HiLabs

APM Case Study 2024

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Problem Statement

Create a tool that replicates the CMS automated criteria to check process for network adequacy while ensuring data accuracy. This tool should evaluate county-specialty pairs to identify gaps based on time, distance, and other guidelines set by federal organizations for Medicare, Medicaid, and Commercial lines of business. Outline the key details that could be displayed about providers and regions to make this tool a comprehensive solution for compliance checks, incorporating both network adequacy and data accuracy.

Assumptions

Internal Sources
Provider Databases, Claim Databases, HSD Tables, Feedback and Satisfaction Data

Data Volume
Provider data can be assumed to be large-scale, with thousands of records from thousands of providers.

Frequency of Updates
Provider's data will be updated **monthly**, while compliance regulations may change **very occasionally**

Data Formats
Data from providers can be in multiple formats such as **Docs, PDFs, CSVs** and

External Sources
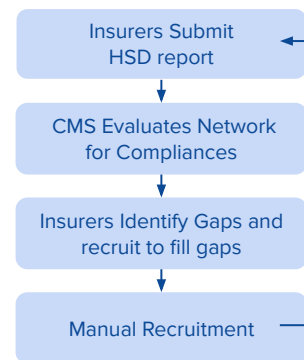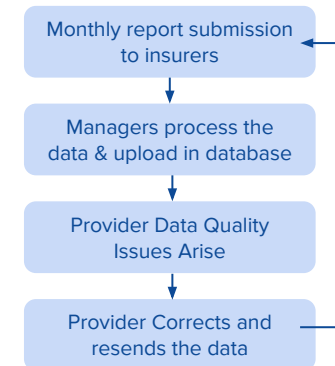CMS guidelines, Medicare / Medicaid compliance rules.

Population Density
Population is evenly distributed in cities & villages, with no sudden density changes.

AI & Data Capabilities
AI will be able to convert the unstructured data into structured data and calculate metrics.

Rural and Urban
There are only two types of areas are considered urban and rural.

Current Network Management Flow

Insurers Submit HSD report

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CMS Evaluates Network for Compliances

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Insurers Identify Gaps and recruit to fill gaps

↓

Manual Recruitment

Provider Data Flow

Monthly report submission to insurers

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Managers process the data & upload in database

↓

Provider Data Quality Issues Arise

↓

Provider Corrects and resends the data

Compliances Breakdown

Geographic Accessibility
- Time Standards
- DIstance Standards
- Rural Areas

Provider-to-Enrollee Ratios
- Primary Care P2E ratio
- Speciality Care P2E ratio

Service Availability
- Emergency Services
- Specialty Care
- Mental Health Services

Stakeholders
- Providers
- CMS
- Network Manager

User Pain Points

Network Manager

1. Manual Report Creation: Manually creating HSD reports is slow and tedious.
2. Tracking Compliance: Hard to track data and compliance across states.
3. Data Quality Queries: Constantly raising queries manually and mailing Provider.
4. Provider Recruitment: Recruiting new providers manually is time-consuming.

Provider

1. Frequent Data Quality Queries: Constantly responding to data quality queries on email is time-consuming and
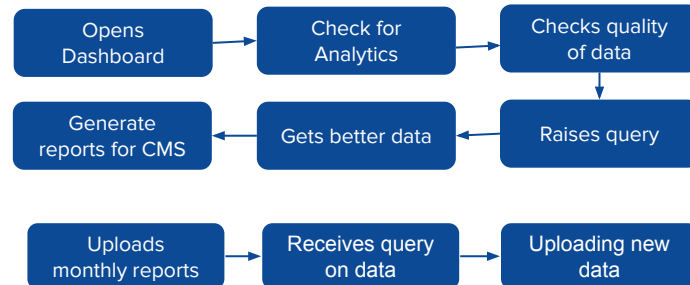**2. Manual Report Submission**: Having to personally email reports to the network manager is inefficient.
3. Manual Report Creation: Generating reports manually for submission to Network Manager is tedious
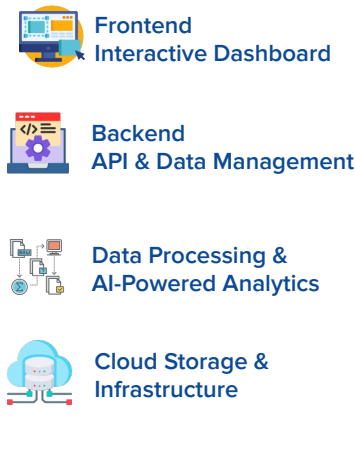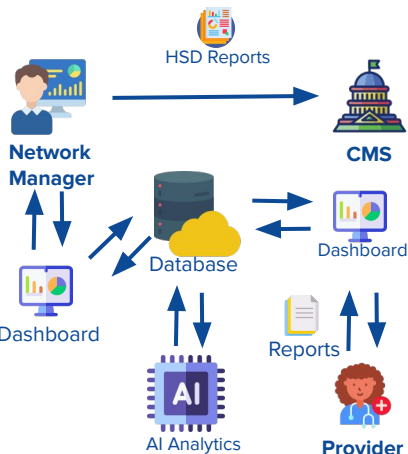
User Journey Mapping

Network Manager

Opens Dashboard → Check for Analytics → Checks quality of data

Generate reports for CMS ← Gets better data ← Raises query

Provider

Uploads monthly reports → Receives query on data → Uploading new data

System Overview

HSD Reports

Network Manager

CMS

Database

Dashboard

Dashboard

Reports

AI Analytics

Provider

Technology Walk Through

Frontend Interactive Dashboard

React.js & Next.js: responsive visualization
Tailwind CSS: Rapid Development
Chart.js & Recharts: Data visualizations

Backend API & Data Management

Node.js + Express: Scalable REST APIs
PostgreSQL / Mongodb: data storage for data.
JWT Authentication: Secure user access

Data Processing & AI-Powered Analytics

Python : data validation, report generation
Apache Airflow: Automate data extraction & processing

Cloud Storage & Infrastructure

AWS S3: Scalable storage and data backups.
Snowflake: Advanced analytics & processing.
Docker & Kubernetes: Easy deployment and scaling.
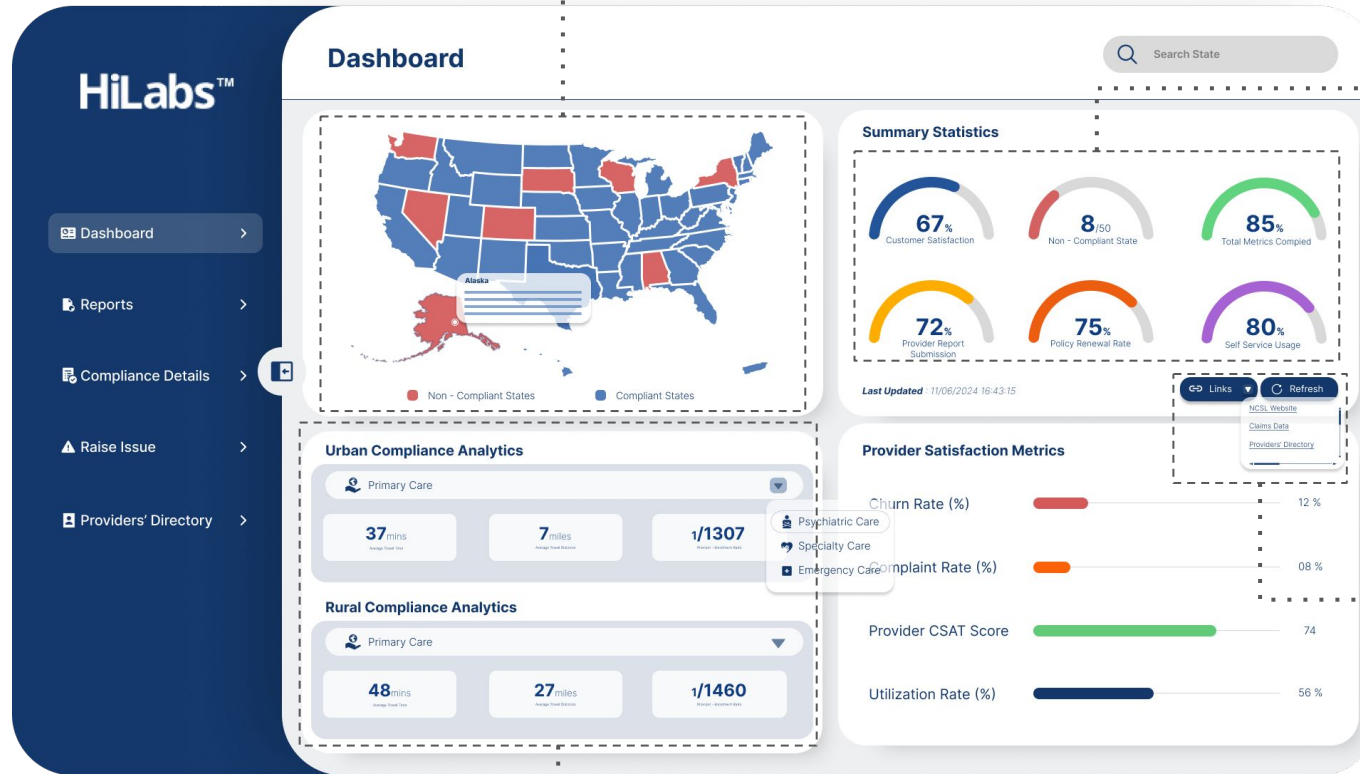
Key Offerings

Dashboard

1. Visual Representation of metrics: Allows network manager to track compliances & user feedback metrics visually
2. Upload Provider Data and query loop: Allow provider to upload data in any format and easily communicate with network manager for data queries

AI Powered Analytics

1. Processing unstructured data: Process unstructured data from Provider reports
2. Creating Analytics: Creating compliance & user feedback analytics from raw data
3. Report Generation: Allow user to generate reports according to standard format and data uploaded
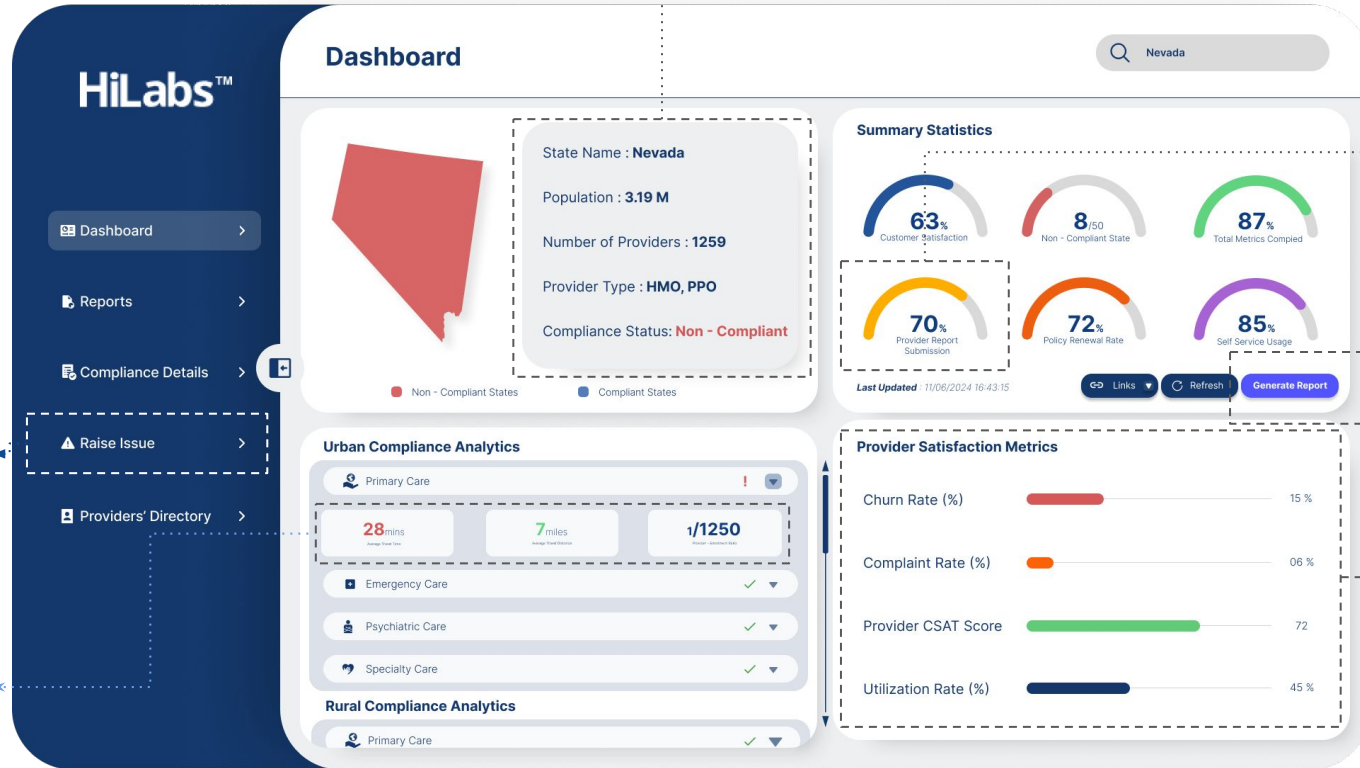
Network Manager Dashboard (Country)

Visual Tracking: Allows to track Non-compliant States visually and Click on state to see the Statewise metrics

Track Latest Metrics: Track Compliance Metrics for Urban and Rural areas

Dashboard

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- Dashboard
- Reports
- Compliance Details
- Raise Issue
- Providers' Directory

Non - Compliant States   Compliant States

Alaska

Urban Compliance Analytics

Primary Care

| 37 mins | 7 miles | 1/1307 |
| Average Travel Time | Average Travel Distance | Provider - Enrollment Ratio |

Psychiatric Care
Specialty Care
Emergency Care

Rural Compliance Analytics

Primary Care

| 48 mins | 27 miles | 1/1460 |
| Average Travel Time | Average Travel Distance | Provider - Enrollment Ratio |

Search State

Summary Statistics

| 67% Customer Satisfaction | 8/50 Non - Compliant State | 85% Total Metrics Complied |
| 72% Provider Report Submission | 75% Policy Renewal Rate | 80% Self Service Usage |

Last Updated : 11/06/2024 16:43:15   Links ▼   ↻ Refresh

NCSL Website
Claims Data
Providers' Directory

Provider Satisfaction Metrics

Churn Rate (%)		12 %
Complaint Rate (%)		08 %
Provider CSAT Score		74
Utilization Rate (%)		56 %

Summary Tracking: Track the Summary and Key Metrics

Track Compliances and Refresh: Track latest compliances and refresh newly uploaded data

Network Manager Dashboard (State)

Dashboard

Display Crucial information: Displays information like population, provider type compliance status etc.

Check for Reports: Check reports provided by each providers

Track Metrics visually: The metrics like P2E Ratio, Average Distance, Time to Travel Appear red when falls below a threshold

Dashboard

Nevada

- 📇 Dashboard >
- 📑 Reports >
- 📑 Compliance Details >
- ⚠️ Raise Issue >
- 📄 Providers' Directory >

State Name : **Nevada**

Population : **3.19 M**

Number of Providers : **1259**

Provider Type : **HMO, PPO**

Compliance Status: **Non - Compliant**

🟥 Non - Compliant States   🔵 Compliant States

Summary Statistics

63% Customer Satisfaction

8/50 Non - Compliant State

87% Total Metrics Complied

70% Provider Report Submission

72% Policy Renewal Rate

85% Self Service Usage

Last Updated : 11/06/2024 16:43:15

🔗 Links ▾   ⟳ Refresh   Generate Report

Urban Compliance Analytics

👤 Primary Care ! ▾

28mins
Average Travel Time

7miles
Average Travel Distance

1/1250
Provider - Enrollee Ratio

- 👤 Emergency Care ✓ ▾
- 👤 Psychiatric Care ✓ ▾
- 👤 Specialty Care ✓ ▾

Rural Compliance Analytics

- 👤 Primary Care ✓ ▾

Provider Satisfaction Metrics

Churn Rate (%) ▬▬▬ 15 %

Complaint Rate (%) ▬▬ 06 %

Provider CSAT Score ▬▬▬▬ 72

Utilization Rate (%) ▬▬▬ 45 %

Check for the percentage of reports submitted for better Data accuracy

Generate Reports: Generate reports for each state in their own format

Track Provider Metrics: Track Metrics like Churn Rate, CSAT and Utilization Rate

Reports

Filter By : Allow user to filter the submitted reports on various basis

A detailed Navigation Bar: allowing user to seamlessly get details and clear call to action

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- Dashboard
- Reports
- Compliance Details
- Raise Issue
- Providers' Directory

🔍 Search

Filter By | State ▾ | ✓ Nevada   ✓ Texas   Alaska   California   46 More ▾

None
Date
State
Provider Type

	Provider ID	Provider Name	State	Month	Submitted On	Status	Issue	
☑	21903	Albert Laboratories	Nevada	August 2024	08/07/2024	ACCEPTED	Click Here	View Report
☐	22758	Carlson Laboratories	Nevada	May 2024	05/22/2024	NOT ACCEPTED	Click Here	View Report
☑	22523	Jameson Clinic	Texas	December 2023	12/22/2023	ACCEPTED	Click Here	View Report
☐	21379	David Clinic	Texas	Jan 2024	01/25/2024	NOT ACCEPTED	Click Here	View Report

✕ Clear Selection   ⬇ Download Report

Clearly allows user to check the status and see the issue in the report

Multiple Report Download: Allows user to select and download multiple reports

Upload Bar:
Allows the user to Track how much the report has been uploaded

Allows the user to select the particular type of report the user wants to upload

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Hi 21903 !

- Dashboard
- Upload Report
- View Reports
- Issues Raised

Upload Report

UPLOAD
*file format PDF and CSV only

Uploading ...

Select Report Type   ○ User Satisfaction Report   ○ Performance Metrics   ○ Claim Database   ● *Provider Information*   **UPLOAD**

Uploaded Report Preview

Provider-Info-CSM.pdf

Field	Details
Hospice CMS Certification Number (CCN)	123456
Hospice Agency Name and Mailing Address	ComfortCare Hospice. 1234 Serenity Lane, Peaceful Town, CA 987654
CEO or CEO Designated Representative Contact Information	Dr. Jane Smith, 1234 Serenity Lane, Peaceful Town, CA 987654, jame.smith@comfortcarehospice@com, (555) 123-4567
Supporting Information	Quality Measures: Timeliness of Care
Additional Information Requests	CMS may contact Dr. Jane Smith for more details

Upload Button :
Allows the user to check and

Report Preview :
Allows user to check whether the content uploaded has been parsed correctly

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Hi 21903 !

- 🖾 Dashboard ›
- 🖻 Upload Report ›
- 🖹 View Reports ›
- ⚠ Issues Raised ›

Issue Raised

Provider ID	Provider Name	Query	Comment from Provider	Comment from Network Manager	Query Resolution Status	Original Status	Actions
21903	Albert Laboratories	CCN Number not found			ACCEPTED	ACCEPTED	Delete Report View Report
21903	Albert Laboratories	More details required			NOT ACCEPTED	NOT ACCEPTED	Delete Report View Report
21903	Albert Laboratories	Address not updated			ACCEPTED	ACCEPTED	Delete Report View Report
21903	Albert Laboratories	More information on types of services provided			IN PROGRESS	NOT ACCEPTED	Delete Report View Report

↻ Refresh   Update

Pitfalls

Scalability of Systems
The current system will not be able to handle larger number of uploads and refresh rates.

Population Distribution
The current solution assumes evenly distributed population in cities and villages that may not be the case always .

Recruitment of Providers
The recruitment of providers was not considered in the solution.

Adaptability of dashboard
Current Dashboard has rigid structure and may not be changed according to compliances of each state.

AI Accuracy
Solution relies on the AI for multiple aspects and an AI Hallucination can harm the accuracy of the systems.

Types of areas
In this solution we have just considered the Urban and Rural Areas, we can also consider the sub-urban areas.

Future Enhancements

Adaptive dashboard
We can create a dashboard which adapts to the compliance metrics particular to each state.

Recruitment of Providers
We can add a feature which display exact location of the providers on map & allow to recruit new providers.

System Architecture
We can choose more scalable system architecture for better upload and refresh rates.