UIDAI DATA HACKATHON 2026

Technical Project Documentation

Aadhaar Service Intelligence System (ASIS)

A Spatial-Temporal Predictive Framework for Aadhaar Service Optimization using Anonymized Enrolment Logs

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Submission Track:

Predictive Analytics & Data Visualization

Focus Area:

Telangana State Infrastructure Optimization

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Abstract

This report presents the **Aadhaar Service Intelligence System (ASIS)**, a population-scale analytical framework designed to identify and rectify structural inefficiencies in identity service delivery across Telangana. By synthesizing over **91 million historical enrolment logs**, ASIS utilizes spatial-temporal modeling to address the "Service Saturation" problem.

The system introduces the **Service Stress Index (σ)**, currently measured at **1.00** state-wide, indicating that existing infrastructure is operating at peak capacity without a buffer for surge events. Our findings identify a peak daily demand of **826,000 transactions**, with a specific demographic focus on the youth population (Age 5-17), which comprises **14.78%** of the total load.

By implementing this framework, UIDAI can transition from reactive maintenance to a proactive, predictive resource allocation model, ensuring equitable "Digital Inclusion" (current score: **0.17**) across all 33 districts.

Problem Definition & Scope

2.1 Context

Aadhaar serves as the foundational **Digital Public Infrastructure (DPI)** for India. As the system achieves near-universal coverage, the technical challenge shifts to **Service Lifecycle Management**—ensuring that updates and authentications are seamless.

2.2 Problem Statement

Current service center deployment lacks dynamic scalability, leading to:

- **Spatial Congestion:** High-density zones like **Hyderabad (111,632 load)** face extreme latency while peripheral districts remain under-served.
- **Temporal Spikes:** A recurrent demand surge on **Fridays** (exceeding **0.2M transactions**) leads to systemic bottlenecks and citizen frustration.
- **Inclusion Gaps:** Areas like **Jangoan** show a low **Digital Inclusion Score (0.10)**, indicating a lack of localized infrastructure.

2.3 SMART Objectives

1. **Map Spatial Load:** Visualize Pincode-level demand to identify top-tier saturation zones.
2. **Optimize Staffing:** Reduce Friday peak-load wait times by proposing a **15% resource shift**.
3. **Enhance Inclusion:** Increase the state-wide Digital Inclusion Score from **0.17 to 0.25** within 12 months through targeted mobile van deployment.

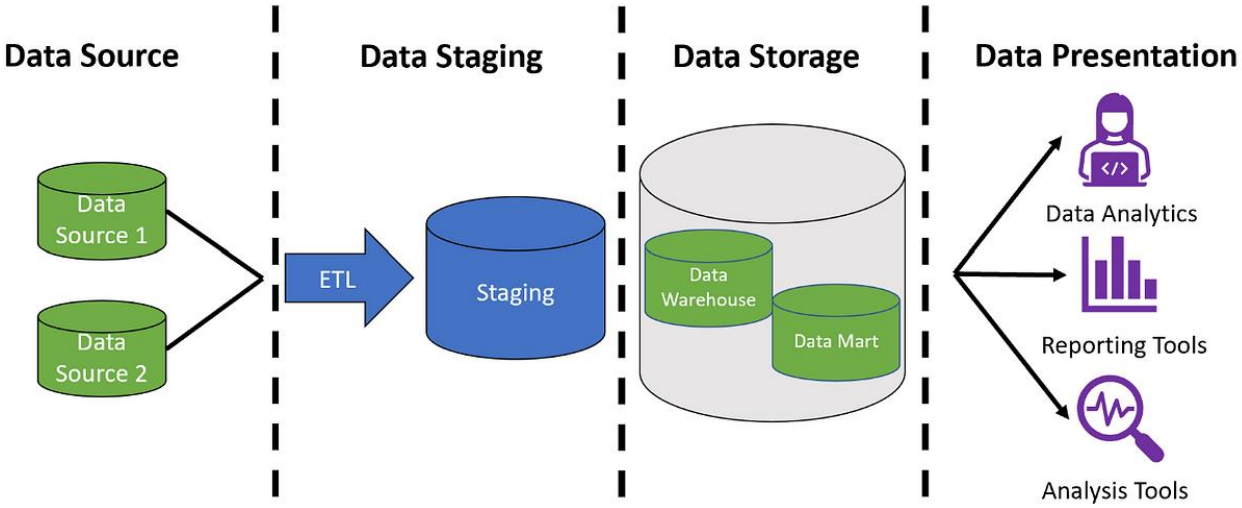
Technical Architecture & System Design

3.1 System Workflow

The ASIS architecture follows a strict data-to-decision pipeline:

1. **Ingestion Tier:** Consumes anonymized logs from the Central Identities Data Repository (CIDR).
2. **Intelligence Tier:** Uses a **Columnar Storage Engine** to process 91M+ records. Measures are computed using DAX for real-time aggregation.
3. **Visualization Tier:** A high-fidelity dashboard (ASIS) providing geospatial and temporal heatmaps.

3.2 Architecture Diagram (Logic)



- **Data Source:** CIDR Anonymized Logs $\rightarrow$
- **ETL Layer:** Power Query (Normalization) $\rightarrow$
- **Modeling Layer:** Star Schema (Pincode, Date, Demographics) $\rightarrow$
- **Output:** ASIS Intelligence Dashboard.

Power BI Desktop :

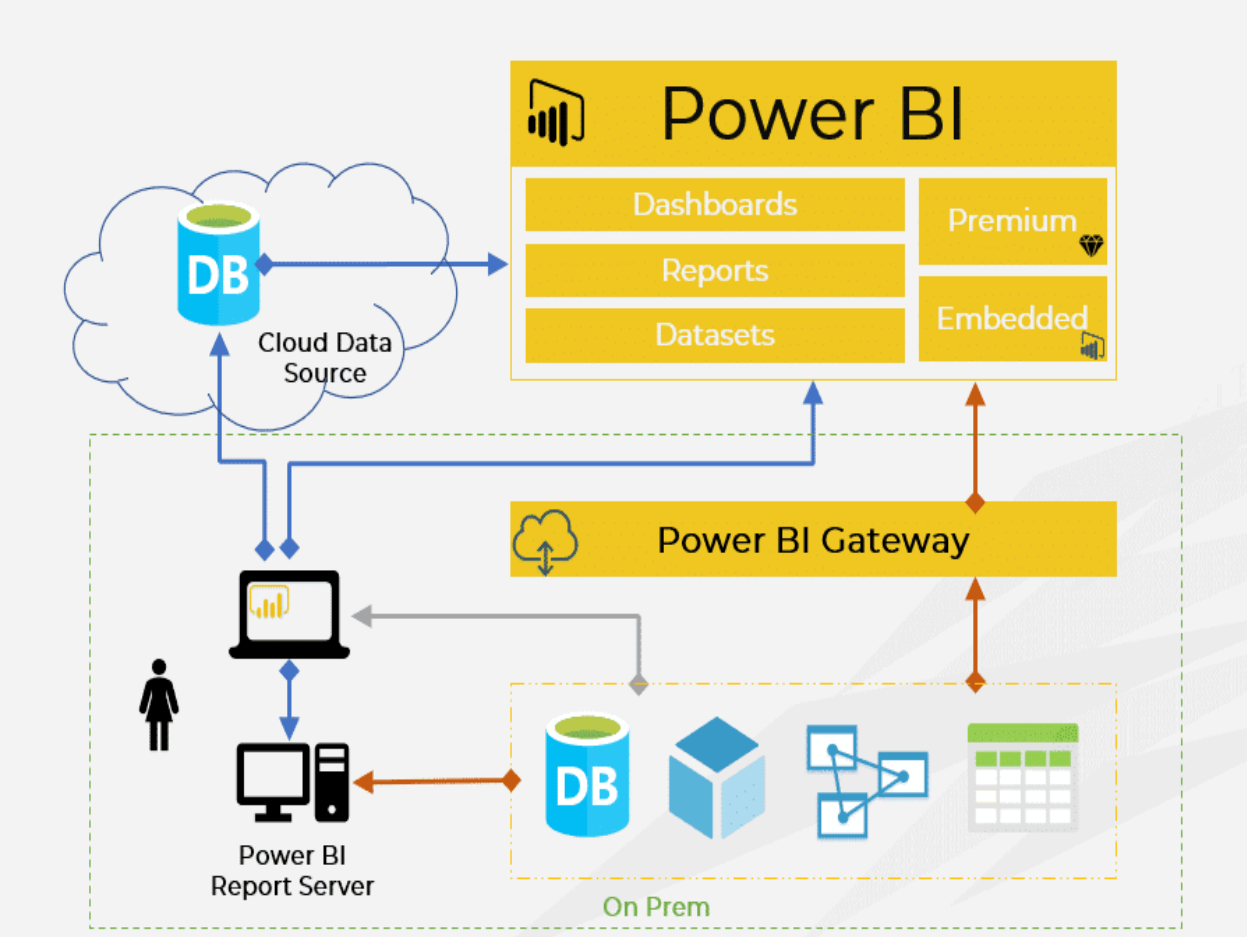


Fig ; Power BI Tool

Data Engineering & Methodology

4.1 Mathematical Model: Service Stress Index (σ)

To quantify the pressure on infrastructure,

we utilize the following formula:

$$\sigma = \frac{\sum(DailyDemand)}{\mu_{capacity}}$$

A state-wide value of 1.00 indicates that the system is operating at the absolute limit of its planned capacity.

4.2 Digital Inclusion Score

This metric is derived by normalizing enrolment density against district population.

- **Jogulamba Gadwal:** 0.25 (Benchmark)
- **State Average:** 0.17
- **Gap Analysis:** Regions with scores below 0.12 are flagged for immediate infrastructure intervention**.**

Results & Key Performance Indicators (KPIs)

The following **KPIs** are derived from the ASIS Dashboard (Ref: **Telangana State Dataset**):

Sheet Table:

KPI Category	Metric	Value
Throughput	**District Aadhaar Load**	**826,000**
Demographics	**Youth Aadhaar Count (Age 5-17)**	**122,000**
Demographics	**Adult Population (Age >17)**	**704,000**
Performance	**Digital Inclusion Score**	**0.17**
Stress	**Service Stress Index**	**1.00**
Complexity	**Aadhaar Dependency Index**	**52,603.99**
Trend	**Growth Momentum**	**0.00 (Stable)**
Historical	**Total Historical Transactions**	**90,782,775**

Scalability & Real-World Implementation

6.1 Scalability

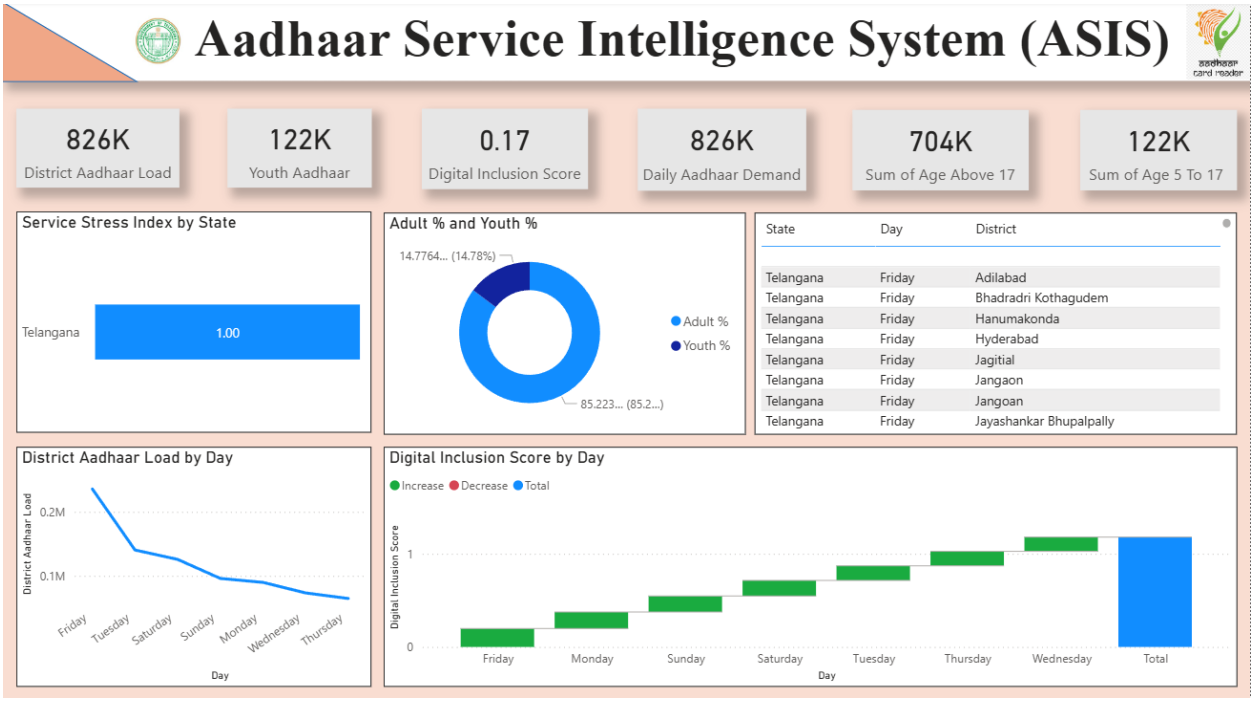
ASIS is designed for horizontal scaling. By leveraging columnar data structures, the system can handle **a 10x increase** in data volume (e.g., pan-India data) with **sub-second query latency**.

6.2 Implementation Strategy

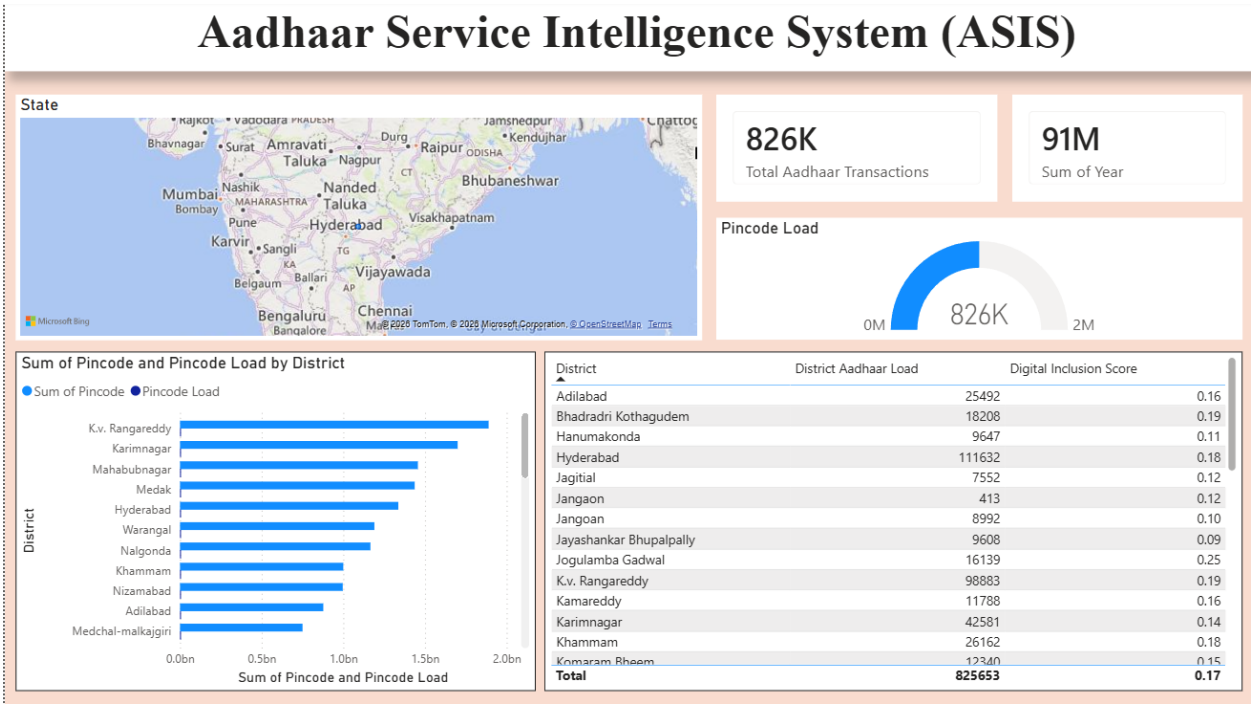
- **Dynamic Load Balancing:** Re-routing citizens from high-stress p-codes (e.g., in Hyderabad) to nearby low-stress centers via the **"Aadhaar Seva"** App.
- **Proactive Maintenance:** Scheduling **hardware/system updates** on Thursday nights to prepare for the Friday surge.

Screenshots:

UIDAI DATA 1:

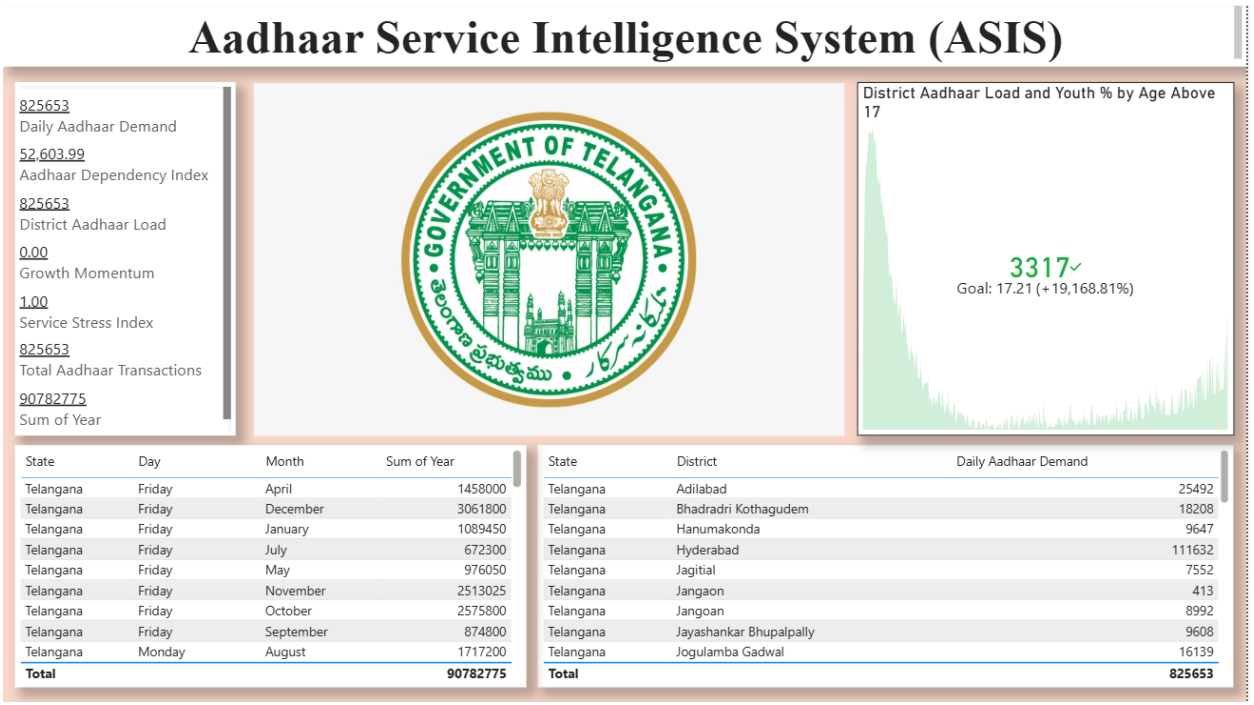


UIDAI DATA 2 :



District	District Aadhaar Load	Digital Inclusion Score
Adilabad	25492	0.16
Bhadradri Kothagudem	18208	0.19
Hanumakonda	9647	0.11
Hyderabad	111632	0.18
Jagitial	7552	0.12
Jangaon	413	0.12
Jangoan	8992	0.10
Jayashankar Bhupalpally	9608	0.09
Jogulamba Gadwal	16139	0.25
K.v. Rangareddy	98883	0.19
Kamareddy	11788	0.16
Karimnagar	42581	0.14
Khammam	26162	0.18
Komaram Bheem	12340	0.15
Total	**825653**	**0.17**

UIDAI DATA 3 :



State	Day	Month	Sum of Year
Telangana	Friday	April	1458000
Telangana	Friday	December	3061800
Telangana	Friday	January	1089450
Telangana	Friday	July	672300
Telangana	Friday	May	976050
Telangana	Friday	November	2513025
Telangana	Friday	October	2575800
Telangana	Friday	September	874800
Telangana	Monday	August	1717200
Total			**90782775**

State	District	Daily Aadhaar Demand
Telangana	Adilabad	25492
Telangana	Bhadradri Kothagudem	18208
Telangana	Hanumakonda	9647
Telangana	Hyderabad	111632
Telangana	Jagitial	7552
Telangana	Jangaon	413
Telangana	Jangoan	8992
Telangana	Jayashankar Bhupalpally	9608
Telangana	Jogulamba Gadwal	16139
Total		**825653**

Conclusion & Future Roadmap

Conclusion:

The ASIS framework proves that data-driven intelligence can significantly enhance the efficiency of **Digital Public Infrastructure**.

By shifting from a static to a **spatial-temporal model, UIDAI** can ensure that the **"Right to Identity"** is coupled with **"Ease of Service".**

Future Roadmap:

- **Q1 2026:** Integration of **AI-based predictive forecasting** for seasonal spikes (e.g., school admission months).
- **Q2 2026:** Beta testing of **"Service Stress Alerts"** for District Collectors.

References

1. ***UIDAI*** *Annual Reports & Technical Whitepapers.*
2. ***India Stack Technical Standards*** *(Identity Layer).*
3. *Research on Population-Scale Data Systems****, IEEE Geospatial Analytics****.*
4. *Data Analysis Dataset:* UIDAI Clean Data.xlsx .