

Wireless Gauge Reader

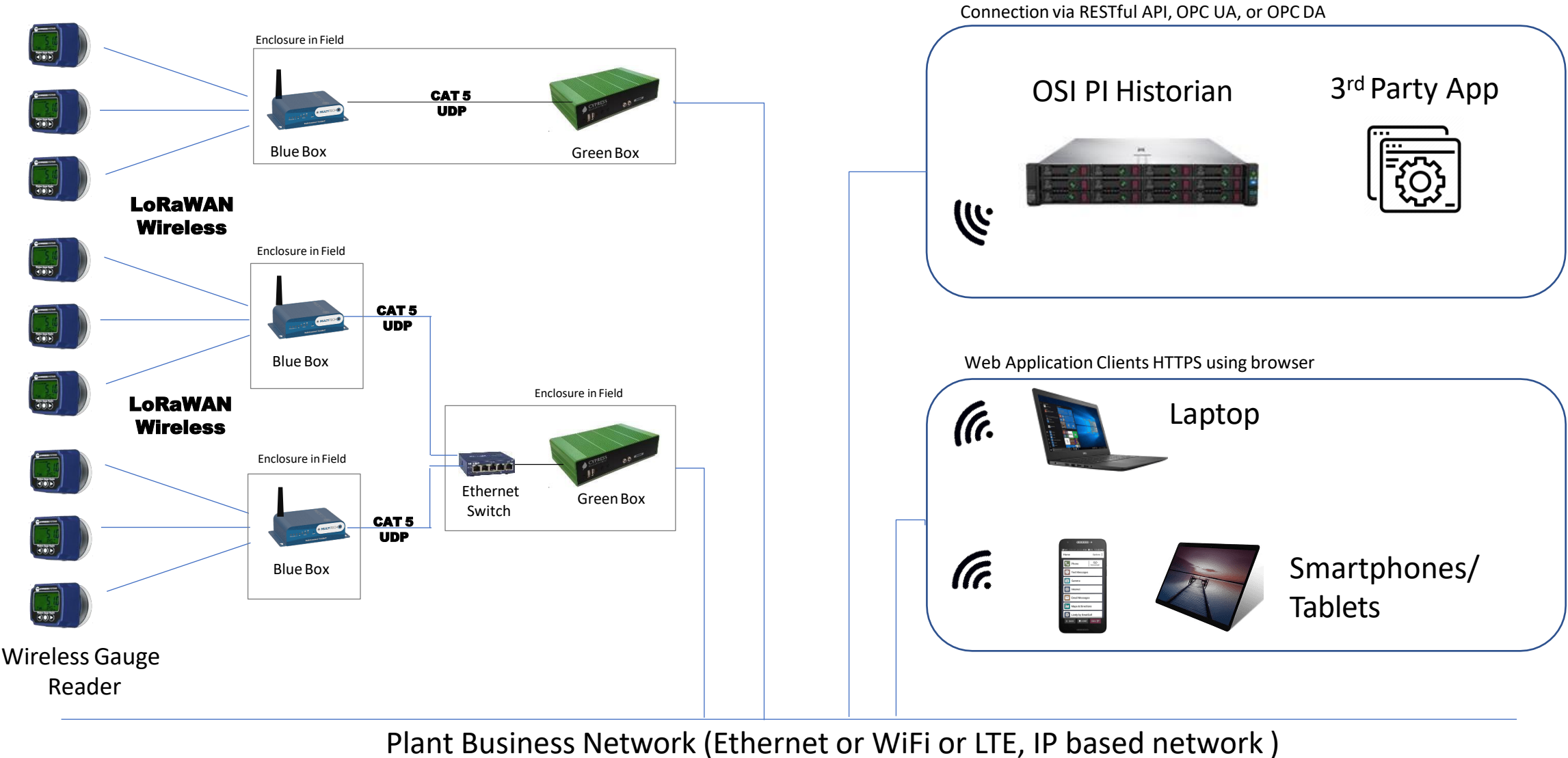
LoRaWAN Network Architecture

Version 7.0 – September 2025

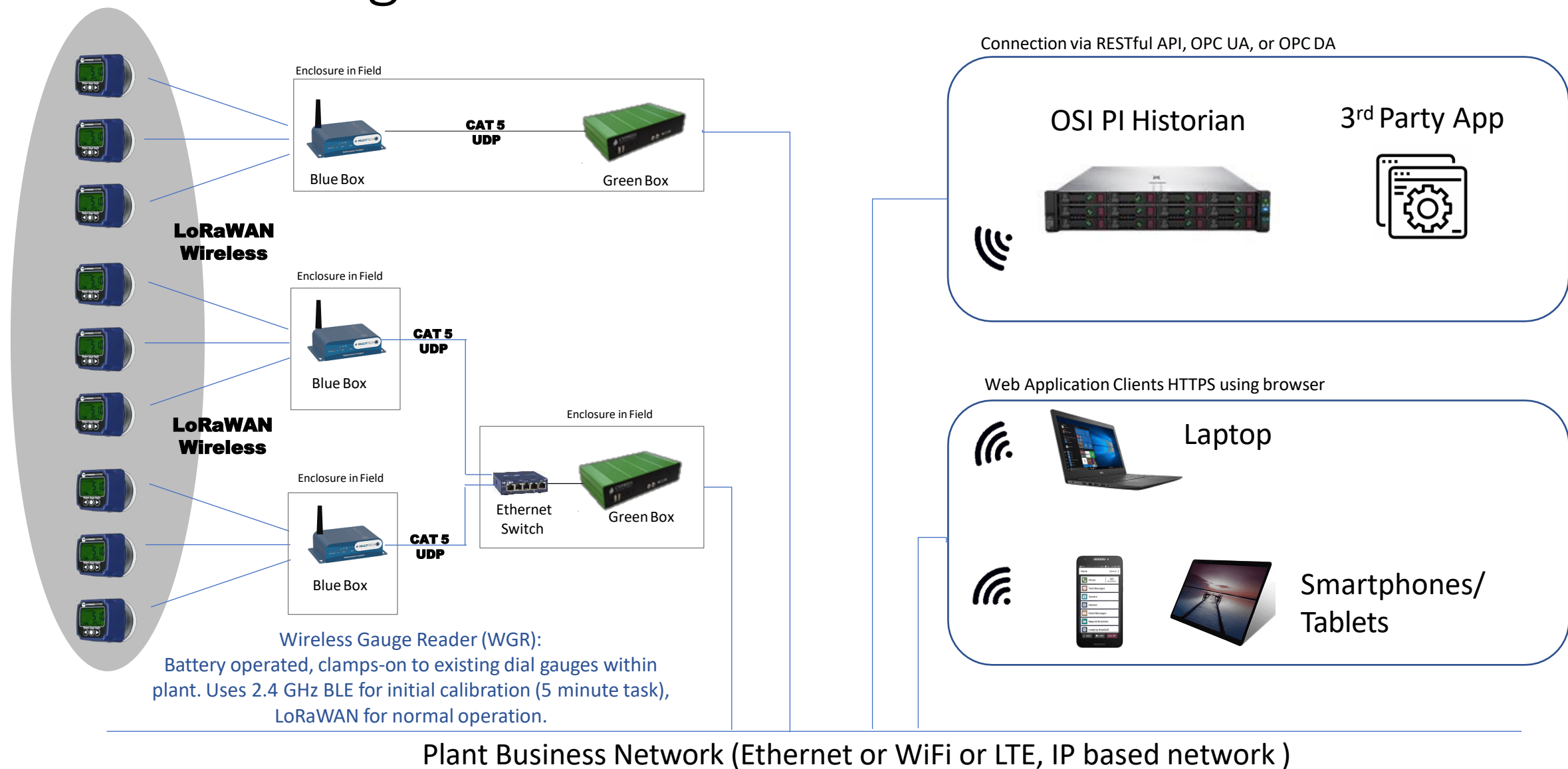


Option 1: Field Deployed Green Box Controller

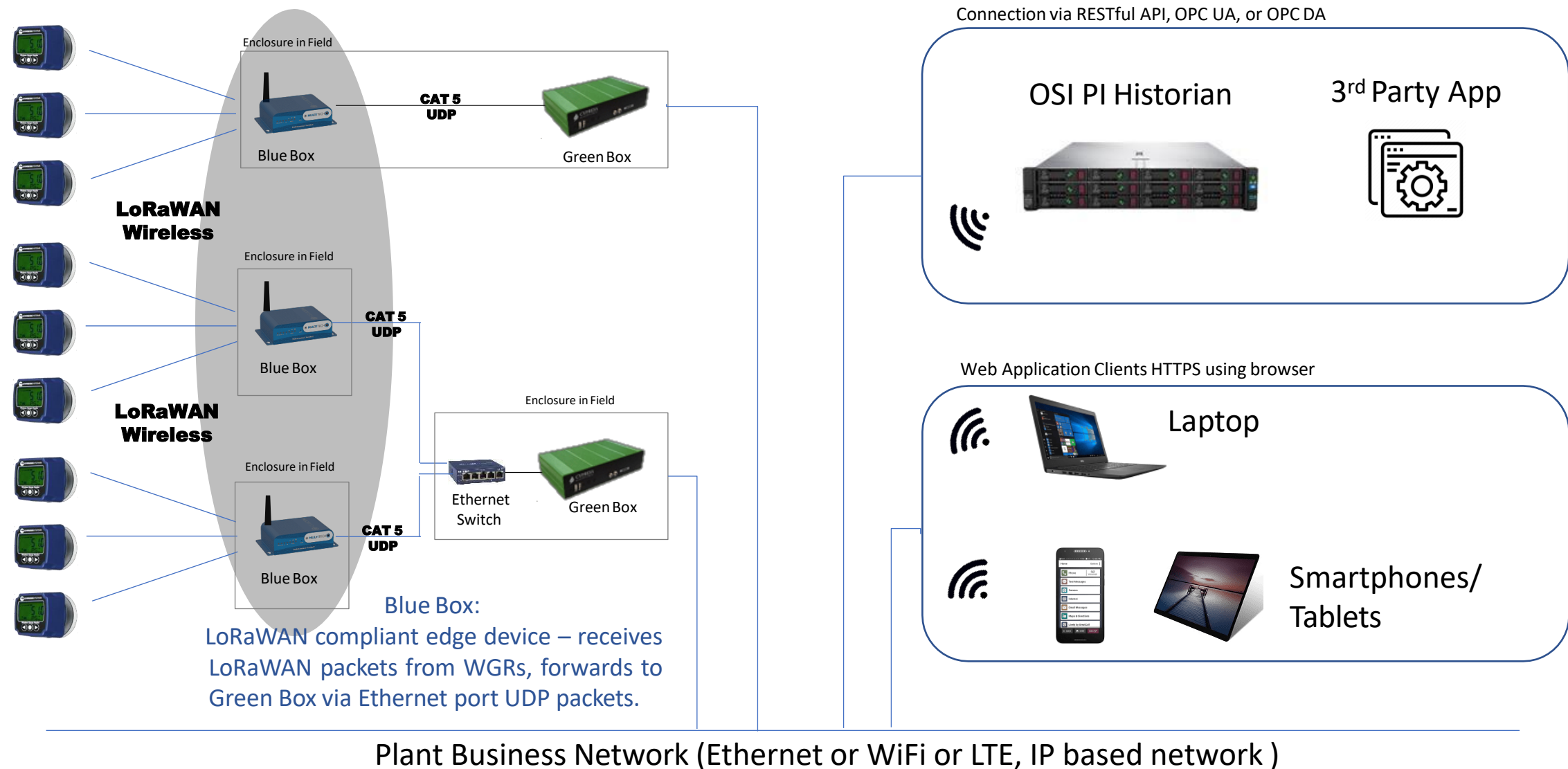
Deployment Architecture



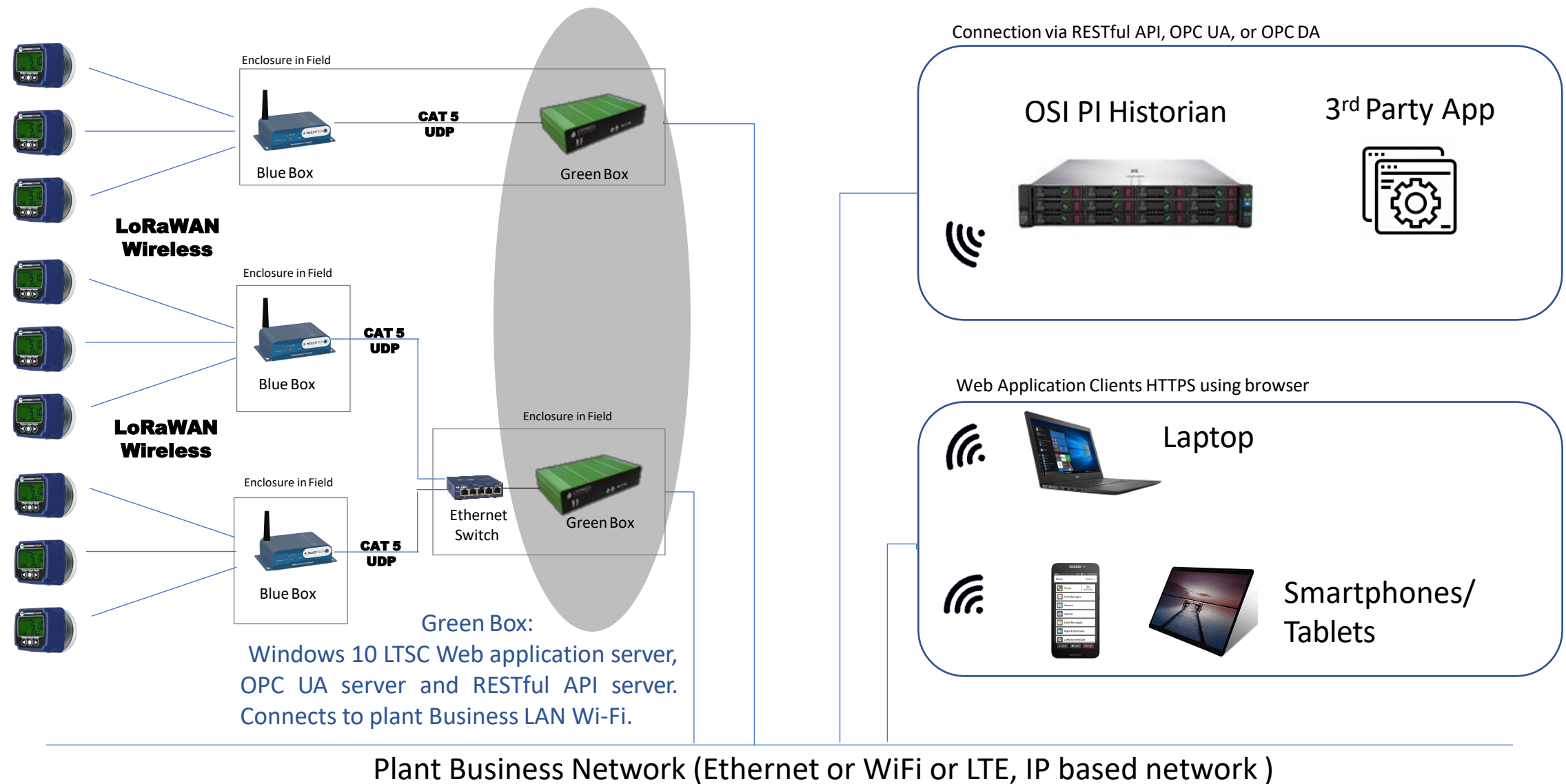
Wireless Gauge Reader



Blue Box (LoRaWAN Network Gateway)



Green Box (Applications Server)



Overview of Application

- Green Box Controller connected to plant L2 Business LAN via PLTE, Wi-Fi or Ethernet:
 - Windows 10 LTSC Enterprise IoT (Microsoft support till February 2032)
 - IIS, SQL Server Express, web application, TLS 2.0 compliant
 - OPC UA server (requires additional license fee)
 - OPC DA server
 - RESTful API server
 - Web Application for User Interface
- Web application accessible from any web browser on Plant LAN
- Web application does not require password login to view sensor data, but password is required to change configuration settings such as sensor description
- Passwords are encrypted, but stored locally, no password policy enforced, no external user authentication used (e.g. Microsoft Active Directory)

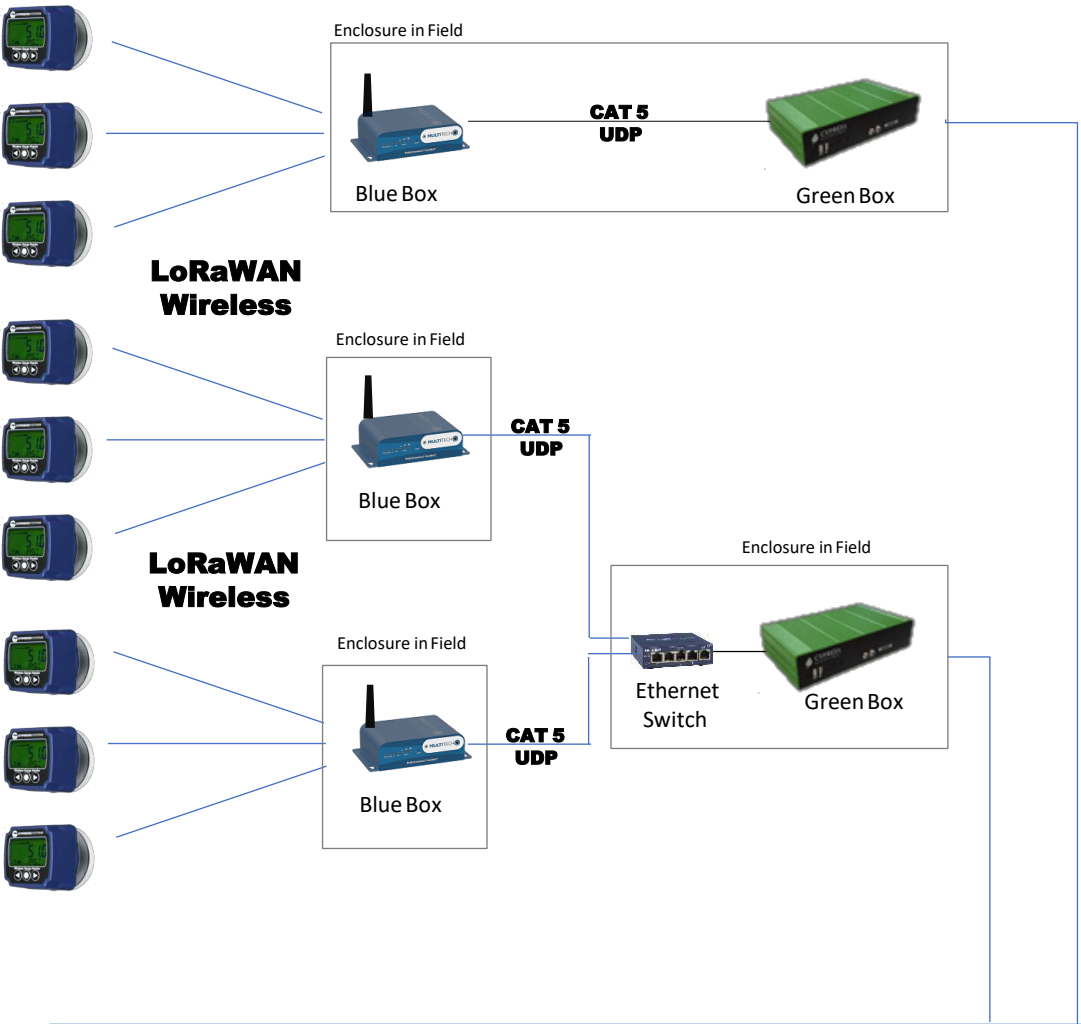
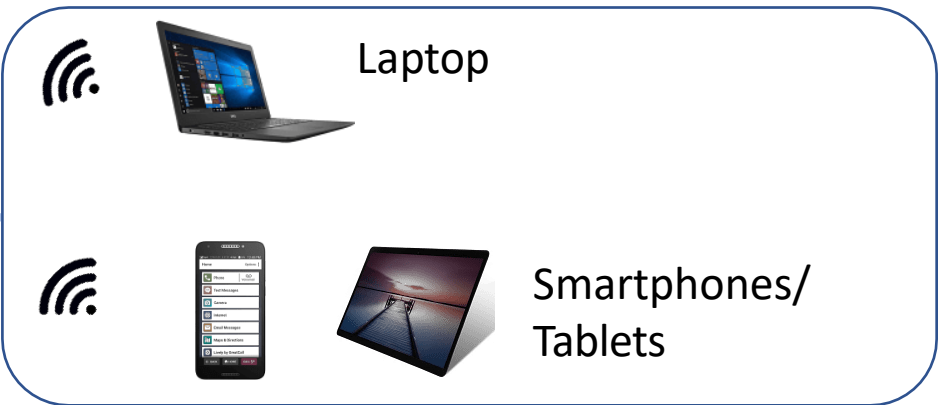
OPC DA/UA, RESTful API Clients

PI Historian and other Applications can retrieve WGR data via OPC or RESTful API

Connection via RESTful API, OPC UA, or OPC DA

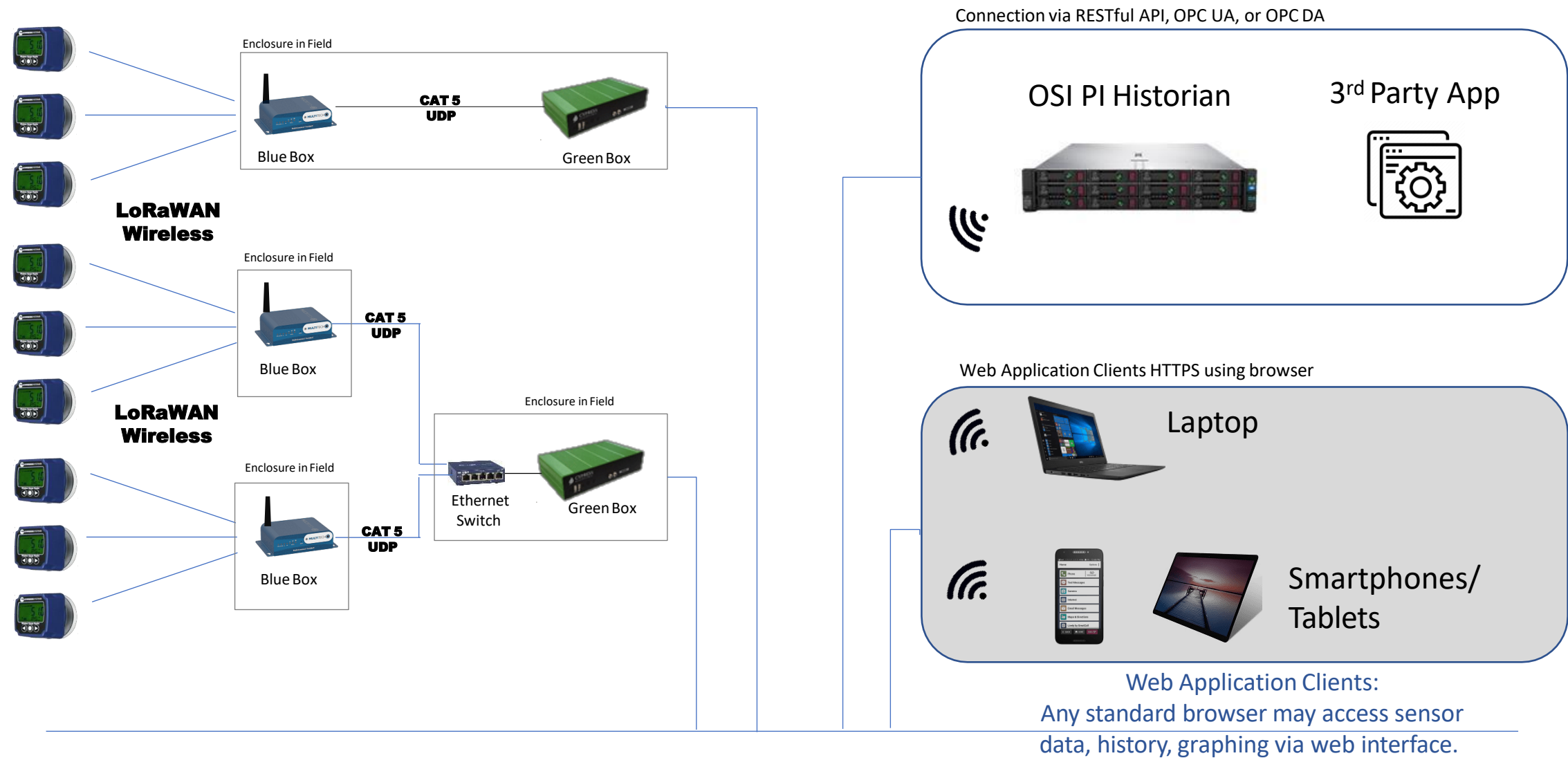


Web Application Clients HTTPS using browser



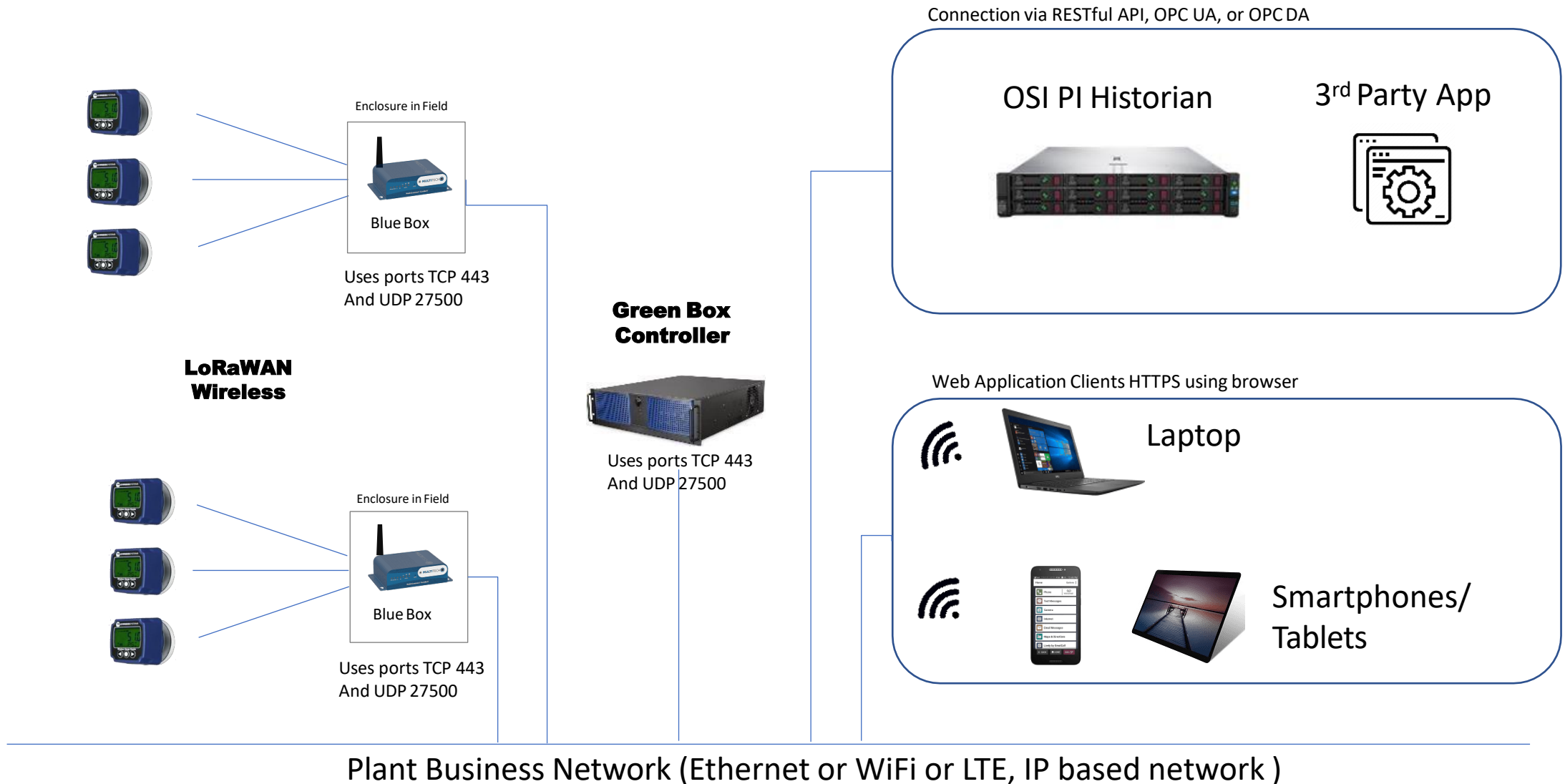
Plant Business Network (Ethernet or WiFi or LTE, IP based network)

Web Application Clients



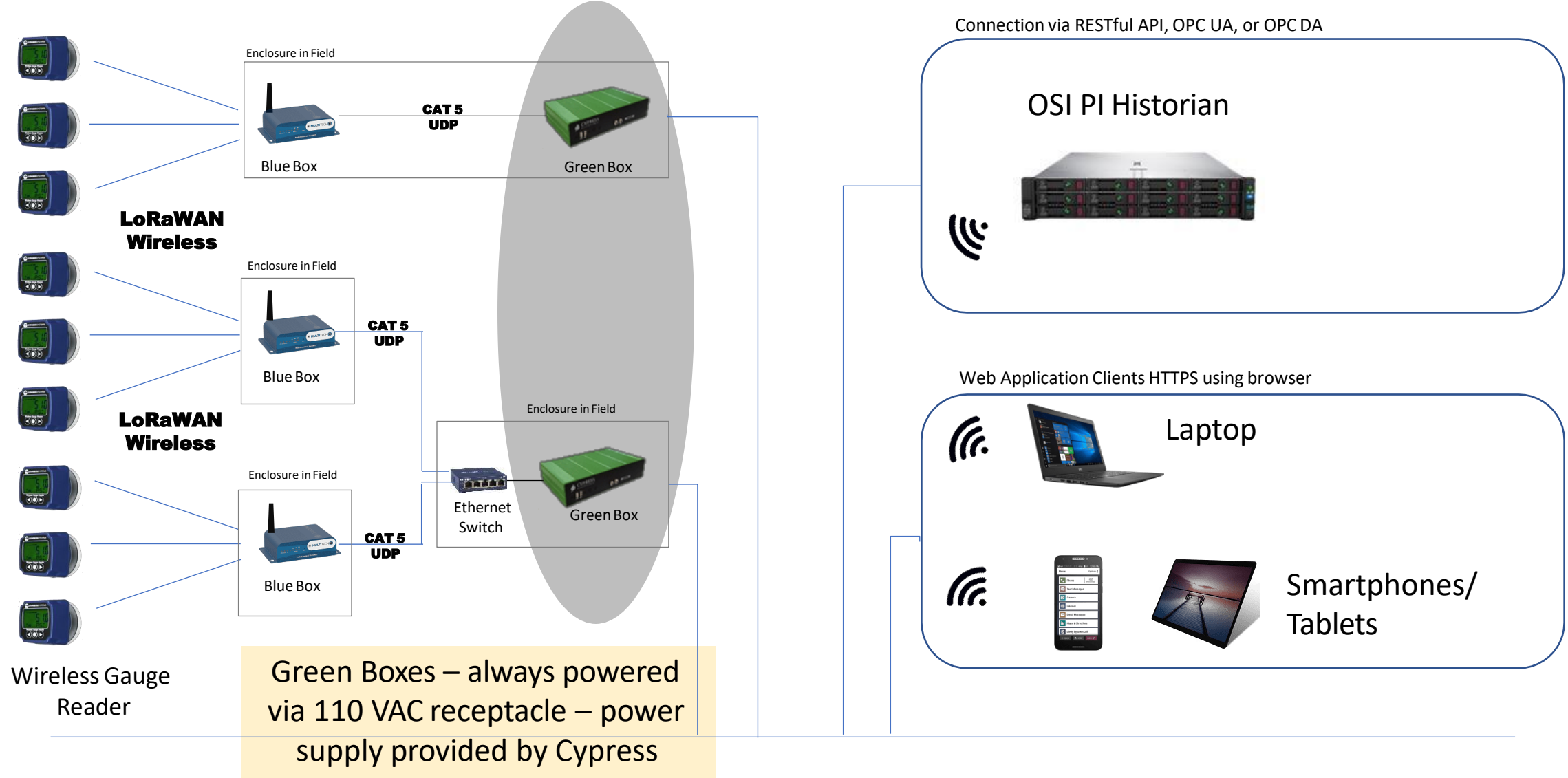
Option 2: Centralized Green Box Controller

Use existing LAN (Ethernet or WiFi) already on-site

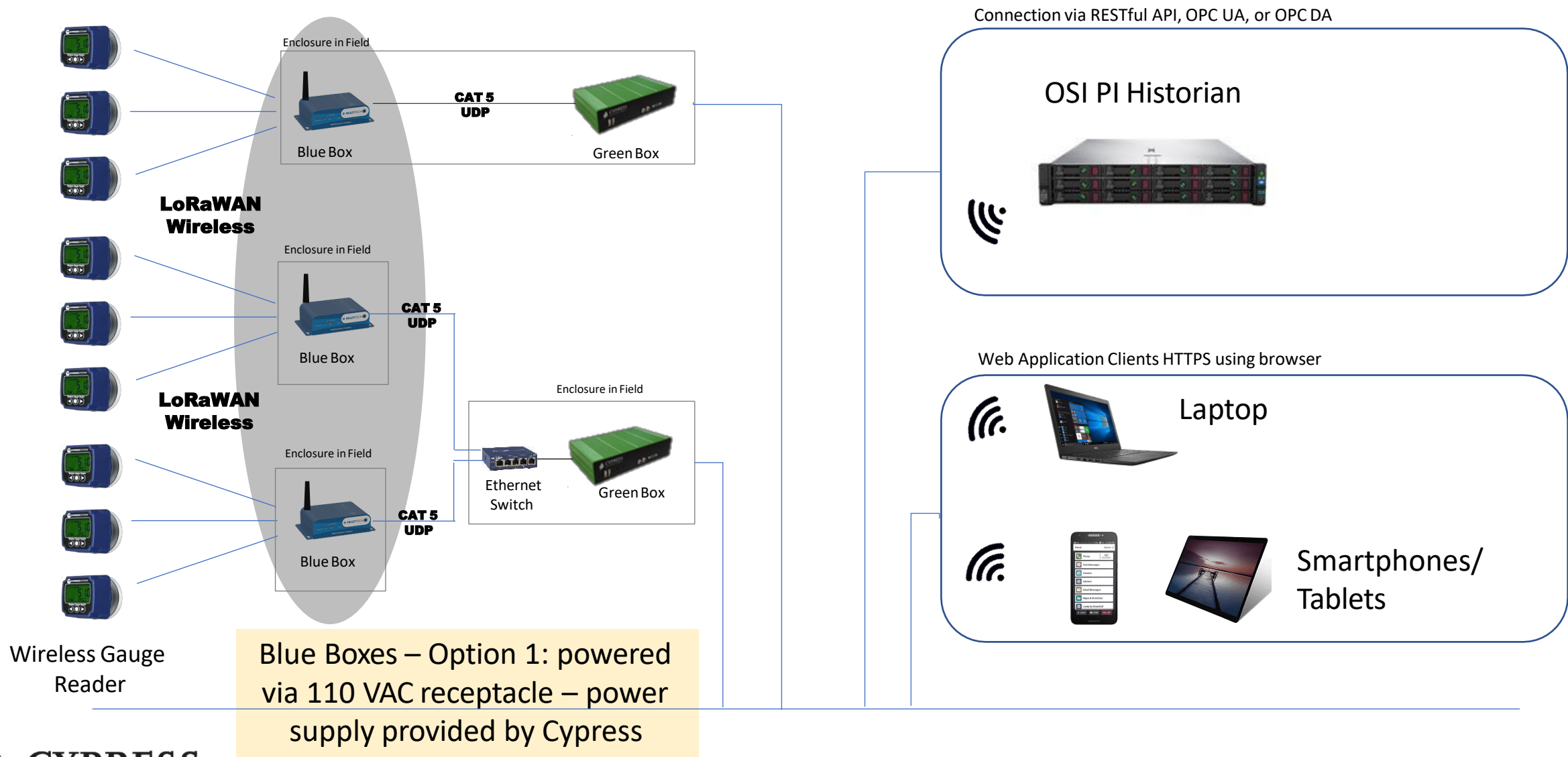


Options for Power Supply

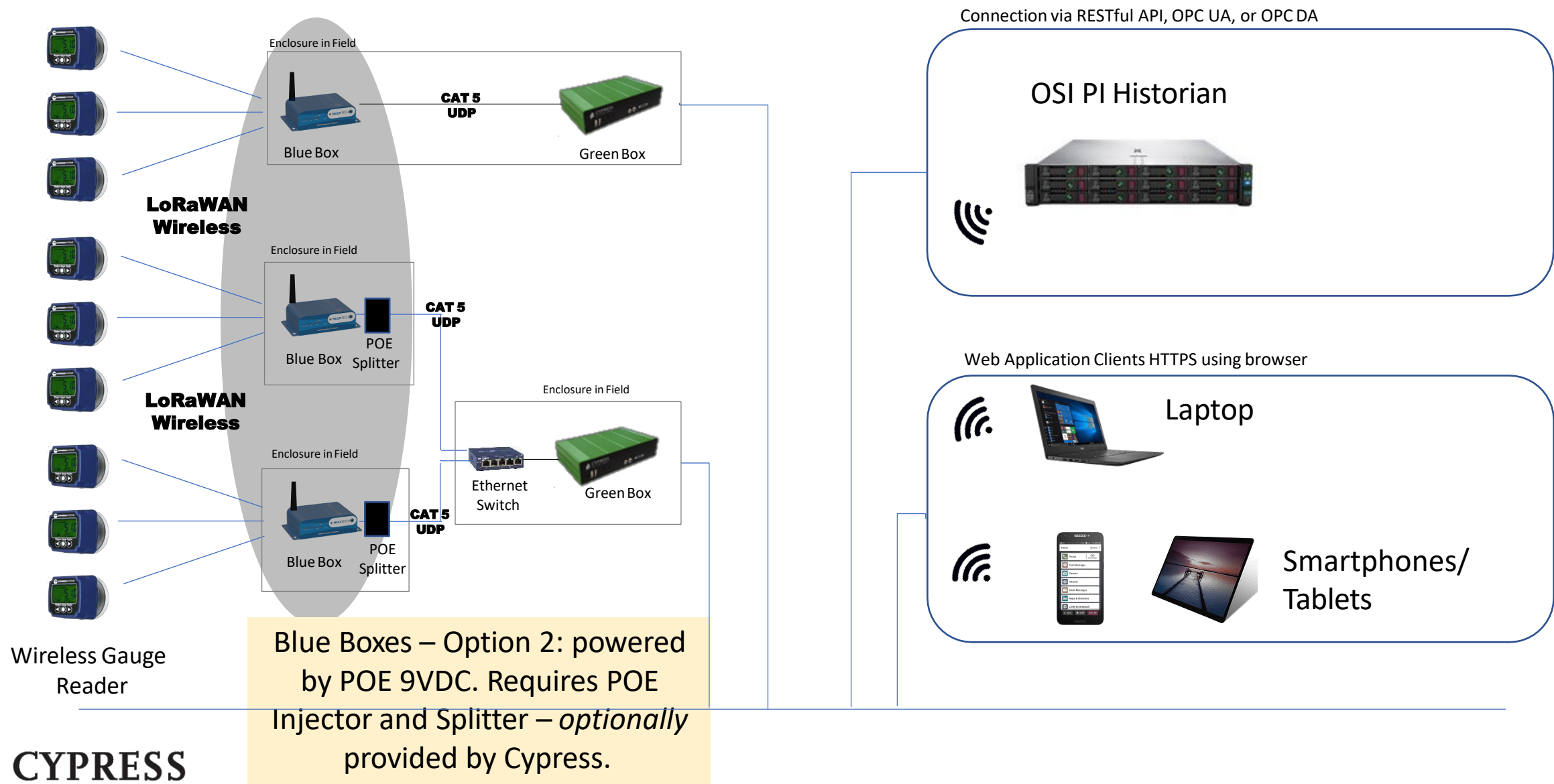
Green Box Power Supply



Blue Box Power Supply – Option 1: 110 VAC



Blue Box Power Supply – Option 2: POE



Blue Box Power Supply – Option 2: POE (cont'd)

Typical POE Injector/Switch Combo



Typical POE Splitter

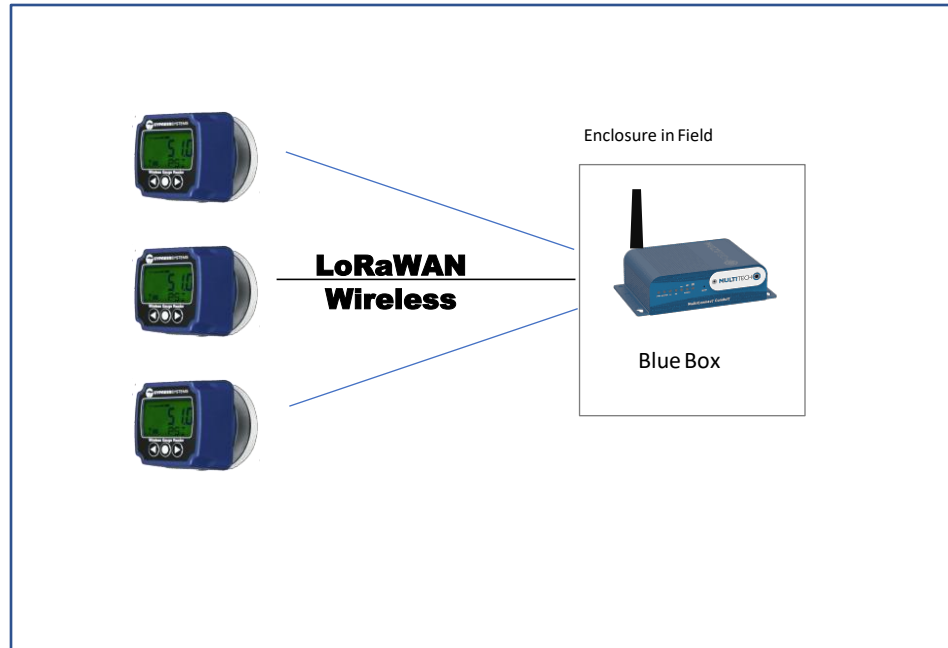


Note: Max Ethernet/POE length is 300 ft

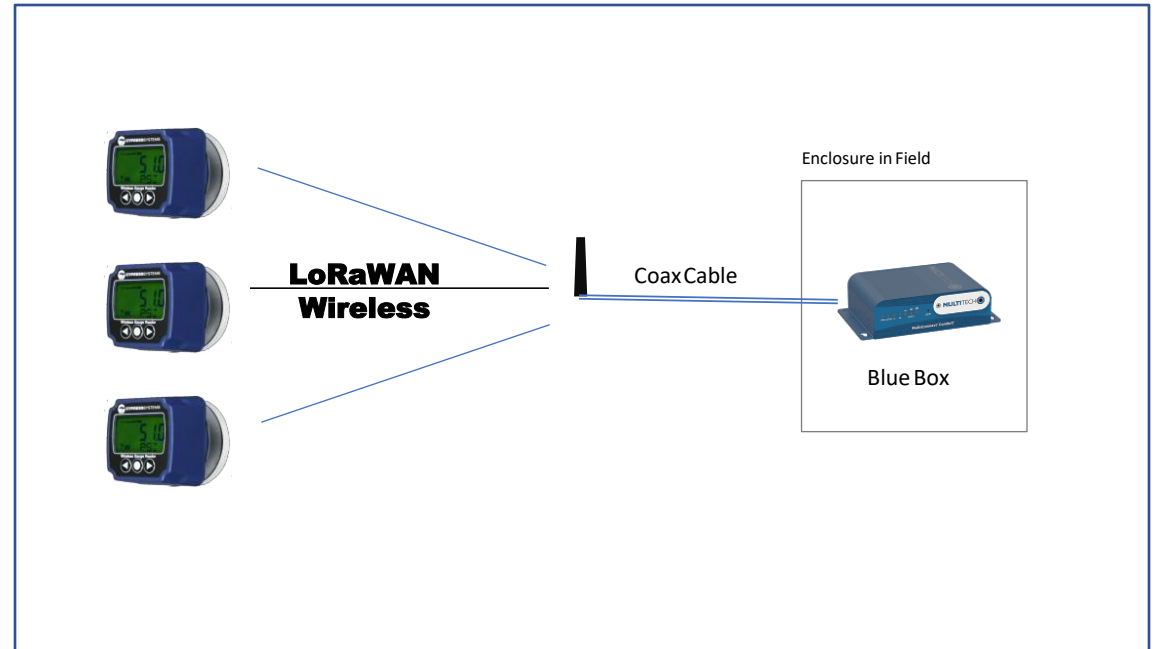
Options for Blue Box Antenna Extension

Blue Box Antenna Extension

Without Antenna Extension

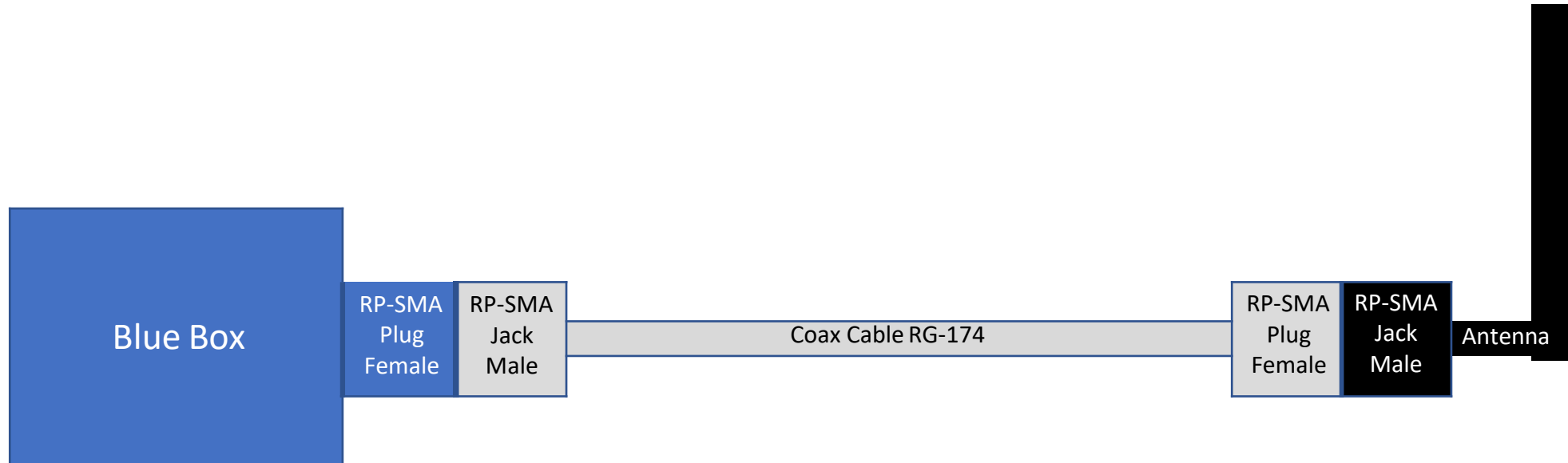


With Antenna Extension via Coax Cable



Note: Antenna Extension max of 100 ft distance – limited by signal loss

Antenna Extender Cable – Single Antenna



Connectors:

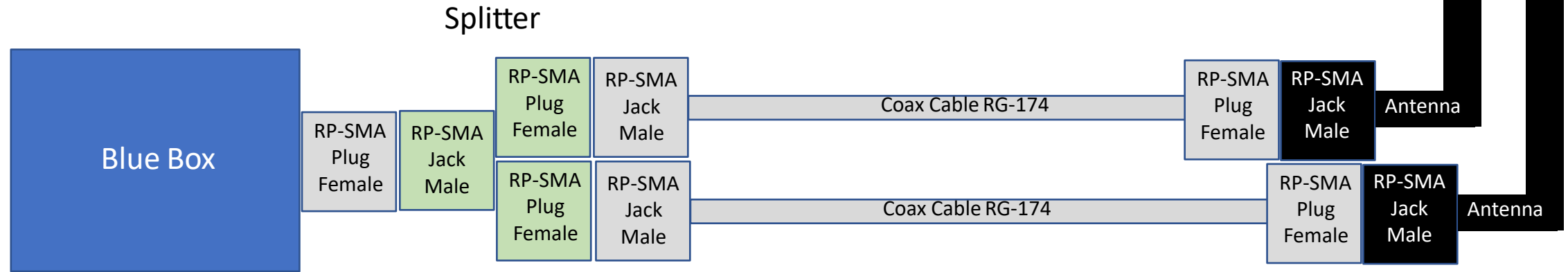
<https://www.amazon.com/SUPERBAT-Connectors-Female-Attachment-Connector/dp/B08F4SYDDF>

Cable:

<https://www.awcwire.com/rg-catalog/rg174-coax-cable>

<https://www.awcwire.com/rg-catalog/rg142-coax-cable>

Antenna Extender Cable – Dual Antenna



Splitter:

<https://www.amazon.com/SUPERBAT-Adapter-Splitter-Antenna-Converter/dp/B08V4WGV1R/>

Connectors:

<https://www.amazon.com/SUPERBAT-Connectors-Female-Attachment-Connector/dp/B08F4SYDDF>

Cable:

<https://www.awcwire.com/rg-catalog/rg174-coax-cable>

<https://www.awcwire.com/rg-catalog/rg142-coax-cable>

Antenna Extension Cable – Signal Loss Details

http://rfelektronik.se/manuals/Datasheets/Coaxial_Cable_Attenuation_Chart.pdf

27.9 dBm attenuation per 100 ft for RG-174 cable

13 dBm attenuation for 100 ft for RG-142 cable

Signal Losses: Connectors: Typical attenuation per connector is 6 dB

Signal Losses: Combined – 25 dB to 40 dB signal attenuation – very significant

Note: Antenna Extension Cables introduce significant signal loss – not suitable for long distances

Options for OSI PI Historian Connection

Options for OSI PI Historian Connection

Option 1: RESTful API

<https://livelibrary.osisoft.com/LiveLibrary/content/en/web-api-v8/GUID-9330057F-C995-4721-A10F-29F3C1EB3E8E>

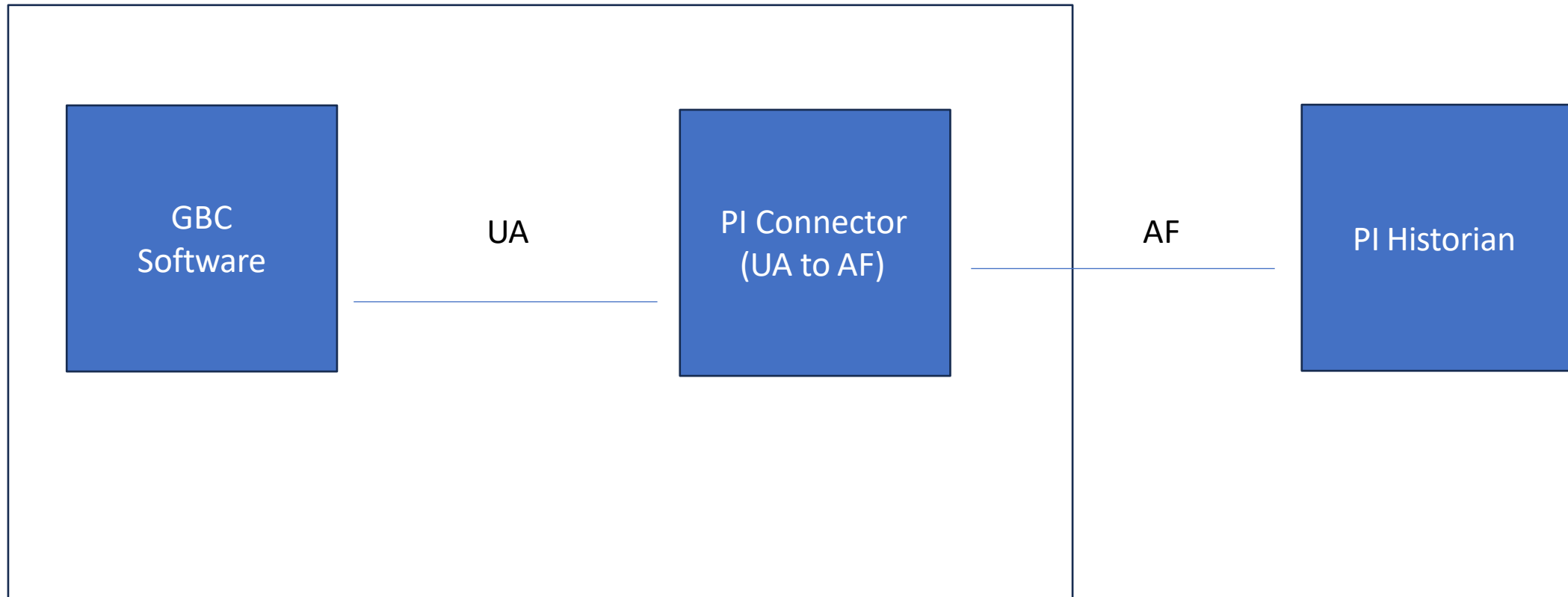
Option 2: OPC UA

<https://techsupport.osisoft.com/Products/PI-Interfaces-and-PI-Connectors/PI-Connector-for-OPC-UA/Interface-Details/>

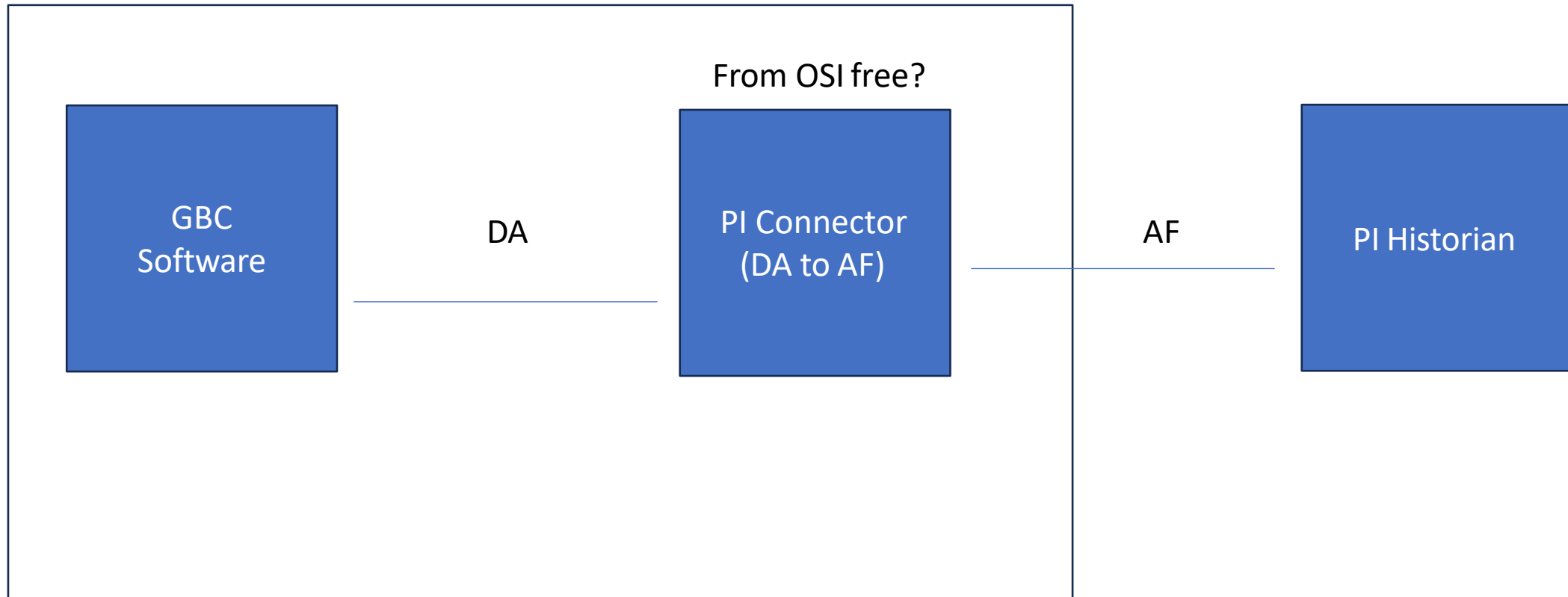
Option 3: OPC DA

http://cdn.osisoft.com/interfaces/1753/PI_OPCInt_2.3.11.0.doc

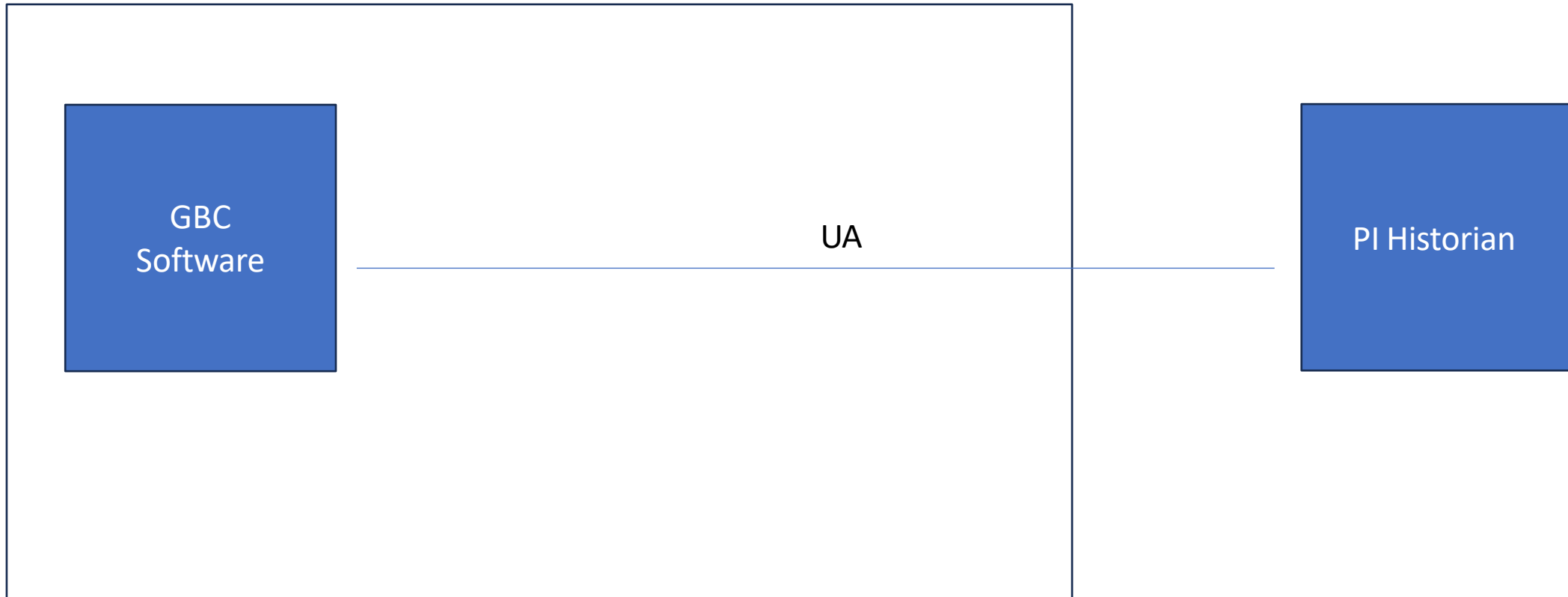
Green Box Server (Windows)



Green Box Server



Green Box Server



LoRaWAN - FAQ

- What is LoRaWAN?
 - It is a Low Power, Long Range radio technology using patented chirp spread spectrum (CSS) technology.
- What are the benefits of LoRaWAN?
 - Long range, low power consumption, low interference, secure, broad adoption – compared to other wireless technologies.
 - See LoRaWAN Alliance <https://lora-alliance.org>
- What frequencies does it use? Does it interfere with WiFi, Bluetooth or cell phones?
 - 915 MHz band (902–928 MHz) in North America divided into multiple channels (can channel hop)
 - The 915 MHz band is a different frequency than WiFi, Bluetooth and cellular, so no interference
- What is the transmission range of LoRaWAN?
 - Maximum range can be up to 10 miles – but bandwidth and battery consumption suffers.
 - WTL range is 100-150 ft typically, on a single floor. Crossing floor plates or thick walls reduce range by up to 50%.
- Does LoRaWAN use repeaters to extend range?
 - No, it uses a STAR topology where each WTL communicates directly with the Gateway. There are no repeaters.

LoRaWAN - FAQ

- Can it be used in nuclear power plants and RF sensitive locations?
 - Yes, Cypress has deployed LoRaWAN networks at 27 nuclear plants.
- Can 3rd party LoRaWAN devices use the Cypress gateways?
 - Yes, once a LoRaWAN gateway is installed, other 3rd party LoRaWAN sensors and devices can use the same gateway. It is necessary to configure the Gateway and write code to parse payload formats – a service provided by Cypress Envirosystems.
- Is LoRaWAN secure?
 - LoRaWAN has built-in mandatory authentication and encryption.
 - The WGR system has been tested and is in use by critical industries including nuclear power plants and NASA.