

# Executive Briefing: Concordium Node Map

**To:** CTO, Head of Engineering  
**From:** Concordium Security Team  
**Subject:** Network Visibility Platform  
**Classification:** Internal

See It Live: <https://concordium-node-map.vercel.app>



Figure 1: Network Topology View

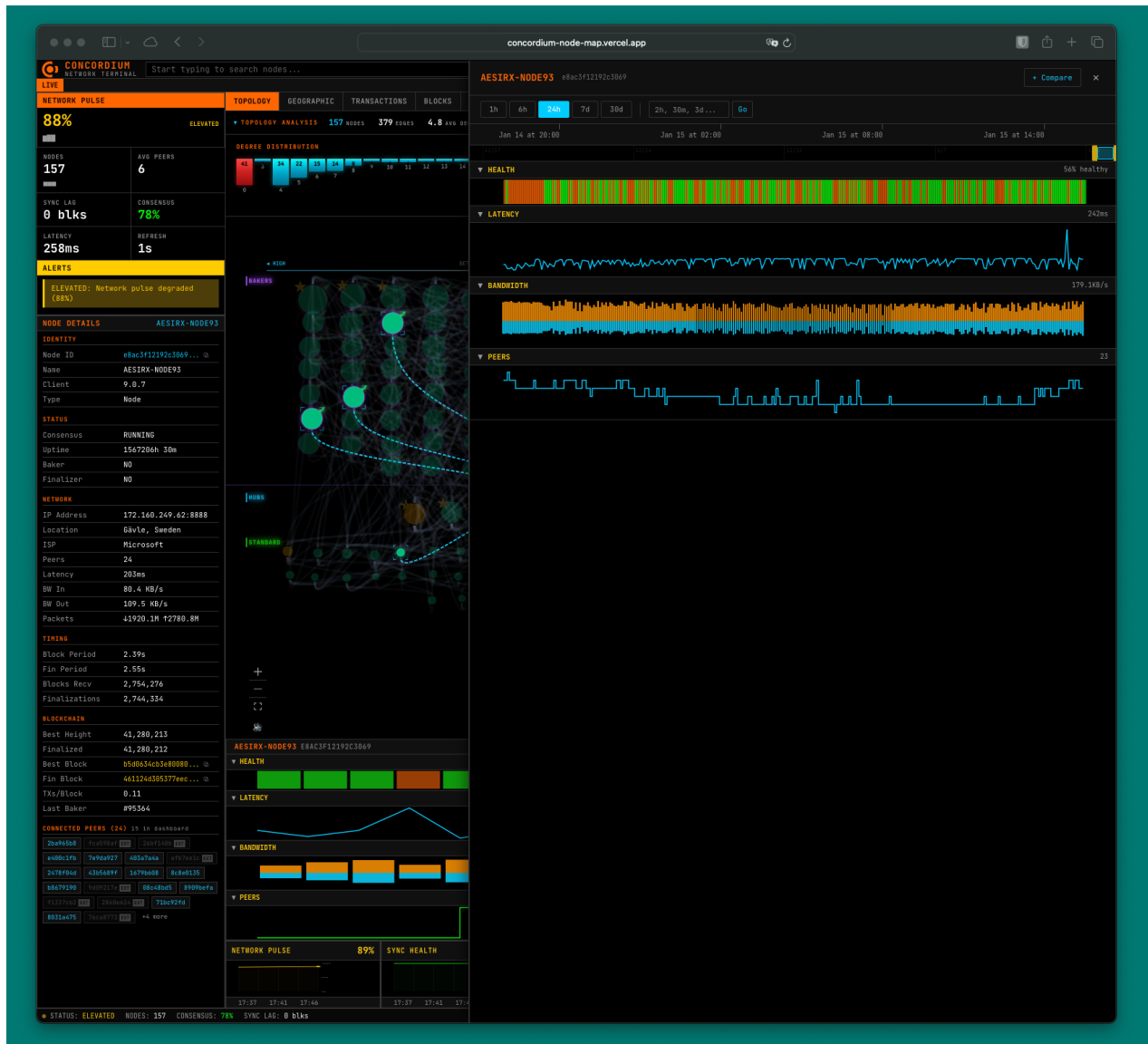


Figure 2: Geographic Distribution View

## Executive Summary

The **Concordium Node Map** is a proprietary real-time monitoring and intelligence platform developed by the Concordium Security Team to provide unprecedented visibility into blockchain network health, validator operations, and peer topology.

**Key Outcome:** Proactive detection of network degradation, consensus failures, and validator health issues before they impact chain finalization.

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## Strategic Context: Internal Security Investigations

Following internal security investigations by the Concordium Security Team, **validator health assurance** emerged as a critical operational requirement:

- Network health depends on  $\geq 67\%$  validator consensus (ConcordiumBFT quorum threshold)
- No existing monitoring solution provided protocol-aware health metrics
- Validator uptime, peer connectivity, and finalization lag require continuous tracking

**Gap Identified:** Off-the-shelf APM tools (Datadog, Grafana, Prometheus) lack blockchain protocol awareness.

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## Why Custom Development Was Required

Requirement	Off-the-Shelf	Node Map
ConcordiumBFT quorum tracking	Not supported	Native 67% alerting
Finalization lag measurement	Generic latency	Protocol-aware sync lag
Peer topology discovery	Static config	gRPC live discovery
Validator identification	No blockchain context	Tier classification
Geographic distribution	Manual mapping	Automated GeoIP
Network Pulse score	N/A	Weighted health algorithm

## System Capabilities

### 1. Real-Time Network Pulse

Proprietary composite health score (0-100%):

- **Finalization Health** (40%) — Block finalization lag
- **Latency Health** (30%) — Network round-trip performance
- **Consensus Health** (30%) — Validators running consensus

**Thresholds:** NOMINAL (90-100%) | DEGRADED (67-74%) | CRITICAL (<67%)

### 2. Topology Intelligence

- Live network graph showing peer relationships
- Automatic bottleneck and bridge node detection
- Validator (Baker) tier classification

### 3. OSINT Integration

- Automated IP reputation lookups via InternetDB
- Vulnerability scanning for node infrastructure

### 4. Historical Trending

- 15-60 minute sliding window analytics
  - Per-node performance history
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## Technical Architecture

**Deployment:** Vercel serverless + Turso edge database | **Update:** 5-min polling, 30-sec UI refresh

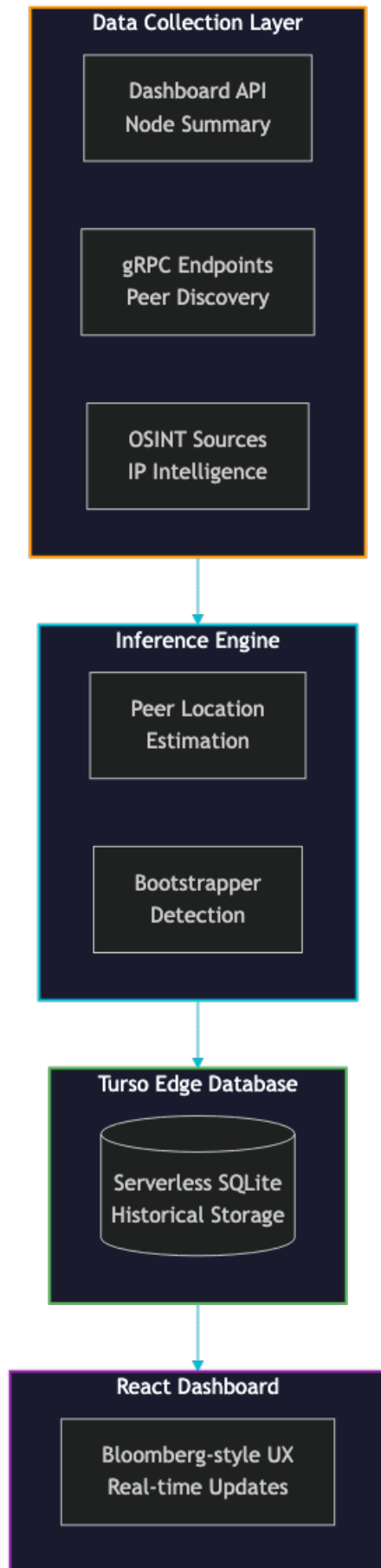


Figure 3: System Architecture

## Value Delivered

Metric	Before	After
Time to detect degradation	Hours (manual)	<b>&lt; 5 minutes</b>
Validator health visibility	None	<b>100% coverage</b>
Topology understanding	Unknown	<b>Full peer graph</b>
Geographic insight	Unknown	<b>Mapped to region</b>
Historical analysis	Not possible	<b>Up to 60 minutes</b>

## Risk Mitigation

Addresses audit-identified risks:

1. **Consensus Failure Prevention** — Real-time quorum monitoring
2. **Validator Accountability** — Individual baker tracking
3. **Infrastructure Security** — OSINT flags vulnerable nodes
4. **Incident Response** — Historical data for root cause analysis

## Investment Summary

Component	Status
R&D Investment	Completed in-house
Operational Cost	Minimal (serverless, free OSINT)
Maintenance	Low (automated, self-healing)
Dependencies	Concordium gRPC SDK, public APIs

## Recommendation

Continue investment — this platform provides **irreplaceable operational visibility** that cannot be achieved through commercial alternatives. Internal security investigations underscored validator health as a critical security control — this system delivers that control.

**Next Steps:** (1) Slack/PagerDuty alerting (2) Extended historical retention (3) Testnet implementation

*Concordium Security Team — R&D Division | January 2026*