



Innovarpel 2025

TECHNICAL DAYS

**DIGITAL TRANSFORMATION
& INDUSTRIAL CYBERSECURITY**
IN THE OIL&GAS INDUSTRY

arpel 

JUNE, 24 & 25
Rio de Janeiro, Brazil

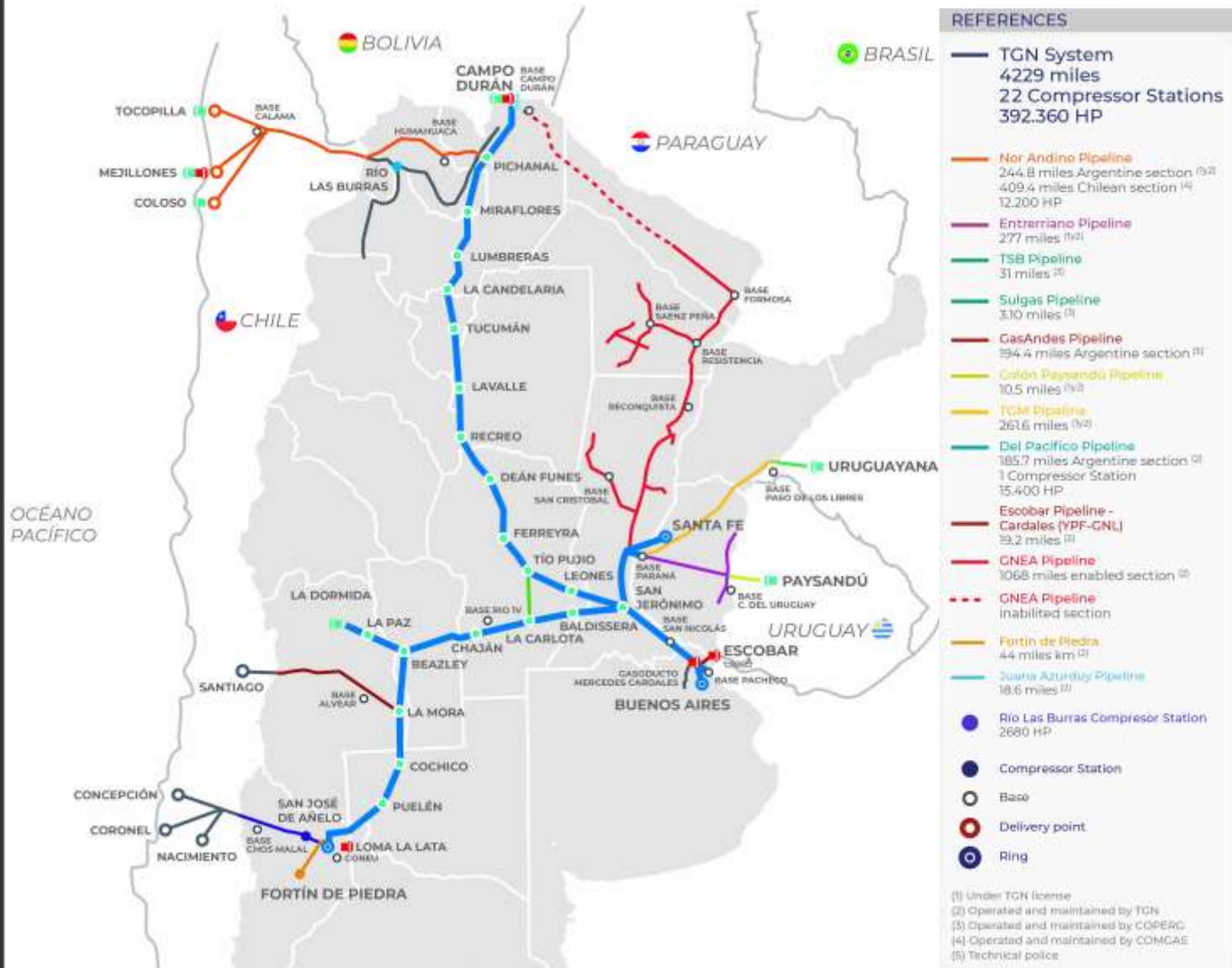
SMER - Use of Industrial Home Automation for Monitoring Communications in Gas Pipelines

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TGN System and Connected Gas Pipelines



+11.200 km of pipelines in operation, along **17 provinces** delivering natural gas to **8** of the 9 **distribution companies** in the country.

We transport **40%** of all **natural gas** injected into main pipelines in Argentina, which represents **20%** of the **energy matrix**.

We are the only operator with regional ties with **Bolivia, Uruguay, Chile y Brazil**.



22 compressor stations (392.360 HP).



O&M of **4.300 km** of **third-party gas pipelines**.



More than **130 customers**.



+30 years in the industry.



+700 employees



Communications Trunk Repeater Stations



96 sites

6500 m of mast/tower

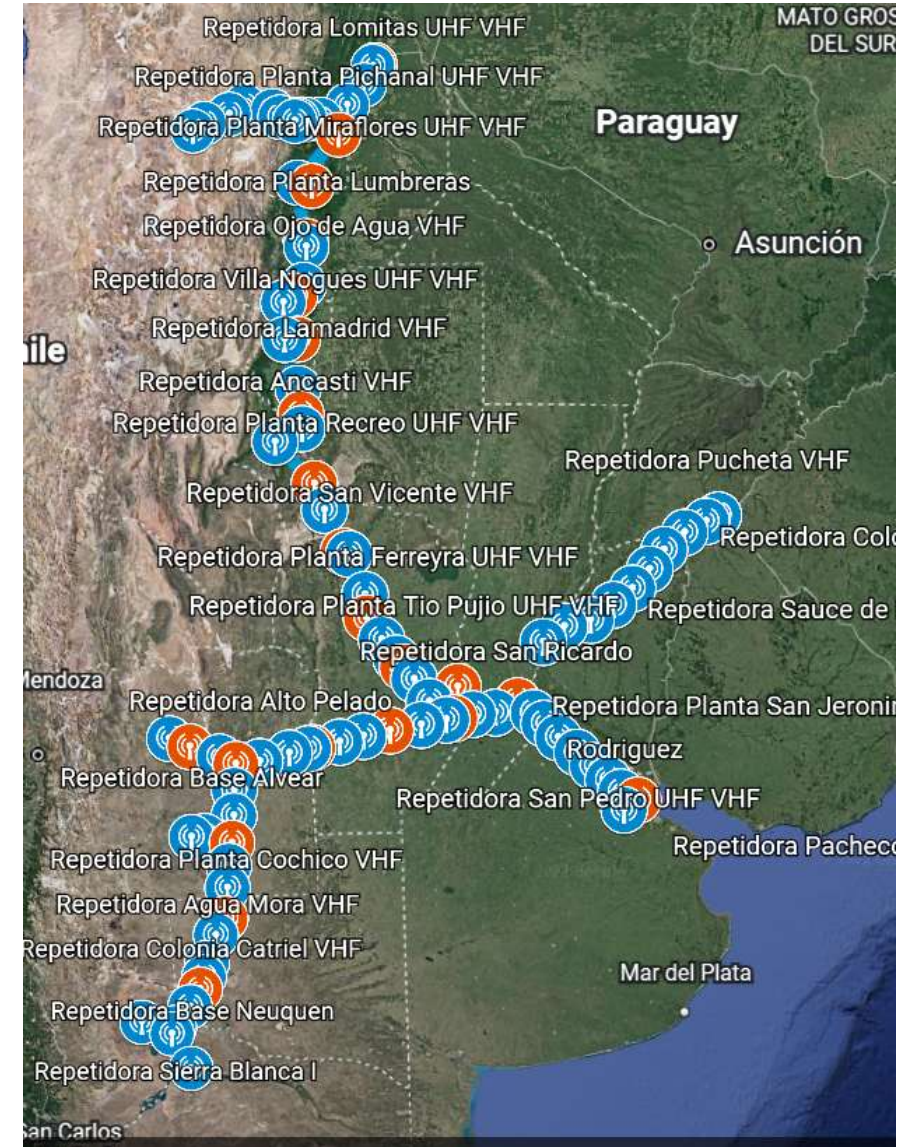
- Max height: 120 m
- Min height: 6 m
- Avg height: 68 m

Microwave backbone

VHF

UHF

LoRaWAN



Site Subsystems

Power



Environmental
Control



Tower



Communications



Security



Power

- Detailed monitoring of battery banks (cell-level voltage and temperature)
- Remote discharge testing and verification of the banks' internal effective resistance
- Operation of motorized switchgear
- Monitoring of power sources, AC and DC consumption, and transformation systems



Environmental Control

- Air conditioner cycling control
- Motorized blinds and exhaust fan control
- Automated environmental control based on energy availability



Tower

- Real-time monitoring of tilt and torsion
- Automated beaconing control upon primary power failure



Communications

Monitoring Parameters of Communication Systems

- Microwave backbone
- VHF repeater stations
- UHF SCADA master stations
- Control network
- Corporate network

Automatic switching of microwave radio transmitters

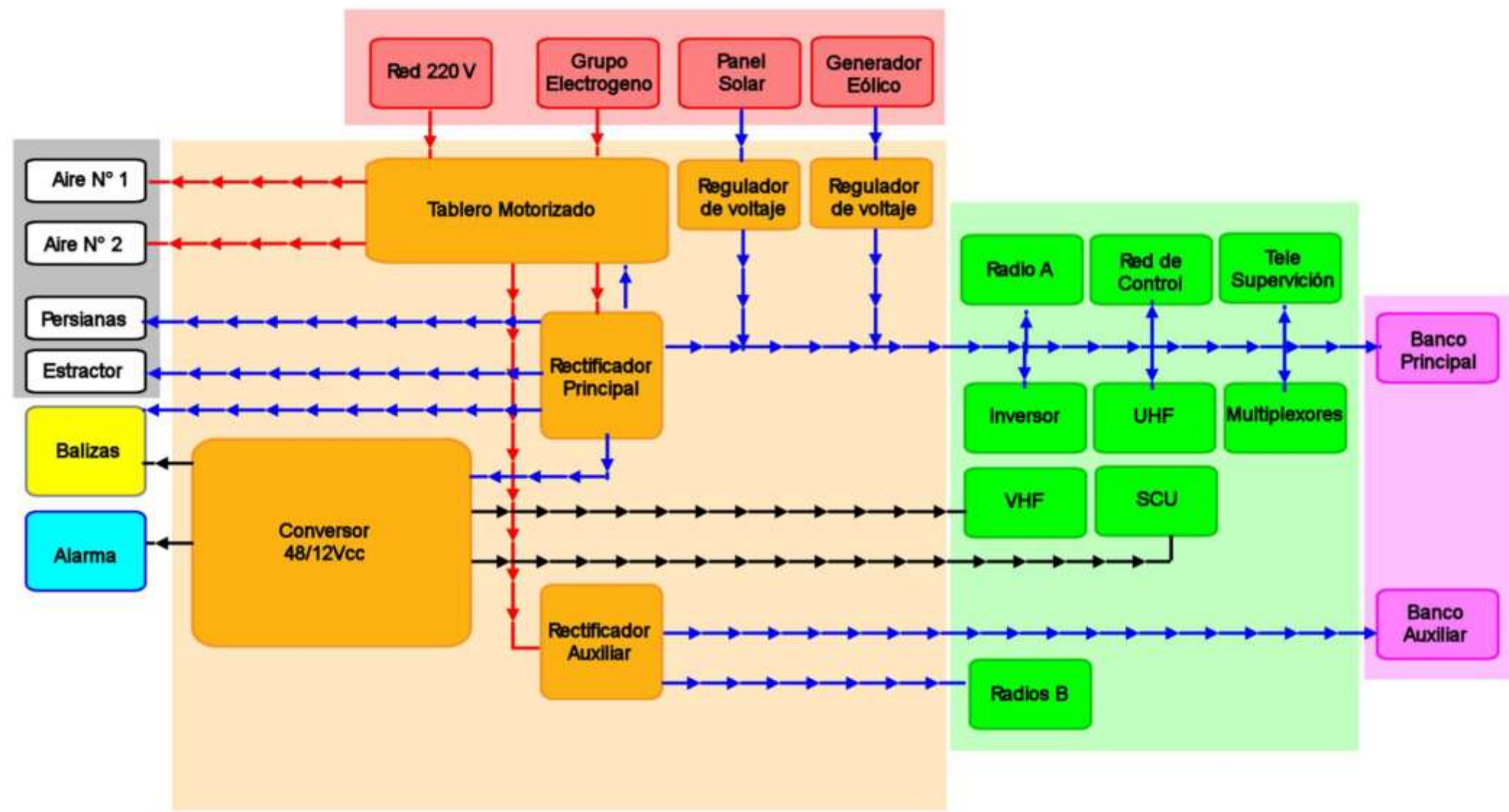


Security

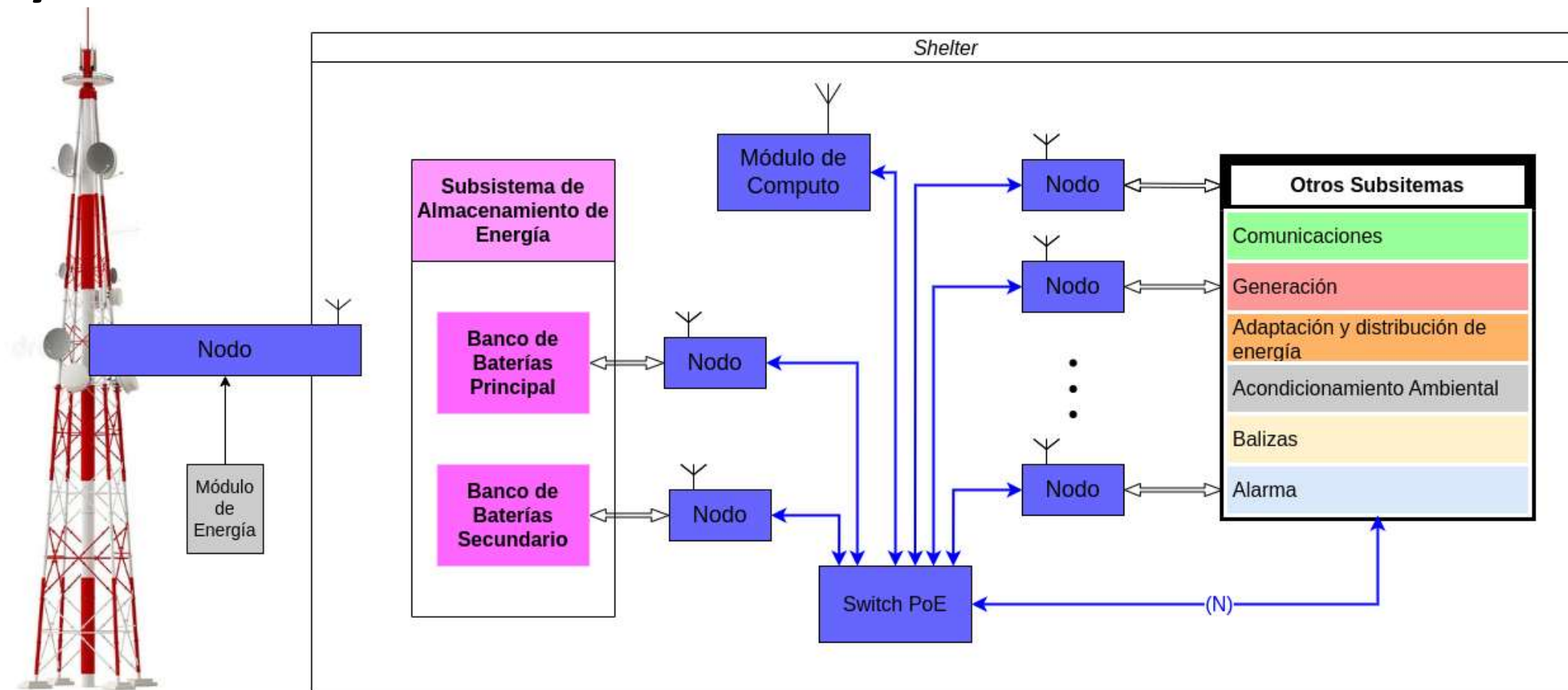
- Presence detection
- Door-open detection
- Security cameras
- Vibration-sensor alarm
- Station emergency
- Local audible and visual alert



Logical Diagram



System Architecture



SW

Node:



Compute
Module:



M . I . N . G Stack

Node Architecture

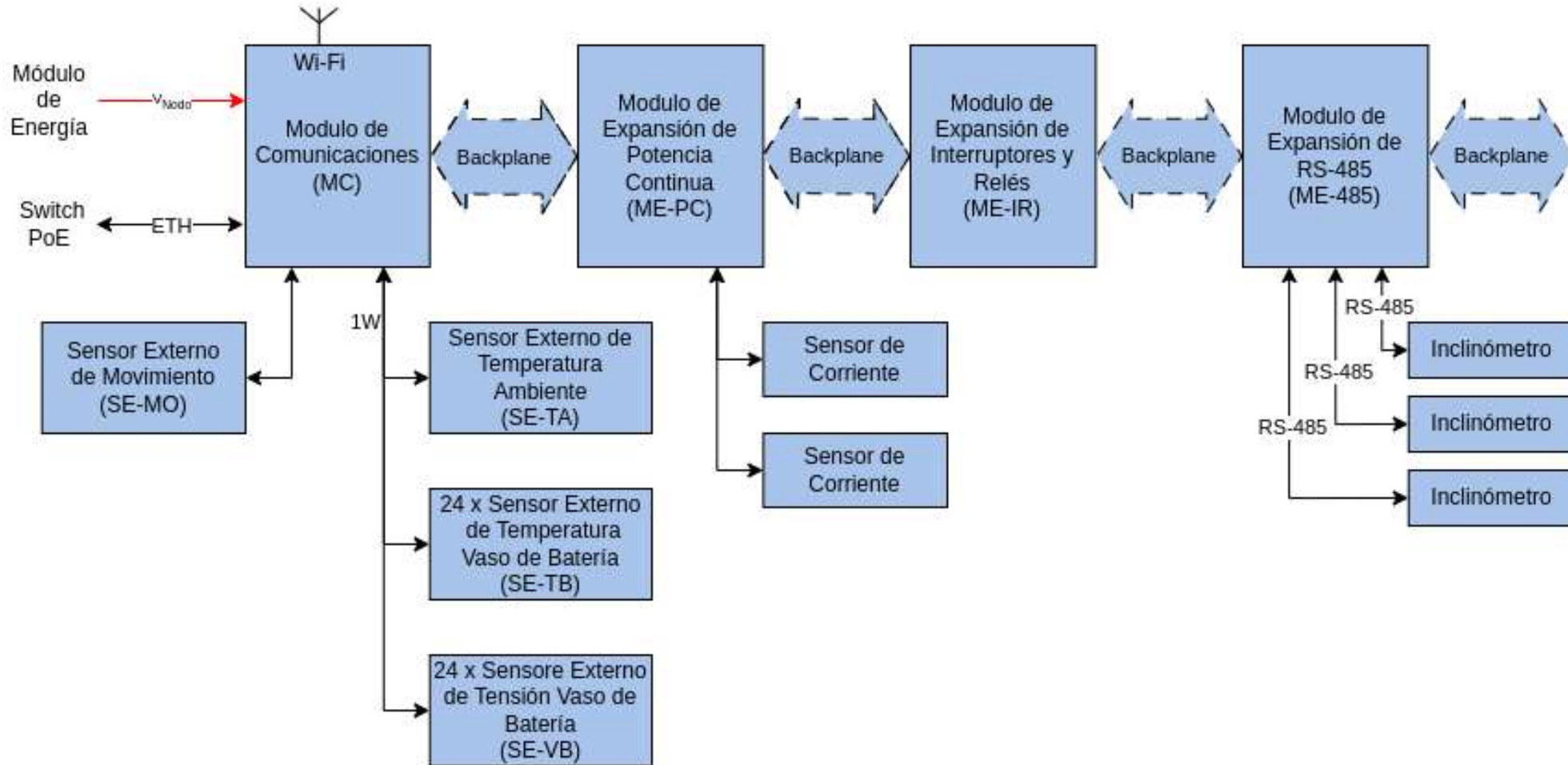


Diagrama de conexión de un módulo de adquisición de datos para sensores de baterías. El diagrama muestra la interfaz entre un módulo anterior y un módulo posterior, pasando por un módulo central de adquisición.

Módulo Anterior: Proporciona V_{cc} y una línea $1W$.

Módulo Central (Adquisición de Datos):

- Puente 1Wire a I2C / SPI:** Recibe V_{cc} y $1W$ desde el módulo anterior. Se comunica con el módulo posterior vía I2C/SPI.
- Protecciones:** Reciben V_{cc} y $1W$ desde el módulo anterior.
- Acondicionamiento Medición DC / Medición AC:** Reciben V_{cc} y $1W$ desde el módulo anterior.
- 2 x ADC entrada diferencial:** Reciben V_{cc} y $1W$ desde el módulo anterior. Se comunican con el módulo posterior vía I2C/SPI.

Módulo Posterior: Recibe V_{cc} y una línea $1W$ desde el módulo central. Se conecta al siguiente módulo.

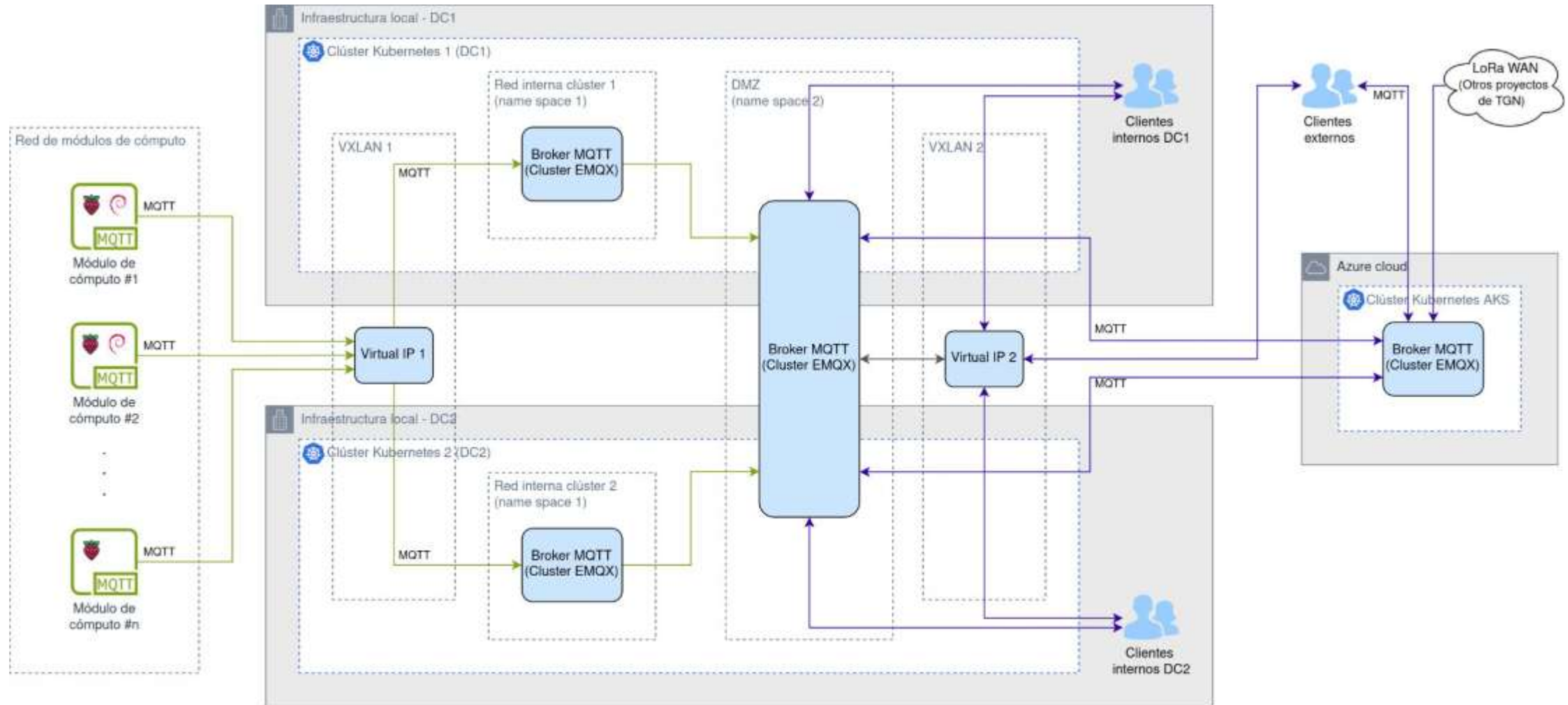
SE-VB Sensores Externos Vasos de Baterías: Se conectan a las líneas $1W$ y V_{cc} de los módulos anterior y posterior.



On-Site Installation



High-Availability Hybrid Architecture



Innovarpel 2027

Remote Operation of Humanoid Robots in High-Risk Environments



Muchas Gracias

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