

Title: AI-Assisted Network Health Monitor for Smart Industry (IT/OT) Networks

1. Context / Background

Smart factories operate on converged industrial networks, where Operational Technology (OT) devices—PLCs, sensors, drives, SCADA—and Information Technology (IT) systems—servers, cloud, analytics—communicate over a unified infrastructure.

These networks span all layers from L1 (physical) to L7 (application):

L1: cables, connectors, signal quality

L2: switching, VLANs, MAC tables

L3: routing, subnets, firewall transitions

L4: TCP/UDP reliability and flow

L5–L7: session stability, application response times, protocol behavior

Failures in any layer can impact production, making visibility across all layers essential.

2. Current Challenges

- L1 issues (cable damage, CRC errors) often look like L3 routing issues.
- OT protocols behave differently than IT traffic; diagnosing cross-layer problems is complex.
- No unified view of device status, topology, and data flow.
- Asset sprawl: hundreds/thousands of devices across one factory with no central visual overview.
- Operators rely on manual, siloed tools.

3. Why It Matters for Belden / Industry

- Belden specializes in industrial connectivity: Hirschmann switches, EAGLE security routers, enterprise/industrial WLAN, and edge gateways.
- Smart factories need end-to-end visibility (L1–L7) and asset monitoring, something Belden aims to strengthen.
- This assignment aligns with Belden’s strategic push into IT/OT convergence solutions, industrial automation, and intelligent diagnostics.

4. What Students Must Achieve

- Design a concept or prototype for an AI-assisted tool that provides:
- KPI Visibility Across Layers (L1-L7)
- Asset Monitoring & Visualisation
- AI-Driven Health Insights

- Operator Dashboard
- They do NOT need to build the full system — only a *concept, data model, workflow, and AI idea*.

5. Research Requirements (Belden + Industry)

Industry Research:

- Industrial networks & protocols (Ethernet/IP, Modbus/TCP, Profinet).
- Basics of L1–L7 OSI layers & relevant KPIs.
- Methods for asset monitoring & topology mapping.
- AI techniques for summarising logs and correlating KPIs

Belden Product Research (Recommended):

- Hirschmann Managed Switches (L1–L3 KPIs)
- Belden Industrial WLAN
- EAGLE security/firewall routers
- Edge/IIoT gateways
- High-level concepts of BHNO (orchestration/visibility)

6. Constraints

- No real industrial data required → simulation is allowed.
- No programming required; architecture + design is enough.
- AI can be conceptual (flow + sample prompt).
- Deliver a workable concept, not a final product.

7. Evaluation Metrics (100%)

- Technical Understanding - 25%, KPIs (L1–L7), IT/OT convergence, industrial protocols
- Innovation & AI Usage - 25%, New KPIs, correlation ideas, visualization, AI logic
- Practical Relevance - 20%, Useful in a real factory environment
- Research Depth - 15%. Clear Use of Belden + industry concepts
- Clarity & Presentation - 15%, Visual storytelling, diagram quality

8. Expected Deliverables

An 8-10 slide PPT/PDF, including:

- Problem Context & IT/OT Convergence Background
- Layer-Wise KPI Selection (L1–L7)
- Asset Monitoring & Visualization Approach



- Architecture (Data → KPI Engine → AI → Dashboard)
- AI Layer Design(How AI summarizes, correlates, or predicts issues)
- Operator Dashboard / Visualization Mockup
- Bonus: Mock UI, AI pattern detection technique, novel KPI selection and correlation