

Makkal Initiative 2023_Jan2

Draft Version, dated January 2, 2023



Initiative: Innovation in Makkal Service

Epic: Domain Driven Design

Epic: Home Identifier

Epic: Golden Record at birth

Epic: Golden Record at death

Epic: Makkal Identifier for permanent residents

Epic: Makkal Identifier for guest residents

Epic: Makkal Identifier for transient persons

Epic: Bounded Context for various departments

Epic: CQRS - Command Query Responsibility Segregation



User Stories:

- UIDAI - <https://www.uidai.gov.in/en/914-developer-section.html> integration
- Build Aadhar query service
- Build query service for the current state family database



- User Entry
- Department Login
- NFSA reports
- NFSA Sales Transaction Reports
- Public Distribution Project Reports
- Warehouse Reports
- List of Hotels & Charities



- ELECTRONIC CARD SERVICES**
- Apply for electronic card
 - Status of Electronic Card Application
- COPY ELECTRONIC FAMILY CARD**
- Apply for a duplicate electronic family card
 - Copy Electronic Family Card Application Status
- ELECTRONIC CARD RELATED SERVICES**
- Add member

Application: Makkal Id Application

This document is a collective effort of 31st batch students of Madras Institute of Technology, Chromepet, Anna University, Chennai, Tamil Nadu, India.

Mission: develop innovation and entrepreneurship in student community

Innovation: Single Source of Truth for the state administration

Entrepreneurship: Innovators create wealth; two Phd students developed Google Search Engine at Stanford; Google still shares revenue with Stanford; We could develop both innovation and entrepreneurship at the university. Students working on an epic could go out and start implementing and maintenance of the state family database.

Exploration is **the act of searching an unfamiliar area in order to learn about it**. It involves the discovery of new information; students and gurus gather to explore the sports initiative; both hardcore technical students as well as entrepreneur students participate in the exploration.

CERTIFICATE FOR AADHAAR ENROLMENT/ UPDATE					
<i>Instructions: All details to be filled in Block Letters</i>			<i>(To be valid for 3 months from date of issue)</i>		
<i>To be printed on plain A4 paper size;</i>		<i>Not required to print on letter head;</i>			
12 07 2022					
Resident's Details					
<input checked="" type="checkbox"/> Resident <input type="checkbox"/> Non-Resident Indian (NRI) <input type="checkbox"/> New Enrolment <input checked="" type="checkbox"/> Update Request					
Aadhaar Number: <small>(For update only)</small>	123456789012				
Full Name:	MOHAN KUMAR				
C/o:	MAHESH KUMAR				
House No./ Bldg./ Apt:	A - 312 15				
Street/ Road/ Lane:	BLOCK - D4				
Landmark:	NEAR OXFORD LIBRARY				
Area/ Locality/ Sector:	MOHAN NAGAR				
Village/ Town/ City:	INDRAPURAM				
Post Office:	INDRAPURAM				
District:	GAZIABAD				
State:	UTTAR PRADESH				
PIN Code:	201007				
Date of Birth:	01	01	1990	 <small>Signature of the Resident Thumb/ Finger Impression</small> 	
Certifier's Details (To be filled by the certifier Only)					

Requirements:

From various public domains.

Tamil Nadu e-Governance Agency has requested a proposal for the selection of system integrators for the implementation and maintenance of master data management (MDM) and De-duplicate tool for state family database (SFDB) in Tamil Nadu. According to the tender document proposal for Makkal ID, "each residence should be provided with a unique individual ID which will be known as 'Makkal ID'. 'Makkal ID' should be generated as a random number and not as a pattern-based number with encoded information or the alphanumeric string".

"Let us mark keywords from the above statement."

- Implementation and Maintenance
- MDM - Master Data Management
- SFDB - State Family Database
- Makkal ID
- Unique ID for each residence
- Random number

- Not as a pattern based
- Encoded information
- Alphanumeric string



https://it.tn.gov.in/en/TNEGA/State_Resident_Data_Hub

SRDH - State Resident Data Hub

During Governor's Address 2013 and Budget Speech, 2013-14, it has been announced that the State will create the State Resident Data Hub (SRDH) as a unified data repository with biometry enabled citizens data derived from the National Population Registry to service all departments. Now it is renamed as "Makkal"

Orders have been issued in G.O.Ms.No.21, IT department, dated 29.11.2013 giving administrative approval for the project.

AIM

Makkal Application is a unified Aadhaar enabled Database of all citizens. This repository will be made available to all departments which deliver services to citizens. It will help the

Government in better targeting, effective service delivery, greater accountability and more efficient monitoring of schemes. It is also proposed to use it to put in place a biometric or Aadhaar based payment system to disburse welfare benefits to citizens.

The Makkal Application aims to enable the State to:

- Manage complete State Level Resident Data in a digitized, centralized and secured manner.
- Utilize Aadhaar number to uniquely identify citizens (the beneficiaries of different schemes implemented by the Government).
- Integrate Aadhaar enabled National Population Register (NPR) data with departmental utility databases on a real time basis.
- Incorporate Aadhaar authentication into various departments.

Departments proposed to be covered under the project:

S.No	Departments & Schemes
1	Department of Civil Supplies – Public Distribution System
2	Department of Social Welfare/Revenue – Old Age Pensions
3	Department of Rural Development – MGNREGA, IAY/CM's Green House Scheme
4	Department of Health & Family Welfare – Comprehensive Health Insurance Scheme

5	Department of Labour & Employment – Schemes for Unorganized Labour Welfare Boards
6	Department of Adi-Dravidar and Tribal Welfare – Scholarship Schemes, Department of BC, MBC and Minorities Welfare – Scholarship Schemes
7	Department of Social Welfare – Welfare Schemes
8	Department of Revenue (Land Administration), Department of Registration
9	Department of School Education - Common Database/Smart card / laptop schemes
10	Department of Commercial Taxes –Dealer Authentication using Aadhaar
11	Department of Revenue Administration Disaster Management & Mitigation – Priceless Saree-Dhoti

12	Department of Social Welfare & Nutritious Meal Programme – Integrated Child Development Scheme
13	Department of Treasuries & Accounts – Pensioners database & Employees database

Aadhaar Linking

Aadhaar linking is a process by which Unique IDs of residents are included in the service delivery database of service providers for enabling Aadhaar based authentication during service delivery.

Aadhaar Authentication

Aadhaar Authentication is the process wherein Aadhaar Number, along with other attributes including biometrics are submitted online to the Central Identity Data Repository (CIDR) for its verification on the basis of information or data or documents available with it. Aadhaar authentication provides several ways in which a resident can authenticate themselves using the system. At a high level, authentication can be using Demographics data and/or biometric (FP/Iris) data and/or OTP.

During the authentication transaction, the residents record is first selected using the Aadhaar Number and then the demographic/biometric inputs are matched against the stored data within CIDR which was provided by the resident during enrolment/update process.

Authentication User Agency (AUA)

An organization or an entity using Aadhaar authentication as part of its applications to provide services to residents. Examples include Government Departments, Banks and other public or private organizations. All AUAs (Authentication User Agencies) must be registered within the Aadhaar Authentication server to perform secure authentication.

Tamil Nadu e-Governance Agency (TNeGA) has registered itself with UIDAI as an Authentication User Agency (AUA) for the State of Tamil Nadu.

Sub AUA (SA)

An organization or a department or an entity having a business relationship with AUA offering specific services in a particular domain. All authentication requests emerging from an AUA contain the information on the specific SA. For example, a State Government being an AUA can have the health department under them as the SA using Aadhaar authentication while providing healthcare benefits.

Authentication Service Agency (ASA)

An organization or an entity providing secure leased line connectivity to UIDAI's data centers for transmitting requests from various AUAs. All connections to production authentication servers must come through private and secure connections through ASAs. Those AUAs who wish to provide their connectivity can become their own ASA whereas smaller AUAs who do not wish to create direct leased line connection to UIDAI's data centers can use an ASA. BSNL has been chosen as the ASA for the Makkal Application.

Know Your Customer (KYC)

A fundamental building for service delivery is the KYC (Know Your Customer) process, which establishes the identity of the resident, their address and other basic information such as their date of birth and gender. Typically, this KYC information is combined with other information at the point of service delivery to determine eligibility – either for an LPG connection, a scholarship, a loan, a social security pension, a mobile connection, etc. The Aadhaar e-KYC service provides an instant, electronic, non-repudiable proof of identity and proof of address along with date of birth and gender. In addition, it also provides the resident's mobile number and email address to the service provider, which helps further streamline the process of service delivery. e-KYC may be performed at an agent location using biometric authentication, as well as remotely using an OTP on a website or mobile connection. The Aadhaar e-KYC ecosystem has been designed to be scalable just like the enrollment, updation and the authentication ecosystems. It follows the same operating model as that of the Aadhaar authentication ecosystem.

KYC User Agency (KUA)

KUAs are the entities currently acting as the Authorization User Agents (AUAs) and who are eligible to use e-KYC service in compliance with UIDAI's policies/procedures. Please note all KUAs are AUAs but converse is not true. The existing AUA providers should explicitly register with UIDAI to enable them to provide e-KYC service to their customer base. The e-KYC service responds with resident demographic/photograph information to authorize the resident and uses the information to provide additional services.



<https://www.thenewsminute.com/article/makkal-id-not-similar-aadhaar-card-says-tn-e-governance-director-171384>

'Makkal ID' is not similar to Aadhaar card, says TN e-Governance Director
Tamil Nadu's State Family Database (SFDB) will provide a unique Makkal ID
to each citizen, which is expected to provide a 360-degree profile of the state's
residents.

The Tamil Nadu government has invited tenders to bid for the database
handling of the 'Makkal ID', which is to be issued to the state's citizens. In a
bid to strengthen data-centric governance in the state, the government is
setting up a State Family Database (SFDB), which is described as a "single
source of resident data" for the state. The SFDB, which will provide a unique

Makkal ID to each citizen, is expected to act as a comprehensive citizens' data repository.

It may be noted that the SFDB was preceded by the State Resident Data Hub (SRDH), which was supposed to be an Aadhaar-linked repository of citizens' data for '360-degree profiles' of residents. The aim of the repository was to derive data from the National Population Registry (NPR) for services provided by all departments. However, the nationwide operation was later dropped.

Speaking to TNM, Director of e-Governance/Chief Executive Officer Praveen P Nair clarified that Makkal ID is not similar to Aadhaar ID. "There will be no physical card provided to the citizens. Rather, it will be a backend number that helps the government avoid duplication of a person's identity — through misspellings or other reasons. The purpose of Makkal ID is to integrate different types of databases existing under different departments," he said.

Praveen also added that there will be no survey or citizen data collection carried out for the creation of the database. "The intention of the SFDB is not to collect the database of citizens. Its primary objective is to interlink different departments' databases," he said, adding that the tender that has been passed now is just a partial implementation of a Government Order (GO) passed in 2021.

Our notes:

- No physical card
- Makkal ID will be a backend number
- Avoid duplication of person's identity
- Integrate different types of databases
- No survey
- No citizen data collection

What is the State Family Database?

SFDB is a platform that will act as a single source hosting the details of the state's residents. The data provided by SFDB shall be "most current, relevant, complete, logically consistent, and comprehensive", and can be used by all the government departments.

Our notes:

- SFDB - single source of truth
- All government departments would be consumers of Makkal Service

Why such a database?

The government, in its tender, has said that the SFDB has been introduced keeping in mind that there is a large volume of data with the government in different platforms and technology stacks. This has created challenges in providing “efficient, transparent, and seamless delivery of services” to the residents of Tamil Nadu. “SFDB is envisioned as a data driven decision support infrastructure for improving Governance by aiding planning, implementation and execution of government schemes and programs,” the tender says.

The SFDB is expected to streamline service delivery by enabling cross-department data harmonization and synchronization. It will also assist policy makers in making the right decisions by providing data-driven policies. The platform will be set up and maintained by the Tamil Nadu e-Governance Agency (TNeGA).

TNeGA has now floated a tender inviting proposals from firms who specialize in the domain of “big data, open source technologies, data analytics, data warehousing, master data management solutions” for the implementation and maintenance of SFDB.

Our Notes:

- Big data
- Open Source
- Data Analytics
- Data Warehousing
- MDM
- Implementation and Maintenance

“A person might have his name spelled differently in different databases. This would mean that they have multiple identities and be counted as multiple people across the system. The objective of the SFDB is to create a golden record for a person, which will help us identify a person across the databases of different departments,” Praveen said, adding that the SFDB will also be used to identify if a person misses out on a policy or scheme. Golden record encompasses all the data in all the departments related to a particular person.

Our Notes:

- Golden record for a person
- Single Source of Truth
- One Person - One Entry
- No missing person
- No duplicates or multiple entry

What will the SFDB do?

The primary aim of the SFDB is to connect the existing applications and database to the updated ones, in order to improve governance through effective service delivery, greater accountability of government departments, and more efficient monitoring of government schemes. Further, it will also support data driven policy-making and improve transparency within government departments. Once SFDB comes into operation, new services can be easily designed and integrated into the database.

What is Makkal ID?

Makkal ID is supposed to be a unified Aadhaar-enabled database of all citizens of the state. The SFDB will contain all the data of all the citizens in one place, which can be accessed through the Makkal ID. The data repository will be made accessible to all departments that provide services to citizens. Each resident will be provided with a unique ID known as ‘Makkal ID’. It will be a string of ‘random numbers’ consisting of 10-12 digits. The government’s idea is that this randomness will make it difficult for anybody to guess a person’s number.

"It is purely for administrative convenience, and is not meant to be an identity card," Praveen clarified.

Our Notes:

- Makkal ID is for administrative convenience
- Not to be an identity card

What does Makkal ID do?

- > It manages the data of the state's residents in a digitized, centralized, and secure manner.
- > It incorporates Aadhar authentication into various departments.
- > It identifies if a person is eligible for a scheme, but is not a beneficiary of it.
- > Combined with all the other state department databases, the SFDB would also become a 360-degree profile of Tamil Nadu residents.
- > If a person brings any identity card to any office, that card shall be used to find the person within any database of any department in Tamil Nadu.

According to the tender floated by the government, the existing core database available with the state government is that of the Public Distribution System (PDS). It contains demographic details about around seven crore residents in Tamil Nadu. Further, each department has their own database. The multiple databases shall be compared against the PDS data and a Makkal ID will be assigned. This will facilitate data exchange across the databases.

PHOTO IDENTIFICATION FOR AADHAR CARD



Key	Value	Description
Area	130,058 sq km	
Population	72,147,030	
Districts	38	
Family Cards	20,945,676	

Beneficiaries	67,621,965	
Corporation	15	
Municipality	121	
Town Panchayat	528	
Village Panchayat	12,524	


GOVERNMENT OF TAMIL NADU
Information Technology and Digital Services Department
Tamil Nadu e-Governance Agency (TNeGA)


E-TENDER NOTICE

Online tenders are invited by the Chief Executive Officer (CEO), Tamil Nadu e-Governance Agency (TNeGA), towards the **Selection of System Integrator for the Implementation and Maintenance of Master Data Management (MDM) and De-Duplication Tool for State Family Database (SFDB) in Tamil Nadu.**

The tender document (RFP) can be downloaded at free of cost from <https://tntenders.gov.in/>, <https://tnega.tn.gov.in/> from **23.12.2022, 14:00 hrs.**

Pre-bid meeting is scheduled online on **29.12.2022 at 11:30 hrs. through video conference (VC)** by TNeGA and the link for the VC can be referred in the RFP.

EMD for an amount of Rs.5,00,000/- has to be paid through online mode. Last date and time for online submission of bids through <https://tntenders.gov.in/> (e-Tender) is **09.01.2023 till 16:00 hrs.** Technical Bid shall be opened online on **09.01.2023 at 16:30 hrs.** Bidders are advised to participate in the pre-bid meeting scheduled by TNeGA.

DIPR/ 5675 /TENDER/2022

* **Chief Executive Officer,
Tamil Nadu e-Governance Agency.**

"தமிழ்நாட்டு அரசு, தமிழ்நாட்டு முனிஸிபல் குழுமம்"

Tender No.: TNeGA/MDM/2022-23
Tender Title: Selection of System Integrator for the Implementation and Maintenance of Master Data Management (MDM) and De-Duplication Tool for State Family Database (SFDB) in Tamil Nadu

 Last Date to Submit	 Date & time of opening of Technical Bid	 Status
09-01-2023 @ 16:00 hrs	09-01-2023 @ 16:30 hrs	Open

“January 9, 2023 - would it be possible?”

“Could we ask for exemption from paying the tender amount of Rupees Five Lakhs?”

“How could students have previous implementation?”

“Educational Institutions need to be exempted from MEC.”

“What is MEC?”

“Minimum Eligibility Criteria.”

“Exemption also from submitting FORM TECH 1 and 2.”

“Straight to PoC.”

“Proof of Concept.”

“To develop PoC, we need hardware, servers.”

“Each one of us could sign-up for a trial free account.”

“Google Cloud, AWS and Azure.”

“PoC - we could build it.”

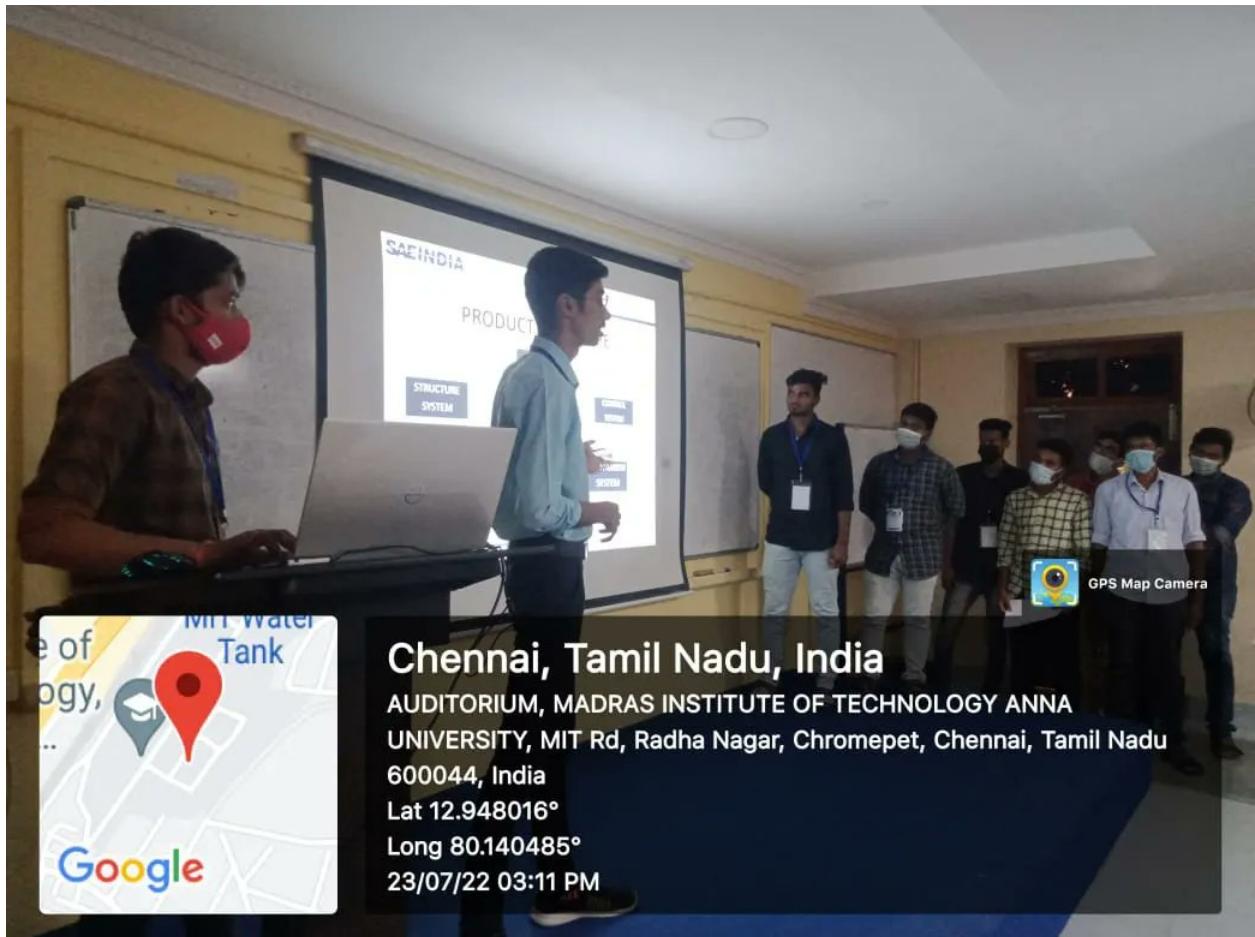
“This could be the need for all states in India.”

“Maybe in all countries.”

“We could learn to model real-life challenges.”

“Could we open source our model?”

Exploration



Our Notes:

- Golden Record solution on non-unique attributes like
 - Name
 - DoB
 - father's name
 - Address
 - phone no
 - email id
- With unique identifiers
 - PAN
 - Aadhaar
 - Driving License
 - Ration Card
 - Phone Number
- Search Query by
 - Name
 - Name + Father's Name

- Name + Address + Age
- Identifier
- Creation of Makkal Id - T1=30 days
- Creation of Golden Record T2=T1+15 days

“Why do we need a new system?”

“Current systems are like Navagraha. They don’t communicate with each other.”

“Even the new system does not integrate all departments.”

“Makkal Identifier would be at the center and all departments refer to Makkal Id.”

“Like a Sun at the center of the Universe.”

“Would one identifier solve all the chaos and confusion?”

“No. Certainly not. But it would be the beginning for refactoring the government platform.”

“Why do we need to create the Makkal Id first and then create the Golden record?”

“Government doesn’t have clean data; missing, duplicate and multiple entries exist.”

“First get the raw data; refine it to the silver layer; further refine it to the gold layer.”

“With unique identifiers such as PAN, Aadhaar, Drivers License, it may be possible.”

“With non-unique parameters Name, Address, DoB, Father’s name also, you could refine the raw data into silver and gold.”

“How!”

“With human and artificial intelligence.”

“Do you say that we could create Golden Makkal Id, right from the beginning.”

“Yes. We need to build the foundation first.”

“Do you need PAN, Aadhaar data?”

“It would be better. We could start with state data.”

“How do you refine state data?”

“To start with we need a static reference; immutable, static information.”

“People are always on the move.”

“That’s right. People are on the move. At the end of the day, everyone needs to come back home.”

“Home. Residence. Address. It is static and immutable.”

“For Home, we don’t need any assistance from the Union.”

“Property Registration. Property Tax. Water. Electricity.”

“Before Makkal Id, we could build Home Id.”

“Home Id or Residence Id or Property Id.”

“Home id. Everyone lives in only one home.”

“Home could be your own home, rental.”

“Home is a home.”

“For instance - 18 Raghava Veera Avenue, Poes Garden, Chennai”

“Home id would be a random number; seed could be geo-location.”

“For instance, Home Id - 765492172839.”

“For that Home, what will be the Makkal Id?”

“459298347429 - Makkal Id for Rajinikanth.”

“873429307284 - Makkal Id for Latha.”

“Golden Record is created.”

“But Rajini has several properties. Ragavendra Mandapam too.”

“Artificial Intelligence would be trained to get the list of all properties and find the home for that person and their family.”

“Home identifier. Makkal Identifier. Makkal Movement would capture the current home.”

“What is the Makkal Movement?”

“At present, you are studying at MIT; you live at Birla Hostel.”

“Okay.”

“Makkal Movement query would provide two records.”

“How?”

“First record would be your home in Madurai; second record would be at MIT Hostel.”

“Every year, students move from one hostel to another.”

“That would be too many records without any significance. Let us have only one MIT Hostel for four years.”

“What is the advantage?”

“No advantage; it would be a disadvantage to your father.”

“How?”

“You are here. But your father collects rice, sugar in your name in Madurai.”

“What else?”

“Just like your use case, we need to explore several use cases.”

Home Identifier



96, Varadharajapuram, Poes Garden, Teynampet,
Chennai, Tamil Nadu 600018, India



27R3+H9 Chennai, Tamil Nadu, India

“From Property Registration, we get this address.”

“96, Varadharajapuram, Poes Garden, Teynampet.”

“Okay. Who owns the property?

“Senthil.”

“From the Electricity Department, who lives in that home?”

“Senthil.”

“Owner lives in his own home. It is a simple and straightforward use case.”

“If the names are different then it may be a rental home.”

“Could we have a model for Home?”

“From Domain Driven Design, Home is an Entity.”

“HomeEntity”

“What are the attributes for HomeEntity?”

“Address. Owner. Rental.”

“Could we have a real-life example?”

Address: 96, Varadharajapuram, Poes Garden, Teynampet.

Owner: Senthil

Renter: NULL

“Instead of the Owner Name, could we have the Makkal Id?”

“That would be a problem; Circular Dependency.”

“What is Circular Dependency?”

“What came first? Chicken or Egg?”

“We still don’t have Makkal Id; so let us not add here as an attribute.”

“The Property Registration Department is interested only in the owner.”

“The Electricity Department is interested only in the current resident.”

“Each department has its own boundary.”

“We couldn’t have all attributes in one Entity.”

“What are the minimum attributes we need for HomeEntity?”

“Address.”

“96, Varadharajapuram, Poes Garden, Teynampet.”

“Could we generate an identifier for the above address?”

“We could use the Google Plus Codes for identifiers.”



HomeEntity:

Identifier: 27R3+H9

Physical Address: 96, Varadharajapuram, Poes Garden, Teynampet.

“Could we break down the physical address?”

HomeEntity:

Identifier: 27R3+H9

DoorNumber: 96

Street: Varadharajapuram

Area: Poes Garden

Division: Teynampet

City: Chennai

State: Tamil Nadu

Country: India

“Why Country?”

“If we get popular, then we may build the system for the entire planet.”

“The Property Registration system, how do they model?”

PropertyEntity:

HomelIdentifier: 27R3+H9

Owner: Senthil

“Could we have the Makkal Identifier for Senthil?”

“You could provide a place holder; later, update the record from Golden Record.”

PropertyEntity:

HomelIdentifier: 27R3+H9

Owner: Senthil; Makkal Identifier: NULL

“For the Electricity Department, could we have a similar model?”

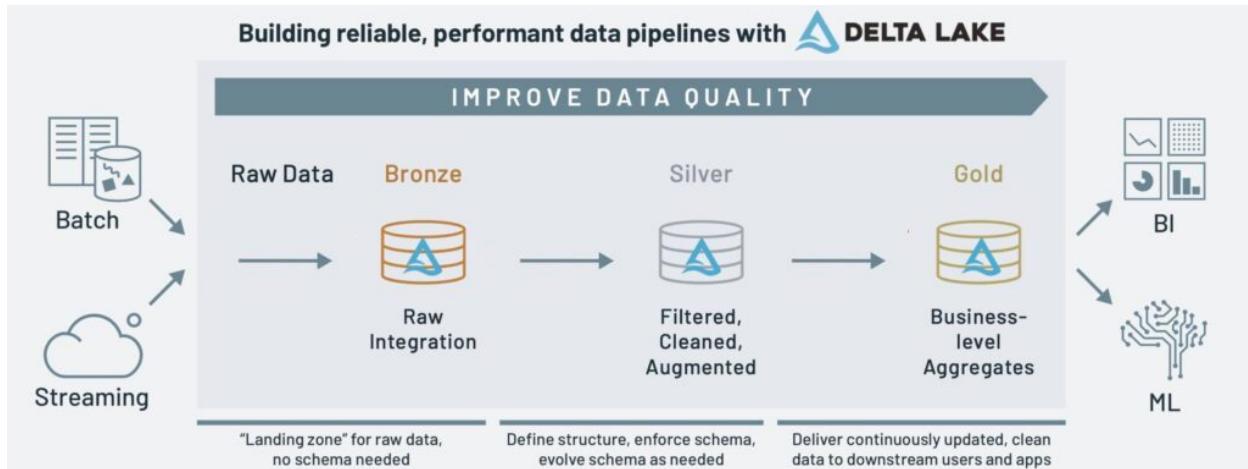
PropertyEntity:

HomelIdentifier: 27R3+H9

Owner: Senthil; Makkal Identifier: NULL

Current Resident: Kumaran; Makkal Identifier: NULL

Raw Data - Silver - Gold



“What is raw data?”

“Data from multiple sources; not unique; not authentic; not reliable.”

“Could we have an example?”

“Meenakshi Sunderaswarar family.”

Mother: Meenakshi

Father: Sunder

Children: Pillayar, Murugan

“The data looks like golden records.”

“Let us see the complex, real-life scenario; each person give them different names.”

Mother: Meenakshi, Parvathi, Angayarkanni

Father: Sunder, Chokkanathar, Siva

Pillayar, Ganesh, Vinayaka

Murugan, Kumaran, Kanthan, Velavan

“We cannot corrupt Makkar Id with so many name variants.”

“When officers query with any name, we need to return a single unique Makkal Id.”

“In PostgreSQL, we will create the Makkal Id with one primary name; in Cassandra, key-value pair, let us add all these names; and let us index them in Solr too; then the query would support any variants, including Tamil or other languages.”

Birth Certificate



"Let us create the Golden Record at birth."

"MakkalEntity."

"What are the attributes in MakkalEntity?"

MakkalEntity:

Identifier: number or alphanumeric or private key of cryptography

DoB: January 2, 2023

Mother: Makkal Identifier

Father: Makkal Identifier

Name: Surya Chandran

Other Names: Surya, Chandru

Gender: Male

Address: Home Identifier or Google Plus Code

Religion:

Caste:

Social Classification:

"Could we have religion, caste and classification, all NULL?"

"Parents' caste is for the Children."

“What about political affiliation?”

“That’s the child’s choice at the age of 18.”

“Let the child grow with NULL caste, religion, classification; at the age of 18, let the child update or leave NULL for life.”

Death Certificate



“Let us also create the Golden Record at death.”

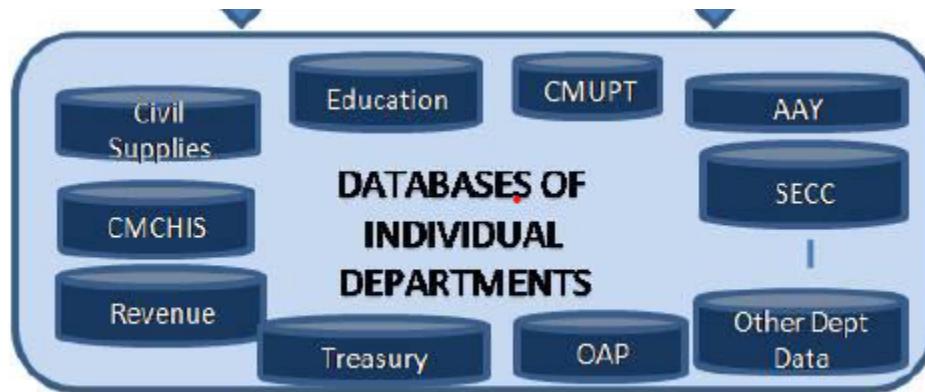
“Why?”

“Jayalalitha died in 2016; for her home, the Electricity Bill is still paid on her name.”

“We need to create a Makkal Id for Jayalalitha and be marked as EXPIRED.”

“That may be the case in many families.”

Current System



நவக்கிரகம்
ஒன்றுக்கு ஒன்று பேசாது
ஒன்றுக்கு ஒன்று பார்க்காது
ஒன்பது ரகம்

New System

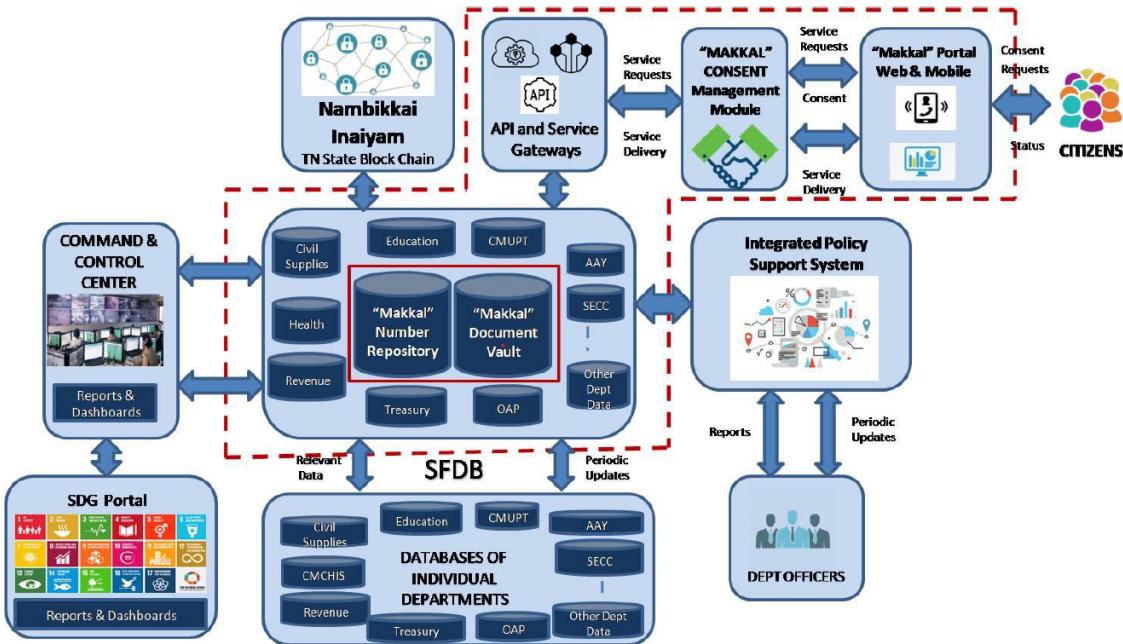
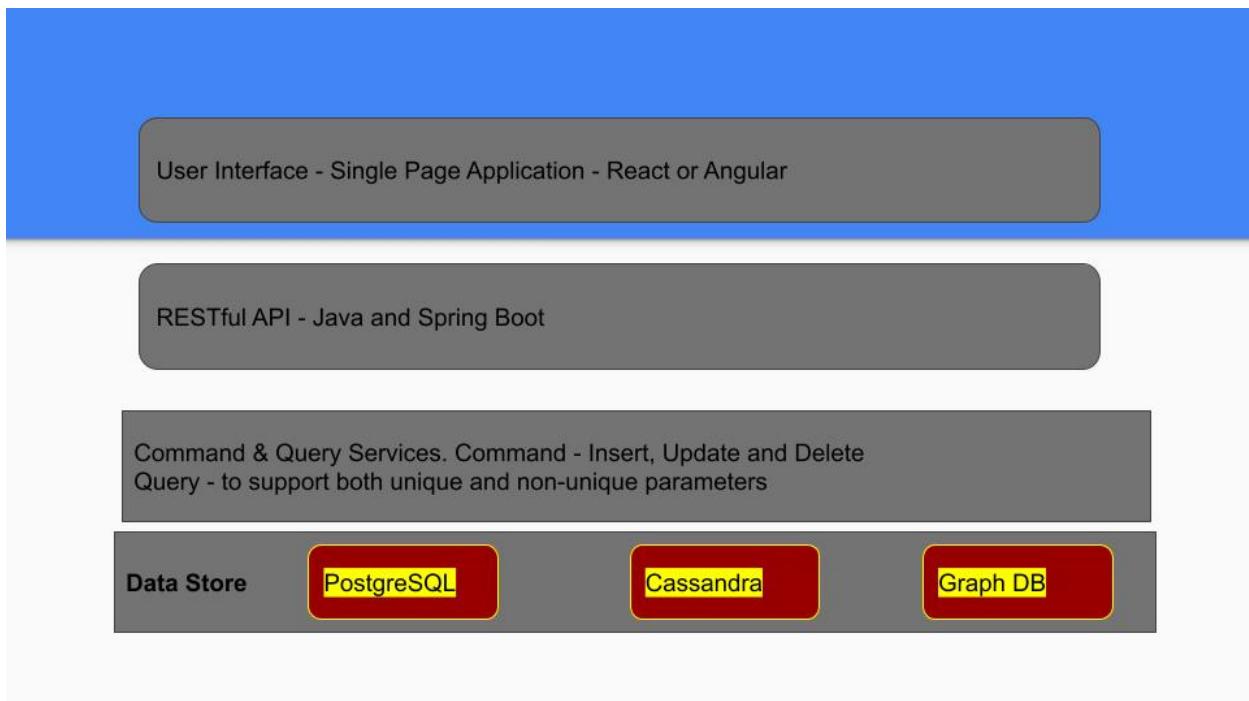


Figure 1 - Conceptual diagram of SFDB Platform and other key system interactions

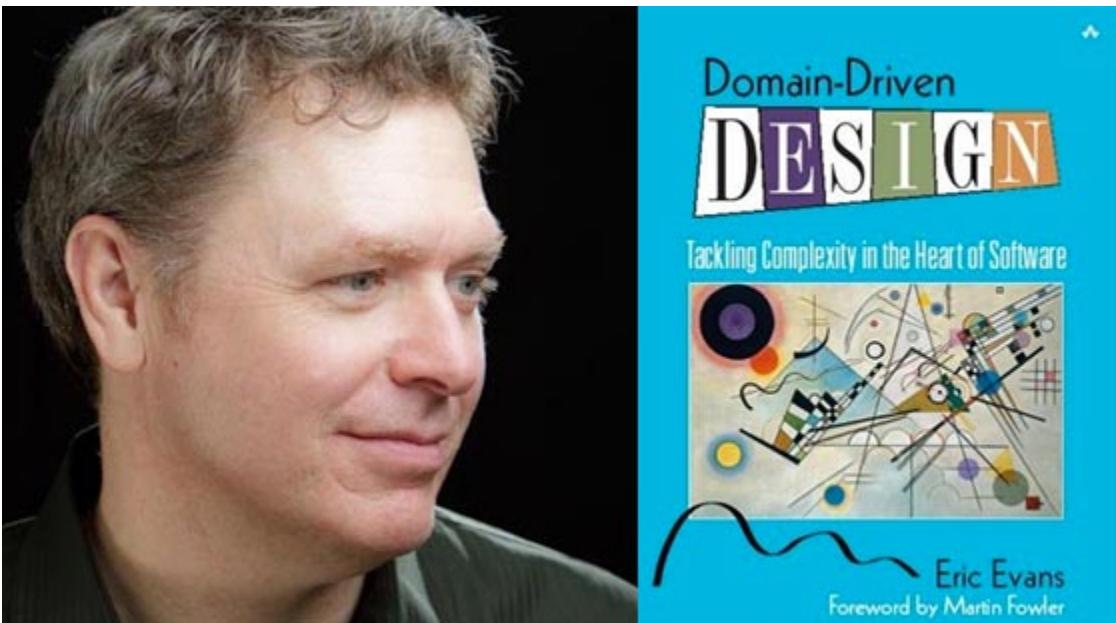


Technology Stack

Key	Value
User Interface	Single Page Application React or Angular
API	RESTful API Java Spring Boot
Core Services	gRPC Java
Transactional Database	PostgreSQL Structured Data
Cassandra	Scalable Unstructured Data
Search Engine	Solr Cloud
Graph DB	Neo4J

References:

- Domain Driven Design - Eric Evans



- Context Map - <https://www.youtube.com/watch?v=sFCgXH7DwxM>
- UIDAI - <https://www.uidai.gov.in/en/914-developer-section.html> integration
- <https://www.thenewsminute.com/article/makkal-id-not-similar-aadhaar-card-says-tn-e-governance-director-171384>
- https://it.tn.gov.in/en/TNEGA/State_Resident_Data_Hub
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