A Universal Control System on Open Standards

Concept for discussion | BM Global with ENGIE | 3 November 2026 | Draft V4

This page puts together the discussion with Mr. Sunil (ENGIE) on 23 October 2026, starting from his question: do we want to build our own control system?

The problem

Plants run control systems from many vendors such as ABB, Siemens, Yokogawa and Omron. Their hardware becomes obsolete one part at a time. The goal is to use hardware available on the open market and integrate it with existing, fully or partly obsolete systems, without losing connectivity or program logic execution.

The system

Level and authority	What it does	Standard
L0 Protection and isolation Absolute. Trips and overrides every level. Holds the lock.	Hardwired machinery protection (overspeed, vibration), protection relays, safety instrumented functions and isolation for maintenance. Independent of every other level; not part of the new system. Nothing restarts under a lock.	IEC 61508, 61511, 62061 / ISO 13849, IEC 60255, API 670, ISO 14118
L1 Controller Acts, within its logic and protection limits.	Real-world actions. Logic from any vendor (ABB, Siemens, Yokogawa, Omron) converted to standard language. CODESYS is the first runtime; the standard language is the asset.	IEC 61131-3
L2 Channels Gatekeeper. Decides what is allowed to cross and in which direction. Cannot originate commands.	Two separate channels. Out channels are data channels: data leaves the control system, one-way. In channels are control channels: commands enter, one-way. They never mix. Data diodes, switches and gateways.	One-way transfer
L3 Data nodes Holds and serves. Processes, stores and presents data on demand. Grants no access, takes no action.	Meaning Tags. Every tag is its own node with value, time, validity, history, alarms, operator manual and description. A node can be reached by any of its names (plant code, vendor tag, drawing reference): all names are records on standard DNS servers, a distributed database of signal names, signed with DNSSEC. Data is served over open standards.	DNS / DNSSEC, OPC UA, MQTT or other open standards
L4 HMI and operator Decides. The operator commands the controllers.	ONE universal HMI for every system: same screens, alarms, trends and manuals regardless of vendor.	OPC UA, MQTT or other open standards
L5 AI Lowest. Analyzes, interprets, supports. No vote on actions.	Supporting oversight. Analyzes the Meaning Tags, interprets the plant state and supports the operator with suggestions, e.g. a Jev-style System One model.	System One models (Jev, TypeSafe AI)

Step by step, while the plant runs

- **Step 1. One universal HMI.** Control and HMI are completely unplugged from each other. Vendor operator stations are replaced by one HMI. Controllers, logic and I/O stay untouched. Each vendor system gets an adapter that publishes its data over an open standard (OPC UA, MQTT) into the Meaning Tag nodes. Where a system offers no data access, a camera reading terminal lights and numbers is the fallback adapter.
- **Step 2. Logic to standard.** Logic of each controller is converted to IEC 61131-3 and runs in parallel on the live inputs, compared with the real outputs of the old system.
- **Step 3. Controllers one by one.** Open-market controllers and I/O take over loop by loop through the in channel (control). Operators keep the same screens, because the HMI only talks to Meaning Tags.
- **Step 4. AI as support.** Oversight and suggestions to the operator on the full Meaning Tag history. AI takes the least action of any layer; control stays with controllers and operators.

Proof of concept: first result

A complete Siemens SIMADYN D gas turbine controller (45 function packages, 5,245 blocks) is translated 1:1 into IEC 61131-3 Structured Text for CODESYS by BM Global with AI. An independent compiler finds 0 errors, library tests pass, all tasks run in simulation, and every package is traced to the Siemens drawings. Next: test in CODESYS against a turbine model. Accompanying: 4-page schematic and code listing.

The Beyond Purdue approach

Purdue sorts devices by where they sit. Beyond Purdue sorts them by what they are allowed to do. The concept follows the Beyond Purdue approach to ICS resilience: build around proven systems instead of replacing them, and move from Purdue layers to channels. The levels follow the Beyond Purdue Laws of Authority (separate statement). Background in the Beyond Purdue newsletter at beyondpurdue.com and on LinkedIn.

Proposal

- **Working group.** ENGIE and BM Global set up a small working group.
- **Development project.** A small joint project that turns the vision into a first working pilot: all old systems coming together into one.
- **Open result.** ENGIE ends up with a system based on open standards, usable and understood by everyone. OEMs can contribute in future.

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