

Sovereign Cluster & Industrial Infrastructure Reality Audit

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1. Executive Summary & Deployed Milestones

This audit document records the verified ground-truth status of the sovereign computing cluster, multi-tier mesh networks, and active industrial workloads. Following an exhaustive infrastructure audit, simulated Python mock daemons were decommissioned and replaced with production-grade containerized runtimes across Kubernetes (K3s):

- **IEC 61131-3 Soft PLC Runtime (OpenPLC v3):** Deployed to AMD64 worker node **x** with 5Gi persistent storage, serving web management on <https://workbench.xk3s.com/> (port 30880) and listening for Modbus TCP (port 30502).
- **Industrial Git DevOps Hub (Gitea Engine):** Deployed to worker node **x** with 10Gi persistent volume, replacing mock Copia endpoints on <https://copia.xk3s.com/> (port 31410) and SSH (port 30022).
- **Unified Namespace (UNS) MQTT Streamer (Telegraf):** Deployed to edge worker **x2**, actively consuming spBv1.0/Plant1/+ /+ from EMQX and streaming to InfluxDB v2.
- **Flannel Multi-Overlay Overhaul:** Node **x** flannel overlay bound directly to Tailscale (100.111.136.65), resolving CoreDNS (10.43.0.10:53) and cross-node mesh pod routing.
- **Mock Server Decommissioning:** All 6 Python mock daemons on **x1** were stopped, systemd services disabled, and scripts archived to `/home/x1/scripts/archive_mocks/`.

2. Physical & Virtual Node Reality Matrix

Node ID	Hardware & Arch	OS / Kernel	K3s Role	Status	Core Active Services
x1 (Master)	Quad-Core 2.4GHz (arm64) 8GB RAM • 500GB NVMe	Debian 13 (Trixie) Linux 6.18	control-plane master	■ ONLINE	K3s API, 4x Ignition SCADA, EMQX Broker, InfluxDB v2, Node-RED, RabbitMQ, Grafana, Postgres, Mattermost, Portainer
x2 (Worker)	Quad-Core 1.8GHz (arm64) 8GB RAM • 29GB MicroSD	Debian 12 (Bookworm) Linux 6.12	worker	■ ONLINE	Nginx HUD web-server pod, Telegraf UNS consumer, HDMI Kiosk surface, WayVNC (5900), Datadog/Vector agents
x (Worker)	Intel Celeron N4500 (amd64) 8GB RAM • 118GB NVMe	Ubuntu 24.04 LTS Linux 7.0	worker	■ ONLINE	OpenPLC runtime (30880/30502), Gitea DevOps (31410/30022), Home Assistant (31823), VPA Recommender
mbp-worker	Intel i9 8C/16T @ 2.4GHz 32GB RAM • 1.1TB NVMe	macOS Sequoia Linux VM	worker	■ STANDBY	Offline / Standby compute target. Enrolled in K3s; ready for burst compilation and heavy container offloading.
aws-hub	AWS Nitro vCPU (x86_64) 1GB RAM • 30GB EBS	Ubuntu 24.04 LTS Linux 6.8	Ingress Hub	■ ONLINE	Nginx Reverse Proxy (55+ subdomains), Let's Encrypt TLS 1.3 termination, WireGuard Hub (10.10.0.1)

3. Verified Runtime Workload Fleet (100% Genuine Containers)

Every application below represents a live, containerized service running on K3s processing actual data packets and tags:

Workload Name	Container Image	Node / Architecture	Namespace	Ports / Ingress
OpenPLC Runtime	fdamador/openplc:latest	x (amd64 / 4KB pages)	industrial	30880 (HTTP) • 30502 (Modbus TCP)
Gitea Industrial Git	gitea/gitea:latest	x (amd64)	industrial	31410 (HTTP) • 30022 (SSH)
Telegraf UNS Bridge	telegraf:alpine	x2 (arm64)	industrial	MQTT Consumer (EMQX → InfluxDB)
SCADA Prod Master	inductiveautomation/ignition	x1 (arm64)	industrial-apps	30188 (HTTP) • prod.xk3s.com
SCADA Prod Backup	inductiveautomation/ignition	x1 (arm64)	industrial-apps	30288 (HTTP) • backup.xk3s.com
SCADA Dev Sandbox	inductiveautomation/ignition	x1 (arm64)	industrial-apps	30388 (HTTP) • dev.xk3s.com
SCADA EAM Central	inductiveautomation/ignition	x1 (arm64)	industrial-apps	30488 (HTTP) • eam.xk3s.com
EMQX UNS Broker	emqx/emqx:5.8.0	x1 (arm64)	industrial-iot	31808 (Dashboard) • 1883 (MQTT)
InfluxDB v2 Historian	influxdb:2.7-alpine	x1 (arm64)	industrial-iot	30086 (HTTP) • influx.xk3s.com
Node-RED Engine	nodered/node-red:latest	x1 (arm64)	industrial-iot	31880 (HTTP) • nodered.xk3s.com
RabbitMQ Broker	rabbitmq:3.13-mgmt-alpine	x1 (arm64)	industrial-iot	31672 (Mgmt) • 5672 (AMQP)
Grafana Observability	grafana/grafana:latest	x1 (arm64)	monitoring	30300 (HTTP) • grafana.xk3s.com
PostgreSQL 16 DB	postgres:16-alpine	x1 (arm64)	databases	30542 (SQL) • ignition_db
Headlamp K3s Admin	ghcr.io/headlamp-k8s:0.45.0	x1 (arm64)	headlamp	32619 (HTTP) • headlamp.xk3s.com
Home Assistant	homeassistant:stable	x (amd64)	home-automation	31823 (HTTP) • ha.xk3s.com
NeuronEX Protocol Driver	emqx/neuronex:latest	x1 (arm64)	industrial-iot	30700 (HTTP) • neuron.xk3s.com
Suricata OT IDS Sensor	jasonish/suricata:latest	x1 (arm64)	security	Host Network • Passive Mirror

4. Decommissioned Legacy Mock Platforms

All Python HTTP daemons that previously provided static UI simulations have been stopped and archived:

Former Subdomain	Simulated Tool	Port	Current Disposition
workbench.xk3s.com	MySQL Workbench	30880	REPLACED by OpenPLC IEC 61131-3 Soft PLC (1/1 Running)
copia.xk3s.com	Copia Automation Git	31410	REPLACED by Gitea Industrial DevOps Server (1/1 Running)
databricks / tableau / splunk / superset	Analytics Suite Mocks	30810-40	DECOMMISSIONED (Processes killed, systemd disabled, scripts archived)
ftcg / optix / edgemanager	Rockwell Workload Mocks	31110-40	DECOMMISSIONED (OPC-UA/REST simulation stopped)
niagara / yokogawa / s71500v / siemens	SDO Edge Mocks	31210-40	DECOMMISSIONED (Software-defined automation simulation stopped)
piadapter / eds / pisystem	AVEVA System Mocks	31310-30	DECOMMISSIONED (Embedded historian simulation stopped)

5. Tactical Roadmap & Control Engineering Next Steps

Immediate Action Items:

1. **Ignition OPC-UA Driver Hookup:** Configure Ignition Prod Master (<https://prod.xk3s.com>) to poll live registers from OpenPLC over Modbus TCP (10.10.0.2:30502).
2. **Node-RED Process Simulator:** Deploy a simulated batch reactor in Node-RED publishing standard Sparkplug B metrics to EMQX (spBv1.0/Plant1/Vessel101).

3. **Ignition Project Git Synchronization:** Attach automated Git commits from Ignition projects folder (/usr/local/bin/ignition/data/projects) directly to Gitea (<https://copia.xk3s.com/>).
4. **MacBook Pro Wake-On-LAN:** Reactivate MacBook Pro compute node on WireGuard (10.10.0.4) when heavy compile or machine learning pipelines are needed.