



Yellow Sense Technologies Pvt Ltd

Startup India - Govt of India DP - IIT: DIPP – 138 388

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Startup name: YellowSense Technologies Pvt. Ltd.

Incubator Name: IIIT-Bangalore Innovation Center (Dr Lakshmi and Natarajan Sir)

Grant received (Rs 7 lakhs) from: Govt of INDIA - MEITY TIDE 2.0 – Oct 2025

Challenge: Contactless Fingerprint Authentication (UIDAI – SITAA Program) | **Date:** 29th Dec 2025

1. OVERALL PROPOSAL SUMMARY:

We propose a 6-month, stage-wise development of an AI-based Contactless Fingerprint Authentication system, progressing from PoC to pre-commercial readiness (**TRL 3 → TRL 8**), fully aligned with UIDAI SITAA challenge timelines and deliverables. The proposed **₹2.5 crore** budget covers **end-to-end R&D and pre-commercial readiness over 6 months**, strictly aligned to Stage 1–4 milestones defined by UIDAI SITAA.

Duration: 6 Months

Total budget asked for: INR 2.5 crore

TRL Progression: TRL-3 → TRL-8

Problem:

Physical contact-based fingerprint authentication faces hygiene, usability, and hardware constraints. Contactless biometrics offer a promising alternative but introduce challenges due to perspective distortion, scale variance, and illumination differences.

Solution:

YellowSense proposes an AI-driven contactless fingerprint authentication system that:

- Supports CL ↔ CB matching
- Delivers 1:1 and 1:10 matching
- Operates via a secure SDK
- Is Aadhaar-scale ready

Execution Plan:

Stage-wise delivery aligned to UIDAI SITAA timelines, with strict focus on technology development.

Working Demo (Basic PoC - Proof of Concept):

<https://www.yellowsense.in/products/fingerprint-authentication>

<https://huggingface.co/spaces/talha-yellowsense/contactless-fingerprint-demo>

The current work represents an early TRL-2+ implementation, where a basic end-to-end contactless fingerprint processing pipeline has been validated in controlled conditions. This existing prototype will be systematically matured into a robust, UIDAI-compliant TRL-3 PoC during Stage-2 of the program.

Hence, the **Stage-2 TRL-3 PoC** will be **significantly more advanced** than the current baseline prototype, with quantitative benchmarking, dataset-driven validation, and SDK-grade stability.

Final Outcome:

A pre-commercial, scalable, and privacy-preserving contactless fingerprint authentication solution suitable for national digital identity systems.

2. STAGE-WISE TIMELINE & DELIVERABLES

Stage 1 – Project Design Document (PDD)

Timeline: T0 + 1 Month

Funding Allocation: 20% = INR 50 lakhs

Deliverables:

1. End-to-end system architecture for contactless fingerprint capture, enhancement, and matching
2. Dataset collection protocol (CL + CB fingerprints)
3. AI model design (preprocessing, feature extraction, matcher)
4. Security, privacy, and Aadhaar-aligned compliance plan

Output:

Approved PDD with clear technical blueprint and execution plan, defining model architecture, data strategy, device/demographic coverage, and evaluation framework.

Stage 2 – Proof of Concept (PoC | TRL 3)

Timeline: T0 + 2 Months

Funding Allocation: 20% = INR 50 lakhs

Stage-2 focuses on **maturing the existing early PoC** into a **fully validated TRL-3 SDK**, strengthening robustness across acquisition variability, demographic diversity, cross-domain matching accuracy (CL-CB), and reproducibility under UIDAI-defined evaluation protocols.

Deliverables:

1. Working SDK implementing full pipeline:
 - o Contactless fingerprint capture | Image normalization & enhancement
 - o Feature extraction | Matching engine
2. **1:1 and 1:10 matching capability**
3. Dataset collected by startup:
 - o Contactless + contact-based fingerprint pairs
4. Demonstration of **CL ↔ CB interoperability**

Output:

Executable SDK demonstrating feasibility and baseline accuracy.

Stage 3 – MVP (Beta Release | TRL 6)

Timeline: T0 + 4 Months

Funding Allocation: 30% = INR 75 lakhs

Deliverables:

1. Improved AI models with robustness to:
 - o Angle variation | Illumination changes
 - o Skin texture variability
2. Spoof resistance checks
3. Performance benchmarking (accuracy, FAR/FRR, latency)
4. Android & iOS compatibility validation | Secure API interfaces

Output:

Beta-ready MVP suitable for controlled pilots.

Stage 4 – MRP (Pre-Commercial | TRL 8)

Timeline: T0 + 6 Months

Funding Allocation: 30% = INR 75 lakhs

Deliverables:

1. Production-grade SDK/API | Scalability testing (Aadhaar-scale simulations)
2. Security hardening and audit readiness
3. Integration readiness with UIDAI systems | Final technical documentation

Output:

Pre-commercial solution ready for deployment and certification.

3. REVISED BUDGET STATEMENT

The total project budget (INR 2.5 crore) is strictly aligned to a 6-month execution window and allocated stage-wise as per SITAA guidelines: Stage 1 – 20%, Stage 2 – 20%, Stage 3 – 30%, Stage 4 – 30%.

| Stage | Timeline | % | Amount (₹) |
|-----------------------|-----------------|-------------|-------------------|
| Stage 1 – PDD | T0+1 month | 20% | ₹50 lakh |
| Stage 2 – PoC (TRL-3) | T0+2 months | 20% | ₹50 lakh |
| Stage 3 – MVP (TRL-6) | T0+4 months | 30% | ₹75 lakh |
| Stage 4 – MRP (TRL-8) | T0+6 months | 30% | ₹75 lakh |
| Total | 6 months | 100% | ₹2.5 crore |

The budget is exclusively focused on:

- AI/ML model development | Dataset collection and annotation
- SDK and system engineering | Security and performance validation

4. REVISED TECHNICAL SOLUTION DESCRIPTION & TECHNICAL ARCHITECTURE (STAGE-WISE):

YellowSense proposes an AI-based **Contactless Fingerprint Authentication system** designed to enable accurate identity verification without physical touch, while maintaining interoperability with existing contact-based fingerprint databases.

1. Contactless Fingerprint Capture

- Mobile camera-based acquisition | Edge-optimized preprocessing
- Multi-frame capture to handle motion, blur, and illumination variance

2. Image Enhancement & Normalization

- Perspective correction & Scale normalization
- Contrast enhancement & Noise suppression

This step bridges the structural gap between contactless and contact-based fingerprints.

3. Feature Extraction & Matching

- AI models learn **cross-domain representations** for CL \leftrightarrow CB fingerprints
 - Supports:
 - 1:1 authentication
 - 1:N (1:10) matching
 - Optimized for low latency and mobile deployment
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4. SDK-Based Pipeline

- End-to-end SDK covering:
 - Capture \rightarrow Enhancement \rightarrow Feature Extraction \rightarrow Matching
 - Modular design for UIDAI system integration | Secure logging and audit hooks
-

5. Security & Privacy

- No raw biometric storage by default
 - Secure feature handling
 - DPDP-aligned data minimization principles | Ready for UIDAI security audits
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6. Dataset Strategy

- Startup-collected dataset
 - Paired contactless and contact-based fingerprints
 - Controlled and real-world variations
 - Data collected with informed consent and secure storage
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7. Device & Capture Variability Coverage

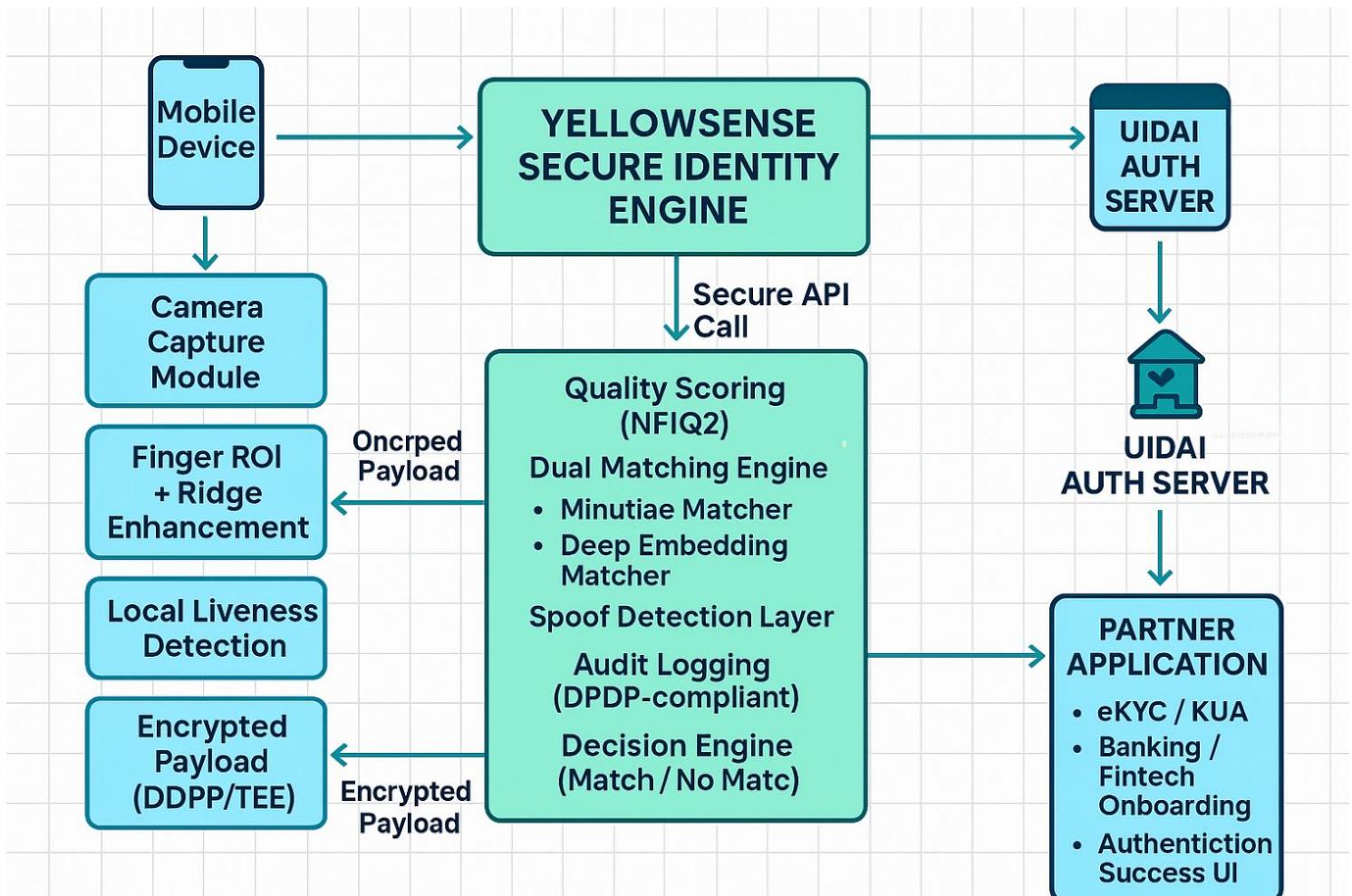
- Dataset collection will intentionally span **heterogeneous capture devices**, including:
 - Low-end smartphone cameras (8–12 MP)
 - Mid-range smartphones (16–32 MP)
 - High-resolution devices (48–64 MP and above)
 - Tablets and laptop webcams (where applicable)
 - Models will be trained and evaluated for **resolution invariance**, scale normalization, and perspective distortion robustness.
 - Performance will be benchmarked across **device classes**, not just aggregated accuracy.
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8. Demographic & Finger Variability Coverage

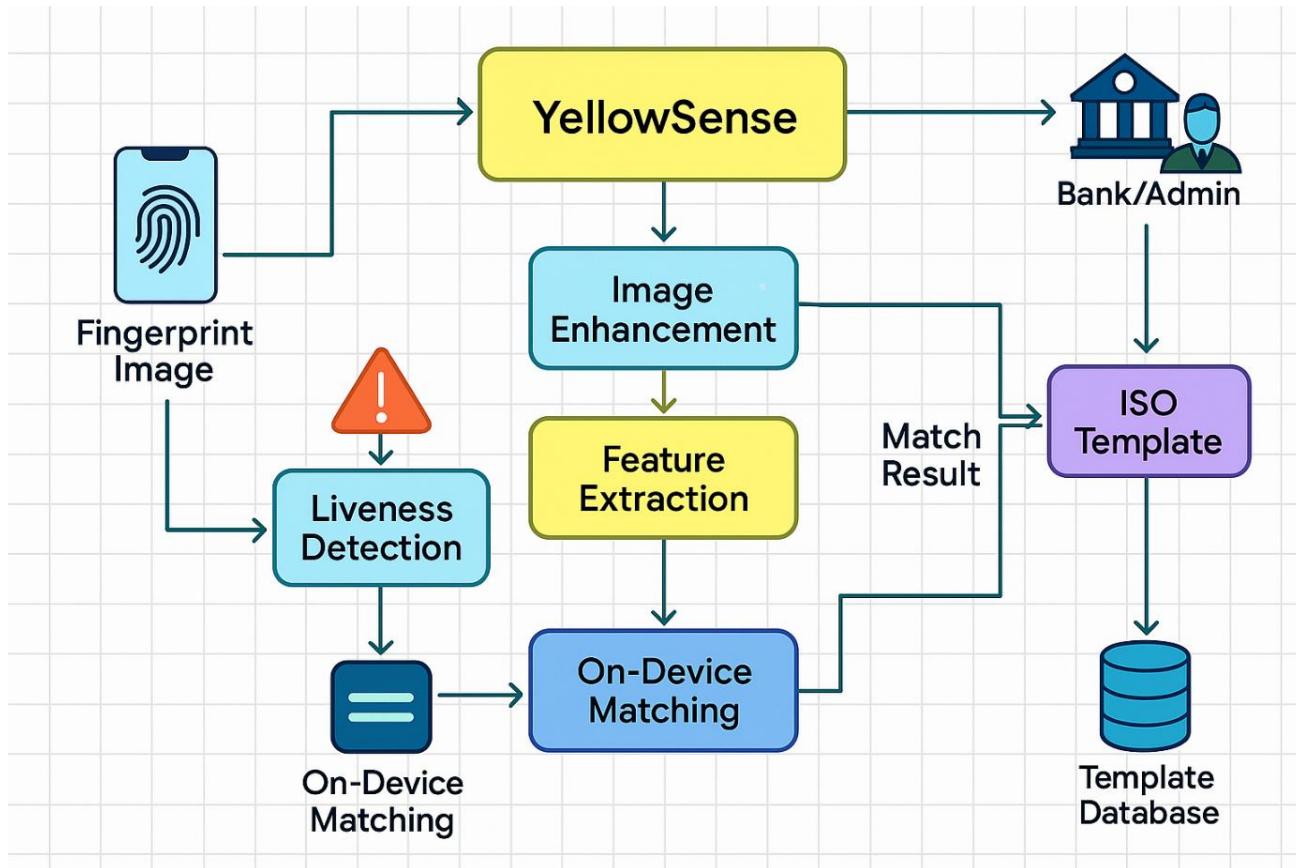
- Dataset design will ensure representation across:
 - Age groups (young adults, middle-aged, elderly)
 - Gender
 - Occupation-linked finger wear patterns (manual labor vs non-manual)
 - Skin texture and ridge clarity variations
- Special attention to **dry, worn, aged, and low-contrast fingerprints**, which are common failure cases in real-world deployments.
- Evaluation metrics will include **demographic-wise error analysis** to ensure fairness and robustness.

Note: These variations are treated as **first-class design constraints**, not post-hoc evaluation artifacts.

Architecture Diagram (Contactless Fingerprint Authentication)



Block diagram:



5. AI/ML MODEL BUILDING CAPABILITIES, PAST RELEVANT EXPERIENCE & EVIDENCE OF UNDERSTANDING CONTACTLESS FINGER BIOMETRICS:

1. Identity & Biometric AI Systems (Relevant Experience)

- Built and deployed **AI-based identity verification systems** involving facial analysis, liveness detection, spoof detection, and cross-source biometric matching.
- Developed **computer vision pipelines** handling low-quality, real-world data (blur, noise, illumination variance, partial captures), directly applicable to contactless fingerprint challenges.
- Experience in **cross-domain matching problems** (e.g., matching across different capture conditions, devices, and environments), which is a core challenge in CL-CB fingerprint matching.

2. Liveness & Anti-Spoofing Expertise

- Designed **face liveness detection systems** capable of detecting presentation attacks (print, replay, digital manipulation).
- Applied **temporal and texture-based feature extraction** techniques transferable to fingerprint spoof resistance.
- Experience aligning AI outputs with **regulatory-grade trust requirements**, not just ML accuracy.

3. Large-Scale, Sensitive Data Handling

- Built AI systems for **government and regulated environments** (Kerala Government, maritime authorities, DPI-related projects).
 - Hands-on experience with **secure data pipelines**, auditability, and compliance-first AI design.
 - Familiarity with **dataset governance**, consent, anonymization, and lifecycle controls.
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4. Model Development & Optimization Experience

- Trained and validated **deep learning models (CNNs, metric learning, Siamese architectures)** for similarity matching and identity verification.
 - Experience optimizing models for:
 - Low-latency inference
 - Edge/SDK-based deployment
 - Scalability to population-level matching
 - Proven ability to move from **research-grade models to deployable SDKs**.
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5. Readiness for Contactless Fingerprint Challenge

- Clear understanding of **contactless fingerprint-specific challenges**, including scale variance, perspective distortion, and ridge reconstruction.
 - Proposed solution builds on prior **vision + identity AI expertise**, extended with domain-specific fingerprint modeling.
 - Capability to **collect datasets, design evaluation protocols, and meet UIDAI-defined performance benchmarks** within a 6-month framework.
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5. FEASIBILITY, SCALABILITY, AND TECHNICAL SOUNDNESS

- Implementation structured in **clearly defined, time-bound stages** (PDD → PoC → MVP → MRP) fully aligned to the 6-month SITAA framework.
- Modular SDK-based architecture ensures **rapid iteration, testing, and replacement of components** without system redesign.
- Scalable to **large population sizes** through efficient matching, indexing, and batch processing strategies.
- Designed for **cross-platform deployment** (Android and iOS) using camera-based capture without specialized hardware dependencies.
- Uses **industry-standard, well-tested AI frameworks**, ensuring stability and maintainability.
- Architecture supports future expansion to:
 - Multi-finger capture

- Multi-modal biometrics
- Integration with Aadhaar ecosystem components
- Technical risks are mitigated through phased validation, controlled dataset growth, and continuous performance benchmarking.

6. TRACTION / ONGOING CUSTOMERS:

- **IIT Bangalore (P3Dx):** Homomorphic encryption + consent AI project – MOU signed.
- **New Mangaluru Port:** Maritime cargo forecasting intelligence – MOU in progress.
- **Stellantis:** OT anomaly detection + PLC bypass detection (active discussions – NDA signed, factory visit done).
- **Kerala Government:** Welfare fraud anomaly detection demoed.
- **RBI Harbinger Cybersecurity:** Bharat-Trust AI Platform proposed.

7. TEAM MEMBERS:

Key Founders

1. Prakhar Goyal — Founder, CEO & CTO

- Qualification: **B.Tech + M.Tech, Computer Science, IIT Bombay**
- Experience: Ex-**Microsoft, Amazon**, SAP; 15+ yrs in large-scale AI/ML data platforms, cybersecurity solutions, forensics authentication using distributed systems and machine learning models, LLMs, NLP.
- Role: Leads AI architecture, cybersecurity systems, product engineering.
- Email: prakhar@yellowsense.in | 9869397868
- LinkedIn: <https://www.linkedin.com/in/prakhar-goyal-1744021b/>

2. Komal Goyal — Co-Founder & COO

- Qualification: **BCom, MBA**; 8+ yrs experience in operations, customer engagement, field deployments.
- Role: Drives operations, partnerships, execution at customer sites.
- Email: komal@yellowsense.in | 9284367406
- LinkedIn: <https://www.linkedin.com/in/komal-goyal-51b09555/>

Technology Team:

1. Ms Binita Mahto — Senior AI/ML Engineer

- Qualification: MSc – Computing and Mathematics, IIT Dhanbad
- Role: Leads the AI/ML development and drives the performance optimisation of the LLM models.
- Email: binita@ai.yellowsense.in
- <https://www.linkedin.com/in/binita-mahto-b491a020b/>

2. Abhimanyu Malik — Senior AI/ML Engineer

- **Qualification:** B.Tech, Thapar Institute of Technology
- **Role:** Builds real-time detection systems, secure AI pipelines, & high-performance model deployment.

Email: abhimanyu@ai.yellowsense.in

<https://www.linkedin.com/in/abhimanyu-malik-19190622a/>

3. Dweep Solanki – CyberSecurity & AI/ML Engineer

- **Qualification:** BSc in CyberSecurity, Siliguri Institute of Technology
- **Role:** AI/ML systems development, AI pipelines, computer vision, cybersecurity anomaly detection.

Email: dweep@ai.yellowsense.in

<https://www.linkedin.com/in/dweep-solanki/>

4. Animesh Sharma — AI Engineering Intern

- **Qualification:** B.Tech (final year), IIT Patna
- **Role:** AI/ML systems development, AI pipelines, computer vision, cybersecurity anomaly detection.

Email: animesh@ai.yellowsense.in

<https://www.linkedin.com/in/animesh-sharma-144732250/>

5. Talha Nagina — AI/ML Intern

- **Qualification:** BTech, Nirma University
- **Role:** Deals with the datasets and pre-processing/fine-tuning of the models using Kaggle/open source.

Email: talha@ai.yellowsense.in

<https://www.linkedin.com/in/talhanagina306/>

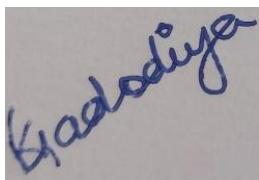
6. Kushagra — Frontend & UI Engineering Intern

- **Qualification:** B.Tech, CMR University Bengaluru
- **Experience:** UX engineering, dashboards, mobile interfaces.
- **Role:** Builds OT security dashboards and mobile alerting layers.

Email: kushagra@ai.yellowsense.in

<https://www.linkedin.com/in/kushagra2503/>

Yours Faithfully,



Name: Ms Komal Goyal & Mr Prakhar Goyal

Designation: Directors at Company (CHRO and CTO)

Date: 28th Dec 2025





GOVERNMENT OF INDIA
MINISTRY OF CORPORATE AFFAIRS

Central Registration Centre

Certificate of Incorporation

[Pursuant to sub-section (2) of section 7 and sub-section (1) of section 8 of the Companies Act, 2013 (18 of 2013) and rule 18 of the Companies (Incorporation) Rules, 2014]

I hereby certify that YELLOWSENSE TECHNOLOGIES PRIVATE LIMITED is incorporated on this SEVENTH day of JUNE TWO THOUSAND TWENTY THREE under the Companies Act, 2013 (18 of 2013) and that the company is Company limited by shares

The Corporate Identity Number of the company is U62099KA2023PTC174648

The Permanent Account Number (PAN) of the company is AABCY6908P*

The Tax Deduction and Collection Account Number (TAN) of the company is BLRY02955B*

Given under my hand at Manesar this SEVENTH day of JUNE TWO THOUSAND TWENTY THREE

Certification signature by DS MINISTRY OF CORPORATE
AFFAIRS 10 <roc.cro@ma.gov.in> Validity Unknown

Digitally signed by
DS MINISTRY OF CORPORATE
AFFAIRS 10
Date: 2023.06.10 10:31:31 IST

PM Mohan

Assistant Registrar of Companies/ Deputy Registrar of Companies/ Registrar of Companies

For and on behalf of the Jurisdictional Registrar of Companies

Registrar of Companies

Central Registration Centre

Disclaimer: This certificate only evidences incorporation of the company on the basis of documents and declarations of the applicant(s). This certificate is neither a license nor permission to conduct business or solicit deposits or funds from public. Permission of sector regulator is necessary wherever required. Registration status and other details of the company can be verified on mca.gov.in

Mailing Address as per record available in Registrar of Companies office:

YELLOWSENSE TECHNOLOGIES PRIVATE LIMITED

F NO 9C LAVENDER REGENCY,PINNACLE HEIGHTS,Dr. Shivarama Karanth Nagar,Bangalore North,Bangalore-560077,Karnataka

*as issued by Income tax Department



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