

Technical Design Implementation: Onchain Employment and Identity DApp with AI Integration (MetaTasker.base.eth)

1. Overview

This document outlines the technical design of a decentralized application (DApp) that integrates an on-chain gig economy and identity verification system with on-chain AI functionalities. The platform is designed to provide decentralized job matching, identity verification, payroll automation, and dispute resolution, powered by blockchain and decentralized AI systems.

1.1 Goals and Objectives

The key objectives are:

1. Create a secure on-chain marketplace for gig economy participants.
2. Offer verifiable identities for workers, leveraging on-chain biometric data.
3. Utilize AI-driven features for job matching, payroll, dispute resolution, and identity verification, ensuring privacy and scalability.
4. Ensure that AI computations are performed efficiently on-chain using emerging blockchain technologies.
5. Guarantee data security and privacy through decentralized storage and cryptographic proofs.

2. Architecture Overview

2.1 Key Technologies

- **Blockchain (Base Network):** For smart contract deployment to handle job posts, payroll, identity verification, and dispute resolution.
- **Oracles:** To bridge on-chain smart contracts with off-chain AI computations when necessary.
- **IPFS:** Decentralized storage for large datasets (user profiles, timesheets, job listings, etc.).
- **zk-SNARKs:** For privacy-preserving AI verification of sensitive data, such as biometric information.
- **Decentralized AI on-chain:** AI models will be hosted on-chain (using frameworks like Canisters), ensuring scalability, efficiency, security, and decentralized execution.

3. System Components

3.1 Frontend (UI/UX)

- **Users:** Freelancers (workers), employers, platform administrators.
- **Key Features:**
 - **Job Posting:** Employers create job listings.
 - **Profile Creation & Verification:** Workers submit profiles, including biometric data.
 - **AI-Driven Job Matching:** Provides job recommendations.
 - **Timesheets and Payroll:** Workers submit timesheets, verified by AI.

- **Chat & Ticketing System:** Enables communication and dispute resolution.

3.2 Backend (Blockchain & AI)

- **Smart Contracts:**
 - Job postings, applications, payroll, escrow, and identity verification.
- **AI Models:**
 - On-chain AI for job matching, identity verification, timesheet validation, and sentiment analysis for dispute resolution.
- **Data Storage:**
 - IPFS for storing profiles, timesheets, and AI outputs.

3.3 AI Integration Points

The AI processes will run on-chain using frameworks like Canisters and zk-SNARKs for privacy. Below are the AI-driven features integrated into the platform:

1. **Job Matching:**
 - **AI Task:** Match workers with jobs based on skills, experience, and past performance.
 - **Solution:** AI models process worker profiles and match them with suitable jobs. The results are stored directly in the smart contract.
2. **Identity Verification (Facial/Biometric):**
 - **AI Task:** Verify worker identity using biometric data (e.g., facial recognition, fingerprints).
 - **Solution:** The AI runs on-chain, processing biometric data and using zk-SNARKs to verify the results securely.
3. **Timesheet Validation and Payroll Automation:**
 - **AI Task:** Validate timesheets based on hours worked and tasks completed.
 - **Solution:** AI processes timesheet data on-chain, ensuring accuracy, and triggers the escrow contract to release payment once validated.
4. **Dispute Resolution (Chat Sentiment Analysis):**
 - **AI Task:** Analyze chat logs to identify potential disputes and suggest resolutions.
 - **Solution:** On-chain AI models analyze chat logs and update the dispute resolution smart contract with suggestions.

4. Smart Contracts

4.1 Job Contract

- **Functions:** Job creation, worker applications, job status updates.
- **AI Integration:** AI processes are triggered for job matching when a job is posted.

4.2 Escrow and Payroll Contract

- **Functions:** Timesheet verification and payment release.
- **AI Integration:** After timesheet validation by AI, escrow payments are triggered automatically.

4.3 Identity Verification Contract

- **Functions:** Store and verify worker identities.

- **AI Integration:** On-chain AI processes biometric data, validated using zk-SNARKs.

4.4 Dispute Resolution Contract

- **Functions:** Manage disputes between workers and employers.
- **AI Integration:** Sentiment analysis AI runs on-chain to provide dispute resolution suggestions.

5. Oracle and Decentralized Storage

5.1 Chainlink Oracles

Oracles are used for any off-chain computation that must interface with on-chain smart contracts (e.g., fetching large datasets).

5.2 Decentralized Storage (IPFS)

Large datasets, such as user profiles, timesheets, and job listings, are stored in IPFS, while the AI computations use decentralized storage and compute layers.

6. AI Hosting and On-Chain Computation

- **Canisters:** AI models are hosted on decentralized computational platforms like , allowing the execution of AI computations directly on-chain.
- **zk-SNARKs:** Used to verify sensitive AI computations, ensuring privacy while maintaining on-chain execution.

7. AI Workflow and Process Flow

7.1 Job Matching

1. Employer posts a job.
2. Worker submits a profile.
3. On-chain AI matches jobs to workers based on skillsets.
4. AI updates job contracts with matched workers.

7.2 Timesheet Submission and Payroll

1. Worker submits timesheets.
2. AI validates timesheets and sends results to the smart contract.
3. Escrow contract releases payment upon successful validation.

7.3 Identity Verification

1. Worker submits biometric data.
2. On-chain AI verifies the data using zk-SNARKs.
3. Identity verification status is updated on-chain.

7.4 Dispute Resolution

1. Either party raises a dispute.
2. On-chain AI analyzes chat logs and recommends resolution strategies.
3. Suggestions are written to the dispute resolution contract.

8. Security and Privacy Considerations

1. **Data Privacy:** Biometric data is hashed and processed using zk-SNARKs to ensure privacy.
2. **Smart Contract Security:** Regular audits to prevent exploits, especially around escrow and identity management.
3. **AI Model Security:** Models hosted on decentralized platforms to prevent tampering.

9. Final Thoughts

This comprehensive system integrates on-chain AI with blockchain-based smart contracts to power a decentralized employment platform. By leveraging on-chain AI, decentralized storage, and privacy-preserving technologies like zk-SNARKs, the platform ensures privacy, scalability, and trustless execution, providing a seamless experience for freelancers, employers, and administrators.

10. System overview diagram

