Solar Energy Use Case

Protocol gateway handling 250,000 points with DNP3/Modbus translation across distributed substations.
Industry: Renewable Energy / Utilities

Quick Facts

Attribute	Value
Customer	Major utility company — solar/hydro generation
Scale	250,000 points (125k Modbus reads + 125k DNP3 writes)
Sites	5 remote substations
Points per Site	25,000 tags
Architecture	EdgeConnect + Enterprise with DataHub TagProvider
Infrastructure	48 vCPU, 128 GB RAM (including redundancy)
Status	In production

The Challenge

Challenge: Implement a gateway solution to read from 125,000 PLC points and write to 125,000 electrical points across 5 remote substations with real-time protocol translation, redundancy, and zero-downtime maintenance.

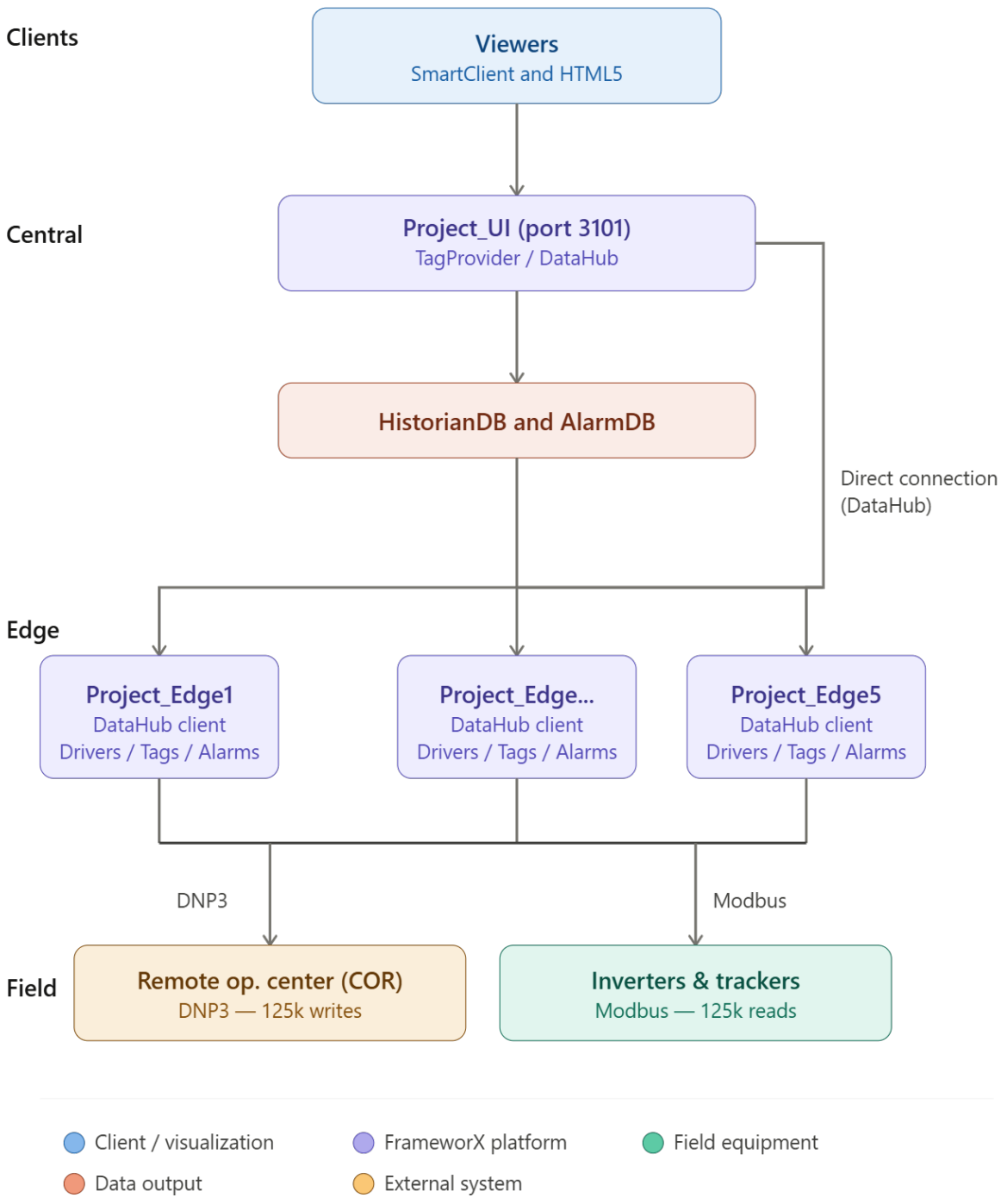
Specific pain points:

- Legacy system couldn't handle protocol translation at scale
- Lack of real-time visibility across distributed substations
- No redundancy — single point of failure for critical grid operations
- Required full downtime for any system changes
- Risk to critical grid operations during maintenance windows

Impact: Without scalable gateway architecture, substations operate in isolation, protocol mismatches prevent unified control, and any system update risks grid stability.

The Solution

Architecture



Tier	Component	Capabilities
Edge (5 sites)	FrameworX EdgeConnect	Modbus collection, 25k tags each, store-and-forward
Central	FrameworX Enterprise	UI, DataHub TagProvider, Historian, Alarms
Protocol Translation	DNP3 Master/Slave + Modbus	Bidirectional gateway (125k read 125k write)
Clients	SmartClient + HTML5	Operations monitoring

Scale

Metric	Value
Total Points	250,000 (125k reads + 125k writes)
Edge Nodes	5 substations
Tags per Edge	25,000
Modbus Reads	125,000 points
DNP3 Writes	125,000 points
Infrastructure	48 vCPU, 128 GB RAM

Connectivity

Protocol	Direction	Application
Modbus	Inbound	Field device collection (inverters, trackers)
DNP3	Outbound	Remote Operation Center integration
DataHub	Internal	Edge-to-Central communication

Modules

Module	Configuration
Historian	Postgres + TimescaleDB
Alarms	Centralized alarm database
DataHub	TagProvider for distributed engineering

Redundancy & Failover

Central:

- Full-project redundancy (1 pair)
- Automatic failover

Edge:

- Store-and-forward enabled
- Independent operation during network outages
- Automatic resync on reconnection

Engineering:

- DataHub TagProvider enables hot-add of new Edge sites
- Zero downtime for system expansion

Key Enablers

FrameworX capabilities that made this solution possible:

Capability	Application
DataHub TagProvider	Distributed engineering with zero-downtime Edge additions
Full-project redundancy	99.99% uptime with store-and-forward
DNP3 protocol support	Electrical utility integration (master/slave)
Modbus collection	Field device connectivity at scale
Protocol translation	Seamless Modbus-to-DNP3 conversion
Scalable Edge architecture	5 sites × 25k tags with unified management

Strategic Insights

Protocol Gateway Architecture

Utility operations often require bidirectional protocol translation — field devices speak Modbus, control centers speak DNP3. Rather than custom middleware, FrameworX provides native support for both protocols with built-in translation, reducing integration complexity.

Zero-Downtime Engineering

Traditional SCADA systems require downtime to add new sites or modify configurations. DataHub TagProvider enables distributed engineering where new Edge nodes can be hot-added without interrupting production systems — critical for utilities that cannot afford maintenance windows.

Right-Sized Infrastructure

250,000 points with full redundancy running on 48 vCPU / 128 GB RAM demonstrates efficient resource utilization. Proper architecture design avoids over-provisioning while maintaining performance headroom.

The Results

- **Full Gateway Capability** — Data flow handling 250,000 points (125k Modbus reads 125k DNP3 writes) with real-time protocol translation
- **Real-time Protocol Translation** — Seamless Modbus-to-DNP3 conversion across all 5 substations without custom middleware
- **Zero Downtime** — Hot-add new sites without system interruption via DataHub TagProvider
- **99.99% Uptime** — Full redundancy with store-and-forward eliminated data loss during network disruptions
- **85% Faster Deployment** — New edge sites added in hours instead of days
- **40% Cost Reduction** — Optimized infrastructure (48 vCPU, 128 GB RAM) supporting entire redundant system

---

This case demonstrates large-scale protocol gateway architecture with DNP3/Modbus translation, distributed edge deployment, and zero-downtime engineering for utility operations.

In this section...
