



# Multi-Modal Biometrics for One Billion People

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# Agenda

- Need
- Mandate
- UID 101
- Strategy
- Biometric Architecture
- PoC
  - Thesis
  - Early Results
- Next Steps



# Need in India

- World's 4<sup>th</sup> Largest Economy
- World's Largest Social Service Programs
  - Touches 150M Families @ \$30B/ year
  - 20 – 40 % leakage
- Middle Class Growth @ \$40M persons/year
- World's Largest Democracy:
  - 714M Voters, 364 Political Parties

Still, 600M+ people have no definitive identity



# Need in India

- Poor do not have access to benefits and services due to inability to prove identity
- No universality of identity means re-proving again and again
- No continuity and mobility of identity
- Financial exclusion
  - Only 18% people have bank accounts and only 35% have any savings
  - No access to credit
  - Savings under the mattress
- Poverty premium



# The Unique ID initiative

## Need for unique ID

To provide accessible identification that can be used for entitlement (unique and universal)

Prevent duplication of effort and leakages existent in the current system

Enable service and applications that require a verifiable unique ID (continuity and mobility)

## UIDAI mandate

To provide a unique number to the residents of India

Collect basic demographic information and biometric information

Guarantee non-duplication through biometrics

Offer online authentication services that can be used across India



# UID 101

<u>What THE UID IS</u>	<u>Why</u>
✓ Issue 12 digit number not card	• Card has misuse potential, not needed to prove identity
✓ Every individual, including infants not families	• Moving from family targeted benefits to individual targeted benefits
✓ Establishes <i>identity</i> , and is for every resident in India	• Inclusiveness
✓ Will collect basic demographic and biometric information, not collect profiling information	• Privacy and personal right protection issues
✓ Voluntary	• Demand and choice driven ID
✓ Irrespective of existing documentation	• Empowers cross-section of society not having any existing identity documents
✓ The UID will be truly unique	• Prevent duplicate IDs and ghosts in the system



# Information Collected

KYR Fields – Name, Address, Gender, DOB



Photo & Address Verification



Photo



10-fingerprints on Slap scanner

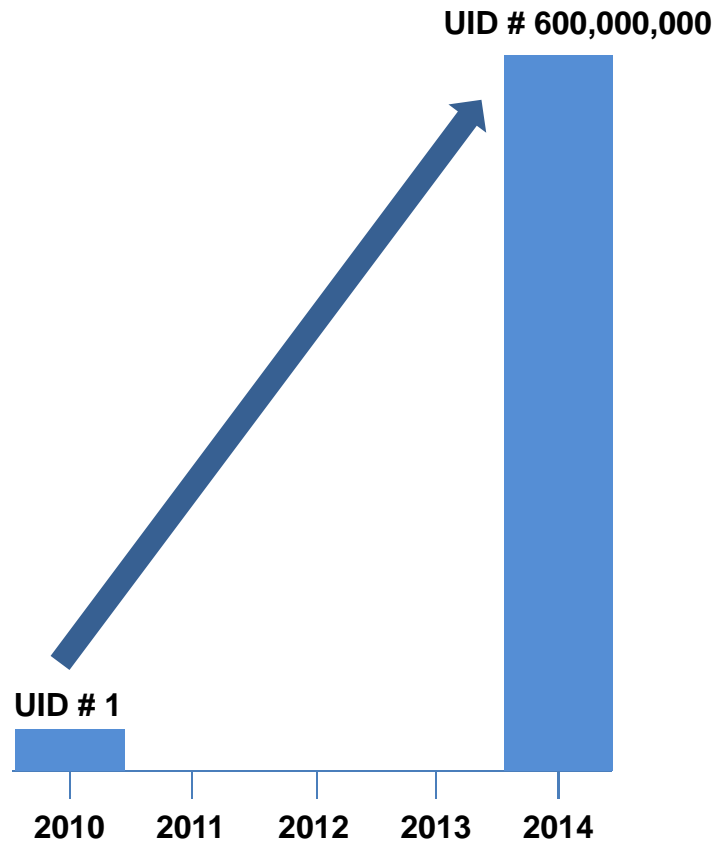


Iris Scan

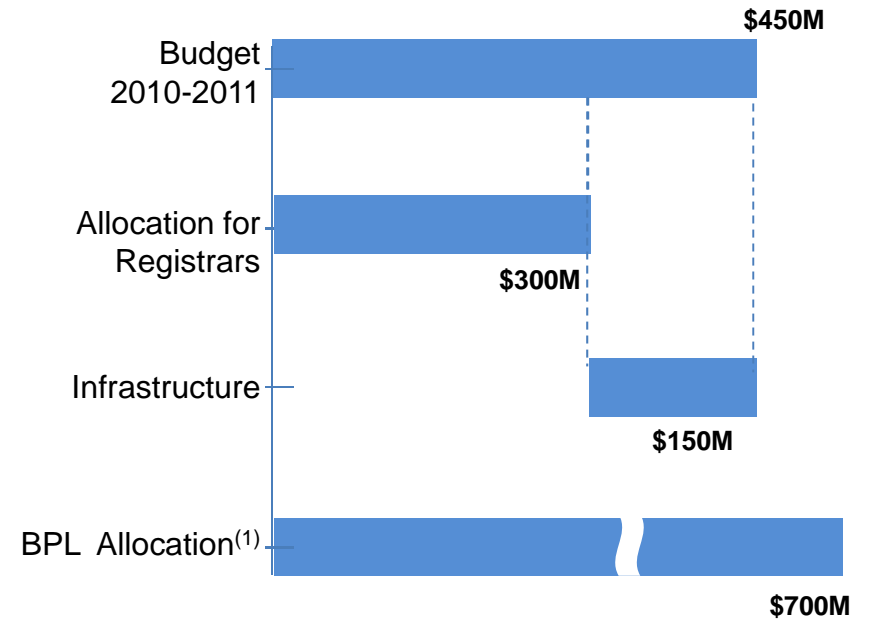




## Ambitious Targets



## Strong Govt backing



(1) Total money allocated by 13<sup>th</sup> Finance commission over next 4 years for re-imbursements to the BPL residents to enroll







# The UIDAI team

**Within Govt**

IAS

IPS

IAAS

IRS

Post

BSNL

Railways

**Strong domain expertise**

**Diverse Skill Sets**

**Outside Govt**

Entrepreneurs

Corporate Executives

Investment Bankers

Academics

Technocrats

Civil Society

Attorneys

## UIDAI



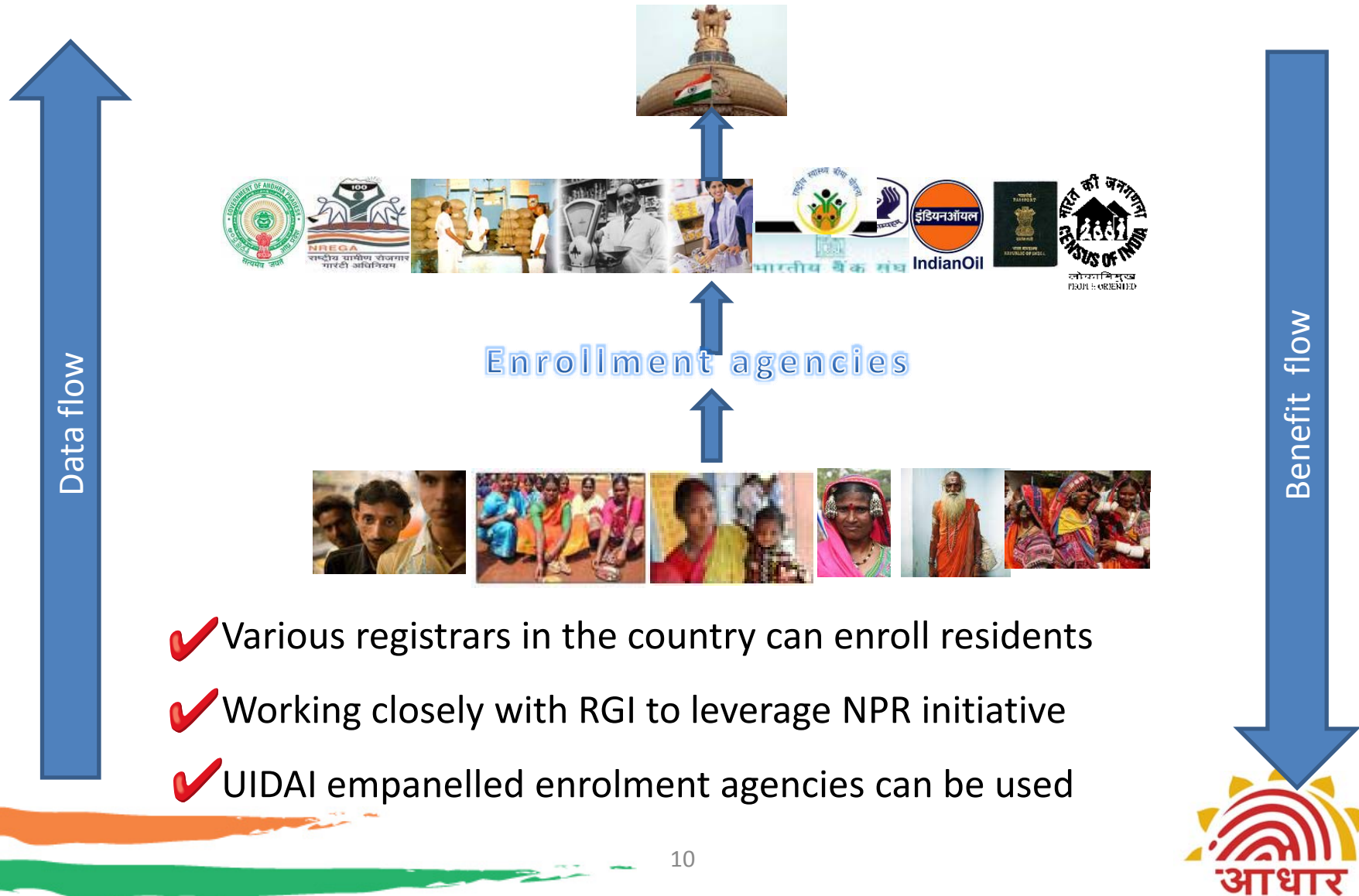
**Deputation**



**Sabbatical  
Volunteer  
NISG PMU**



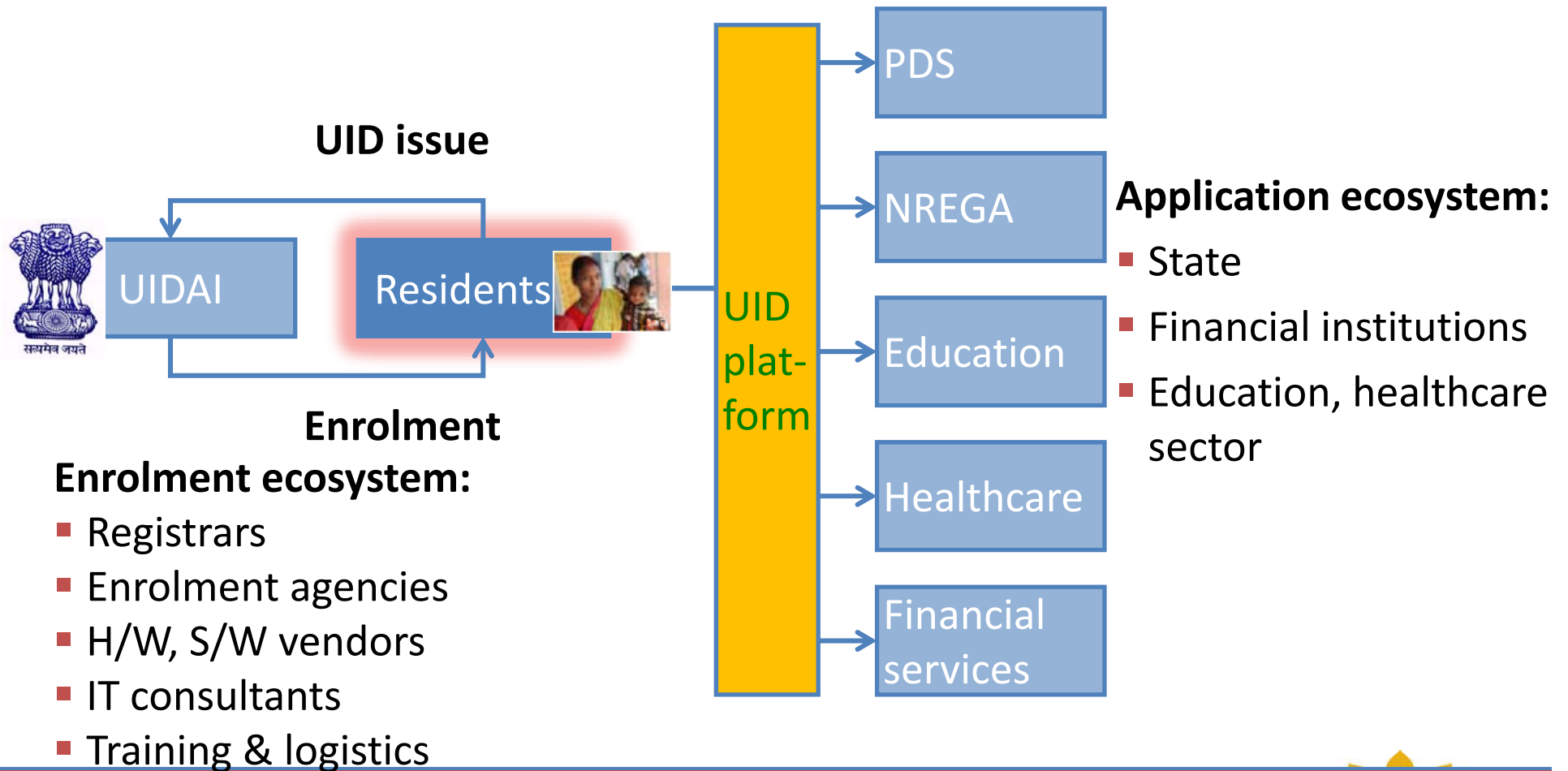
# UIDAI will enroll only through registrars



# UID flow from resident's perspective

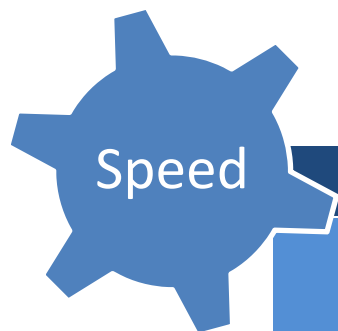
## UID enrolment

## UID application



Empowering the common man's rights and convenience, reduces poverty premium  
Creating business, employment opportunities and vibrant hi-tech industry over 5 yrs

# Status update



Category	Task	Status
Information technology	Specifying standards	Complete
	Hiring Project Management Consultant	Complete
	Setting data centre	RFP issued
	Hiring Application development agency	Complete
	Procure Biometric solution	Eol issued
	Facilitation centre	In progress
	<b>MSP selection</b>	<b>TBD</b>
Enrolment & Training	Content development	Eol issued
	Training institutes	Eol issued
	Testing and certification	Eol issued
	Device certification	Eol issued
Awareness & communication	Brand name and logo	Complete
	Advisory board	Complete
	UID value proposition document	Complete
Proof of concept	Technical studies and analyses	In progress
	Behavior & perception studies	In progress
	Diversity analysis	In progress
Registrar activation	Designing registrar enrolment strategy	Complete
	Detailed technical workshop with pilot registrars	In progress
	Designing detailed registrar activation kit	In progress
State consultation and MoUs	Kickoff meetings with all states in India	Done
	MoU signing	10 done
Legal	Consultations with consitutional lawyers	Done
	Establishing privacy framework	In progress
	Draft UIDAI act	In progress

# BIOMETRIC ARCHITECTURE

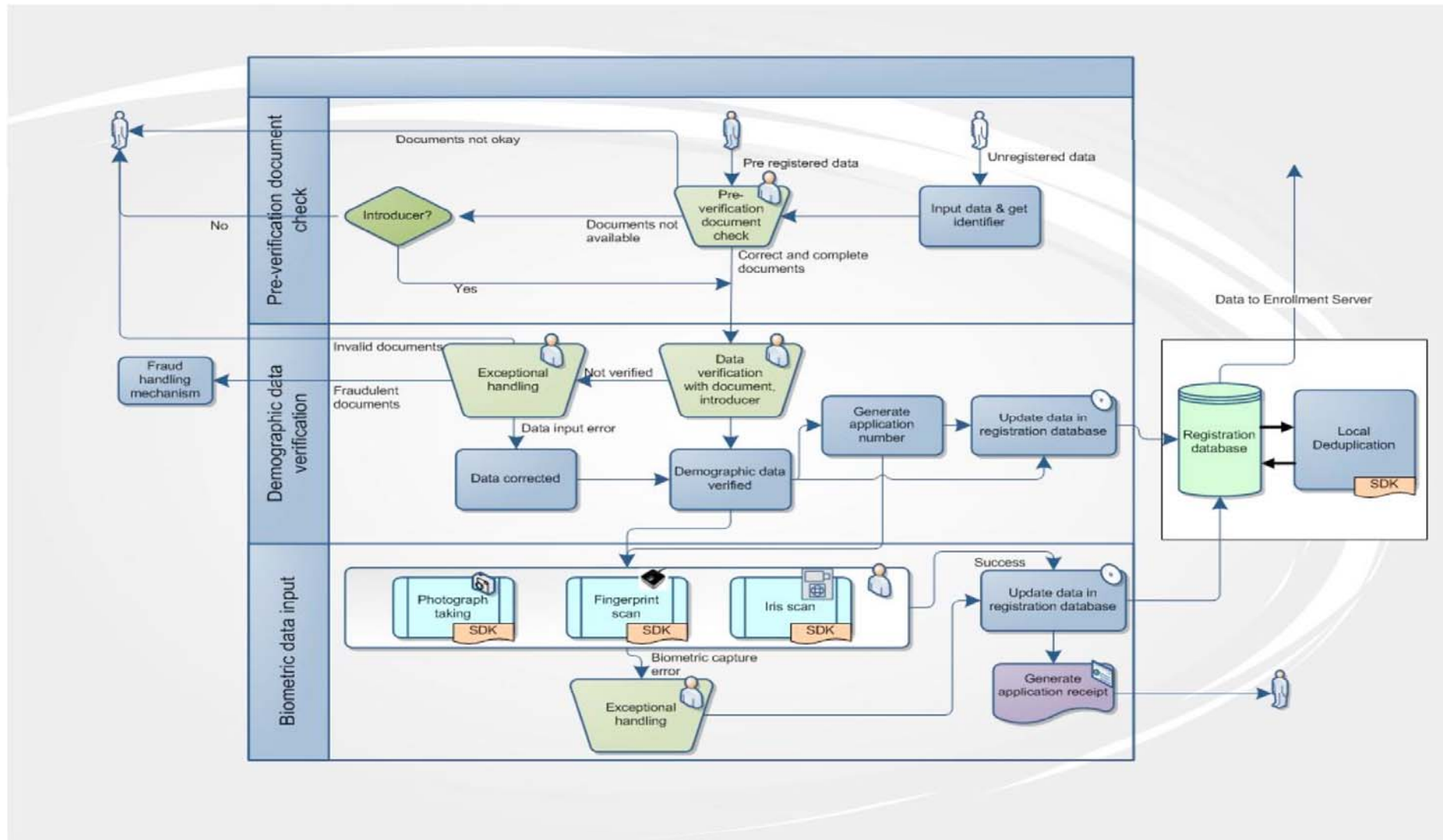


# Principles

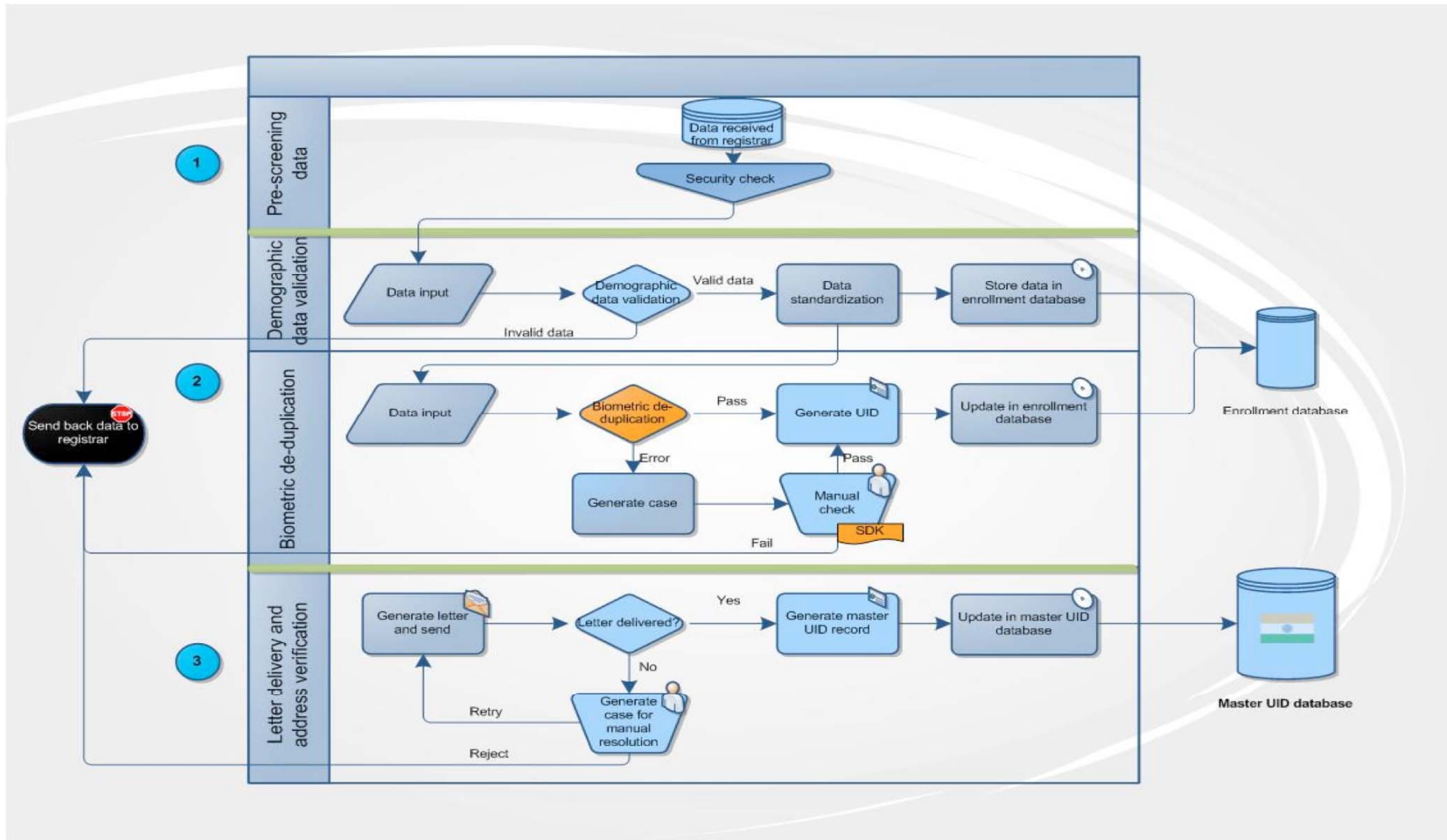
- Minimum Demographical Data
- “Over design” biometrics
  - Multiple Modalities
  - Multiple ABIS/De-duplication
- Vendor independence
- Standards & Open System
- Enrolment suitable for mobile operation
- Ubiquitous authentication



# Enrolment Client

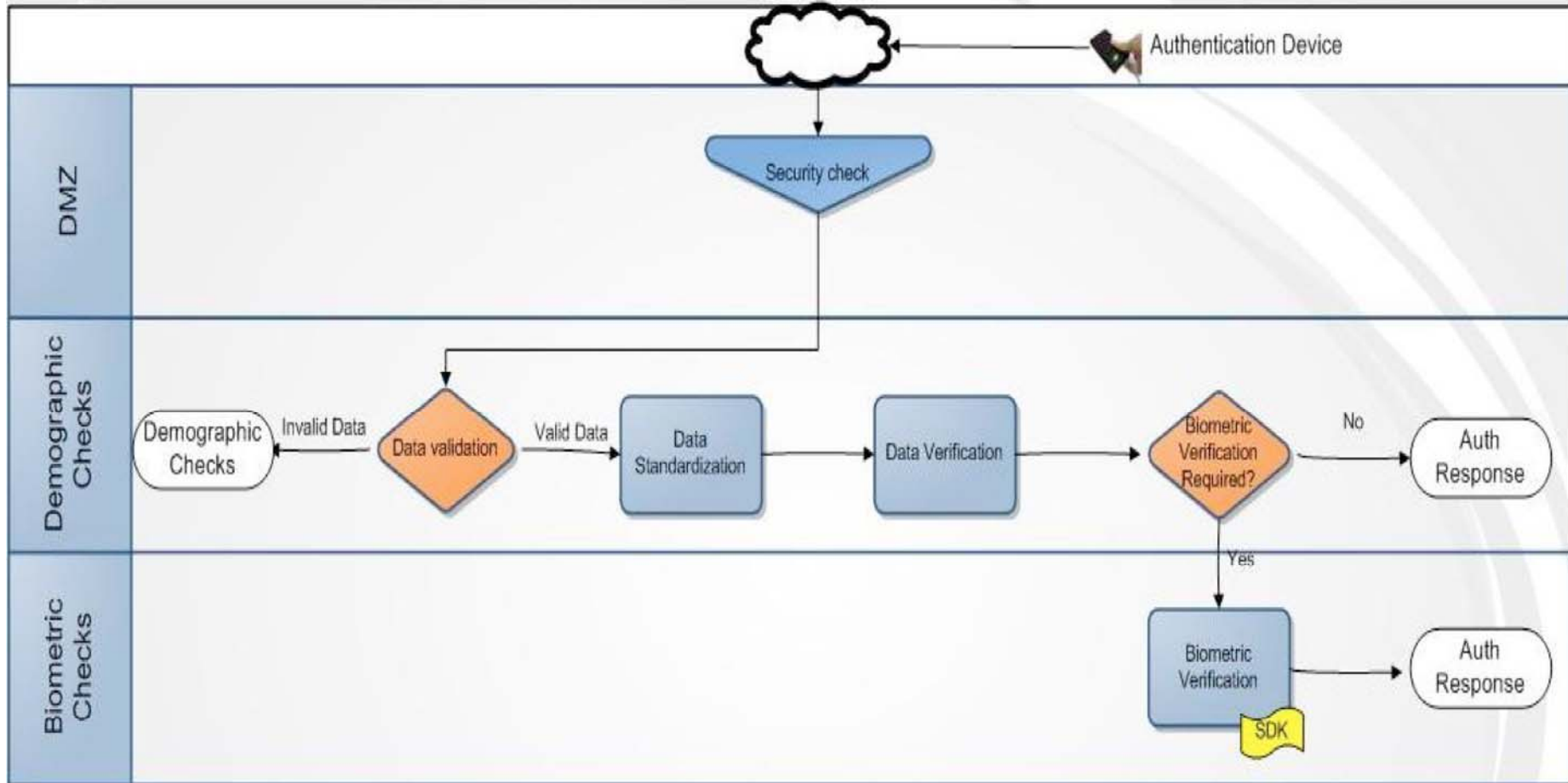


# Enrolment Server

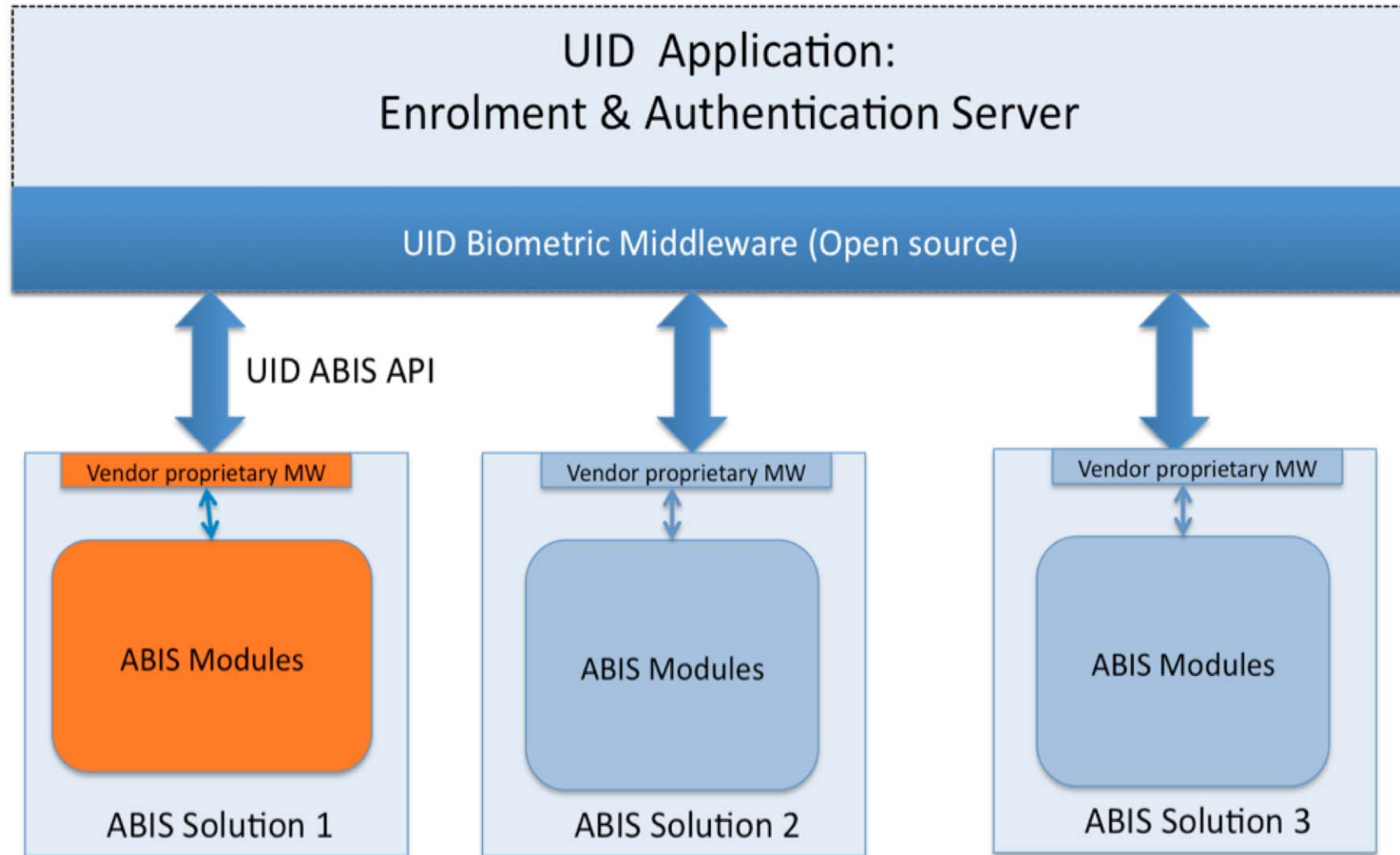




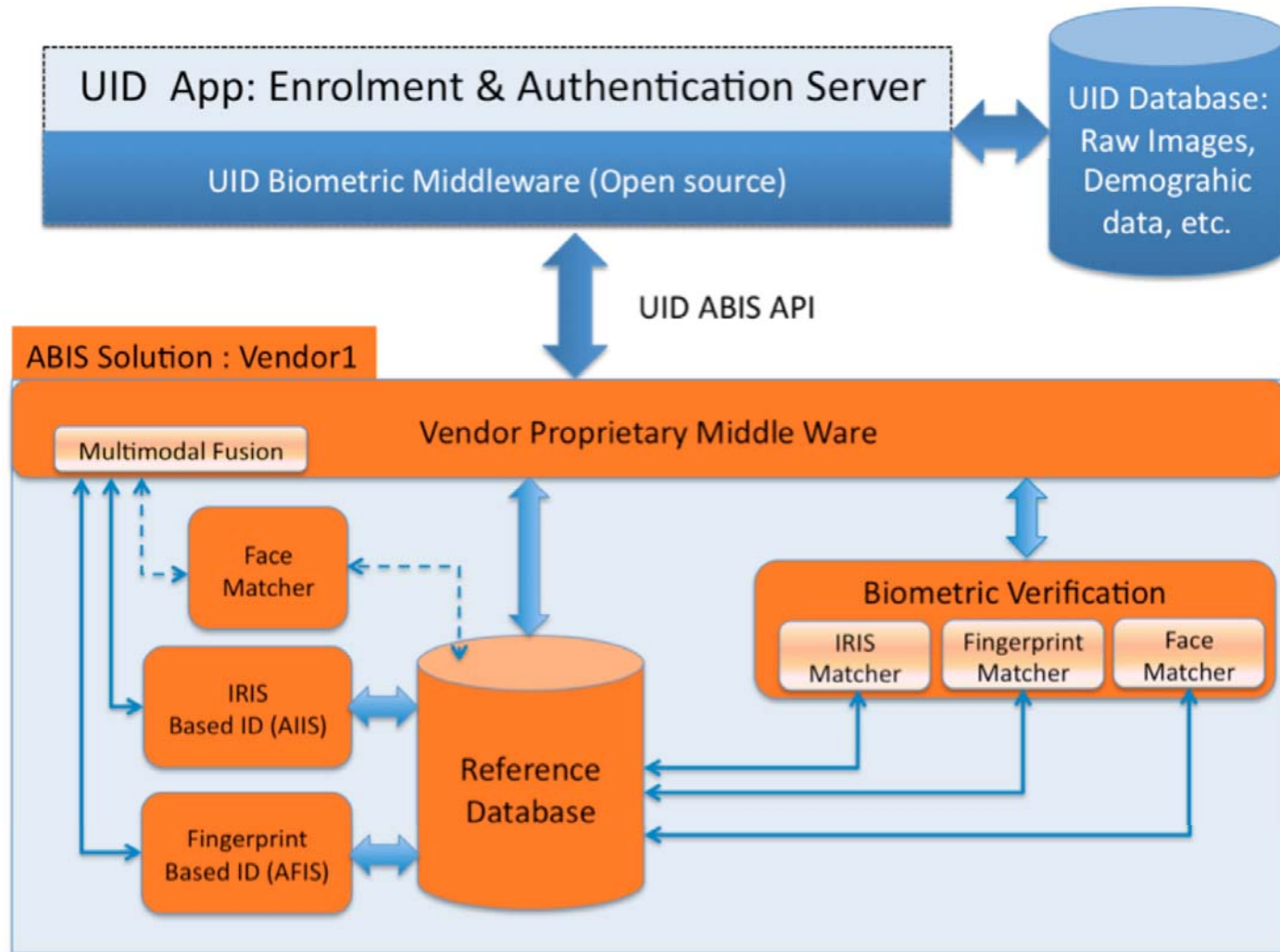
# Authentication Server



# Multi-Vendor Architecture



# Multi-Modal Architecture



# PROOF OF CONCEPT



# Goals

- What process and practices will result in optimum quality of captured biometric information?
- What level of accuracy can be expected by using fingerprints, iris, and a combination of fingerprints and iris?
- How does this accuracy vary across certain demographical traits such as gender, age, rural/urban and occupation?





# Set-up



# Set-up





# Set-up





# Set-up



# Capture



# Capture





# Capture Process



# FP Capture



# Iris Capture





# Iris Capture



# Challenges





# Juvenile Capture



# Process Statistics

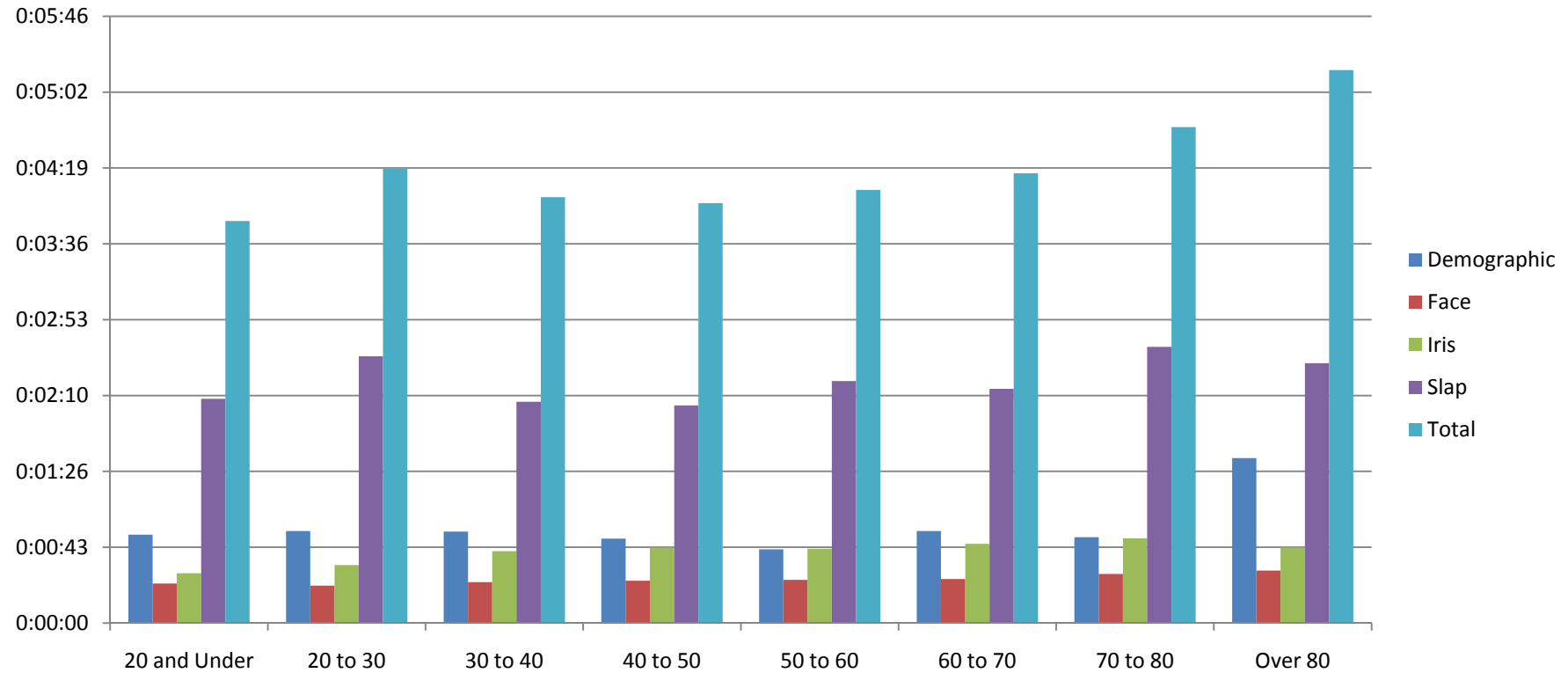
## Enrollment times

	Demographics	Face	Iris	Slap FP	Total
Loc 1	00:00:50	00:00:23	00:00:38	00:02:15	<b>00:04:06</b>
Loc 2	00:01:08	00:00:58	00:00:50	00:01:14	<b>00:04:07</b>



# Process Statistics

## Age versus Enrollment times



# Process Statistics

## Enrollment times in Loc 2

	Demographic	Face	Iris	Slap	Total
<b>Student -PoC</b>	00:00:57	00:00:33	00:00:35	00:01:13	<b>00:03:17</b>
<b>Adults</b>	00:01:08	00:00:58	00:00:50	00:01:14	<b>00:04:07</b>

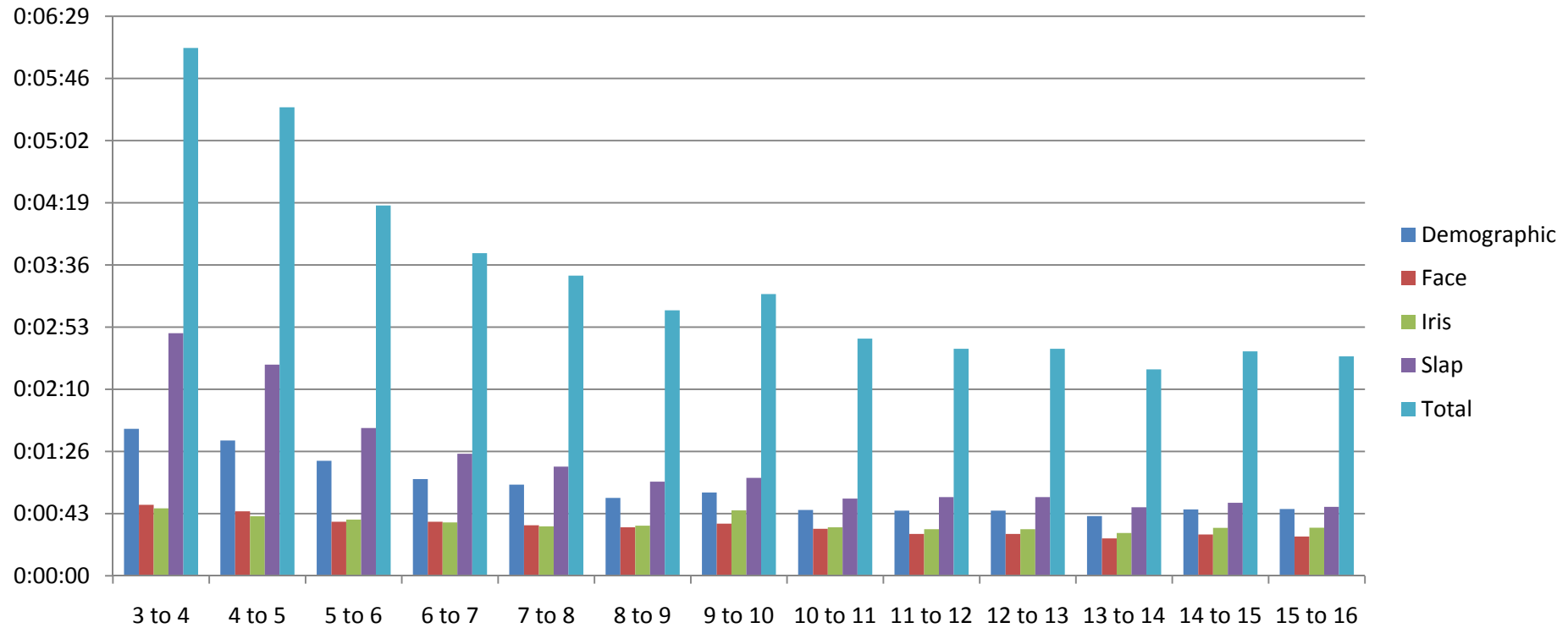
Notes:

1. The lighting conditions were better in schools than in villages. So, face capture times are better for children
2. The Iris device was used as a hand-held device in the school and mounted on a tripod for the adult PoC.



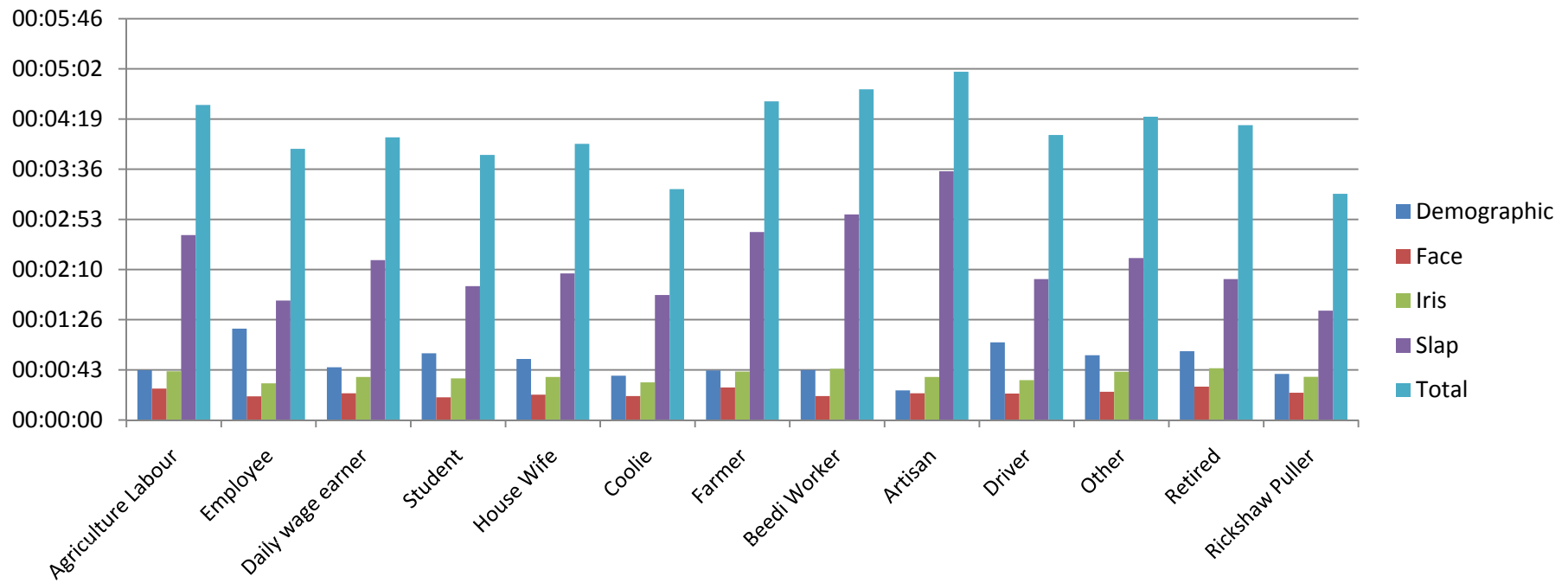
# Process Statistics - Juvenile

## Age versus Enrollment times



# Process Statistics

## Occupation versus Enrollment times



# Process Related Conclusions

- Total capture time variation largely due to
  - Fingerprint attempts (age, occupation)
  - Iris capture process (tripod, active participation of subject)
  - More frequent iris capture needed but capture is quick
- Variation not significant in overall context
  - 50% spread
- Zero FTE is possible even with 4 year children & 80 year adults
- Social customs are not major obstacles



# **PRELIMINARY ACCURACY RESULTS FROM PoC LOCATION 1**



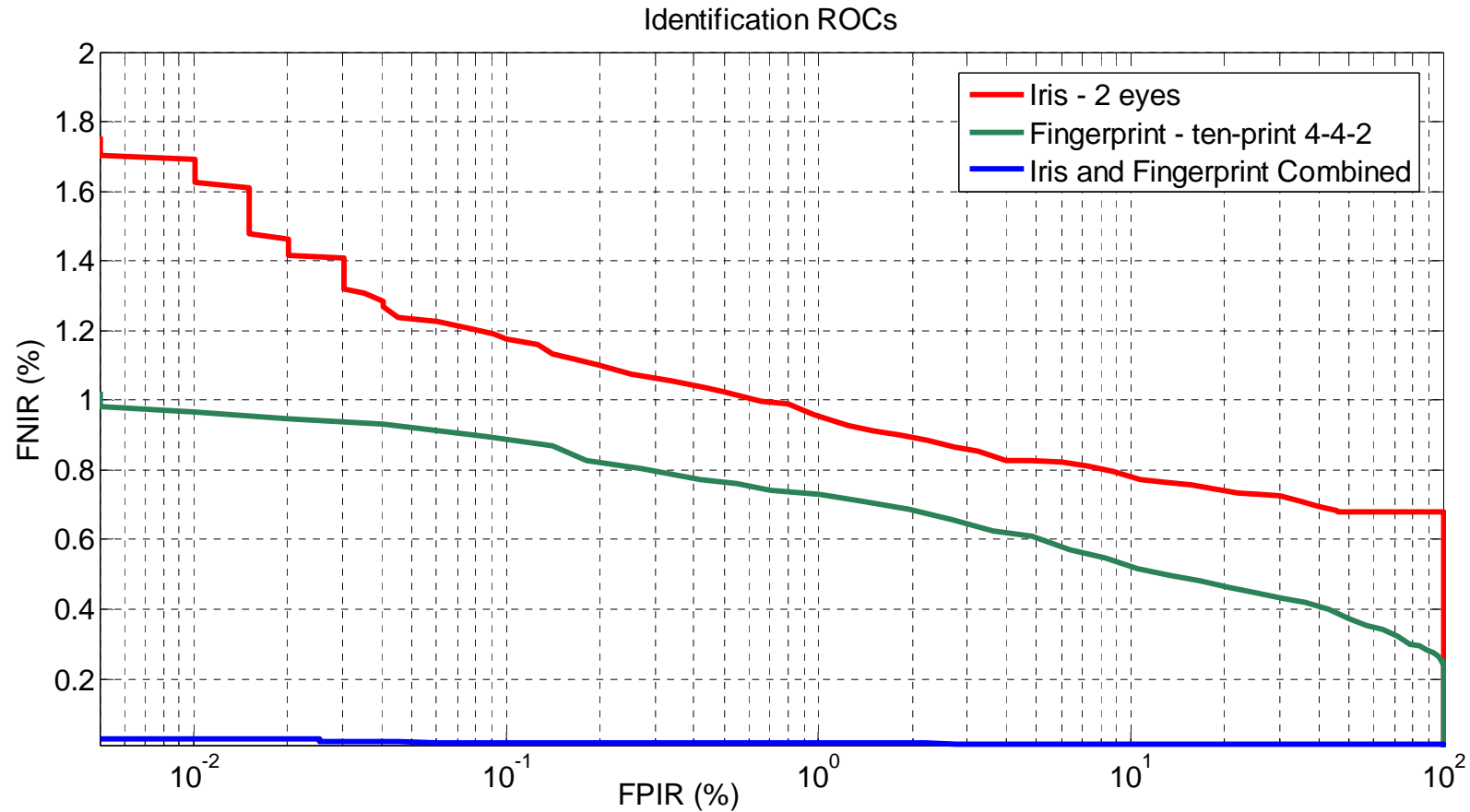


# Multimodal Accuracy Test

- Collected in 2 session – ~4 weeks apart
- In the state of Andhra Pradesh in India
- ~25K number of people in session 1
- ~20K number of people in session 2
- Session 1 is used for Gallery
- Session 2 is used for Probes
- ~20K open set searches
- ~20K closed set searches



# Multimodal Accuracy Test



# Thank you

