Biometric Authentication

Biometric Consortium Conference
Tampa
18 September 2013
Features of UID (Aadhaar) Authentication

<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>Only Numbers – No Smart Cards</td>
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<tr>
<td>Random Numbers – No Intelligence, No Profiling</td>
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<tr>
<td>All Residents enrolled – Including Children</td>
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<tr>
<td>Uniqueness – Ensured through biometric attributes</td>
</tr>
<tr>
<td>Security and Privacy of Information Collected</td>
</tr>
<tr>
<td>Ubiquitous Online Authentication – From No ID to Online ID</td>
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What is UID (Aadhaar) Authentication?

- **UID** (Aadhaar) authentication is identity verification of an individual based on his/her UID number, demographic and/or biometric information.

- Demographic and Biometric data captured at the time of enrolment, which is available in UID database centrally, works as the reference baseline data during authentication process. Remember that response to authentication is either “y” or “n”.
Authentication at a Glance

NAME, GENDER
DOB, Address, ...

PIN / OTP

Any or All

YES
OR
NO
Authentication Devices

- Single Function Optimized
- Multi Function Capable
- Versatile

- POS Terminals
- MicroATM, PDS
- Diverse Usages Rugged

AADHAAR
Authentication – Participants & Transaction

UID Holders
Residents who have obtained their UID number

Authentication Devices
Point of initiation of authentication transaction e.g., PCs, kiosks, handheld devices etc

Authentication User Agency (AUA)
Agency that uses UID authentication to enable its services

Authentication Request

Authentication Service Agency (ASA)
Agency that has secured leased line connectivity with CIDR

Unique Identification Authority of India
Offers online authentication

Sub Auth. User Agency (Sub AUA)
Agencies that access UID authentication through an existing AUA
**Authentications Factors**

- **Type 1 – Demographic Only – Single Factor**
  - Demographic Attributes like Name, Date of Birth, Address etc. can be used

- **Type 2 – OTP Only – Single Factor**
  - Authentication using One Time Password (OTP) alone

- **Type 3 – Biometrics only – Single Factor**
  - Authentication using Biometrics (single factor authentication) – Fingerprint/ Iris

- **Type 4 – Biometric & OTP – Two Factors**
  - Authentication using Biometrics (Fingerprint/ Iris) and OTP (two factor authentication)

- **Type 5 – Three Factors**
  - Authentication using Fingerprint biometrics, Iris and OTP (three factor authentication)
PoC on Fingerprint Authentication

• UIDAI conducted a series of Proof of Concept (PoC) studies to find out feasibility and factors impacting fingerprint authentication in the Indian context between Jan 2011 to Jan 2012

• More than 50,000 individuals from both rural and urban areas were covered in the PoCs at following locations
  – PoC1 Karnataka - Apr 15 2011 to May 21
  – PoC2 Delhi - June 3 to 15
  – PoC3 Delhi - July 9 to 20
  – PoC4 Himachal Pradesh - July 23 to Aug 3
  – PoC5 Maharashtra - July 28 to Aug end
  – PoC6 Jharkhand - Aug 18 to 26
  – PoC7 Delhi - Sep 22 to 29
  – PoC8 Karnataka - Dec 17 to Jan 31 2012
PoC on Fingerprint Authentication contd …

• Study included impact of various factors on fingerprint authentication such as
  – Authentication devices and interoperability - different sensor makes & technologies, different minutiae extractors, different form-factors (handheld devices & USB based devices)
  – Number of fingers - using single finger once, same finger multiple times, using multiple distinct fingers
  – Fingerprint quality in climatic conditions that prevail in various parts of India
  – Feasibility and effect of “best finger” detection (BFD)
  – Network factors such as bandwidth, service provider, landline vs. mobile, latency factors across networks)
Conclusions drawn from PoCs

– The accuracy of 96.5% can be achieved using one best finger with up to three attempts, and
– The accuracy of 99.3% can be achieved using two fingers with up to three attempts
– Accuracy could be further improved by using second modality such as iris or additional factors such as one-time-pin(OTP)
– Ability to show NFIQ score at the device helps to capture good quality image
UID Biometric Authentication Reports

- Report on [Role of Biometric Technology in Aadhaar Authentication](http://uidai.gov.in/auth.html) is published on [http://uidai.gov.in/auth.html](http://uidai.gov.in/auth.html)

- Fingerprint Authentication services were launched in India on 07\(^{th}\) Feb 2012 for partners to conduct pilots in their application context

- UIDAI backend infrastructure was benchmarked to sustain one million authentications per hour
Iris Authentication PoC using KIND 2 images

- UIDAI had also collected iris images of residents during enrolment, and successfully leveraged iris modality for de-duplication.
- A PoC study was carried out to assess the feasibility of using iris for on-line biometric authentication in the Indian context between May 27th and July 30th 2012.
- This PoC used KIND 2 compressed image of size 15 KB.
Feasibility of Iris based on-line Authentication

The empirical results clearly demonstrate iris authentication to be viable in Indian context.

<table>
<thead>
<tr>
<th>Findings</th>
<th>% of Residents</th>
<th>Single-eye cameras</th>
<th>Dual-eye cameras</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authenticated in first try</td>
<td></td>
<td>95.89</td>
<td>99.29</td>
</tr>
<tr>
<td>Authenticated in multiple tries</td>
<td></td>
<td>99.21</td>
<td>99.40</td>
</tr>
<tr>
<td>Failed authentication (FRR+FTC)</td>
<td></td>
<td>0.79</td>
<td>0.60</td>
</tr>
</tbody>
</table>

**Device Readiness:** Six different devices with a variety of form and function are available to form competitive vendor eco-system.

**System Readiness:** Median time for end-to-end authentication was less than one minute over GPRS mobile network in semi-rural setting.

IRIS Authentication Accuracy – PoC Report is published on http://uidai.gov.in/auth.html
Iris Authentication PoC using KIND 7 images

• A new PoC was conducted to study the feasibility of using KIND7, size ~2-5KB, iris images for on-line biometric authentication in the Indian context
• The PoC was carried out in urban setting at centers in East Delhi district between April 5th and April 12th 2013
• In scenario testing, 101663 online authentication transactions were performed
• In all, 131863 iris images were capture during this process
• The report IRIS Kind-7 Authentication Accuracy- PoC Report is published on http://uidai.gov.in
• Summary of results is mentioned in the next slide
Feasibility of KIND7 Iris for line Authentication

The empirical results clearly demonstrate KIND7 iris images of size over 2.5KB is viable in Indian context for online authentication.

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Kind 2</th>
<th>KIND7 (Size ~1.5KB)</th>
<th>KIND7 (Size ~ 2.5KB)</th>
<th>KIND7 (Size ~ 3.5KB)</th>
<th>KIND7 (Size ~ 5KB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>True Accept rate*</td>
<td>99.30%</td>
<td>97.93%</td>
<td><strong>99.13%</strong></td>
<td>99.53%</td>
<td>99.36%</td>
</tr>
</tbody>
</table>

*100-(FTC+FRR)

Device Readiness: Six different devices with a variety of form and function are available to form competitive vendor eco-system.

System Readiness: Median time for end-to-end authentication was little over one minute over shared internet in urban setting.
Iris Authentication as Service

UID Iris Authentication Service was launched on 24th May 2013 for partner AUAs to conduct pilots in their application context.
UID Biometric Authentication Pilots

- Aadhaar enabled Public Distribution System (PDS) delivery by Food and Civil Supplies (F&CS) department in the Indian State of Andhra Pradesh
- Covers
  - 100 Fair Price Shops (FPS) in Gollaprollu Mandal of East Godavari
  - 50 FPS in Hyderabad district
  - 90,000 ration cards which translates to about 360,000 residents
  - Over 1,000,000 (1 million) transactions have been done since start of the pilot
UID Biometric Authentication Pilots

• Aadhaar enabled Payment system for Pensions and MNREGA by Dept of Post Andhra Pradesh Circle

• Covers

  – 1286 Post Offices in Chittoor district
  – 10 Post Offices in East Godavari (One Mandal)
  – **500,000 (0.5 Million) transactions** are made since start of the pilot
  – About **Rs 400,000,000 (Rs 400 Million)** disbursed for pension payments and MNREGA wages
UID Biometric Authentication Pilots

Aadhaar enabled Payment system for Pensions and MNREGA by Dept of Post Andhra Pradesh Circle
UID Biometric Authentication Pilots

Aadhaar enabled Payment system for Pensions and MNREGA by Dept of Post Andhra Pradesh Circle
UID Biometric Authentication Pilots

Key Learning's

• Need for Operator’s training to ensure
  – Usage of best finger detection application for improving authentication accuracy
  – Non-usage of dirty, dry, cracked fingers
  – Non-usage of same finger in two finger authentication

• Device Ergonomics
  – Placement of sensor in a slot in a particular device model did not allow certain Aadhaar holders to use their best finger (Index) having big finger nails that were grown as part of their religious believes
Thank You

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