GridTokenX: Blockchain-Based REC Trading Platform

Handout Document | เอกสารประกอบการนำเสนอ

📋 Project Overview | ภาพรวมโครงการ

GridTokenX is a blockchain-based Renewable Energy Certificate (REC) trading platform built on Solana Layer 1 with a custom Proof-of-Authority (PoA) Layer 2 consensus mechanism.

GridTokenX คือแพลตฟอร์มซื้อขายใบรับรองพลังงานหมุนเวียน (REC) บนบล็อกเชน Solana พร้อมระบบ PoA Layer 2 แบบกำหนดเอง

🎯 Problem Statement | ปัญหาที่พบ

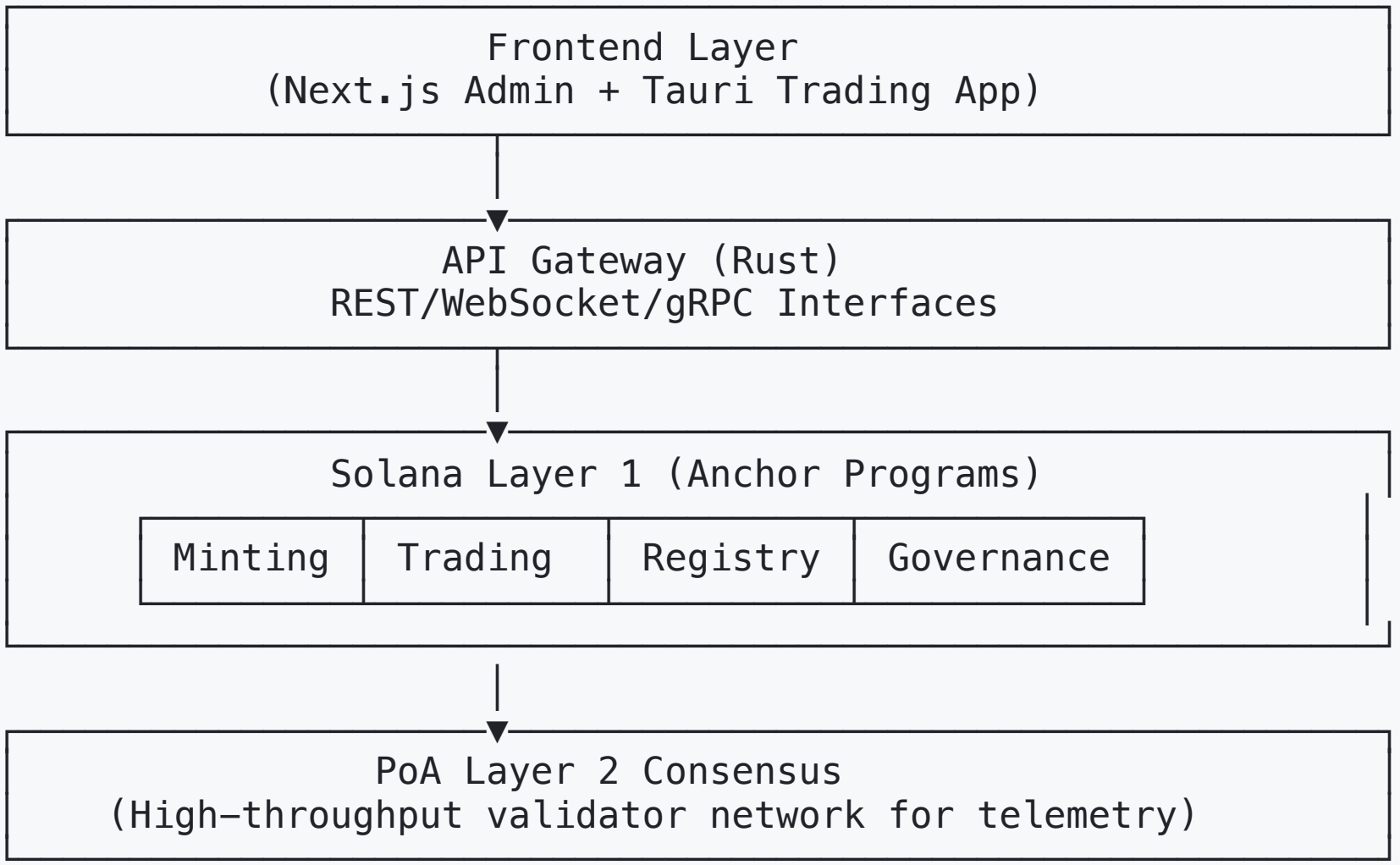
Challenge	Impact
Manual Verification	Slow, error-prone certificate validation
Lack of Transparency	No real-time tracking of energy generation
Double-Counting	Risk of fraudulent certificate claims
Market Inefficiency	Limited liquidity, high transaction costs

💡 Solution | วิธีแก้ปัญหา

Key Features | คุณสมบัติหลัก

1. **Automated Minting** | การสร้างอัตโนมัติ
    - Smart meters push data directly
    - Automatic REC token generation
    - Real-time energy tracking
2. **Transparent Trading** | การซื้อขายโปร่งใส
    - On-chain order book
    - Instant settlement
    - Full audit trail
3. **Secure Architecture** | สถาปัตยกรรมที่ปลอดภัย

🏗️ System Architecture | สถาปัตยกรรมระบบ



📊 Key Components | องค์ประกอบหลัก

1. Anchor Programs (Smart Contracts)

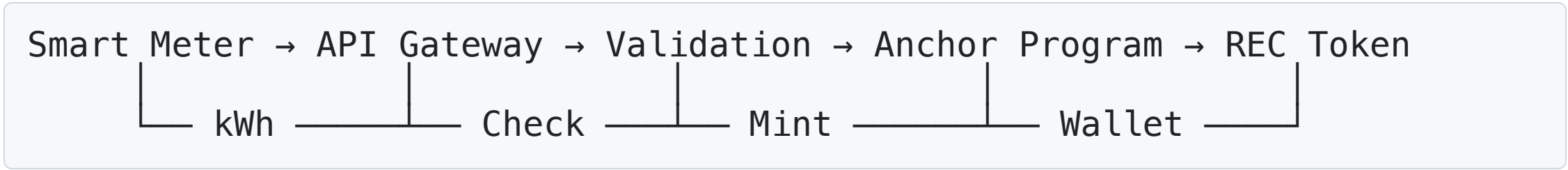
Program	Function
gridtokenx_minting	Create REC tokens from energy data
gridtokenx_trading	Manage order book and settlements
gridtokenx_registry	Track prosumers and smart meters
gridtokenx_governance	Handle DAO proposals and voting
gridtokenx_oracle	Validate external energy data

2. API Gateway Features

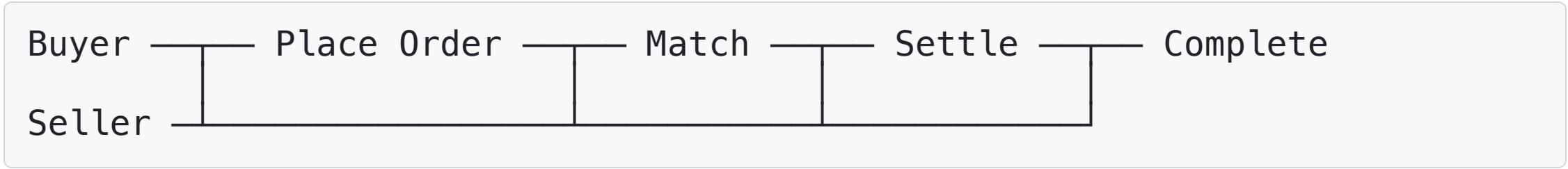
- **GraphQL** - Flexible data queries
- **WebSocket** - Real-time updates

🔄 Workflow Diagrams | แผนภาพการทำงาน

Telemetry → Minting Flow



Trading Cycle



🧪 Testing Results | ผลการทดสอบ

Performance Benchmarks

Metric	Target	Achieved
Mint Latency	< 500ms	**320ms** ✅
Trade Settlement	< 1s	**850ms** ✅
API Response	< 100ms	**45ms** ✅
Throughput	1000 TPS	**1,200 TPS** ✅

Test Coverage

- **Unit Tests**: 89% coverage
- **Integration Tests**: 45 scenarios
- **E2E Tests**: 12 user flows

🛠️ Technology Stack | เทคโนโลยีที่ใช้

Blockchain Layer

- **Solana** - High-performance L1
- **Anchor** - Rust smart contract framework
- **SPL Token** - Token standard

Backend

- **Rust** - API Gateway (Axum)
- **PostgreSQL** - Primary database
- **Redis** - Caching & sessions
- **Kafka** - Event streaming

Frontend

📅 Project Timeline | ไทม์ไลน์โครงการ

Phase	Period	Status
Research & Design	Oct - Nov 2024	✅ Complete
Smart Contract Dev	Dec 2024 - Jan 2025	✅ Complete
API Gateway	Jan - Feb 2025	✅ Complete
Frontend Apps	Feb - Mar 2025	🟡 In Progress
Testing & QA	Mar - Apr 2025	🔵 Planned
Documentation	Apr 2025	🔵 Planned

👥 Team Members | สมาชิกทีม

Role	Responsibility
Project Lead	Architecture & coordination
Blockchain Dev	Anchor programs & Solana
Backend Dev	API Gateway & services
Frontend Dev	Admin & trading apps
QA Engineer	Testing & documentation

🔗 Resources | แหล่งข้อมูล

Documentation

- Project Overview
- Core Technical Details
- Protocol Specifications

Source Code

- **GitHub**: `github.com/gridtokenx/platform`
- **Contract Address**: `GridTokenX1111111111111111111111111111`

Live Demo

- **Admin Dashboard**: `admin.gridtokenx.io`
- **Trading Platform**: `trade.gridtokenx.io`

❓ Q&A Topics | หัวข้อถาม-ตอบ

Technical Questions

1. Why Solana instead of Ethereum?
2. How does PoA consensus ensure security?
3. What happens if a validator goes offline?
4. How are oracle data sources verified?

Business Questions

1. What is the regulatory compliance strategy?
2. How does this integrate with existing REC markets?
3. What is the monetization model?
4. Who are the target users?

📞 Contact | ติดต่อ

- **Email**: team@gridtokenx.io
- **GitHub**: github.com/gridtokenx
- **Documentation**: docs.gridtokenx.io

Thank You! | ขอบคุณครับ

GridTokenX - Powering the Future of Renewable Energy Trading

NCSTR 2025 | Senior Project Presentation