PROJECT: NEXUS V1 SUBMISSION

# CHAMELEON DEFENSE SYSTEM

## Moving Target Defense & Active Deception

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**FOCUS DOMAIN:** Innovation & Emerging Tech

Created by Shashwat Shekhar

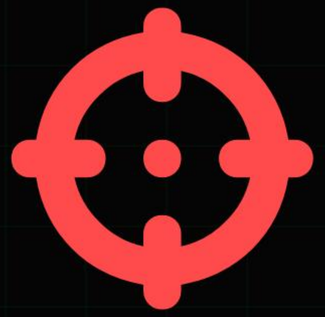
# THE PROBLEM: STATIC TARGETS

In modern cloud architecture, security relies on thicker walls, but the **door never moves.**

> **Infinite Attack Window:** Once a hacker discovers an endpoint like `/admin/login`, they have unlimited time to exploit it.

> **Automated Scanning:** Bots can map an entire API surface in minutes and store the vulnerabilities for later use.

> **Reactive Defense:** Firewalls only block known threats. They cannot stop legitimate-looking requests to exposed endpoints.



STATIC = VULNERABLE

# THE SOLUTION: MOVING TARGET DEFENSE

## DYNAMIC MUTATION

We use **Python AST** to rewrite the server code every 30 seconds, randomizing API routes (e.g., /login_x9k2). The attack surface effectively vanishes.

## ZERO-DOWNTIME SWITCHING

Utilizes an **Active/Passive Node architecture**. While one server mutates (restarts), the other handles traffic, ensuring 100% availability.

## ACTIVE DECEPTION

We don't just block attacks. If a hacker uses a stale URL, the Proxy returns a **Honeypot Payload** (Fake DB), wasting their time and resources.

## CLOUD ISOLATION

Fully containerized using **Docker** to bypass host-level interference and ensure deployment consistency on platforms like Render.

# TECHNOLOGY STACK

PYTHON 3.9 | FASTAPI | UVICORN (STATRELOAD) | DOCKER | STREAMLIT | HTTPX ASYNC

## CORE INNOVATION: AST MUTATION ENGINE

Unlike simple URL redirects, we modify the **Abstract Syntax Tree** of the running application code to physically change the Python function decorators on the disk.

# DEMO HIGHLIGHTS

> **The Mutation Event:** Every 30 seconds the backend rewrites itself. You will see live console logs confirming the AST rewrite and node switch.

> **The Bait (Phase 1):** The Hacker Bot initially succeeds (200 OK), capturing the "current" secret route.

> **The Trap (Phase 3):** 26 seconds later, the bot replays the old endpoint. Because the system has mutated, it falls into the Honeypot.

> **Visual Telemetry:** The dashboard shows real-time node rotation, replay attempts, and defense posture.

> **Log Evidence:** Mutation cycles, proxy rewrites, and honeypot triggers are all visible via runtime logs.

ACTIVE DEFENSE

# IMPACT & FUTURE ROADMAP

## POTENTIAL IMPACT

**Economic Asymmetry:** We drastically increase the cost of an attack. A hacker must be right every 30 seconds; we only need them to fail once.

**Devaluation of Intelligence:** Automated scanning data becomes worthless within seconds of being gathered.

## FUTURE ROADMAP

- **Kubernetes Integration:** Scaling from 2 nodes to a dynamic swarm of mutating pods.
- **AI-Driven Mutation:** Adjusting the mutation interval dynamically based on threat levels (e.g., speed up during an attack).
- **Production Ban-Lists:** Automatically propagating IP bans from the Honeypot to the Cloud Firewall.