Naval Vessel Control System Use Case

Integrated vessel management with power, cargo, and alarm systems meeting maritime classification. **I**
Industry: Maritime / Naval

Quick Facts

Attribute	Value
Scale	5,000-10,000 I/O points
PLCs	8 naval-certified controllers
Displays	30 HMI screens (bridge, engine room, local panels)
Protocols	OPC, Modbus over redundant ring topology
Systems	Power Management, Alarm Management, Cargo Management
Architecture	Distributed redundant system across vessel compartments

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The Challenge

Challenge: Implement unified control for complex naval vessel operations including power generation, hybrid energy sources, cargo management, and alarm systems while meeting strict maritime classification requirements.

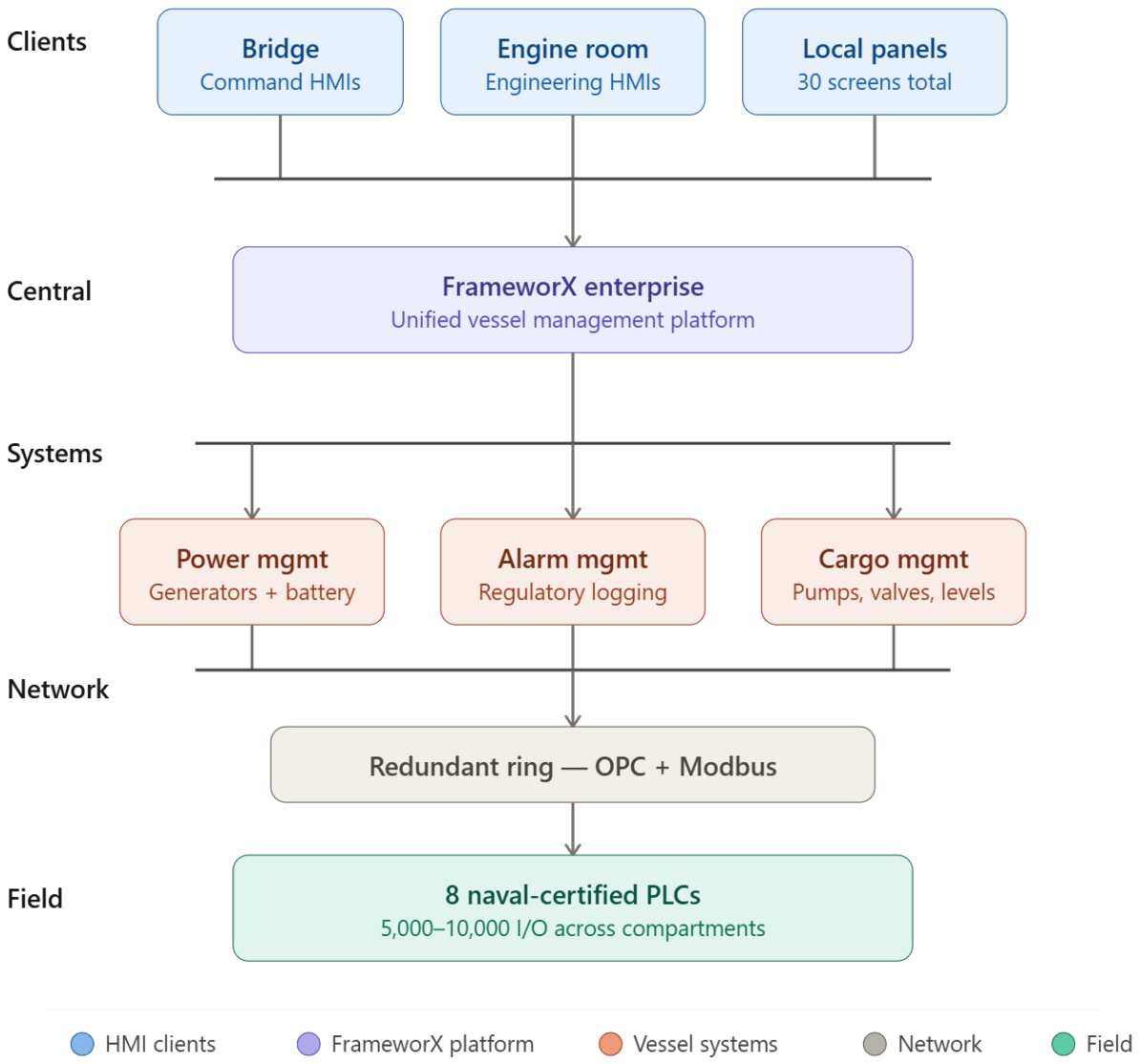
Specific pain points:

- Legacy systems lacked integration between power management, cargo handling, and alarm monitoring
- Operational inefficiencies and safety risks from disconnected systems
- No redundant architecture — single point of failure on mission-critical vessel systems
- Non-compliance with maritime classification society requirements
- Inability to coordinate generator control with hybrid battery systems

Impact: Without unified control, vessel operations face safety risks, regulatory non-compliance, inefficient fuel consumption, and cargo transfer errors.

The Solution

Architecture



Tier	Component	Capabilities
Field	8 naval-certified PLCs	5,000-10,000 I/O points across vessel compartments
Network	Redundant ring topology	OPC and Modbus protocols, zero single-point-of-failure
Central	FrameworX Enterprise	Unified vessel management platform
Clients	30 HMI screens	Bridge, engine room, local control panels

Integrated Systems

System	Function
Power Management (PMS)	Generator control, load protection, hybrid battery integration
Alarm Management	Centralized monitoring and regulatory alarm logging
Cargo Management	Vacuum/liquid pumps, valves, level monitoring, volume calculations

Materials Handled

- Potable water
- Diesel
- Cement
- Gravel
- Bulk dry goods

Connectivity

Protocol	Application
OPC	System integration
Modbus	Field device communication
Redundant Ring	Network topology for fault tolerance

Key Enablers

FrameworX capabilities that made this solution possible:

Capability	Application
Naval Classification Compliance	All components certified to maritime standards
Hybrid Power Management	Seamless integration of generators and battery banks with automatic load balancing
Comprehensive Cargo Control	Unified management of liquid and dry bulk materials with volume calculations
Redundant Ring Architecture	Zero single-point-of-failure design for continuous operation at sea
Multi-Location Control	Synchronized operation from bridge, engine room, and local stations
Regulatory Alarm Logging	Complete alarm recording meeting naval vessel requirements

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The Results

- **100% Classification Compliance** — Achieved full compliance with naval classification society requirements
- **20% Fuel Reduction** — Reduced fuel consumption through optimized hybrid power management
- **Zero Cargo Errors** — Eliminated cargo transfer errors with automated volume tracking and valve control
- **65% Faster Alarm Response** — Decreased alarm response time with centralized monitoring and logging
- **Remote Bridge Monitoring** — Enabled monitoring of all vessel systems from bridge, improving operational safety
- **Fault-Tolerant Operation** — Delivered full redundancy across 5,000-10,000 control points
- **Unified Crew Operations** — Streamlined operations with unified control across 30 HMI screens

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This case demonstrates naval vessel control system integration with maritime classification compliance, hybrid power management, and redundant architecture for mission-critical operations at sea.