LocaNext System Architecture

System Overview

DEPLOYMENT MODEL

User's PC (Windows .exe)

- LocaNext.exe (Electron desktop app)
- Embedded Python Backend Server
- Connects to Central PostgreSQL Database
- Local processing on user's CPU (FAST)
- Works with company network

Central Server (Cloud/On-Premise)

- FastAPI Server (Python 3.11+)
- **PostgreSQL Database** (ALL data)
- PgBouncer connection pooling (1000 connections)
- Admin Dashboard (web interface)

Communication:

- HTTPS (REST API) for data exchange
- WSS (WebSocket) for real-time updates

Database: PostgreSQL Only

Why PostgreSQL?

Feature	Benefit
COPY TEXT bulk insert	31,000 entries/second
Full-Text Search (tsvector)	Fast search
GIN trigram indexes	Similarity matching
PgBouncer pooling	1000 concurrent connections
Enterprise reliability	Production-grade
Backup & Recovery	Built-in tools

Database Statistics

Metric	Value
Tables	17
API Endpoints	63+
Tests	912
Bulk Insert Speed	31K entries/sec

Communication Protocols

Layer	Protocol	Port	Purpose
API	REST/HTTPS	443	Data exchange
Real-time	WebSocket (WSS)	443	Live updates
Database	PostgreSQL	5432	Direct
Connection Pool	PgBouncer	6433	Pooled

Security Layers

1. IP RANGE FILTERING (Primary)

- Only company network IPs allowed (e.g., 192.168.11.0/24)
- All other IPs receive 403 Forbidden

2. CORS (Cross-Origin Resource Sharing)

- Whitelist of allowed origins only
- Blocks requests from unauthorized domains

3. JWT AUTHENTICATION

- Access Token: 30 minutes
- Refresh Token: 7 days
- Secure key generation required

4. TLS/HTTPS ENCRYPTION

- All data encrypted in transit
- TLS 1.2/1.3 supported

5. AUDIT LOGGING

- All login attempts logged
- Failed access attempts tracked
- 1 year retention

6. INPUT VALIDATION

- SQL Injection: Protected (SQLAlchemy ORM)
- XSS: Sanitized inputs
- Path Traversal: Blocked

PostgreSQL Tables

Table	Purpose
users	User accounts
projects	All projects
ldm_projects	LDM projects
ldm_files	Translation files
ldm_rows	Translation rows
ldm_translation_memory	TM databases
ldm_tm_entries	TM entries
telemetry_events	Usage tracking
audit_logs	Security logs
sessions	Login sessions

Total: 17 Tables

Application Components

Component	Technology	Purpose
Desktop App	Electron + Svelte	User interface
Backend	FastAPI + Python	API + Processing
Database	**PostgreSQL**	ALL data storage
Connection Pool	PgBouncer	Performance
Real-time	Socket.IO	Live updates
Admin Dashboard	SvelteKit	Monitoring

Data Flow

Step 1: User Action

User opens LDM, loads translation file

Step 2: Database Query

- FastAPI queries PostgreSQL
- PgBouncer manages connections
- Full-text search for TM matches

Step 3: Local Processing

- Python processes on user's CPU
- Translation memory suggestions
- Real-time updates via WebSocket

Step 4: Save to Database

- Changes saved to PostgreSQL
- COPY TEXT for bulk operations
- Backup and safety checks

Test Coverage

Category	Tests	Status
Unit Tests	377+	PASS
API Tests	168	PASS
Security Tests	86	PASS
E2E Tests	164	PASS
Total	**912**	**100%**