solarnetwork

SolarNode Reference Design	Industrial 8
Approximate Hardware Cost (USD)	Sub $1000.00 USD
Use Cases	3-Phase bi-directional monitoring, load control over Ethernet & WiFi, environmental

Description:

Industrial 8 is a versatile 3-phase revenue grade SolarNode design, able to capture energy data from a commercial building load, individual loads and direct from a solar inverter or bank of inverters. The AccuEnergy 1310 Class 0.5 kWh SunSpec compliant meter supports split core and rogowski coil current transformers (CTs) that can measure 3000A of current along with phase voltages, powerFactor, frequency, with bidirectional accumulating energy totals. Using an additional Modbus RTU connection, the SolarNode can also collect data directly from the solar inverter over a SunSpec Modbus TCP interface. Industrial 8 can be configured with a single switchable loads, but future variants could allow for multiple switchable loads. Battery backup and surge protection is included to protect the SolarNode gateway unit from intermittent power or power surges.

Using 4G LTE, Ethernet and WiFi connectivity this SolarNode implementation makes it easy to position the unit anywhere in range of your WiFi access point, or hardwired to your building's ethernet.

With BlueTooth support, 3 USB ports, and CANbus support, additional RS485 adapters and other devices can later be added to your SolarNode such as USB Cameras, thermistors, ethernet Adapters, pyranometers and more. Industrial 8 can toggle an AC load of up to 10 Amps using software controls.

Due to the powerful quad-core CPU of the Raspberry Pi 4 CM4 unit, many more applications can be added to this SolarNode such as motion detection cameras, and soon machine learning.

Properties Peristed:

Circuit sourceIds:

```
watts, current, voltage, powerFactor, frequency,reactivePower,
apparentPower,wattHours, wattHoursReverse, neutralCurrent, current_a, current_b,
current_c, current_a,current_b,current_c,
voltage_ab,voltage_bc,voltage_ca,lineVoltage
```

Inverter sourceIds:

watts, frequency, apparentPower, dcPower1, dcPower2, dcPower3, dcVoltage1, dcVoltage2, dcVoltage3, dcPower, current_a, current_b, current_c, dcVoltage, voltage_a, voltage_b, voltage_c, efficiency, voltage_ab, voltage_bc, voltage_ca, reactivePower, dcCurrent, dcCurrent1, dcCurrent2, dcCurrent3, powerFactor, temp, temp_heatSink, temp_transformer, wattHours
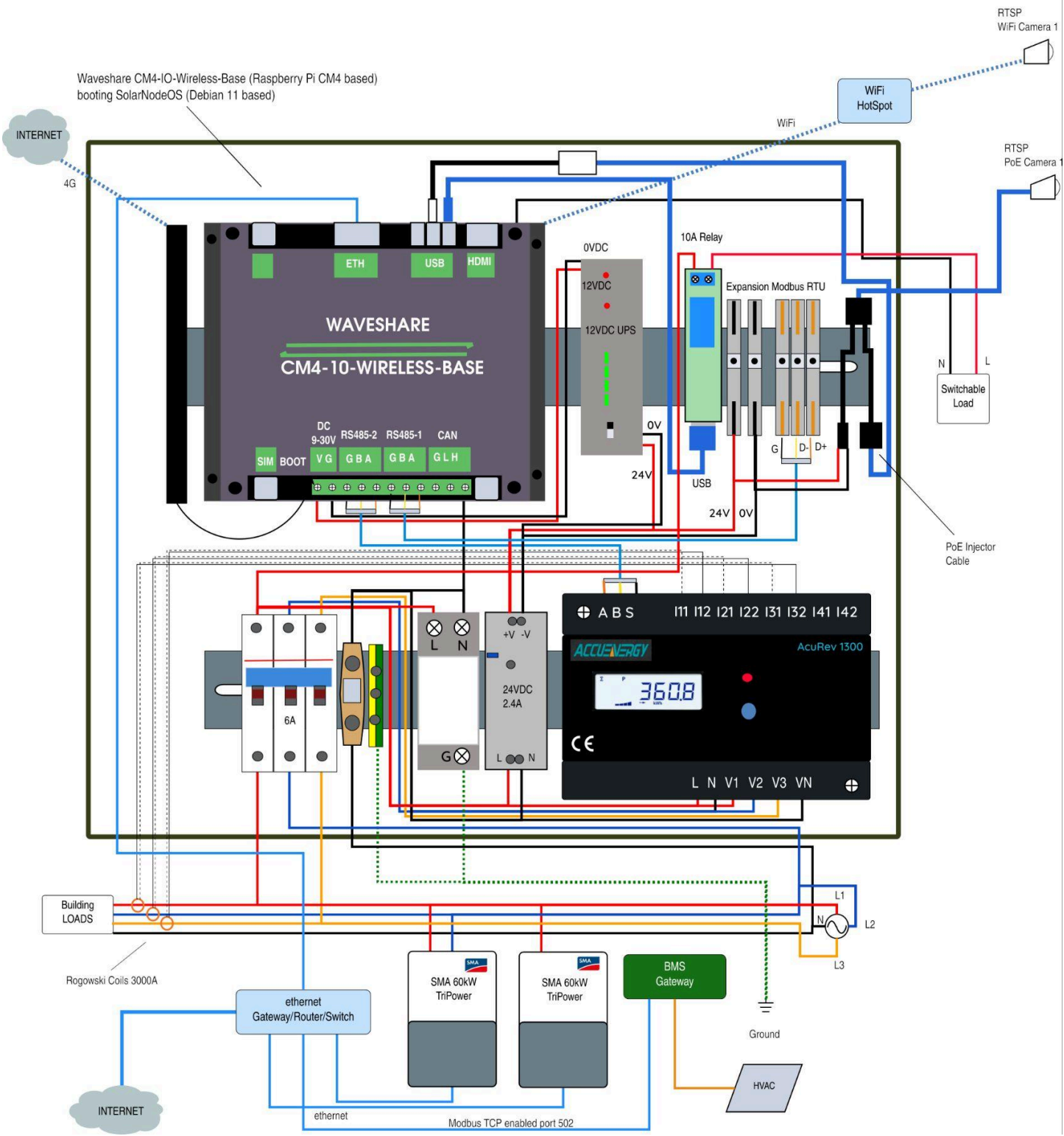
Environmental sourceIds:

temp, tempMin, tempMax, atm, humidity, visibility, wdir, wspeed, wgust, cloudiness, sky

SolarNode sourceIds:

cpu_idle, cpu_temp, cpu_user, fs_size_/, fs_used_/, ram_avail, ram_total, cpu_system, sys_load_1min, ram_used_percent, sys_up, net_bytes_in_eth0, net_bytes_out_eth0

Applications:

- Revenue Grade Commercial Energy Consumption, power quality Monitoring
- Commercial Solar Production and power quality Monitoring
- Submetering
- Check meter data collection
- Coming soon: Edge intelligence (ML) via SolarQuant framework

RTSP
WiFi Camera 1

Waveshare CM4-IO-Wireless-Base (Raspberry Pi CM4 based)
booting SolarNodeOS (Debian 11 based)

WiFi
HotSpot

WiFi

INTERNET

RTSP
PoE Camera 1

4G

0VDC

10A Relay

ETH   USB   HDMI

12VDC

12VDC UPS

Expansion Modbus RTU

WAVESHARE
CM4-10-WIRELESS-BASE

N   L

Switchable
Load

0V

DC   RS485-2 RS485-1   CAN
9-30V

SIM BOOT   V G   G B A   G B A   G L H

24V

USB

G   D- D+

24V 0V

PoE Injector
Cable

A B S   I11 I12 I21 I22 I31 I32 I41 I42

L   N

+V -V

ACCUENERGY   AcuRev 1300

360.8
kWh

6A

24VDC
2.4A

CE

G

L   N

L N V1 V2 V3 VN

Building
LOADS

L1

N

L2

Rogowski Coils 3000A

L3

ethernet
Gateway/Router/Switch

SMA 60kW
TriPower

SMA 60kW
TriPower

BMS
Gateway

Ground

INTERNET

HVAC

ethernet

Modbus TCP enabled port 502

Components:

Item	Quantity	Cost	Subtotal	URL
AccuEnergy 1310	3	$82.80	$248.40	https://store.egauge.net/egauge-core
AccuEnergy RC16 Rogowski Coil	3	$82.80	$248.40	https://www.globaltestsupply.com/product/accuenergy-acuct-flex-series-flexible-rogowski-coils
WaveShare CM4 IO BASE	1	$53.38	$53.38	https://www.aliexpress.com/item/1005004078650406.html
CM4 2GB / WiFi / BT	1	$71.67	$71.67	https://www.aliexpress.com/item/1005003795642399.html
PoE Injector	1	$0.54	$0.54	https://www.aliexpress.us/item/4001083708287.html
UPS Battery	1	$98.04	$98.04	https://www.getic.com/product/teltonika-bat120-uninterruptable-power-supply?vat_state=excl&currency=USD
24VDC Power Supply 2.4A	1	$19.73	$19.73	https://www.digikey.com/en/products/detail/mean-well-usa-inc/HDR-30-24/7703799
GPIO Relay	1	$4.59	$4.59	https://www.aliexpress.com/item/32955376837.html
Surge protection	1	$4.63	$4.63	https://www.aliexpress.com/item/1005001652494301.html
19x15x8 Enclosure	1	$115.36	$115.36	https://www.aliexpress.com/item/1005005664828162.html?
3-pole AC Breaker	1	$3.21	$3.21	https://www.aliexpress.us/item/1005002189837197.html
DIN Rail	2	$1.46	$2.92	https://www.aliexpress.us/item/4000569999928.html
Neutral Junction Block	1	$0.29	$0.29	https://www.aliexpress.us/item/3256801365508538.html
Ground Junction Block	1	$1.00	$1.00	https://www.aliexpress.us/item/2251832687162423.html
20mm Cable Gland	2	$1.82	$3.64	https://www.aliexpress.com/item/1005006158255048.html
DIN rail lever-style connection block	2	$0.49	$0.98	https://www.aliexpress.com/item/1005005645849630.html
DIN rail level-style 3-way connection block	1	$2.87	$2.87	https://www.aliexpress.com/item/1005005544012867.html
120 Ohm resistor	1	$0.05	$0.05	https://www.aliexpress.com/item/1005002020611725.html
WiFi RTSP Camera	1	$39.99	$39.99	https://www.amazon.com/TOPODOME-Security-Wireless-Humanoid-Weatherproof/dp/B08RXV5SGN/ref=sr_1_2
PoE RTSP Camera	1	$59.99	$59.99	https://www.amazon.com/Amcrest-Security-Waterproof-5-Megapixel-IP5M-B1186EW-28MM/dp/B08K1M34ZQ/ref=sr_1_7
TOTAL			**$919.69**	