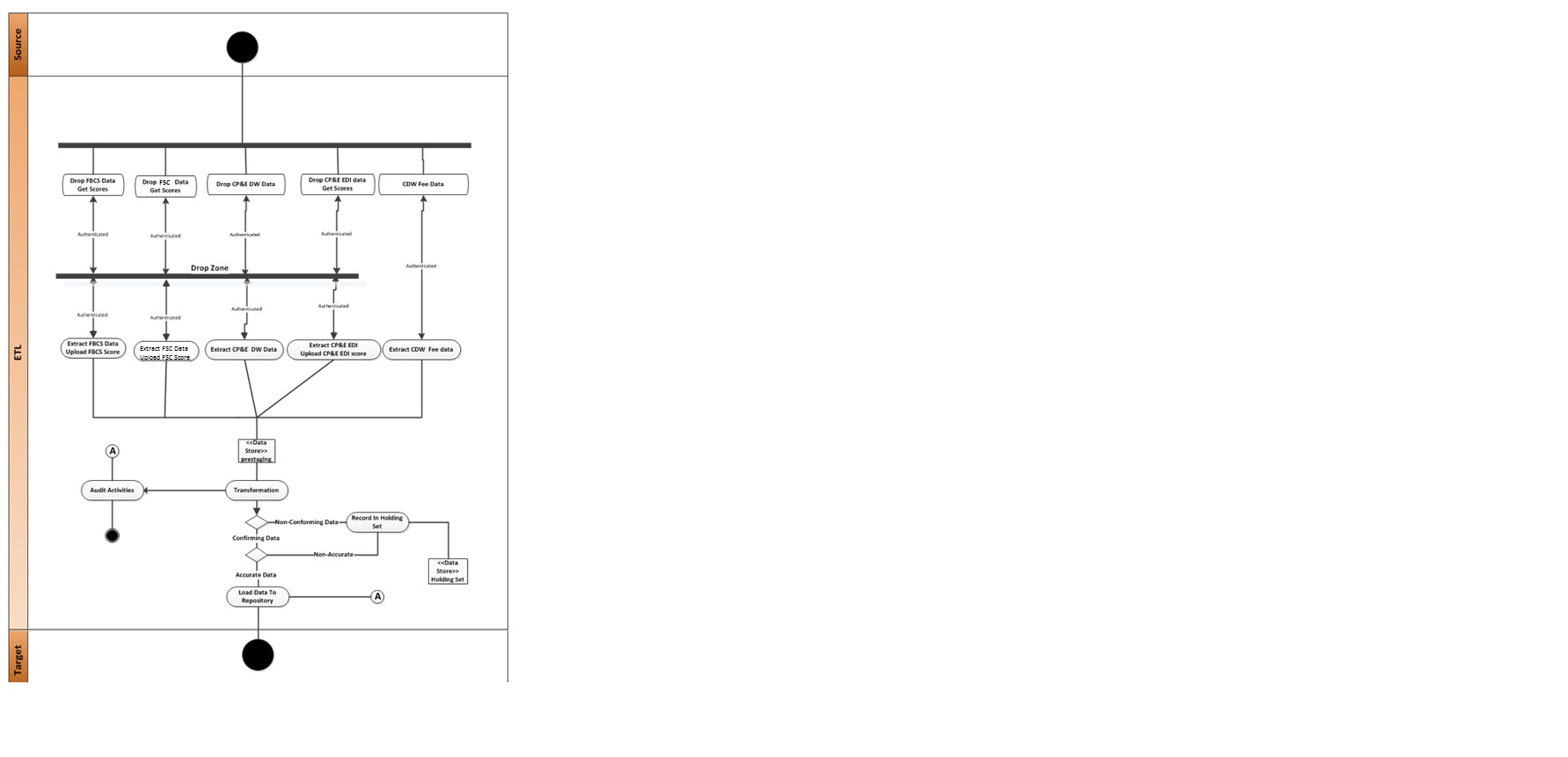
### 2.2.1 ETL Process

The ETL process moves data in batch processes between the drop zone and the data repository (for FBCS, CP&E X12, CP&E DW and VACS data); for CDW, the ETL utilizes an open-database connectivity link to directly integrate data into the Data Repository. InfoSphere Data Stage is the technology used for transforming and loading claims related data into the Data Repository. Business rules for data transformation are established and managed in the Data Stage. The ETL jobs run as services to load claims-related data into the Data Repository operating environment.

The transformation process implements business rules that define data aggregations and the relationships between the various entities in the data.

The loading process inserts and commits the desired attribute into the target tables. The data repository collects data elements at the lowest details of the claim in order to present different levels of aggregation required by the scoring solution and the BI reporting tools. Figure 2 shows the process flow diagram of extracting, transforming and loading of claim data and claim scores from the claims systems to and from the central repository.

**Figure 2: ETL Process**



The following table lists the overview of the business processes from the figures above.

Table 3: ETL Process

| Owner | Description |
| --- | --- |
| Program Integrity Management | Receive FBCS claims data feeds and store raw data feeds for audit and scoring purposes. |
| Program Integrity Management | Receive VACS claim data feeds and store data for scoring purposes. |
| Program Integrity Management | Extract Corporate Data Warehouse payment data and store data for audit purposes. |
| Program Integrity Management | Receive CP&E claims data feeds and store raw data feeds for audit and scoring purposes. |
| Program Integrity Management | Extract CP&E Data Warehouse payment data feeds and store data for audit purposes. |
| Program Integrity Management | Conform the source data; validate data formats; transform data from CP&E DW and CDW and load them to Central PIT Repository |

### 2.2.2 Reporting and Dashboard

PIT provides access to data from across multiple source systems. The data model enables a report-author to design and implement cross-functional reports to meet the information needs of business users and claim processing clerks. In addition, the data repository allows users to interrogate data and build ad-hoc reports and queries.

The Microsoft BI Reporting Tool has been selected by VA to be the toolset for building business intelligence and analytics for Program Integrity users. Microsoft BI will provide the VA with the capability to develop reusable standard reports - reports available to users on-demand or when run on schedule. Users will also have the ability to develop ad-hoc queries/reports where they have greater control over content and layout. Additionally, users will have the ability to create metrics and filters.

User access to reporting is based on his/her authorization level. This characterization distinguishes users primarily by their expected sophistication in the use of reporting applications. The design and complexity of reporting-application use depends on the role performed. Analysts, for example, are expected to typically be the most sophisticated users.

### 2.2.3 Business Benefits

The Proram Integrity Tools benefits the IT Acquisitions associated with the Healthcare Efficiency Initiativ (T-15) and the role that the CBO has been assigned to play in that initiative. The Program Integrity Tools satisfies the OIG findings and provides a means to **address the concerns raised in that finding. PIT improves the organization’s ability to comply with the Improper Payments Elimination and Recovery Act (IPERA) and to reduce improper payments before they occur.**

## ****2.3 Overview of the Significant Requirements****

### 2.3.1 Functional Requirements

All business and technical requirements, from initial requirements elicitation through the elaboration process, will be captured in a Business Requirements Document (BRD). Business Needs are further defined by requirements that are structured as follows:

* An EPIC overarching major requirment
  + To Business User Story that describe the high-level business requirement from the user’s perspective
    - To Development User Story on how the requirement would be implemented.
      * To the Tasks needed to support the requirement.

### 2.3.2 Workload and Performance Requirements

The following table identifies the important performance and workload requirement that is currently in place. This project will not have any impact on existing system requirements.

* Reporting tool shall support a minimum of 100 simultaneous users performing write and read transactions during the estimated peak usage hours of 8 a.m.-10 p.m., EST (during weekdays).
* The operation of any single PIT component shall minimally affect the performance, availability, or speed of any other PIT components.

### 2.3.3 Operational Requirements

The following list identifies the operational requirements that are currently in place and drive the system design. This project will not have any impact on existing system requirements. Monitoring and solution of agreed/identified critical systems are under IT support 24 x 7 x 365.

* PIT shall provide the capability to schedule large transaction functions during non-business hours.
* The ETL Tool shall be capable of performing its duties (extract/transform/load) within the periodic cycle established for synchronization with the external systems.
* Reporting Tool shall be available 99.99% of time from 6 a.m. EST, to 10 p.m. EST, Monday through Friday.
* The Scoring Tool shall be available 99.99% of the time, 24-hours per day, Monday through Friday. Holidays and weekends are excluded because no Veterans Integrated Service Network (VISN) is working overtime.
* The Repository shall be available 24-hours per day, Monday through Friday. Holidays and weekends may be excluded on a scheduled basis provided that no VISN is working weekends.

### 2.3.4 Reliability Specifications

The following summarize requirements for Reliability Specifications that are currently in place. This project will not have any impact on existing system requirements.

* Availability is 99.9% during defined work hours of 6 a.m. EST, to 2 a.m. EST.
* System will fully recover from an outage within 1 business day.
* One-hundred percent (100%) continuous back-up data will be restored when outage is recovered.
* Maintenance periods are non-working hours after 10 p.m., EST, weekdays. All maintenance periods would come with a minimum of 72-hours advanced notice to all users.
* Real-time monitoring and solution of agreed/identified critical systems are under IT support 24 x 7 x 365.

### 2.3.5 Security Specifications

The Federal Information Processing Standard 199 (FIPS-199), *Standards for Security Categorization of Federal Information and Information Systems*, defines the security categories, security objectives, and impact levels to which National Institute of Standards and Technology (NIST) Special Publication (SP) 800-60 Volume 1 Revision 1, maps information types. A FIPS 199 analysis was completed with a determined security categorization of ***Moderate*** impact.

# Conceptual Design

## Conceptual Application Design

This section provides a brief overview of the context within which the Program Integrity Tools exists. The level 0 diagram includes one object for the Program Integrity Tools (PIT) that is the subject of this design, and one object for each external system with which the Program Integrity Tools interfaces. The level 1 diagram decomposes the PIT into multiple sub-components and depicts interfaces in more details.

### Application Context

The following figure shows the users and external systems that will interact with the Program Integrity Tools.

Figure 3: Program Integrity Tools Context Diagram

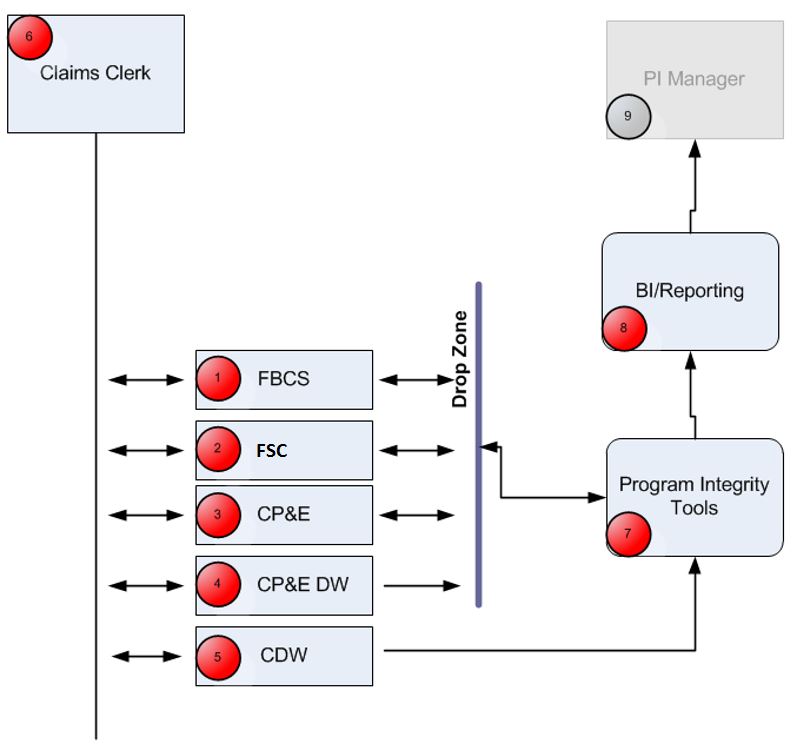


Table 4: Application Context Description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Object ID | Name | Description | Interface | Interface System |
| 1 | FBCS | Fee Basis Claims Software resides locally | Drop Zone (using flat file format) | FBCS |
| 2 | CP&E | Cache based Claims Processing and Eligibility system for handling of CHAMPVA, Spina Bifida, CWVV and Foreign Medical Program claims. | Drop Zone (using ANSI X12 format) | CP&E |
| 3 | CP&E DW | Claims Processing and Eligibility Data Warehouse | Drop Zone (using flat file format) | CP&E DW |
| 4 | VACS | Pre-paid claims received from Financial Service Center | Drop zone (using flat file format) | VACS (FSC) |
| 4 | CDW | Corporate Data Warehouse | ODBC connection | CDW |
| 5 | Claim Clerk | CBO Claim processing staff | GUI | FBCS |
| 6 | Program Integrity Tools | Suite of Program Integrity Tools | GUI/SQL/HTTP/ANSI X12 | Program Integrity Tools |
| 7 | Program Integrity Tools BI | PIT Business Intelligence Suite | Internal to PIT | Microsoft Report Builder |
| 8 | PI Manager | Program Integrity manager to manage the operation of Program Integrity Tools | HTTP/GUI | Program Integrity Tools |

### High-Level Application Design

Figure 4: Program Integrity Tools Context – High-Level Application Design

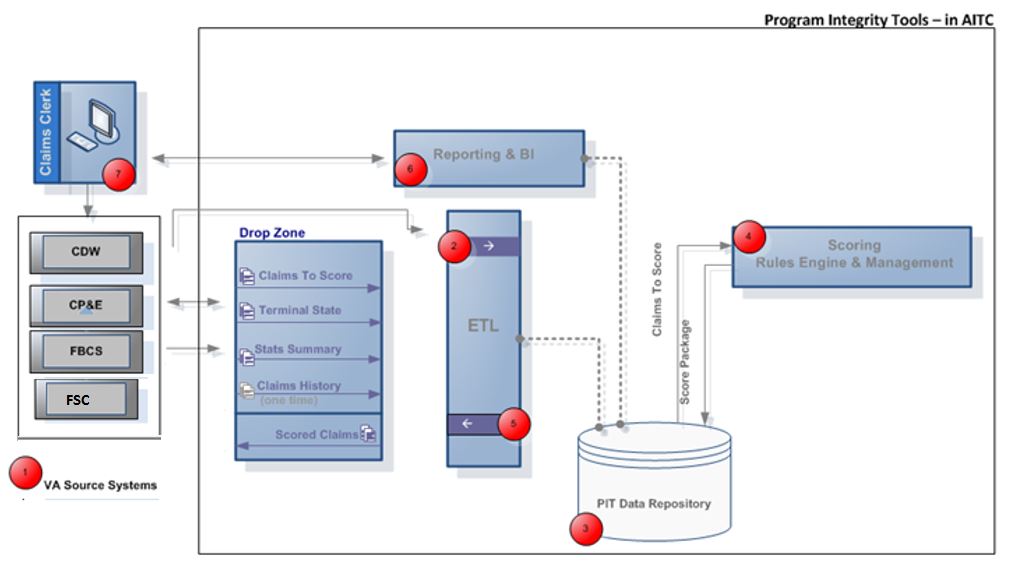


Table 5: PIT Application Design Steps

|  |  |
| --- | --- |
| Step | Details |
| 1 | Initial VA source systems (FBCS, VACS, CP&E EDI) provide claims data to the Drop Zone in flat-file format. CDW data extracted to the PIT directly. |
| 2 | ETL processes claim data from the Drop Zone and loads it into the PIT Data Repository |
| 3 | PIT Data Repository integrates and standardizes claim data to allow for a comprehensive view |
| 4 | Claims Scoring Tool assigns scores based on the risk of fraud, waste and abuse for pre-payment processing |
| 5 | ETL pushes the assigned scores to the Drop Zone (for FBCS, VACS, and CP&E EDI data only) where FBCS retrieve/process ScoredClaims files accordingly |
| 6 | Dashboard and Reporting tool monitor the claim data and accommodate end-user browsing and analysis. End-users interact with Dashboard and Reporting tools to produce standardized reports and engage in other querying, reporting, and business intelligence extractions |
| 7 | PI team and Claims Clerks review PIT-generated scores as part of final payment process |

Table 6: Program Integrity Tools Components

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Objects | | | | | | | | | | | | | | | | |
| Name | ID | Description | Service or Legacy Code | | | | External Interface Name | | | External Interface ID | | Internal Interface Name | | Internal Interface ID | SDP Sections 1&2 | |
| Claim Scoring | 4 | To generate the score decision based on the claims data and business rules defined in the repository | Legacy Code | | | | n/a | | | n/a | | Repository | | 5 | n/a | |
| Internal Data Stores | | | | | | | | | | | | | | | | |
| Name | ID | Data Stored | | | | | | | Steward | | | Access | | | | |
| Repository | 3 | Claims Data and Transaction Data | | | | | | | Program Integrity Management | | | Access the claims data and business rules defined in the repository  Create audit logs to store the transaction | | | | |
| Objects | | | | | | | | | | | | | | | | |
| Name | ID | Description | Service or Legacy Code | | | | External Interface Name | | | External Interface ID | | Internal Interface Name | | Internal Interface ID | SDP Sections 1&2 | |
| Dashboard and Reporting | 6 | To allow business owner to monitor the Claim processing indicator stored in the central Repository | Legacy Code | | | | No External Interface | | | n/a | | Repository | | 5 | n/a | |
| Internal Data Stores | | | | | | | | | | | | | | | | |
| Name | ID | Data Stored | | | | Steward | | | | | | Access | | | | |
| Repository | 3 | Claims Data and Transaction Data | | | | Program Integrity Management | | | | | | Access the claims data and Transaction data to display in table and graph format | | | | |
| Internal Data Stores | | | | | | | | | | | | | | | | |
| Name | ID | Data Stored | | | | | | | Steward | | | Access | | | | |
| Repository | 3 | Claims Data | | | | | | | Program Integrity Management | | | Access the post-payment claims data to run the predictive analytics model to find FWA patterns (Future) | | | | |
| Objects | | | | | | | | | | | | | | | | |
| Name | ID | Description | | | Service or Legacy Code | | | External Interface Name | | | External Interface ID | | Internal Interface Name | Internal Interface ID | | SDP Sections 1&2 |
| ETL Tool | 2 | To extract, transform and load the source data from the drop zone into the repository. And load the claims score from the repository to the drop zone. | | | Legacy Code | | | n/a | | | n/a | | Repository | 5 | | n/a |
| Internal Data Stores | | | | | | | | | | | | | | | | |
| Name | ID | Data Stored | | | | | | | Steward | | | Access | | | | |
| Repository | 3 | Raw Data, Relational Data (if any), Dimensional Data | | | | | | | Program Integrity Management | | | * Create the staging area to store the raw dataset extracted from the drop zone * Create/update conformed and transformed data into the repository which can be then used by other component of Program Integrity Tools * Load the claims score from the repository to the drop zone | | | | |
| Objects | | | | | | | | | | | | | | | | |
| Name | ID | Description | | Service or Legacy Code | | | External Interface Name | | | External Interface ID | | Internal Interface Name | | Internal Interface ID | SDP Sections 1&2 | |
| FBCS,  FSC, CP&E EDI,  CDW | 1 | The source system to extract claim data into the drop zone or directly to the PITEDR | | n/a | | | n/a | | | n/a | |  | | n/a | n/a | |
| **Internal Data Stores** | | | | | | | | | | | | | | | | |
| Internal VA System Repository | 3 | Raw Data, Relational Data (if any), Dimensional Data | | | | | | | VA Source System | | | * Source system to load claim data into the drop zone * Source system to load claims’ score from the drop zone | | | | |

### Application Locations

The Program Integrity Tools components has been deployed in a central location which can be accessed from all the local VAMC as well as from anywhere within the VA network. The Program Integrity Tools suite is hosted at AITC.

Table 7: Application Locations

|  |  |  |  |
| --- | --- | --- | --- |
| Application Component | Description | Location at Which Component is Run | Type |
| Scoring Tool | Pre-payment FWA scoring tool | AITC | Business Logic / Data Logic / Interface Code |
| ETL Tool | Extraction, Transformation and Loading of Claims data to Central Repository | AITC | Business Logic / Data Logic / Interface Code |
| Data Repository | Central data repository | AITC | Data Logic |
| Reporting Tool | Dashboard and reporting Tool | AITC | Presentation Logic |

### Application Users

The following table lists the Program Integrity Tools users:

Table 8: Application Users

| **Application Component** | **Location** | **User** |
| --- | --- | --- |
| Scoring Tool | AITC | For the scored Claims, the CBO Claims Clerk is an Operational Customer For managing the business rules, the following roles apply: Business Rule Analyst   * FAMS: Profiling (to build models and profiles) * ILOG JRules (to define the vocabulary, write and organize business logic into business rules and inspect execution traces)   Business Rule Developer   * FAMS: Value Set Generation User (to setup the data load required for profiling) * ILOG JRules (implementation for the business rule vocabulary, debug and tune rule execution) |
| ETL Tool | AITC | Power Users to maintain and update ETL routines |
| Data Repository | AITC | Power Users to maintain, update, extract data requests |
| Reporting Tool | Throughout VA | **Business Owner as Management Customer General**  Run some standard reports on an ad hoc basis. Not required to build new reports – consumer of standard reports  **Analyst**  Detailed information requirements; may include segments of data corresponding to business transactions based on a period of time  Builds new reports to meet information needs  Typically possesses a good understanding and knowledge of where the data resides and how the data is structured  **Management**  Consumes summarized information at intermediate level across business entities  Limited analytics and drill-down capabilities  **Executive**  Consumes highly summarized information (Dashboard) with limited/ causal drill-down capabilities  Focuses on trend analysis for predefined business entities over a long period of time |

## 3.2 Conceptual Data Design

### 3.2.1 Repository Conceptual Data Model

The objective of the conceptual data design is to define steps to assemble a blueprint to capture, abstract, and identify the layout of the VA Data Repository. The data model is refined through the lifecycle of a project with increasing levels of detail from high level conceptual to a more detail logical and physical design. By Light uses the data modeling process to facilitate communication and understanding of data requirements between the By Light development team and VA business users. In addition, the data model is used by By Light to manage the metadata and to provide input to the physical data repository.

The conceptual model identifies the major business entities and lays the groundwork for the Program Integrity Tool data repository data model. In this multidimensional schema entities are described as dimensions and facts. Dimension tables are sets of related attributes that are used to group or constrain fact-based information when reporting. Dimensions are companions to a fact table. The dimension tables contain the textual descriptors of the business. Common dimensions in the PIT data repository include: time, claim, provider and location. The PIT data repository consists of several fact tables representing different subject areas. A surrogate key uniquely identifies each row in the fact table. The PIT Repository consists of collections of star schemas aligned to multiple fact tables and conforming dimensions tied to the user reporting requirements and FAMS scoring tool application.

Please refer to the *Non-VA Care Program Integrity Tools – Enterprise Data Architecture* document for detailed conceptual, logical and physical diagrams describing the PIT data model.

### 3.2.2 Repository Database Information

The Program Integrity Tools repository currently is deployed into production and serves as the enterprise-wide repository providing a multi-dimensional view to all Purchased Care claims and payment data. The intent of the repository is to house data currently housed in multiple systems within the VA. This central repository contains sufficient data necessary to facilitate multiple goals including the development of a robust Fraud/Waste/Abuse (FWA) program, decreasing improper payments, utilizing industry standard health care claims tools and providing a broad view of payments across VHA Programs.

The repository resides on a MS SQL Server DBMS.

Table 9: Data Repository Key Elements

|  |  |
| --- | --- |
| Key Element | Tools and Technologies |
| DBMS | SQL Server 2012 R2 |
| Data Integration | InfoSphere Data Stage 11.5 |
| Data Access | Services: JDBC, ODBC  In/Outbound data feed: flat files |
| Reporting | SSRS - SQL Server Reporting Services |

#### 3.2.2.1 Database Interfaces

The PIT data repository currently interfaces with the following applications:

* Data integration layer, which consists of InfoSphere Data Stage.
* PIT Fraud and FAMS application
* PIT Reporting Tool

Including external interfaces:

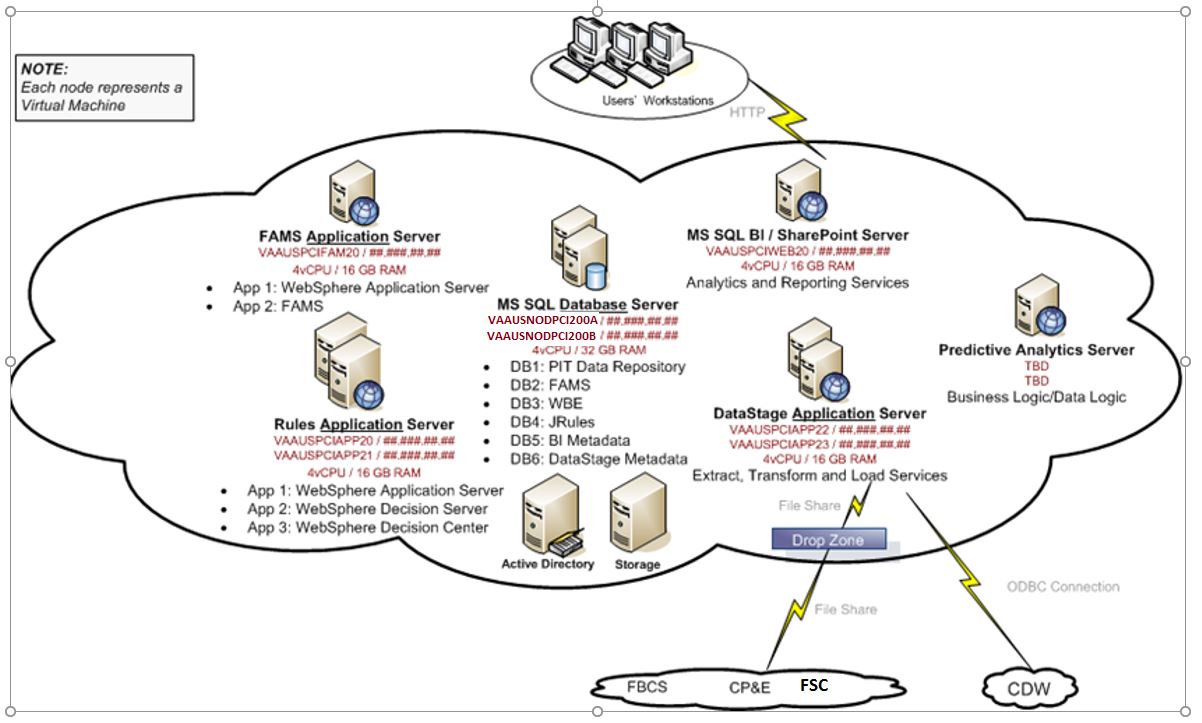
Table 10: Applications Using Data Repository

| System Name | Location | Interface Methods |
| --- | --- | --- |
| FAMS | AITC | JDBC |
| MS Business Intelligence | AITC | .Net/ODBC |
| FBCS | VA VISN | File Transfer |
| VACS | FSC | Simple File Transfer Protocol |
| CP&E | HAC | File Transfer |
| CDW | AITC | ODBC |
| InfoSphere DataStage | AITC | JDBC |

## 3.3 Conceptual Infrastructure Design

This section describes a very high level overview of the conceptual infrastructure of the production environment:

Figure 5: Production Environment



### 3.3.1 System Criticality and High Availability

The Program Integrity Tools adapted the infrastructure and monitoring capability provided by the hosting environment, which is AITC. As such, system criticality and availability is related to consistent availability of AITC’s environment.

Consistent, accurately-transmitted feeds from VA source systems are essential for PIT to process and score claims as well as produce comprehensive reporting information for involved users. The failure of these feeds will inhibit the Scoring Model’s ability to score related data and provide reporting information, but will only inhibit the Model’s functioning for specific failed feeds. PIT will still be able to process and store claims for all working feeds, which will allow for higher total availability.

PIT will also ensure high availability by adhering to general design guidelines like decoupling components. In addition, computing resources will not be shared between applications. Aside from key interdependencies between applications (i.e. the Reporting Tool’s dependency on the accurate functionality of the PIT Data Repository), the functioning and operation of one segment of PIT will not affect the speed or availability of other tools. Finally, the PIT Data Repository will be available 24 hours per day, Monday to Friday.

Please refer to the *Non-VA Care Program Integrity Tools – System Architecture Design for the AITC* for further details on PIT’s reliance on AITC.

### 3.3.2 Special Technology

Not applicable.

### 3.3.3 Technology Locations

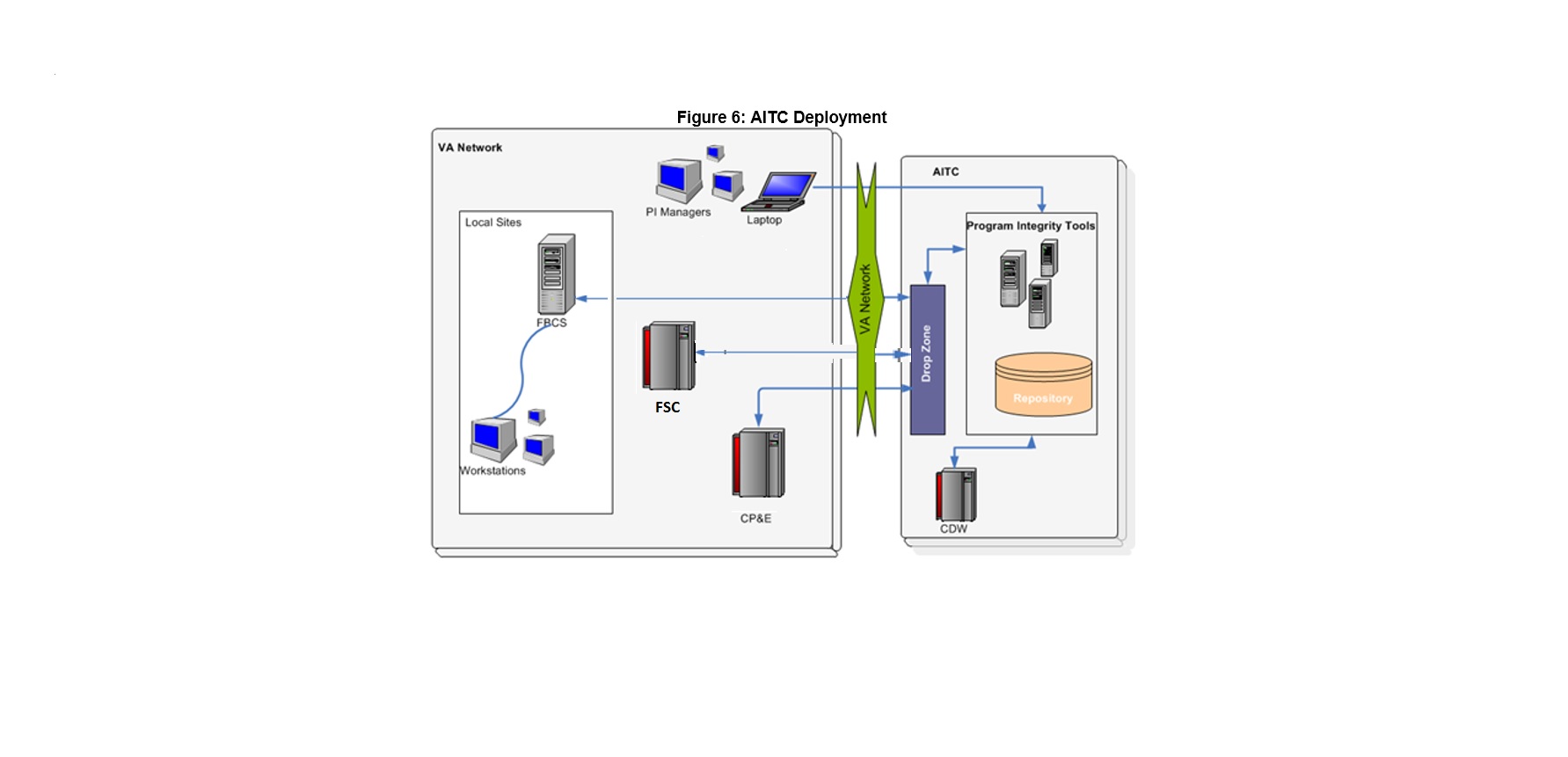
The PIT application is currently hosted at AITC. *Non-VA Care Program Integrity Tools - System Architecture Design for AITC*

### 3.3.4 Conceptual Infrastructure Diagram

### 3.3.4.1 Location of Environments and External Interfaces

The following is the conceptual infrastructure diagram of the Program Integrity Tools deployed within the AITC facility.

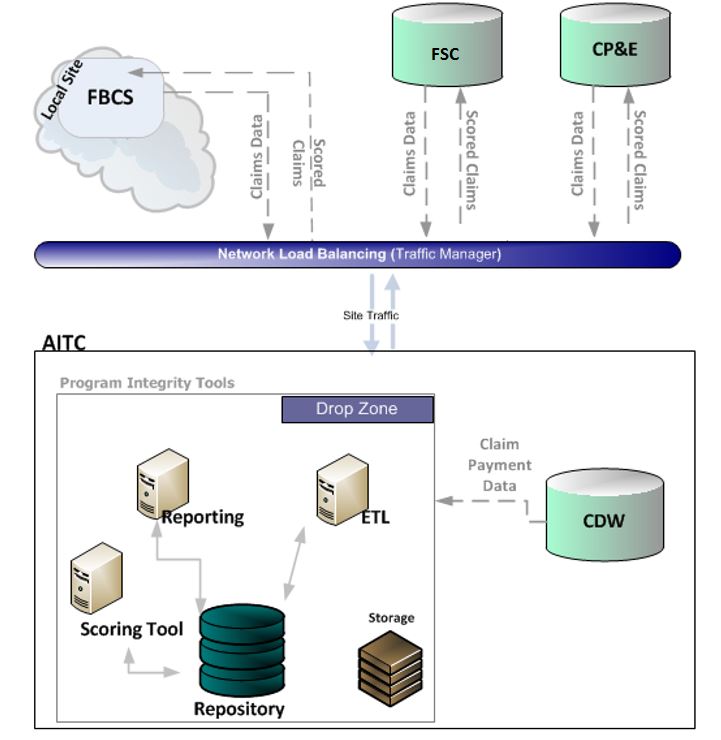
Figure 6: AITC Deployment



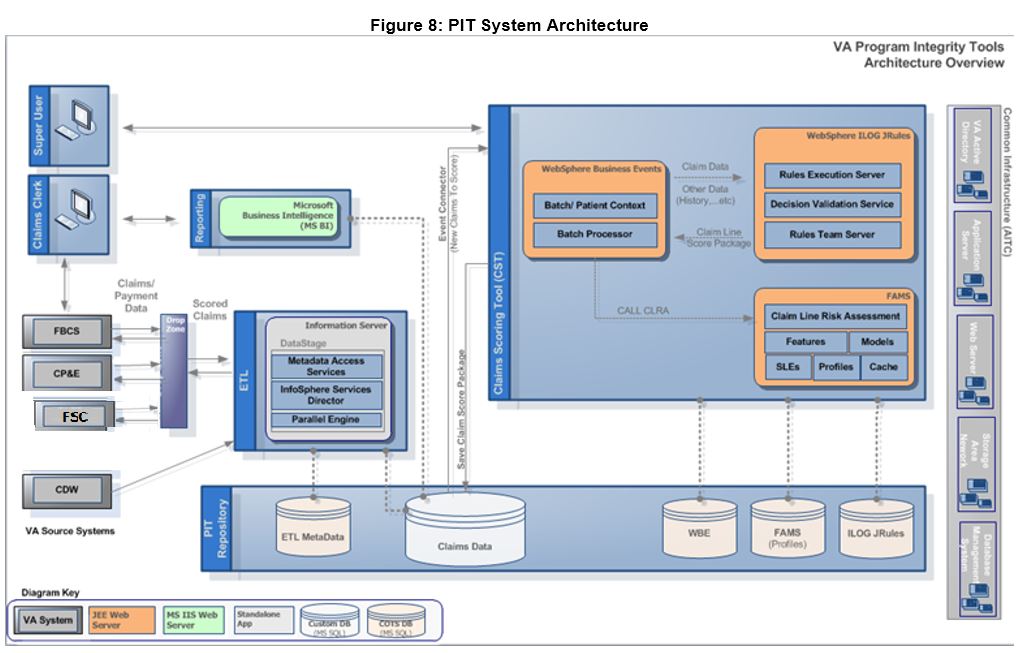
### 3.3.4.2 Conceptual Production String Diagram

The following figure shows a graphical configuration of a single production string of the Program Integrity Tools.

Figure 7: PIT Conceptual Production



# System Architecture



## Hardware Architecture

Table 11: AITC Development Environment Configurations

| Old Server | Newly Upgraded Server | Purpose | IP Address | CPU | RAM  GB | OS  **GB** | APP  **GB** | DATA  **GB** | LOG  **GB** | TEMP  **GB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DNS | DNS | Rules App Server | IP | 2 (3) | 6 | 80 | 200 |  |  |  |
| DNS | DNS | Data Stage Application Server | IP | 2 | 28 | 80 | 39 | 159 | 29 | 19 |
| DNS | DNS | DataStage Application Server | IP | 2 | 8 | 80 | 220 |  |  |  |

Table 12: AITC Test Environment Configuration Details

| Server | Newly Upgraed Server | Purpose | IP Address | CPU | RAM  GB | OS  **GB** | APP  **GB** | DATA  **GB** | LOG  **GB** | TEMP  **GB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DNS | DNS | SharePoint / BI Application Server | IP | 2 | 8 | 100 | 150 |  |  |  |
| DNS | DNS | Rules App Server | IP | 2 | 6 | 80 | 200 |  |  |  |
| DNS | DNS | FAMS Application Server | IP | 2 | 6 | 70 | 80 |  |  |  |

Table 13: AITC Pre-Production Environment Configurations

| Server | Newly Upgraded  **Server** | Purpose | IP Address | CPU | RAM  GB | OS  **GB** | APP  **GB** | DATA  **GB** | LOG  **GB** | TEMP  **GB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DNS | DNS | Rules App Server | IP | 6 | 12 | 80 | 200 |  |  |  |
| DNS | DNS | Rules App Server | IP | 6 | 12 | 80 | 200 |  |  |  |
| DNS | DNS | DataStage Application Server | IP | 6 | 12 | 80 | 200 |  |  |  |
| DNS | DNS | DataStage Application Server | IP | 6 | 12 | 80 | 200 |  |  |  |
| DNS | DNS | FAMS Application Server | IP | 4 | 12 | 64 | 100 |  |  |  |
| DNS | DNS | Database | IP | 8 | 64 | 100 | 244 | (E)2000  (F)1400  (G)800 | 254 | 530 |
| DNS | DNS | SharePoint / BI Application Server | IP | 6 | 16 | 80 | 260 |  |  |  |

Table 14: AITC Production Environment Configurations

| Server | Newly Upgraded Server | Purpose | IP Address | CPU | RAM  GB | OS  **GB** | APP  **GB** | DATA  **GB** | LOG  **GB** | TEMP  **GB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DNS | DNS | Rules App Server | IP | 4 | 12 | 80 | 50 |  |  |  |
| DNS | DNS | Rules App Server | IP | 4 | 12 | 80 | 90 |  |  |  |
| DNS | DNS | Datastage Application Server | IP | 8 | 16 | 100 | 700 |  |  |  |
| DNS | DNS | Datastage Application Server | IP | 8 | 16 | 80 | 400 |  |  |  |
| DNS | DNS | FAMS Application Server | IP | 4 | 12 | 60 | 50 |  |  |  |
| DNS | DNS | SharePoint/BI Application Server | IP | 4 | 12 | 60 | 260 |  |  |  |
| DNS |  |  | IP | 8 | 68 | 80 | 544 | (E)2000  (F)2000  (G)773 | 488 | 400 |
| DNS |  |  | IP | 8 | 68 | 80 | 544 | (E)2000  (F)2000  (G)773 | 488 | 400 |
| DNS |  |  | IP | 8 | 68 | 80 | 544 | (E)2000  (F)2000  (G)773 | 488 | 400 |

## Software Architecture

Please reference the up-to-date versions of the following documents, published separately, for details on the Software Architecture:

* *Non-VA Care Program Integrity Tools - Enterprise Data Architecture*
* *Non-VA Care Program Integrity Tools - FBCS ETL Design Document*
* *Non-VA Care Program Integrity Tools - CP&E ETL Design Document*
* *Non-VA Care Program Integrity Tools - CDW ETL Design Document*
* *Non-VA Care Program Integrity Tools - Repository User Guide*

## Communications Architecture

Table 14: Default Ports

| Component | Default Port Numbers |
| --- | --- |
| IBM Information Server Web-based clients | 9080 |
| IBM Information Server Web-based clients - HTTPS | 9443 |
| WebSphere Application Server Administrative console | 9060 |
| WebSphere Application Server Administrative console (HTTPS) | 9043 |
| IBM Information Server services (RMI/IIOP) | 2809, 9100, 9401–9403 |
| IBM WebSphere Information Services Director services with JMS bindings | 7276, 7286, 5558, 5578 |
| SQL Server database | 1433 |
| IBM Information Server ASB agent | 31531, and a random port number greater than 1024\* |
| IBM Information Server logging agent | 31533 |
| IBM WebSphere DataStage and QualityStage services | 31538 |
| Parallel job monitors | 13400 (port 1) and 13401 (port 2) |
| Parallel engine (APT\_PM\_STARTUP\_PORT) | multiple ports, uses a port number of 10000 or greater |
| Parallel engine remote process startup (rsh/ssh, multiple nodes only) | 22514 |
| Parallel engine (APT\_PLAYER\_CONNECTION\_PORT, multiple nodes only) | multiple ports, uses a port number of 11000 or greater |

Please see section 4 in the *Non-VA Care Program Integrity Tools - System Architecture Design for AITC* document.

# Data Design

Not applicable – the PIT’s Data Design will remain the same for the Enhancement effort as it was for the original development of the PIT.

## Data Management System Files

Information on the database design has been documented in detail in the *Non-VA Care Program Integrity Tools - Enterprise Data Architecture* document. Please refer to that document for information on PIT’s logical and physical design, including entity relationship diagrams and details on the logical model, an enterprise data bus matrix, and more.

## Non-Database Management System Files

Non-DBMS files are received from four different source systems in the course of normal PIT operations, and files from each source system are handled differently by the PIT ETL process. Please refer to the *Non-VA Care Program Integrity Tools – Claims Scoring Tool Interface Control Document* for information on the interactions between these source systems and the PIT, and please refer to individual systems’ ETL design documents for specific details on the ways files are handled by the PIT ETL (*Non-VA Care Program Integrity Tools – FBCS ETL Design document*, *Non-VA Care Program Integrity Tools – CP&E (X12 837 and CP&E DW) ETL Design document*, *Non-VA Care Program Integrity Tools – CDW ETL Design Document*).

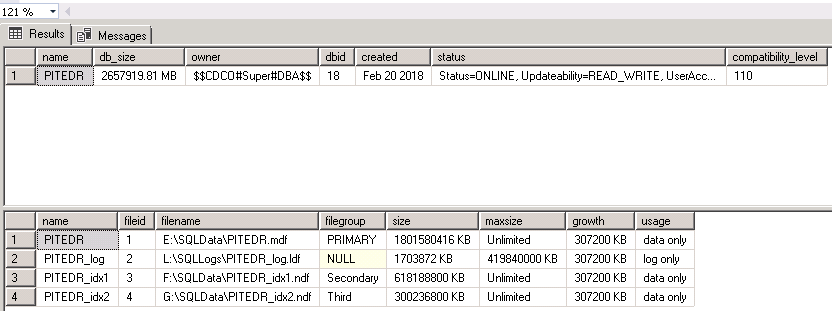
# Detailed Design

Individual ETL design documents specify detailed design specifications for each process of the PIT. Please reference these documents as needed.

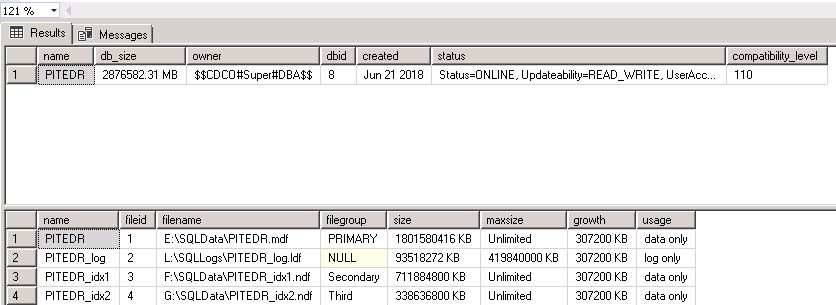
## Hardware Detailed Design

The core hardware design was not modified for the Program Integrity Tools. However, additional database storage space was added to PITEDR (Program Integrity Tools Enterprise Data Repository). Also, production Servers were migrated to new servers and latest sofwares were being installed and configured. Below screenshots indicate the current database size in pre-prod/prod:

Pre-prod database size:



Prod database size:



## Software Detailed Design

The Claim Scoring Tool, PIT repository, ETL tool, and Reporting tool will updated in this increment of work to support the Tasks listed in Section 1. Please refer to the following documents for details on the specific ETL, Scoring, Repository, and Reporting design changes:

* + Repository
    - *Non-VA Care Program Integrity Tools – Data Model*
    - *Non-VA Care Program Integrity Tools – Data Dictionary*
  + ETL
    - *Interfaces*
      * *Non-VA Care Program Integrity Tools – Interface Control Document*
    - *FBCS Fields*
      * *Non-VA Care Program Integrity Tools – FBCS UB file specification*
      * *Non-VA Care Program Integrity Tools – FBCS HCFA file specification*
      * *Non-VA Care Program Integrity Tools – FBCS UB mappings*
      * *Non-VA Care Program Integrity Tools – FBCS HCFA mappings*
  + Scoring Tool
    - *Non-VA Care Program Integrity Tools – Scoring Policy*

## Communications Detailed Design

Please refer to section 4 of the *Non-VA Care Program Integrity Tools - System Architecture Design for AITC* document and the *Non-VA Care Program Integrity Tools – Claims Scoring Tool Interface Control Document* for information on data exchange/format between components.

## 7. External Interface Design

Please refer to the *Non-VA Care Program Integrity Tools - Claim Scoring Tool Interface Control Document* for details on the interface between the PIT and external VA source systems.

## 8. Human-Machine interface

Please refer to the following documentation for details on the interfaces between human end-users and the PIT system, including step-by-step walkthroughs for interacting with the PIT:

* *Non-VA Care Program Integrity Tools - Scoring Tool User Manual*
* *Non-VA Care Program Integrity Tools - Repository User Guide*

## 9. System Integrity Controls

Please refer to the *Program Integrity Tools Operations Manual* for information on configuration and release management, system integrity controls, and maintenance information. This source is the up-to-date reference document for all related topics.

Appendix A

## Packaging and Installation

Please refer to the *Non-VA Care Program Integrity Tools - Comprehensive Server User Manual* (Volumes I and II) for details on software packaging and installation.

## Glossary of Terms

Table 11: Glossary of Terms

| Term | Meaning |
| --- | --- |
| ACR | Artifact Central Repository |
| AITC | Austin Information Technology Center |
| BI | Business Intelligence |
| BRD | Business Requirements Document |
| C&A | Certification and Accreditation |
| CBO | Chief Business Office |
| CHAMPVA | Civilian Health and Medical Program of the VA |
| CDW | Corporate Data Warehouse |
| CLRA | Claim Line Risk Assessment |
| COTS | Commercial Off-The-Shelf |
| CP&E | Claim Processing and Eligibility System |
| DBMS | Database Management System |
| EDI | Electronic Data Interchange |
| ETL | Extract, Transform and Load |
| FAMS | Fraud and Abuse Management System |
| FBCS | Fee Basis Claims Software |
| FWA | Fraud/Waste/Abuse |
| HAC | Health Administration Center |
| HCE | Health Care Efficiency |
| HCP | Heath Claims Processing |
| HIPAA | Health Insurance Portability and Accountability Act of 1996 |
| ICD-9 | International Classification of Diseases Version 9 |
| ICD-10 | International Classification of Diseases Version 10 |
| IPERA | **Improper Payments Elimination and Recovery Act** |
| IT | Information Technology |
| IM/IT | Information Management/Information Technology |
| MOSS | Microsoft Office SharePoint Server |
| MS | Microsoft |
| NCPDP | National Council for Prescription Drug Programs |
| OIT | Office of Information & Technology |
| PCBL | Purchased Care Business Line |
| PD | Product Development |
| PHI | Protected Health Information |
| PII | Personally Identifiable Information |
| PIT | Program Integrity Tools |
| PITEDR | Program Integrity Tools Enterprise Data Repository |
| PMAS | Project Management Accountability System |
| PMP | Program Management Plan |
| RDBMS | Relational Database Management System |
| RSD | Requirement Specification Document |
| SAS | Statistical Analysis System Institute |
| SDD | System Design Document |
| SQL | Structured Query Language |
| VA | Department of Veterans Affairs |
| VAMC | Veterans Affairs Medical Center |
| VHA | Veterans Health Administration |
| VISN | Veterans Integrated Service Network |
| VistA | Veterans Health Information Systems and Technology Architecture |
| WBE | WebSphere Business Events |

# Approval Signatures

This section is used to document the approval of System Design Document. The Chair of the governing Integrated Project Team (IPT), Business Sponsor, IT Program Manager, Project Manager, and the members of the Technical and Enterprise Architectural Review Team are required to sign. Please annotate signature blocks accordingly.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signed: Date:

Gilbert (Tony) Canales

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Signed: Date:

Elizabeth Tyler

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Signed: Date:

Enterprise Architecture

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Signed: Date:

Service Delivery &Engineering