



## AI-Powered Decentralized Domain Name System

Built for **QIE Blockchain Hackathon**

Deployed **Solana Devnet**

AI **Groq LLM**

Demo **Live**

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

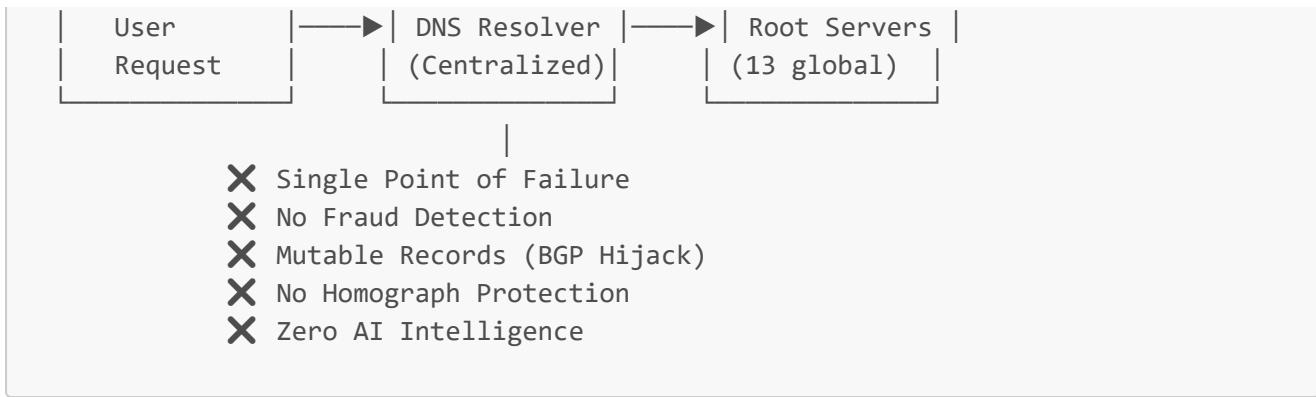
[!CAUTION]

**The rn Attack Explained:** Attackers register domains like **rnicrosoft.com** or **arnazon.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:

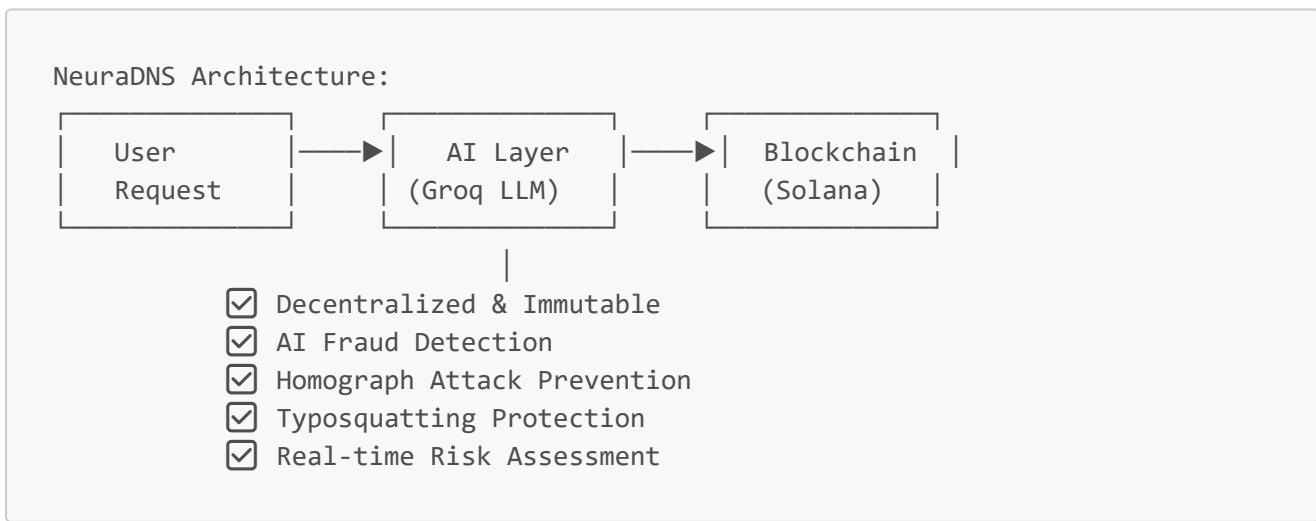




## 💡 The Solution: NeuraDNS

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	<input checked="" type="checkbox"/> Single points of failure	<input checked="" type="checkbox"/> Fully decentralized
Record Immutability	<input checked="" type="checkbox"/> Easily hijacked via BGP	<input checked="" type="checkbox"/> Blockchain-secured
Fraud Detection	<input checked="" type="checkbox"/> None	<input checked="" type="checkbox"/> AI-powered real-time
Typosquatting Protection	<input checked="" type="checkbox"/> None	<input checked="" type="checkbox"/> Homograph detection
Censorship Resistance	<input checked="" type="checkbox"/> Easily censored	<input checked="" type="checkbox"/> Unstoppable

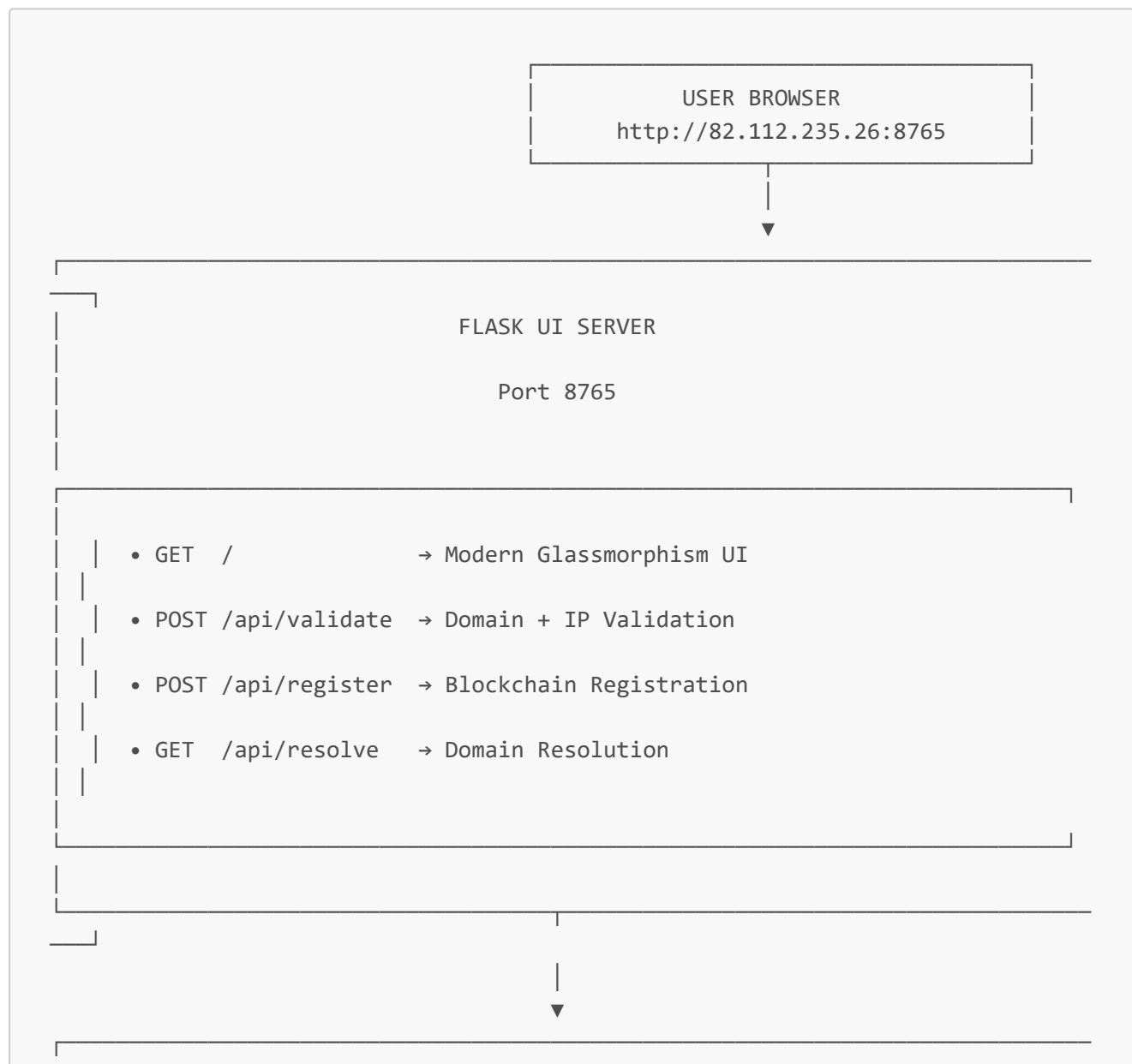
vs. Blockchain DNS (ENS, Handshake, Unstoppable Domains)

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

SOLANA BLOCKCHAIN

n8n + Groq LLM

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
<b>Well-Known Domains</b>	google.com, facebook.com, microsoft.com, etc.	X REJECT
<b>Homograph Detection</b>	rnicrosoft.com, arnazon.com	X REJECT
<b>Typosquatting</b>	gooogle.com, facebok.com	⚠ HIGH RISK
<b>Private IP Addresses</b>	192.168.x.x, 10.x.x.x, 127.x.x.x	X REJECT
<b>Blockchain Keywords</b>	Contains "web3", "blockchain", "crypto"	<input checked="" type="checkbox"/> ACCEPT
<b>Unique Long Names</b>	15+ characters, unique patterns	<input checked="" type="checkbox"/> 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
<b>Blockchain</b>	Solana (Anchor Framework 0.32.1)
<b>AI Engine</b>	Groq LLM (via n8n workflow automation)
<b>Backend API</b>	Node.js + Express + TypeScript
<b>Frontend</b>	Pure HTML/CSS/JavaScript
<b>UI Server</b>	Python Flask
<b>Deployment</b>	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](https://solana.com/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
<b>Phase 1</b>	Core DNS registration, AI validation, Solana integration	<input checked="" type="checkbox"/> Complete
<b>Phase 2</b>	Multi-record support (A, CNAME, TXT, MX), Domain transfer	<input type="checkbox"/> In Progress
<b>Phase 3</b>	QIE Blockchain integration, Cross-chain resolution	<input type="checkbox"/> Planned
<b>Phase 4</b>	ENS-style subdomains, Reverse DNS lookup	<input type="checkbox"/> Planned
<b>Phase 5</b>	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.

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## Team

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

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**Built with  AI +  Blockchain**

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