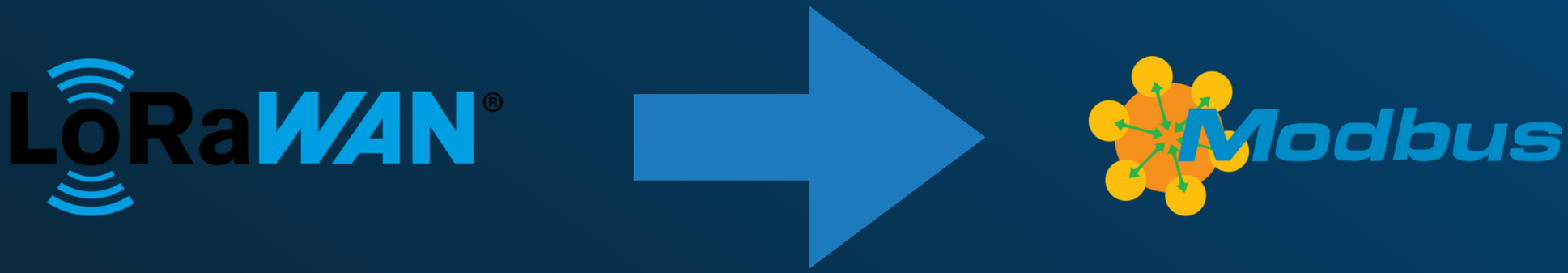
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RDD Link LoRaWAN IoT Server Workshop
21-22 Oct 2026



Presented By: Dani Rustandi

RDD Technologies

rdd-tech.com

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Room Safety Induction

- Akses masuk dan Keluar
- Tempat berkumpul / Muster Point
- Toilet
- Jam pelaksanaan training : 08.00 - 17.00
- Coffee Break : 9.30-10.00 / 14.30-15.00
- Ishoma: 11.30 -13.00
- wifi : RDD Technologies / pass: Honeyw3ll1

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Project Overview

- Transformasi dari Conventional Transmitter/ sensor ke Wireless Transmitter Berbasiskan LoRa (long Range Radio)
- Implementasi LoRaWAN system
- Mengelola LoRaWAN Nodes
- Menghubungkan LoRaWAN server dengan existing DCS System via Modbus Ethernet

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LoRa Frequency

Region	Channel Plan Code	Frequency Range	Regulatory Body
Indonesia 🇮🇩	**AS923** (specifically AS923-1 / AS2)	**920 – 923 MHz**	**SDPPI** (KOMINFO)
North America 🇺🇸🇨🇦	**US915**	902 – 928 MHz	FCC
Europe / UK 🇪🇺🇬🇧	**EU868**	863 – 870 MHz	ETSI
Australia 🇦🇺	**AU915**	915 – 928 MHz	ACMA
China 🇨🇳	**CN470 / EU433**	470 – 510 MHz / 433 MHz	MIIT
India 🇮🇳	**IN865**	865 – 867 MHz	WPC

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LoRa vs LoRaWAN

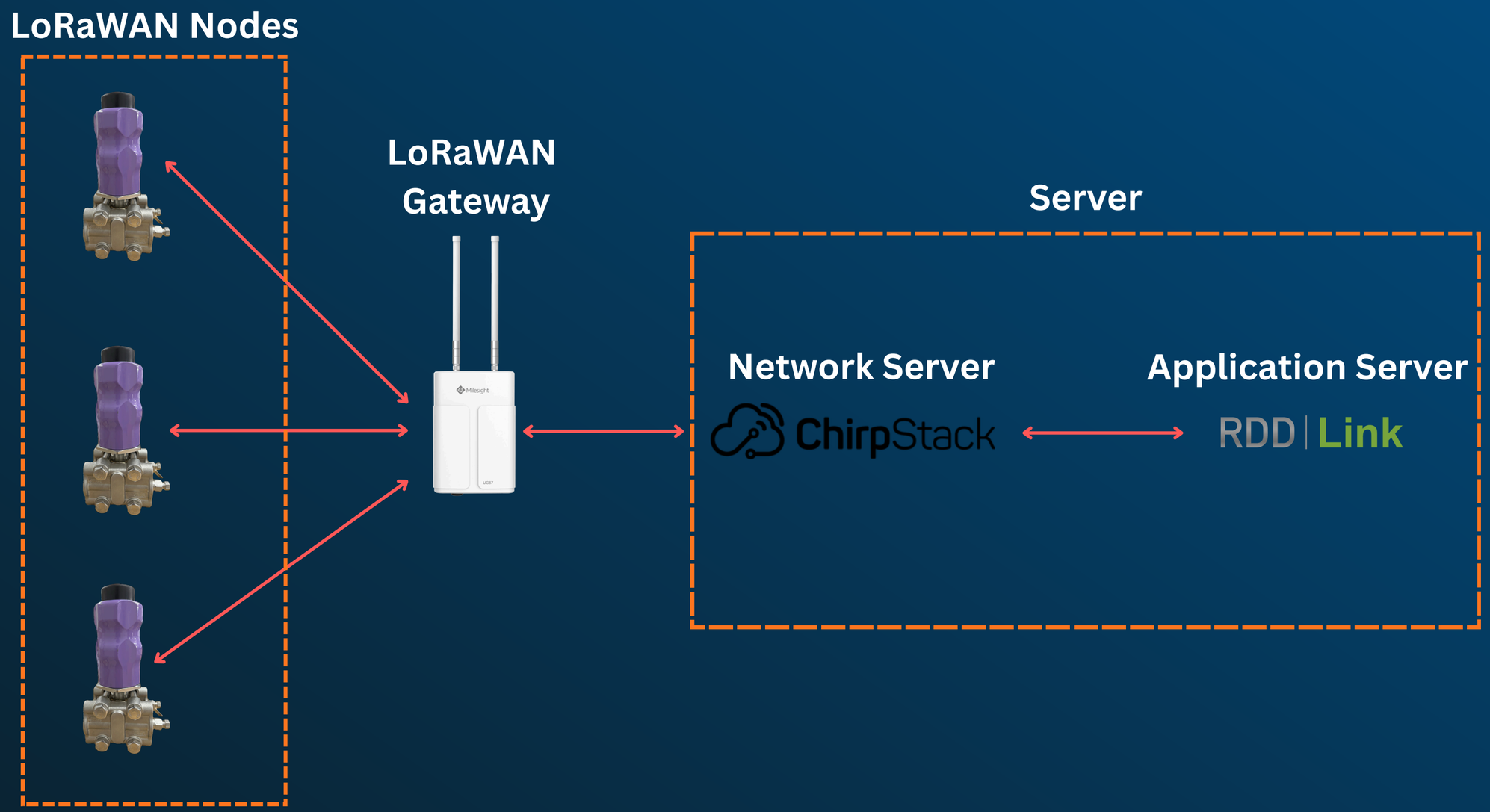
- LoRa is the physical radio signal, while LoRaWAN is the set of networking rules and architecture built on top of that

Direct Comparison Overview

Feature	LoRa (Long Range)	LoRaWAN (Long Range Wide Area Network)
OSI Layer	**Physical Layer** (PHY)	**Media Access Control / Network Layer** (MAC)
What it does	Modulates radio waves to send bits over the air	Manages device addressing, security, and routing
Topology	Point-to-Point (P2P) or small Point-to-Multipoint	Star-of-Stars (Device ➔ Gateway ➔ Cloud Server)
Security	None built-in (you must program it yourself)	Native end-to-end **AES-128 encryption**
Ownership	Proprietary technology owned by **Semtech**	Open standard governed by the **LoRa Alliance**
Best For	Simple, localized, or custom DIY projects	Large-scale, commercial, or regional **IoT deployments**

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LoRaWAN Telemetry System



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LoRaWAN Telemetry System

- **End Devices & Nodes (The Hardware)**

  These are the physical endpoints that gather telemetry data (e.g., temperature, humidity, GPS tracking) and transmit it via LoRa radio waves

- **LoRaWAN Gateway (The Bridge)**

  The gateway acts as a transparent bridge. It listens for LoRa radio packets in the air and forwards them to the internet via Wi-Fi, Ethernet, or Cellular (LTE).

- **Network Server (The Traffic Controller)**

  The Network Server deduplicates identical packets received by multiple gateways, routes messages to the correct application, and handles security decryption.

- **Application Server & Dashboard (The Visualizer)**

  Once the network server decrypts your data, it forwards it to an application layer via MQTT, HTTP Webhooks, or APIs so you can read the metrics.

CPA LoRaWAN Telemetry

LoRaWAN Nodes
Sensaio, etc







Gateway (dual)

#1 Milesight
UG67



#2 Milesight
UG67



Server

Network Server

ChirpStack

Application Server

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Modbus

Honeywell DCS
Scada Points

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LoRaWAN Nodes

- Used at PHM → Sensa io PT, TT, DPT

Spesification:

LoRaWAN 1.0.3	Class	A
	Range	Up to 10km
	Baud rate range[1]	From 0.3 kbps to 50kbps
	Transmission	Downlink/Uplink
	Adaptative Data rate	Yes
	Spreading factor (SF) / modulation [2]	Refer to section 5.1
	Interference immunity	Very high
	Mode	OTAA
	Update rate (Default & adjustable)	100 trames/day
	Frequency plans	800 and 900 bands
	RF power[3]	Max. 14dBm ERP

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Istilah istilah pada LoRaWAN node

- LoRaWAN Class: A, B & C

📊 The Three Classes Compared

Feature	Class A (All/Allways)	Class B (Beacon)	Class C (Continuous)
Downlink Latency	**Highest** (Device dictates traffic)	**Medium** (Scheduled intervals)	**Lowest** (Near real-time)
Power Consumption	**Lowest** (Optimized for batteries)	**Medium** (Controlled wakeups)	**Highest** (Requires constant power)
How it Works	Opens 2 brief downlink windows *only* after a transmission.	Opens periodic downlink windows synchronized by a gateway beacon.	Downlink window is kept open continuously except when transmitting.
Typical Battery Life	**5 to 10+ years** on a single cell.	**2 to 5 years** depending on beacon intervals.	**Days to weeks** (Must use wall power / solar).
Ideal Telemetry Use Case	Environment sensors, fire alarms, soil moisture trackers.	Smart utility meters, tracking items on fixed routes.	Streetlights, smart valves, utility grids, remote actuators.

- Uplink : Pengiriman data dari Node ke Gateway
- Downlink: Pengiriman Data dari Gateway ke node
- Adaptive data rate : Nodes akan mengatur datarate secara otomatis sesuai kualitas sinyal (DR), DR akan berubah2 sesuai dengan kualitas signal yg diterima oleh Node

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Istilah istilah pada LoRaWAN node

- LoRaWAN Datarate

Standard LoRaWAN Data Rate Table (AS923 / EU868)

In most regions using a 125 kHz bandwidth—including **Indonesia's AS923 plan** and Europe's EU868—the data rates scale as follows: The Things Network +1

Data Rate (DR)	Spreading Factor	Bandwidth (BW)	Approximate Bitrate	Max App Payload Size	Airtime / Battery Use
DR0	SF12	125 kHz	250 bps	51 Bytes	Extremely High (Long range)
DR1	SF11	125 kHz	440 bps	51 Bytes	High
DR2	SF10	125 kHz	980 bps	51 Bytes	Medium-High
DR3	SF9	125 kHz	1,760 bps (1.7 kbps)	115 Bytes	Medium
DR4	SF8	125 kHz	3,125 bps (3.1 kbps)	222 Bytes	Low
DR5	SF7	125 kHz	5,470 bps (5.4 kbps)	222 Bytes	Lowest (Short range)

- OTTA (Over-The-Air Activation) - metode untuk untuk Join ke lorawan network,
- DevEUI (Device EUI) = MAC Address
- JoinEUI / AppEUI (Join EUI) = bisa dipakai atau tidak, tergantung keperluan, default nya 0
- AppKey (Application Key): A secret 128-bit AES key unique to your device. This key is never transmitted over the air. It is a shared secret used by both the device and the server to encrypt the handshake.

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LoRaWAN Gateway

The gateway acts as a transparent bridge. It listens for LoRa radio packets in the air and forwards them to the internet via Wi-Fi, Ethernet, or Cellular (LTE).

- Gateway bisa mendengar semua lorawan nodes disekitarnya selama freq. nya sama.
- Gateway pada umumnya menggunakan Chip yg sama buatan semtech, yg membedakan adalah Fitur dari gateway tsb
- CPA akan menggunakan gateway Milesight UG67



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LoRaWAN Gateway

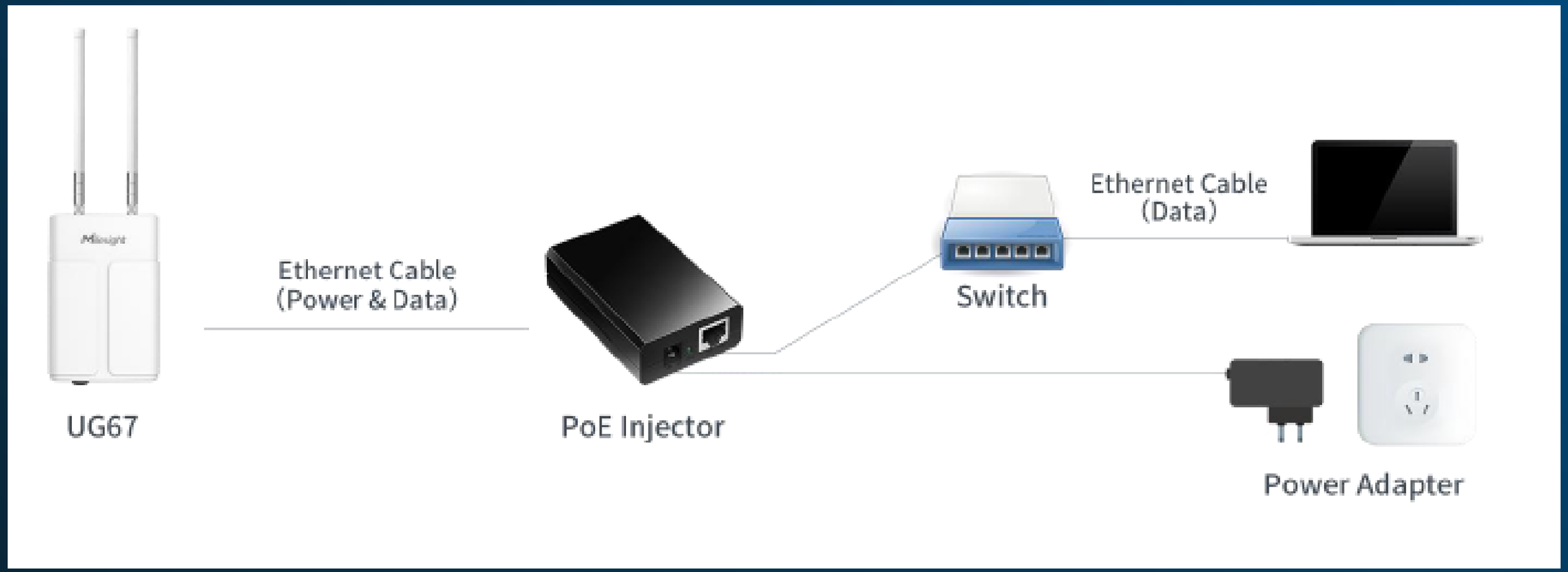
- **Spesification**

Hardware Component	Specification Details
Processor & Memory	Quad-core 1.5 GHz Cortex-A53
LoRaWAN Chipset	Semtech SX1302 (supports 8 channels)
Enclosure Rating	IP67 Waterproof (Die-cast aluminum housing)
Backhaul Interfaces	1× 10/100/1000 Mbps Ethernet port (PoE PD)
	4G LTE Cellular (Global/Regional variants)
	Wi-Fi 2.4 GHz (802.11b/g/n)
Antennas	Internal antennas for Wi-Fi and GPS
	2× external N-Female connectors for LoRa antennas
	1× external N-Female connector for cellular
Power Inputs	PoE (802.3af) via Ethernet port
	12 VDC input via M12 connector
Power Fault Backup	Supercapacitors (provides ~1 minute of backup power to trigger power-loss alerts)
Mounting Options	Wall or Pole mounting

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LoRaWAN Gateway

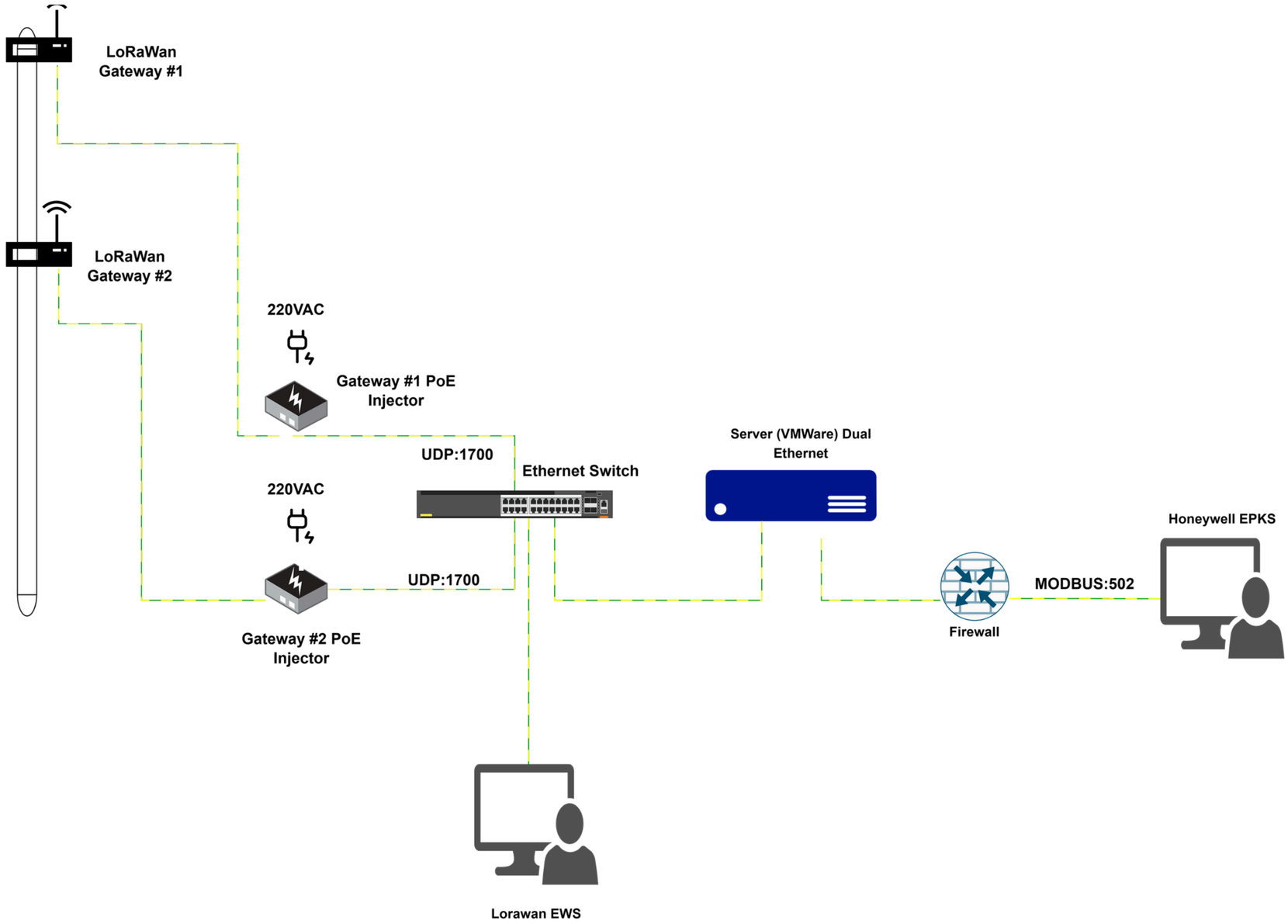
- **Wiring Diagram**



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LoRaWAN Gateway

- **Rencana Sistem Arsitektur CPA**



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Server

Server Spesification

- Ubuntu Server 24.04 LTS, x86-64, No GUI, only terminal
- Network server ChirpStack 4.19.1
- Ingest Node-RED → untuk memasukan data ke tabel database
- Historian TimescaleDB 2.29.1
- Web Application Laravel + Vue (Inertia) on php-fpm, nginx with TLS on 443, wss via mosquitto-ws
- pymodbus slave on TCP 502

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CPA LoraWAN Architecture

LoRaWAN Nodes







LoRaWAN Gateway



192.168.1.131

Server

Network Server

ChirpStack

192.168.1.130:8080

MQTT

Application Server

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192.168.1.130