

# BigBrotr

Global Observability Tool and Dataset for the Distributed Network Nostr

OpenSats Grantee

1,000+ Relays Monitored

100% Open Source

# The Problem: Flying Blind

Nostr is growing explosively – but we're operating without instruments.

**Critical questions remain unanswered:**

- ? Which relays are actually reliable?
- ? How does information propagate across the network?
- ? Where and when does censorship occur?
- ? How resilient is the protocol to failures?

**Without data, we cannot measure progress or validate claims of censorship resistance.**

# The Solution: Total Observability

BigBrotr is an **open-source infrastructure** that continuously monitors, archives, and analyzes the Nostr protocol across **1,000+ relays** on clearnet and Tor.

**1,000+**

RELAYS MONITORED

**600+ GB**

DATABASE SIZE

**24/7**

REAL-TIME TRACKING

It acts as a **black box recorder** for Nostr – capturing and cryptographically verifying every public event, turning a dynamic global network into **measurable, auditable, open data**.

# How It Works

## Microservices Architecture

-  **Finder:** Autonomous relay discovery via NIP-65 parsing and network crawling
-  **Monitor:** Health checks, latency measurements, protocol compliance (NIP-11/66)
-  **Synchronizer:** Parallel event collection with cryptographic validation (secp256k1)
-  **Tor Proxy:** Complete .onion network coverage for censorship-resistant monitoring
-  **PostgreSQL:** 600+ GB database with full temporal provenance tracking

Built in **Python** | Orchestrated with **Docker** | Licensed under **MIT**

# Scientific Breakthrough

BigBrotr enables **unprecedented empirical research** on decentralized communication protocols.

## First-of-its-kind capabilities:

-  **Complete longitudinal dataset:** Full event archive with temporal relay provenance
-  **Cleernet + Tor coverage:** First systematic monitoring of .onion relays
-  **Reproducible research:** Open-source tools enabling independent validation
-  **Real-time metrics:** Live network health and propagation analysis

Validate censorship resistance, measure network resilience, detect anomalies.

# What BigBrotr Enables

## Network Analysis

-  Relay uptime and reliability tracking
-  Event propagation and redundancy mapping
-  Geographic distribution and topology
-  Latency and performance benchmarking

## Security & Integrity

-  Censorship detection and documentation
-  Spam and Sybil attack identification
-  Cryptographic validation at scale
-  Protocol compliance monitoring

Usable by researchers at universities worldwide for studying Nostr network dynamics

# Bitcoin Alignment

Just as Bitcoin enabled verifiable money, BigBrotr enables **verifiable communication networks**.

-  **Transparency:** Fully auditable data (ODbL license) – no hidden operations
-  **Decentralization:** No central authority, anyone can run BigBrotr
-  **Censorship resistance:** Full Tor integration monitors the uncensorable layer
-  **Verifiability:** Cryptographically signed events with complete provenance

**Nostr + Lightning = Bitcoin's communication layer**  
**BigBrotr makes it measurable, auditable, and resilient**

# 100% Open Science

## Open Source

-  Complete infrastructure (MIT)
-  Production-ready Python library
-  Analysis tools and notebooks
-  Docker-based deployment

## Open Data

-  Full datasets (ODbL license)
-  Monthly snapshots
-  Hourly aggregated metrics
-  Public APIs (coming soon)

Only processes public, cryptographically signed events — zero private data collection

# Traction & Validation

**OpenSats**

GRANT RECIPIENT

**3**

MONTHS ACTIVE

**99%+**

SYSTEM UPTIME

## Deployed Infrastructure:

- ✓ Monitoring 1,000+ relays across clearnet and Tor
- ✓ 600+ GB PostgreSQL database with full event archive
- ✓ Python library published on PyPI (nostr-tools)
- ✓ Academic research in progress (ACM CoNEXT, IEEE EuroS&P targets)
- ✓ DVM (Data Vending Machine) for privacy-focused relay recommendations

# Roadmap: Next 12 Months

## Q1-Q2 2026

### Public Release

-  Public relay explorer and dashboards
-  Real-time network health visualization
-  Censorship and downtime alerts

## Q2-Q3 2026

### APIs & Integration

-  Public REST APIs for developers
-  Prometheus & Grafana integrations
-  Enhanced DVM capabilities

## Q3-Q4 2026

### Research & Scale

-  First public dataset release
-  Academic publications at tier-1 conferences
-  Global research collaborations

# Why CypherTank

CypherTank supports the decentralized future. **BigBrotr provides the measurement layer to prove it works.**

## What BigBrotr brings to CypherTank:

-  **Verifiable metrics** for protocol optimization and improvement
-  **Network health data** for intelligent relay selection in applications
-  **Research infrastructure** that strengthens the entire ecosystem
-  **Open data foundation** for all Bitcoin communication tools

**BigBrotr turns decentralized communication from theory into measurable reality – providing the data foundation that accelerates innovation across the ecosystem.**

# Team & Credentials

## Vincenzo Imperati

PhD Candidate in Computer Science – Sapienza University of Rome

-  Specialization: Distributed Systems, Network Analysis, Cryptography
-  OpenSats Grant Recipient — recognized by leading Bitcoin/Nostro funder
-  Research focus: Empirical analysis of decentralized protocols
-  Builder: 5 production repositories, 600+ GB operational database
-  Target publications: ACM IMC, CoNEXT, IEEE EuroS&P, USENIX Security

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# Thank You

Building the Measurement Layer for Decentralized Communication

1,000+ Relays

600+ GB Data

100% Open Source



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