

AI-Powered Decentralized Domain Name System

Built for QIE Blockchain Hackathon

Deployed Solana Devnet

AI Groq LLM

Demo Live

License MIT

Revolutionizing DNS security through the convergence of AI and Blockchain

[Live Demo](#) • [Architecture](#) • [Features](#) • [Quick Start](#) • [API Reference](#)

The Problem: DNS is Broken

The Domain Name System (DNS), the backbone of the internet, is fundamentally flawed. Recent high-profile incidents demonstrate the critical vulnerabilities:

Real-World Security Disasters

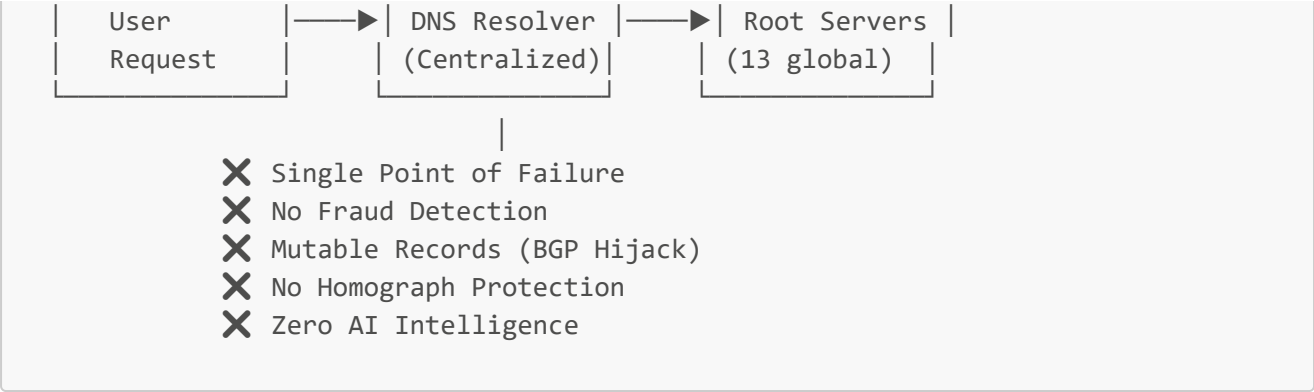
Incident	Impact	Root Cause
Microsoft "rn" Phishing Attack (2024)	Millions of users targeted with emails appearing from "rnicrosoft.com" — where rn mimics m	Traditional DNS has zero protection against homograph/lookalike domains
Cloudflare DNS Outage (2024)	Global outage affecting millions of websites, \$100M+ estimated losses	Centralized DNS infrastructure with single points of failure
AWS Route 53 BGP Hijack	Major cryptocurrency exchange users redirected to malicious servers, \$150K+ stolen	DNS records manipulated through BGP hijacking
GoDaddy DNS Breach (2023)	1.2M customer credentials exposed, DNS records modified	Centralized registrar with vulnerable infrastructure

[!CAUTION]

The rn Attack Explained: Attackers register domains like rnicrosoft.com or rnazon.com where the letters r and n placed together visually appear as m. Traditional DNS has **zero intelligence** to detect or prevent such attacks.

Why Traditional DNS Fails

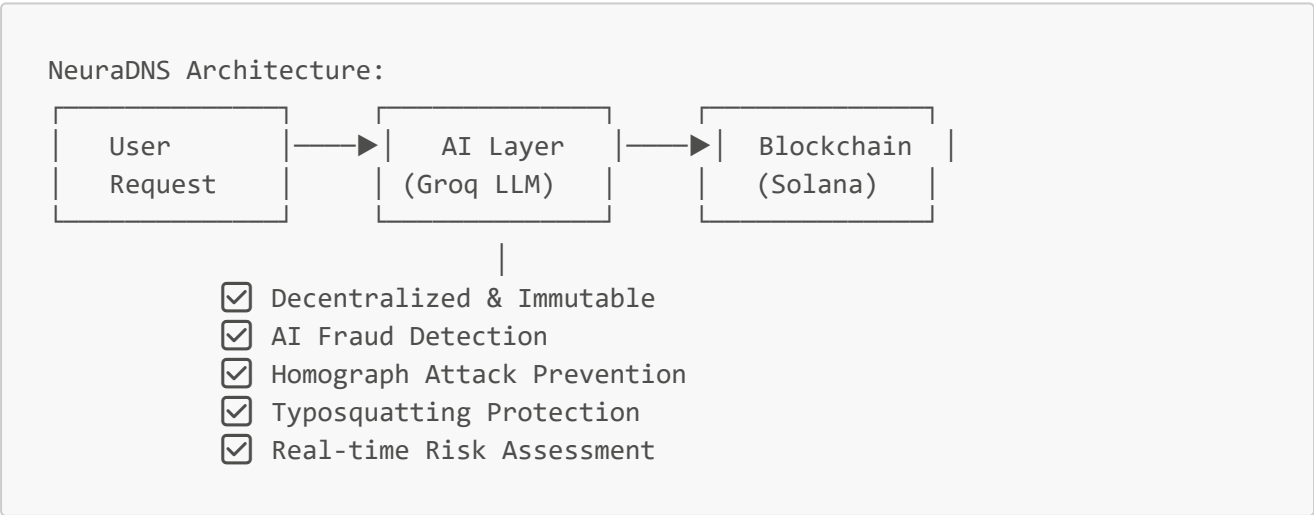
Traditional DNS Architecture:



💡 The Solution: NeuraDNS

NeuraDNS is the **world's first AI-powered blockchain DNS** that combines:

- 🧠 **AI Validation Layer** — Real-time detection of typosquatting, homograph attacks, and suspicious domains
- 🔒 **Blockchain Immutability** — DNS records stored on Solana blockchain, impossible to tamper
- 🛡️ **Cryptographic Authority** — Only verified wallet owners can manage their domains
- ⚡ **Sub-Second Resolution** — Leveraging Solana's 400ms finality for lightning-fast lookups



🏆 Why NeuraDNS Wins

vs. Traditional DNS (Cloudflare, Google DNS, Route 53)

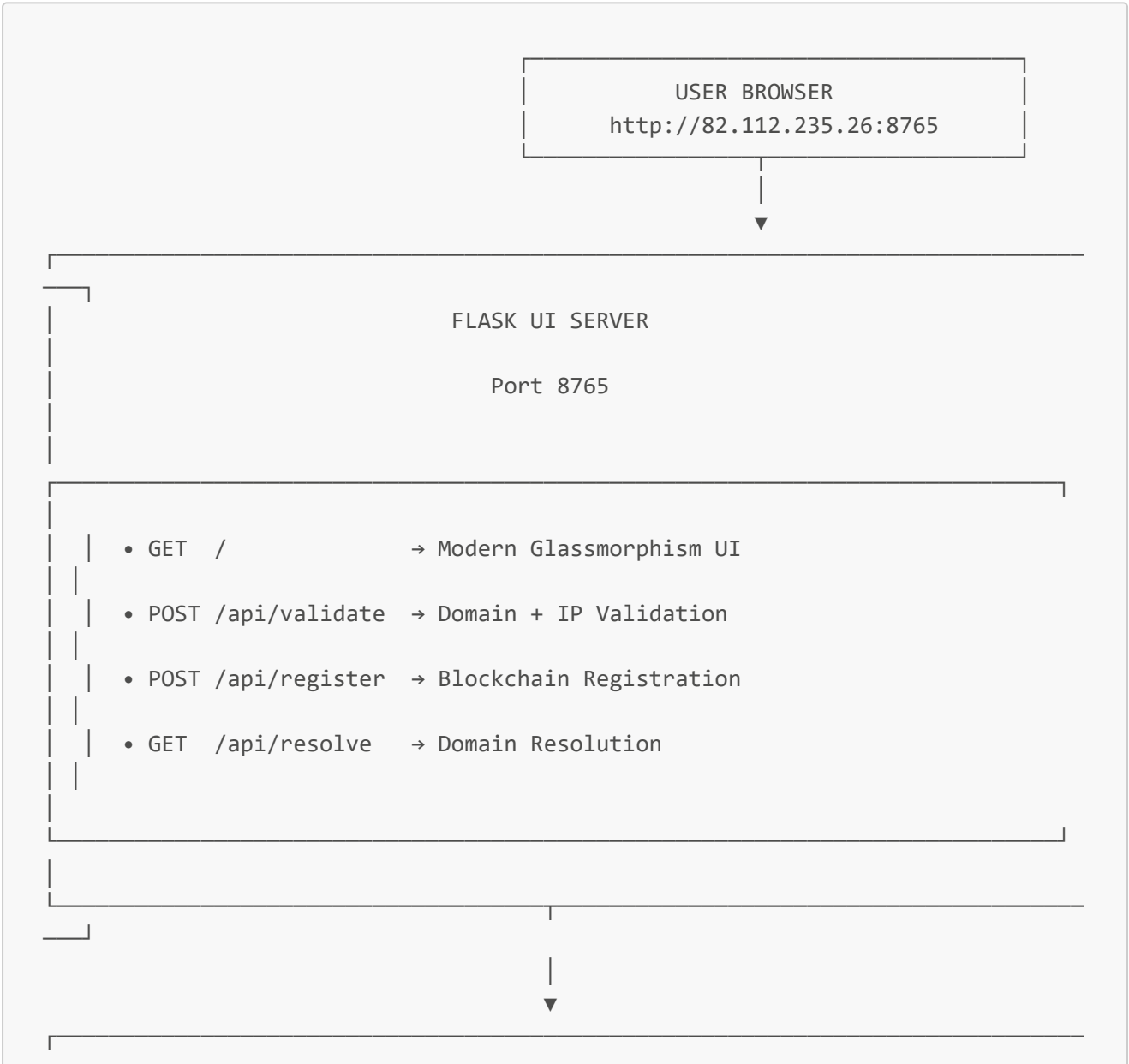
Feature	Traditional DNS	NeuraDNS
Centralization	❌ Single points of failure	✅ Fully decentralized
Record Immutability	❌ Easily hijacked via BGP	✅ Blockchain-secured
Fraud Detection	❌ None	✅ AI-powered real-time
Typosquatting Protection	❌ None	✅ Homograph detection
Censorship Resistance	❌ Easily censored	✅ Unstoppable

vs. Blockchain DNS (ENS, Handshake, Unstoppable Domains)

Feature	ENS/Handshake	NeuraDNS
AI Validation	✗ None	☑ Groq LLM-powered
Fraud Prevention	✗ Anyone can register similar names	☑ AI blocks lookalike domains
Transaction Speed	⚠ 15+ seconds (Ethereum)	☑ 400ms (Solana)
Transaction Cost	⚠ \$5-50+ per registration	☑ <\$0.001 on Solana
Risk Assessment	✗ None	☑ Confidence scoring

[!IMPORTANT]
NeuraDNS is the ONLY blockchain DNS with an AI layer. Existing solutions like ENS and Handshake allow anyone to register `go0gle.eth` or `arnazon.crypto` without any fraud detection.

🏗 Architecture



NODE.JS BLOCKCHAIN API

Port 3007

1. Receive domain registration request
2. Query blockchain for existing records
3. Forward to AI validation layer
4. Execute blockchain transaction if approved



AI VALIDATION LAYER

n8n + Groq LLM

SOLANA BLOCKCHAIN

Devnet

- | | |
|------------------------|-------------------------------------|
| • Homograph Detection | Program ID: |
| • Typosquatting Check | H7azh1pVd3uySy7z4JRmQL2HpF2D9673... |
| • Risk Scoring (0-1) | |
| • Well-known Blocking | • PDA-based domain storage |
| • Private IP Detection | • Rent-exempt accounts |
| • Format Validation | • Cryptographic ownership |

✦ Features

🛡️ AI-Powered Security

- **Homograph Attack Detection** — Blocks domains like `rnicrosoft.com` mimicking `microsoft.com`
- **Typosquatting Prevention** — Identifies suspicious patterns like `gooogle.com`, `amazn.com`
- **Well-Known Domain Protection** — Prevents registration of globally recognized brands
- **Risk Scoring** — Each domain receives a confidence score (0.0-1.0) and risk level
- **Real-time Analysis** — Groq LLM processes validation in <500ms

🔗 Blockchain Immutability

- **Solana-Powered** — 65,000 TPS, 400ms finality, <\$0.001 fees
- **PDA Storage** — Program Derived Addresses for deterministic domain records
- **Cryptographic Ownership** — Only wallet holders can manage their domains
- **Immutable Records** — Once registered, records cannot be tampered with

🌐 Modern Web Interface

- **Glassmorphism Design** — Beautiful, modern UI with animated effects
- **Real-time Feedback** — Instant validation results with AI confidence scores
- **Explorer Integration** — Direct links to Solana Explorer for verification
- **Mobile Responsive** — Works seamlessly on all devices

🚀 Quick Start

Prerequisites

- [Node.js](#) >= 18
- [Python](#) >= 3.8
- [Solana CLI](#) (optional, for local development)

Installation

```
# Clone the repository
git clone https://github.com/your-org/neuradns.git
cd neuradns

# Install Node.js dependencies
cd blockchain_dns_register
npm install

# Install Python dependencies
pip install -r requirements.txt

# Start the API server
npx ts-node production-api.ts
```

```
# In a new terminal, start the UI server
python app.py
```

Access the Application

- **Web UI:** <http://localhost:8765>
- **API Health:** <http://localhost:3007/health>

API Reference

Validate Domain

Check if a domain is available and passes AI validation.

```
POST /api/validate
Content-Type: application/json

{
  "domain": "mywebsite.blockchain",
  "ip": "1.2.3.4"
}
```

Response:

```
{
  "success": true,
  "available": true,
  "valid": true,
  "confidence": 0.95,
  "aiValidation": {
    "checks": {
      "domainFormat": true,
      "ipFormat": true,
      "isWellKnownDomain": false,
      "suspiciousPattern": false
    },
    "riskLevel": "low"
  }
}
```

Register Domain

Register a domain on the blockchain after AI validation.

```
POST /api/register
Content-Type: application/json

{
  "domain": "mywebsite.blockchain",
  "ip": "1.2.3.4"
}
```

Response:

```
{
  "success": true,
  "message": "Domain registered successfully on blockchain",
  "data": {
    "domain": "mywebsite.blockchain",
    "ip": "1.2.3.4",
    "transaction": "5UxH7z...",
    "explorer": "https://explorer.solana.com/tx/5UxH7z...?cluster=devnet"
  }
}
```

Resolve Domain

Query the blockchain for a registered domain.

```
GET /api/resolve?domain=mywebsite.blockchain
```

Response:

```
{
  "success": true,
  "data": {
    "domain": "mywebsite.blockchain",
    "ip": "1.2.3.4",
    "accountAddress": "7YkH..."
  }
}
```

Security Model

AI Validation Rules

Check	Description	Action
Well-Known Domains	google.com, facebook.com, microsoft.com, etc.	✗ REJECT
Homograph Detection	rnicrosoft.com, arnazon.com	✗ REJECT
Typosquatting	gooogle.com, facebok.com	⚠ HIGH RISK
Private IP Addresses	192.168.x.x, 10.x.x.x, 127.x.x.x	✗ REJECT
Blockchain Keywords	Contains "web3", "blockchain", "crypto"	☑ ACCEPT
Unique Long Names	15+ characters, unique patterns	☑ ACCEPT

Blockchain Security

- **PDA Seeds:** `["domain", domain_name]` — Deterministic, collision-free
- **Authority Validation:** Only transaction signer can register
- **Rent Exemption:** Permanent storage on Solana
- **Immutability:** No update/delete functions — records are permanent

Tech Stack

Layer	Technology
Blockchain	Solana (Anchor Framework 0.32.1)
AI Engine	Groq LLM (via n8n workflow automation)
Backend API	Node.js + Express + TypeScript
Frontend	Pure HTML/CSS/JavaScript
UI Server	Python Flask
Deployment	PM2 Process Manager

Project Structure

```
neuradns/
├── README.md           # This file
├── PITCH_DOCUMENT.md   # Investor/hackathon pitch
├── blockchain_dns_register/
│   ├── production-api.ts # Node.js blockchain API
│   ├── app.py           # Flask UI server
│   ├── index.html       # Frontend UI
│   ├── SOLANA_SMART_CONTRACT.rs # Anchor smart contract
│   ├── package.json     # Node.js dependencies
│   ├── requirements.txt  # Python dependencies
│   └── wallet.json       # Solana wallet (devnet)
└── docs/
```



```
| | | COMPLETE_DOCUMENTATION.md
| | | DEPLOYMENT_GUIDE.md
| | | N8N_SETUP.md
| | | examples/
| | | | example_usage.md      # API usage examples
```

Deployment

Production URLs

- **Live Demo:** <http://82.112.235.26:8765>
- **API Endpoint:** <http://82.112.235.26:3007>
- **Solana Program:** [H7azh1pVd3uySy7z4JRmQL2HpF2D9673Y9RP4yXZWfFM](#)

Deploy Your Own

```
# Install PM2
npm install -g pm2

# Start API server
pm2 start "npx ts-node production-api.ts" --name neuradns-api

# Start UI server
pm2 start "python app.py" --name neuradns-ui

# Save PM2 configuration
pm2 save
pm2 startup
```

Roadmap

Phase	Features	Status
Phase 1	Core DNS registration, AI validation, Solana integration	<input checked="" type="checkbox"/> Complete
Phase 2	Multi-record support (A, CNAME, TXT, MX), Domain transfer	<input checked="" type="checkbox"/> In Progress
Phase 3	QIE Blockchain integration, Cross-chain resolution	<input type="checkbox"/> Planned
Phase 4	ENS-style subdomains, Reverse DNS lookup	<input type="checkbox"/> Planned
Phase 5	Mobile apps, Browser extension, Mainnet launch	<input type="checkbox"/> Planned

QIE Blockchain Hackathon 2025

This project is built for the **QIE Blockchain Hackathon 2025** under the tracks:

- 🤖 **AI x Blockchain** — Neural Chain Award (\$2,500)
- 🔒 **Identity & Security** — DID systems, fraud prevention

[!NOTE]

NeuraDNS directly addresses the hackathon's focus on combining AI with blockchain for real-world security applications.

👥 Team

- **Amit** — Blockchain Developer
- Built with ❤️ for the QIE Blockchain Hackathon 2025

📄 License

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Built with 🤖 **AI** + ⛓️ **Blockchain**

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