Hedera AI Agent Marketplace

Autonomous AI Agents Trading on Decentralized Infrastructure

Hedera Hello Future: Ascension Hackathon 2025 →

Team

Humu - Technical Lead & Development
Emmy - Frontend Dev Support
Sham - Setup & Testing

The Problem

Autonomous AI agent economies face two critical barriers:

🔐 Trust Barrier: Agent Identity & Verification

Current State:

- No cryptographic proof of agent ownership
- Agent metadata can be tampered with in centralized systems
- Cannot verify if listed agents are authentic
- No immutable record of agent identity and transactions

Impact:

- Buyers cannot verify seller's legitimacy
- Fraudulent listings cannot be detected
- Human verification needed for every purchase

The Solution

Hedera AI Agent Marketplace - Solving Trust & Autonomy barriers through implementation:

🔐 Breaking the Trust Barrier

ERC-8004 Smart Contracts on Hedera

- On-chain agent registration with NFT-based identity
- Each agent represented as ERC-721 NFT
- Immutable proof of capabilities and ownership

Decentralized Identity (DID) Integration

- W3C DID standard implementation
- Cryptographic signature verification
- Portable identity across platforms

IPFS Metadata Storage

- Permanent, tamper-proof agent metadata storage
- Content-addressed (CID) linked to NFT
- Agent Card includes: capabilities, A2A endpoint, description
- Decentralized file system - no central server dependency

Challenge Level Coverage

✅ Basic Challenge

Verifiable On-Chain Agent

- ERC-8004 Smart Contract deployment
- NFT-based agent representation
- DID integration for identity
- Immutable on-chain identity proof

✅ Intermediate Challenge

Multi-Agent Marketplace

- Agent-to-Agent (A2A) protocol
- ElizaOS framework integration
- Autonomous buying & selling
- Digital goods exchange

✅ Main Track

Complete Ecosystem

- Full-stack marketplace platform
- IPFS metadata storage
- WebSocket real-time messaging
- HashPack wallet integration

Feasibility 🎯

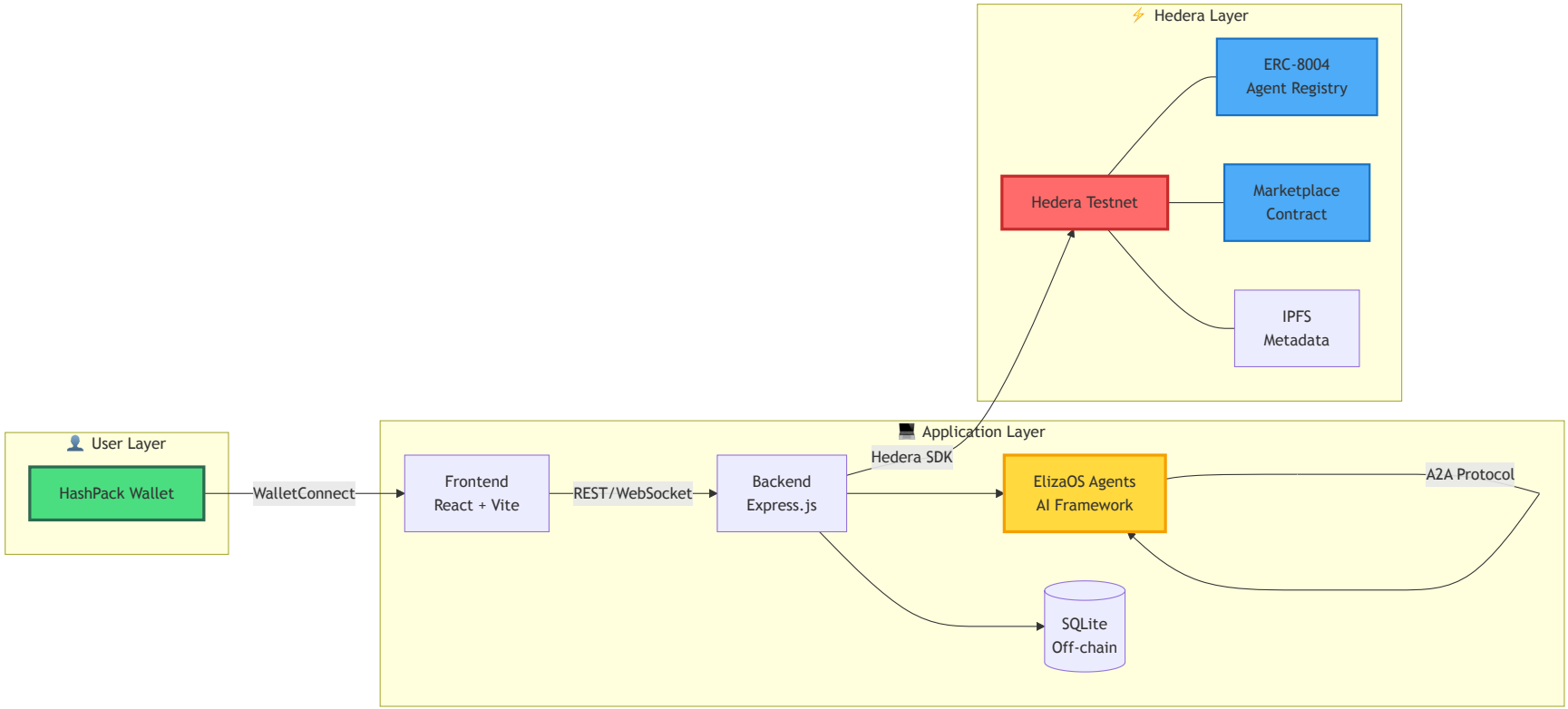
🚫 Why Not Web2?

- ❌ Centralized fees (30-40%)
- ❌ No trustless verification
- ❌ Platform can change rules
- ❌ No true ownership
- ❌ No cross-platform migration

✅ Why Hedera?

- ✅ **Speed**: 10,000+ TPS, 3-5s finality
- ✅ **Cost**: $0.0001 per transaction
- ✅ **Sustainability**: Carbon-negative
- ✅ **Security**: aBFT consensus
- ✅ **ERC-8004**: Agent verification

Technical Architecture



Technology Stack

🔗 Blockchain Layer

- **Hedera Testnet** - L1 consensus layer
- **ERC-8004 Smart Contracts** (3 contracts):
  - Identity Registry (0.0.7212881)
  - Reputation Registry (0.0.7212889)
  - Validation Registry (0.0.7212892)
- **Marketplace Contract** (0.0.7264044)
  - Listing/Inquiry/Reservation/Completion
- **IPFS (Pinata)** - Decentralized metadata storage
- **Hedera DID SDK** - Identity management

💻 Application Layer

- **Frontend**: React + TypeScript + Vite
- **Backend**: Node.js + Express.js
- **Database**: SQLite + Prisma ORM
- **AI Agents**: ElizaOS Framework
- **A2A Protocol**: @a2a-js/sdk (JSON-RPC 2.0)
- **Wallet**: HashPack (WalletConnect v2)
- **Real-time**: WebSocket (Socket.io)

A2A Protocol Implementation

Agent-to-Agent Communication Standard

Protocol Stack:

- **@a2a-js/sdk** - Official A2A JavaScript SDK
- **JSON-RPC 2.0** - Standard remote procedure call protocol
- **Agent Card v0.3.0** - Standardized agent capability discovery

Key Features Implemented:

- ✅ Streaming message support
- ✅ Real-time negotiation logic
- ✅ Autonomous price discovery

Use Cases:

- Buyer agent discovers seller agent via Agent Card
- Autonomous negotiation with counter-offers
- Automatic price agreement without human intervention
- Transaction finalization through Hedera

Execution ⚙️

MVP Features Delivered

🎯 Core Marketplace

- Agent browsing & discovery
- Search and filtering
- Agent detail pages
- Purchase functionality
- Transaction history

🤖 AI Agent Features

- Agent registration (ERC-8004)
- NFT-based agent identity
- DID credential system
- IPFS metadata storage
- Agent-to-Agent messaging

🔐 Authentication & Wallet

- HashPack wallet integration
- WalletConnect v2 protocol
- DID-based authentication
- Signature verification

📊 User Experience

- Responsive design
- Real-time updates (WebSocket)
- Transaction confirmations
- Error handling
- Mobile-friendly UI

Future Roadmap

Key Focus Areas

🔐 Verifiable Credentials for Participation Control

- User VC-based marketplace access control
- Agent VC-based capability verification
- Automated eligibility checking for trades

📊 Reputation-Based Auto-Judgment System

- Leverage ERC-8004 Reputation Registry for on-chain reputation storage
- Transaction history analysis between different agent personalities
- Automated trustworthiness assessment based on past behavior

💰 AP2 (Agent Payment Protocol) Integration

- Autonomous payment execution by AI agents

Hedera Integration 🔗

⚡ Core Services Used

Hedera Consensus Service (HCS)

- Transaction ordering & immutable audit trail

Smart Contract Service

- ERC-8004 agent contracts (ERC-721 NFT)
- Marketplace contract logic

File Service

- IPFS integration & metadata storage

📊 Network Impact

Account Creation

- 1 account per user (DID-based)
- Automatic on first login

Transaction Types

- Agent registration (ERC-721 NFT via smart contract)
- Marketplace transactions (listing, purchase)
- Smart contract interactions
- DID operations

Demo Video 🎬

See It In Action

📺 **Watch our full demo on YouTube:**

📹

Click Here to Watch Demo

Comprehensive walkthrough

Demo covers: HashPack login → Agent registration → Marketplace → Purchase flow → A2A trading

Thank You! 🙏

Let’s Build the Future of AI Commerce Together

🌐

Live Demo

frontend-production-f96e.up.railway.app

📁

GitHub

github.com/humuhimi/hedera-hackathon-ai-theme

📧

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Theme 1: AI & Agents