

## Control Narrative

For a mock building automation system, the following aspects must be simulated:

- Lighting
- Ventilation
- Appliance

Areas served by remote IO can be simulated, assume 3 physical areas.

Optional:

- Access control
- Occupancy detection

*Example:* HMI should show Door N is closed/ajar/locked/failed to lock

Integration with low-power IoT:

- Microcontroller-powered devices via ESP-NOW

Connection with web services:

- Telegram bot (backend built with Zig?)
- Custom app (frontend built with Flutter?)

Lateral (non-critical) integration with AI:

- Gemini chatbot
- Time-series analytics with machine learning

*Example:* Run an actuator, feed pet fish/cat.

## Demo Deployment

Simulated deployment environment with customized install of Debian

PREEMPT\_RT kernel config enabled

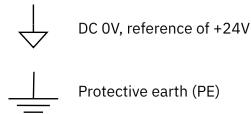
Physical core isolation for critical processes

# Topology Draft Sketch

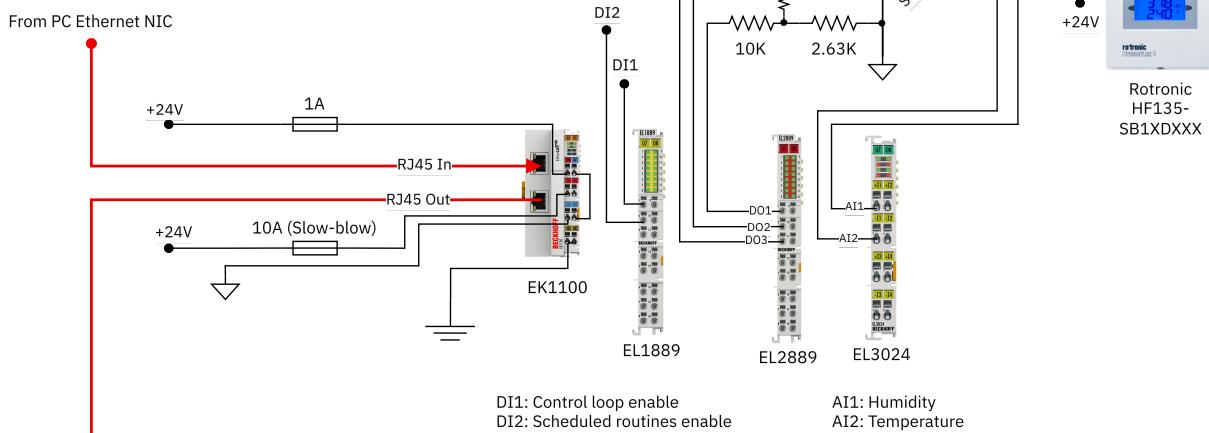
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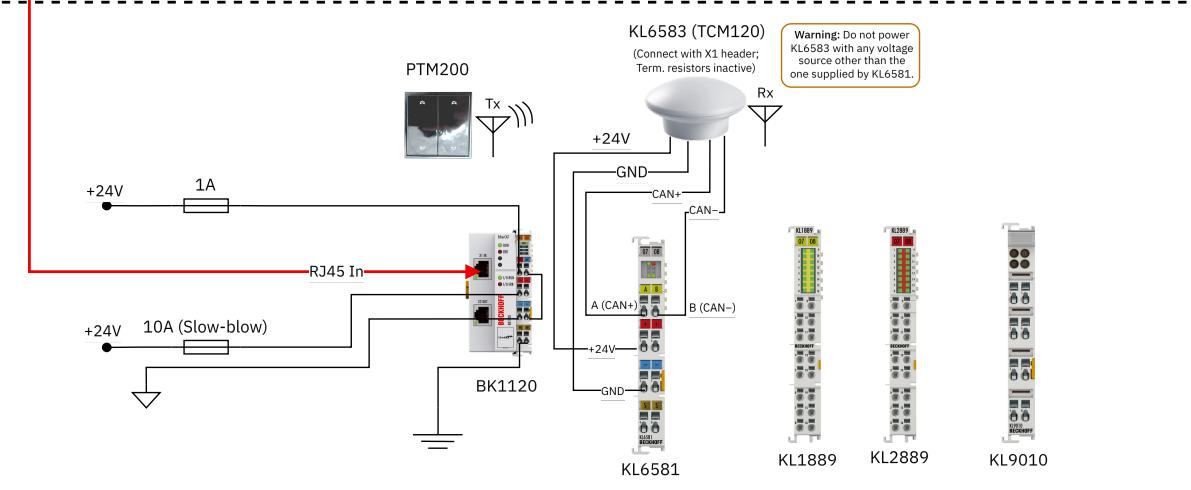
## Potentials



From PC Ethernet NIC



*Simulated distant separation*



Devices controlled by KL2889 can give Boolean feedback via KL1889

KL1889 and KL2889 are active LOW terminals

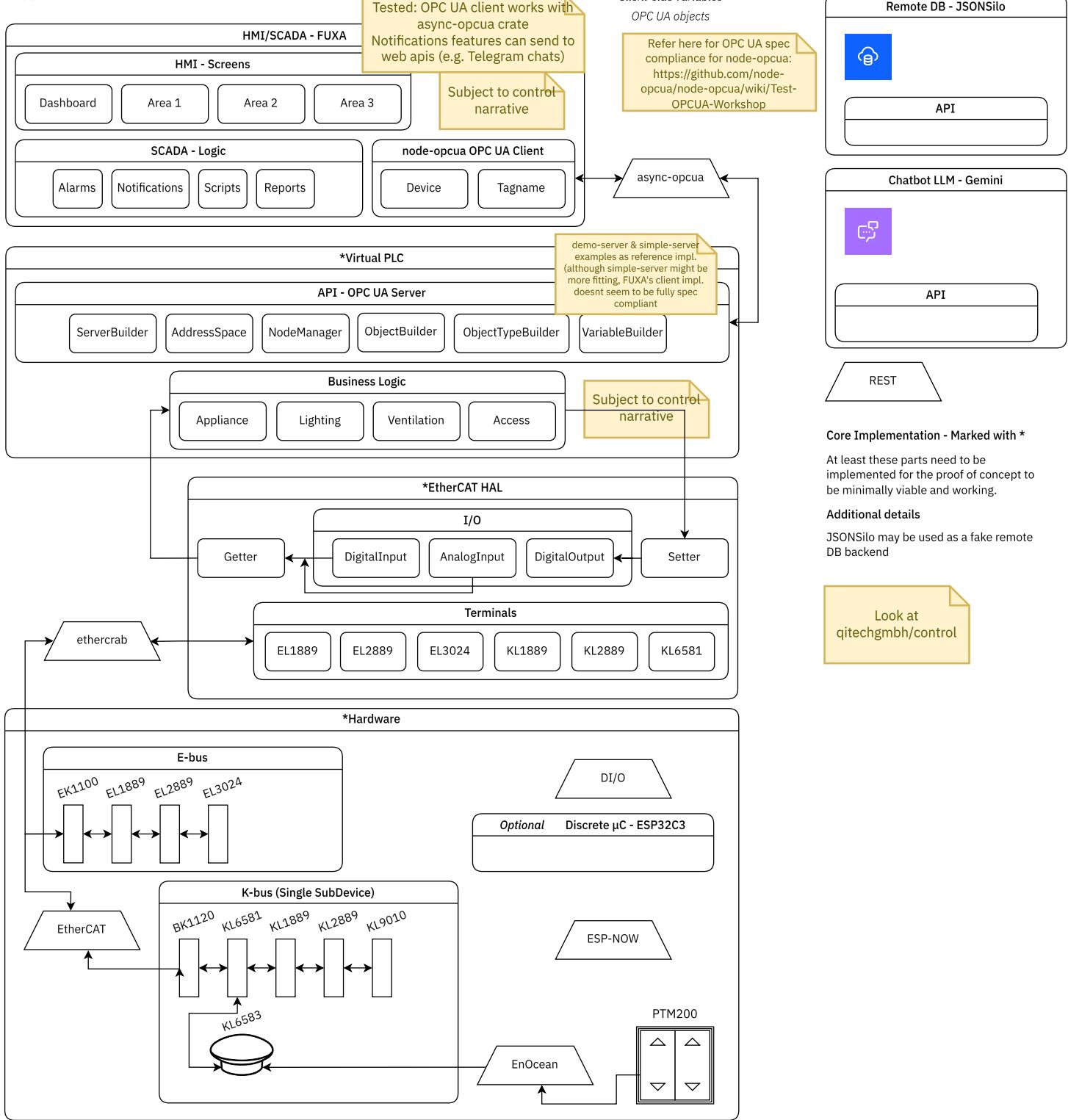
KL2889 can control contactors/relays that in turn control lights, fans, AC units, pumps, TVs, and other appliances.

KL2889 might send 5V digital output to other devices (e.g. RPI, Arduino, ESP). These devices can in turn control other appliances (printers, etc.).

# Architecture Draft

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# EnOcean State Machine Draft

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