

AXELIT

ACTIVEZ VOTRE TRANSFORMATION IT

ZABBIX

Supervision d'objets IOT Industriels

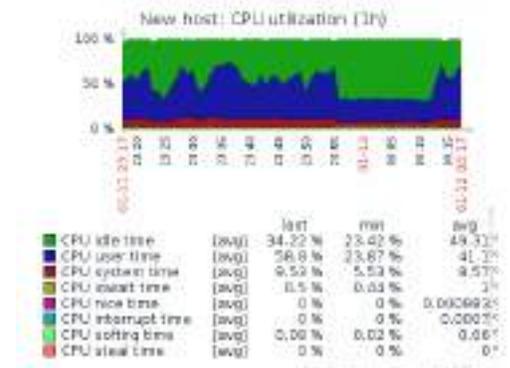
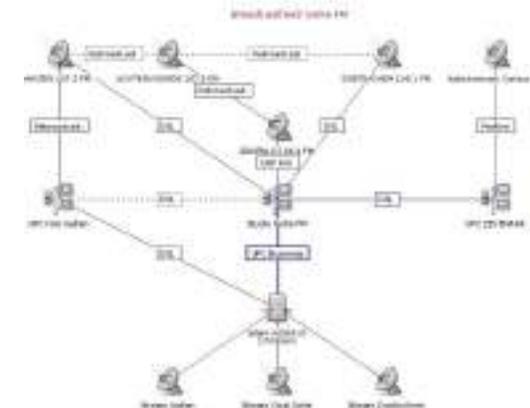
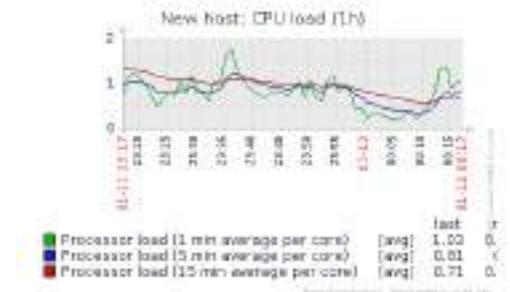
The Enterprise-class Monitoring Solution for Everyone

AXEL IT ET ZABBIX

- Site web officiel : <http://www.zabbix.com>
- GNU General Public License (GPL) version 2
- Versions LTS actuelles : Zabbix 4.0



- Solution **Tout-en-Un**
- Supervise la **performance** et **disponibilité**
 - ✓ Infrastructures Réseaux
 - ✓ Applications
 - ✓ Ressources Virtuelles et Cloud
- Jusqu'à 25 000 Noeud par serveur
- Architectures flexibles et variées
- Notifications et exécution distante en réaction aux anomalies de production
- **Visualisation Riche**, au travers de :
 - ✓ Tableaux de bord
 - ✓ Graphes personnalisés
 - ✓ Cartes réseau
- **Supervision distribuée**



PARTENARIAT AXEL IT ET ZABBIX

OFFRE FIELD SERVICES ZABBIX AXEL IT

✓ PREMIUM PARTNER

AXEL IT est un partenaire majeur ZABBIX œuvrant sur le périmètre suivant :

Distribution et Animation en Langue Française du programme de Contrat de support officiel

➤ **Centre de support Francophone avec techniciens dédiés support Zabbix**

- Animation et distribution de formations
- Architecture
- Optimisation & Stress test Sizing SGBDR
- Assistance Technique au Déploiement
- Intégration
- Implémentation et maintenance de Templates & interfaces



The Premium Partner status is assigned by Zabbix only to those partners that meet a special benchmark in providing Zabbix services and are able to prove high proficiency of personnel about Zabbix solution.

AXEL IT has proven special knowledge, skills and experience and upgraded to the highest Zabbix partnership level



COMPOSANTS ZABBIX

Agent

Agentless

Proxy



Data collection



Analyse & Corrélation

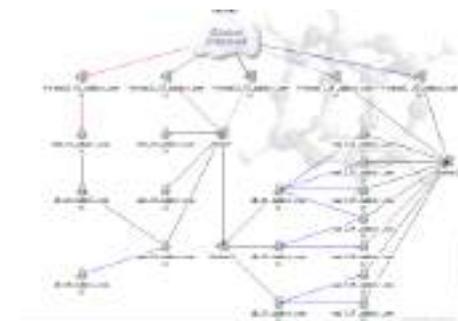


Historique

Alertes & Actions Automatiques



Visualisation



INTERFACES ZABBIX

ZABBIX Monitoring Inventory Reports Configuration Administration

Dashboard Problems Overview Web Latest data Graphs Screens Maps Discovery Services Central NOC

Zabbix Global View

All dashboards / Zabbix Global View

Zabbix Cluster

Amazon Cloud

Azure Cloud

Zabbix Proxy CPU load: 0.0075 PROBLEM IN: 5.22 Kbps OUT: 105.21 Kbps

Zabbix Proxy CPU load: 0.0075 PROBLEM IN: 5.22 Kbps OUT: 105.18 Kbps

Zabbix Proxy CPU load: 0.0075 PROBLEM IN: 1.97 Kbps OUT: 69.88 Kbps

Zabbix server 127.0.0.1 PROBLEM IN: 5.22 Kbps OUT: 125.48 Kbps

Zabbix Proxy CPU load: 0.0075 PROBLEM IN: 5.46 Kbps OUT: 89.34 Kbps

Zabbix Proxy CPU load: 0.0075 PROBLEM IN: 5.93 Kbps OUT: 105.34 Kbps

Zabbix Proxy CPU load: 0.0075 PROBLEM

Zabbix Proxy CPU load: 0.0075 PROBLEM

Detected problems

Host group	Disaster	High	Average	Warning	Information	Not classified
Cloud:AWS			1	1		
Cloud:Azure			1	1	1	
End user services			8	5		
HPC Cluster			29	27	1	
Internal infrastructure		2	43	41	2	
R&D Lab1						
R&D Lab2			1	1		
Region:Australia			1	1		
Region:Brazil					32	
Region:China		1	1	1		
Region:Europe						
Region:Japan			5			
Region:USA			3	1		
SAP HANA infra			1	1	1	
Zabbix infrastructure				1		

Storage IOPs

2018-10-02 04:16:55 - 2018-10-02 09:30:22

UTC time

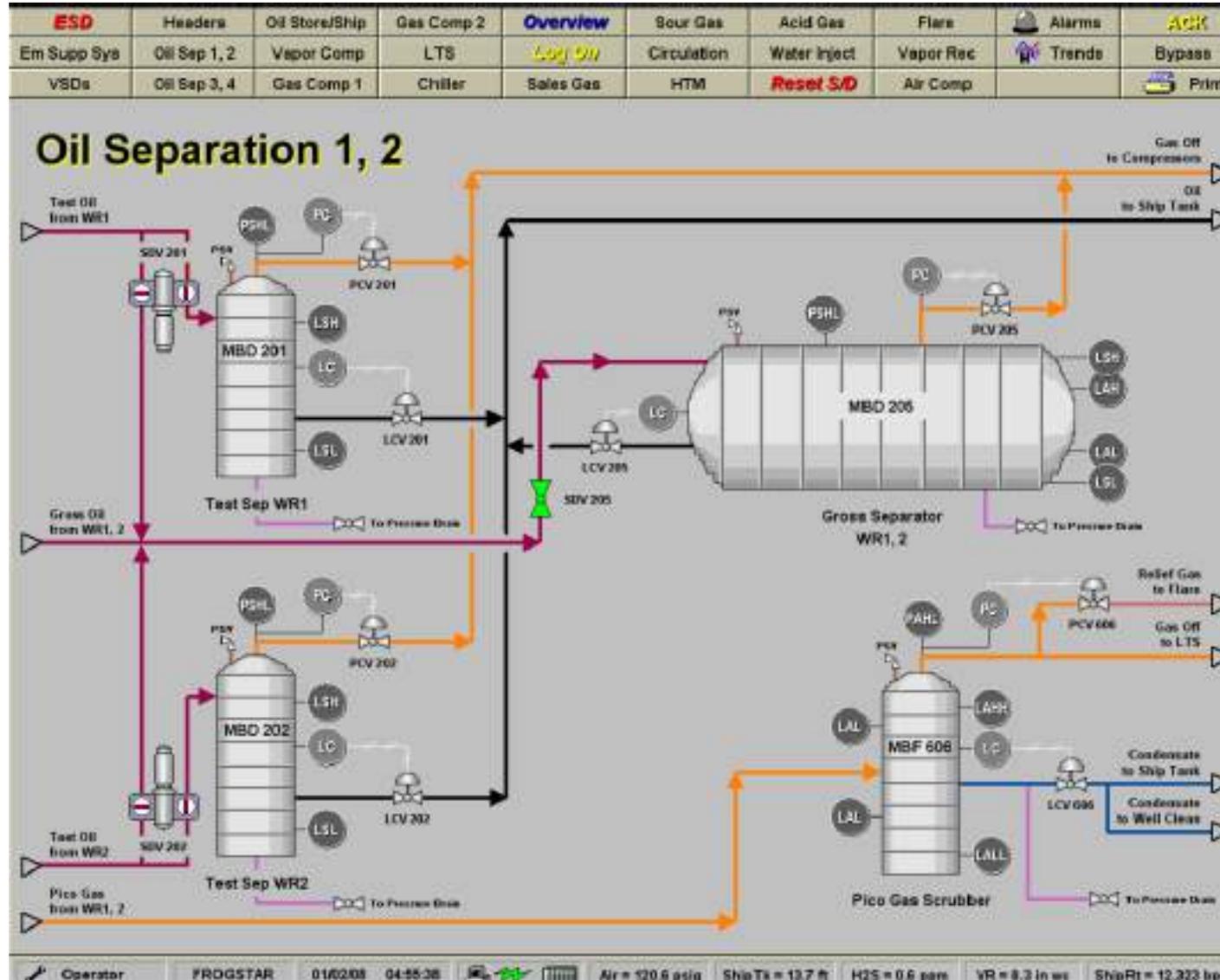
API calls/s



Time	Severity	Recovery time	Status	Host	Problem	Duration	Aut.	Auto	
11:58:59 AM	Average		PROBLEM	Linux008	Too many queries per second	1m 20s	Yes	None	
11:58:59 AM	Average		PROBLEM	Linux008	Too many transactions per second	1m 56s	Yes	None	
11:59:00									
10:13:30 AM	High		PROBLEM	Linux009	Service Docker stopped	1h 42m 20s	Yes	1	
10:17:00 AM	High		PROBLEM	Linux008	Service Docker stopped	1h 05m 14s	Yes	1	
Today									
09:00:00 11:30:00 PM	Information		PROBLEM	Linux007	Slow query resolution time	12h 56m 44s	No		
08:12:00 10:48:24 PM	Average		PROBLEM	Linux008	Too many transactions per second	13h 12m 56s	No		
08:12:00 10:47:27 PM	Average	11:28:19 AM	PROBLEM	Linux008	Too many queries per second	12h 11m 42s	Yes	1	
08:12:00 10:47:04 PM	Average		PROBLEM	Linux008	Too many queries per second	13h 13m 56s	No		



Synoptiques SCADA



CARTES et COLLECTES SCADA



Collecte directe depuis MODBUS



<input type="checkbox"/> Name ▲	Last check	Last value	Change
▶ Current Demand (9 Items)			
▶ Energy (3 Items)			
▼ Information (5 Items)			
<input type="checkbox"/> Device Name	2018-02-08 18:00:15	PM8 POWER METER	Hist...
<input type="checkbox"/> Firmware Version	2018-02-08 18:00:15	12.500	Hist...
<input type="checkbox"/> Model Number	2018-02-08 18:00:15	810	Hist...
<input type="checkbox"/> Serial number	2018-02-08 18:00:15	16256476	Hist...
<input type="checkbox"/> Wiring Type	2018-02-08 18:00:15	Three Phase 4 Wire ...	Graph
▼ Input (9 Items)			
<input type="checkbox"/> Frequency	2018-02-08 18:19:45	50.01 Hz	+0.01 Hz Graph
<input type="checkbox"/> Line A to Line B	2018-02-08 18:19:45	404 V	-1 V Graph
<input type="checkbox"/> Line A to Neutral	2018-02-08 18:19:45	234 V	Graph
<input type="checkbox"/> Line B to Line C	2018-02-08 18:19:45	400 V	-1 V Graph
<input type="checkbox"/> Line B to Neutral	2018-02-08 18:19:46	232 V	Graph
<input type="checkbox"/> Line C to Line A	2018-02-08 18:19:45	404 V	-1 V Graph
<input type="checkbox"/> Line C to Neutral	2018-02-08 18:19:45	232 V	Graph
<input type="checkbox"/> Line to Line Average Voltage	2018-02-08 18:19:46	403 V	-1 V Graph
<input type="checkbox"/> Voltage Line to Neutral 3 Phase Average	2018-02-08 18:19:45	233 V	Graph
▼ Load (9 Items)			
<input type="checkbox"/> 3 Phase Load Average	2018-02-08 18:19:45	33 A	Graph
<input type="checkbox"/> Apparent power	2018-02-08 18:19:45	23 KVA	Graph
<input type="checkbox"/> Phase A Load	2018-02-08 18:19:46	35 A	+1 A Graph
<input type="checkbox"/> Phase B Load	2018-02-08 18:19:46	32 A	Graph
<input type="checkbox"/> Phase C Load	2018-02-08 18:19:45	34 A	+1 A Graph
<input type="checkbox"/> Power factor	2018-02-08 18:19:45	0.96	Graph
<input checked="" type="checkbox"/> Power factor description	2018-02-08 18:00:15	lead	Hist...
<input type="checkbox"/> Reactive power	2018-02-08 18:19:45	-6 KVAR	Graph
<input type="checkbox"/> Real power	2018-02-08 18:19:45	22 KW	Graph



Supervision PARC EOLIEN

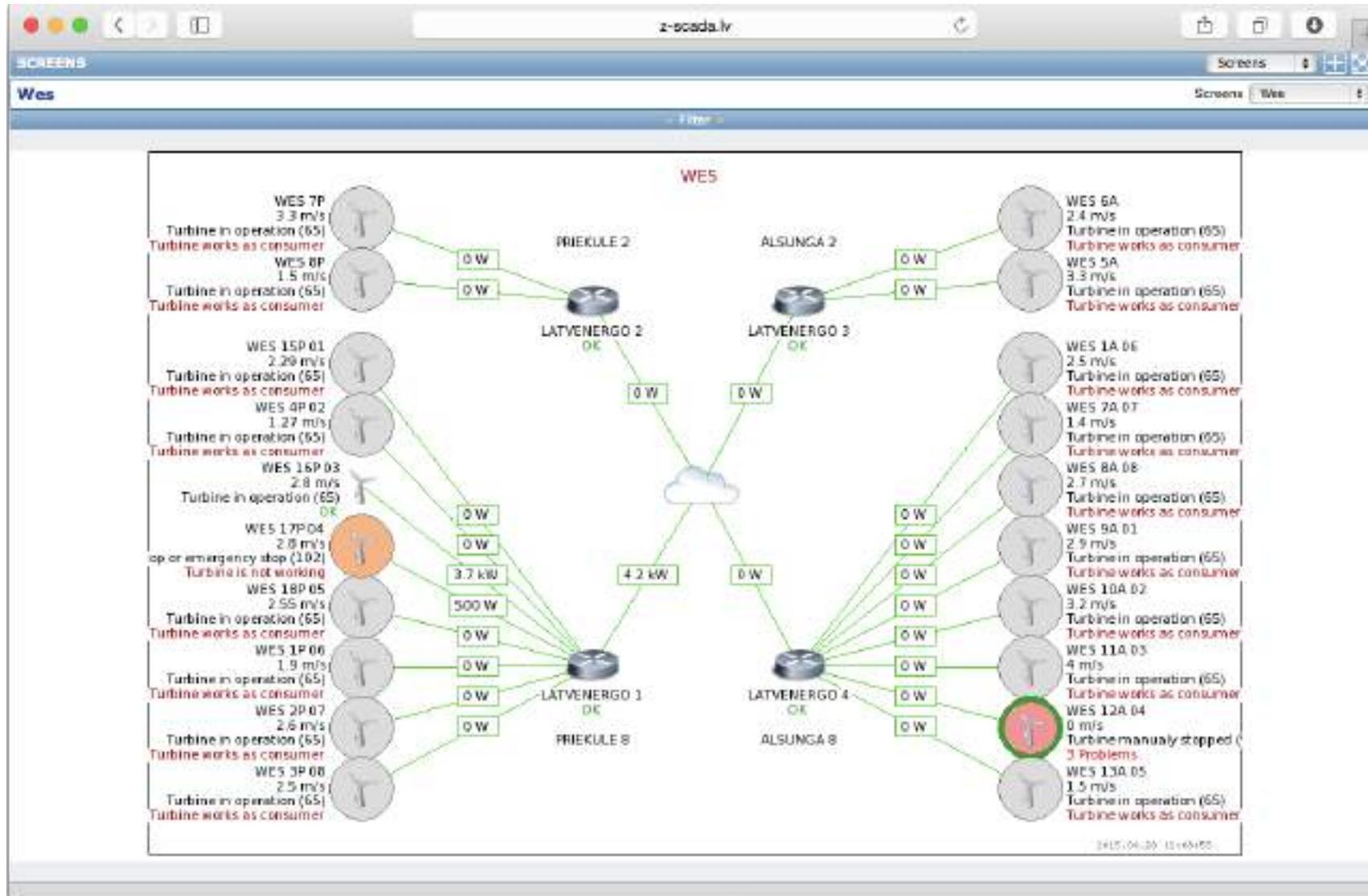
```
SERVICE 15-APR-28 12:12:57
RUN 578.9 KW
-POWER---GEN.---ROTOR---WIND---PITCH
145.2KW 1506RPM 29.7RPM 6.4M/S 1.4
```

```
2015-04-28 12:10:27 GENERATOR
ROTOR: 12.7 RPM GENERATOR: 802.0 RPM
27 KW 2.9 M/S PD 0.82° AP 0.79°
WTG-MODE: GENERATION
```

7	8	9	reset	start	stop	CCW	CW
4	5	6				stop	
1	2	3		left		right	
clear	0	.	-	prev	down	enter	



CARTES et COLLECTES SCADA



CARTES et COLLECTES SCADA

Filter

Title:

Scale:

Period: From / / : Till / / :

Items:

<input type="checkbox"/>	Pope K01: Active Power	Pope K01: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope K01: Wind Speed	Pope K01: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope K02: Active Power	Pope K02: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope K02: Wind Speed	Pope K02: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope K03: Active Power	Pope K03: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope K03: Wind Speed	Pope K03: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope K04: Active Power	Pope K04: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope K04: Wind Speed	Pope K04: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope K05: Active Power	Pope K05: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope K05: Wind Speed	Pope K05: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope P01: Active Power	Pope P01: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope P01: Wind Speed	Pope P01: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope P02: Active Power	Pope P02: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope P02: Wind Speed	Pope P02: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope P03: Active Power	Pope P03: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Pope P03: Wind Speed	Pope P03: Wind speed	avg	1	2	m/s	total	<input type="checkbox"/>
<input type="checkbox"/>	Pope P04: Active Power	Pope P04: Active Power	avg	0.001	2	kWh	total	<input checked="" type="checkbox"/>

Error #	Type	Error description
0000		Turbine OK
0230	S	1 sec wind speed high
0000		Turbine OK
0010	A	Grid spikes L2
0009	S	Grid spikes L1
0000		Turbine OK
0621	W	Service key
0621	W	Service key
0411	S	Following fault blade 1
0000		Turbine OK
0411	S	Following fault blade 1
0000		Turbine OK
0411	S	Following fault blade 1
0000		Turbine OK
0411	S	Following fault blade 1
0000		Turbine OK
0411	S	Following fault blade 1
0000		Turbine OK
0998	W	Max stop time
0290	S	Generator speed sensor 1 fault
0000		Turbine OK
0396	S	Senser fault / direction TAC85
0000		Turbine OK



CARTES et COLLECTES SCADA



CARTES et COLLECTES SCADA



CARTES et COLLECTES SCADA

ZABBIX Monitoring Inventory Reports Configuration Administration

Dashboard Problems Overview Web Latest data Triggers Graphs Screens Maps Discovery IT services

Maps Minimum severity: Not classified (default) Edit

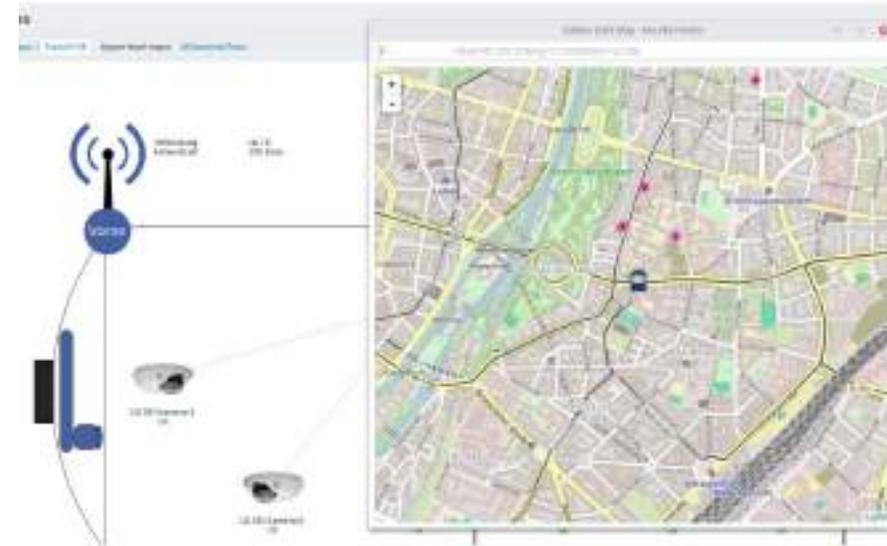
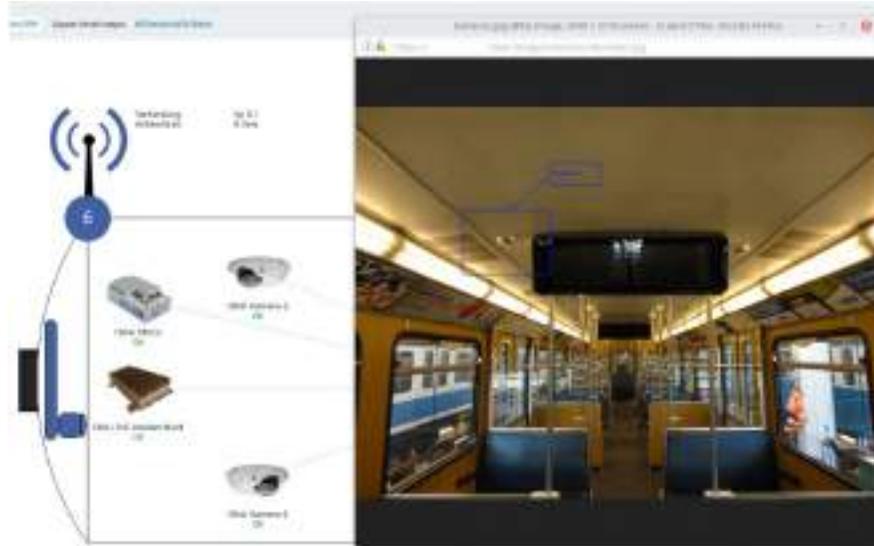
All maps / #Übersicht/U-Bahn Upper level maps: #Übersicht/Gesamtsysteme Fahrzeuge

#Übersicht/U-Bahn

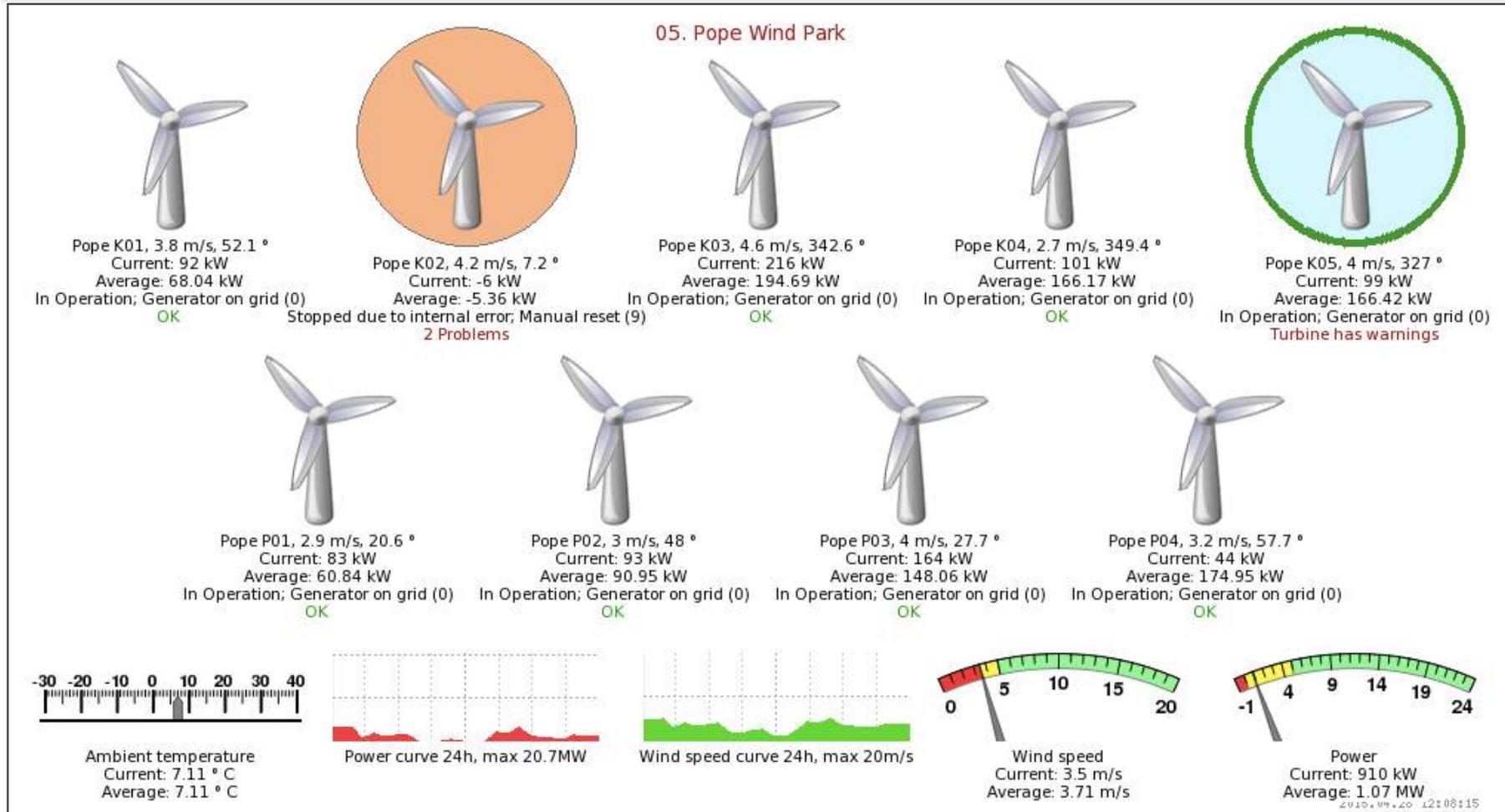
301 Down (0) OK	302 Up (1) OK	303 Up (1) OK	304 Up (1) OK	305 Up (1) OK	306 Down (0) 1 Problem	307 Up (1) OK	308 Up (1) OK	310 Down (0) OK	311 Down (0) 1 Problem	312 Up (1) OK	313 Up (1) OK	314 Up (1) OK	315 Down (0) OK	316 Up (1) OK
317 Up (1) OK	318 Down (0) OK	319 Up (1) OK	320 Down (0) OK	321 Up (1) OK	322 Up (1) OK	323 Up (1) OK	324 Up (1) OK	325 Down (0) 1 Problem	326 Up (1) OK	327 Up (1) OK	328 Up (1) OK	329 Down (0) OK	330 Up (1) OK	331 Up (1) OK
332 Up (1) OK	333 Up (1) OK	334 Up (1) OK	335 Up (1) OK	336 Down (0) 1 Problem	337 Down (0) OK	338 Up (1) OK	339 Up (1) OK	340 Up (1) OK	341 Up (1) OK	342 Down (0) 1 Problem	343 Up (1) OK	344 Up (1) OK	345 Down (0) OK	346 Down (0) 1 Problem
347 Up (1) OK	348 Up (1) OK	351 Down (0) OK	353 Up (1) OK	354 Up (1) OK	355 Up (1) OK	356 Up (1) OK	359 Down (0) OK	360 Down (0) OK	361 Up (1) OK	362 Down (0) OK	364 Up (1) OK	365 Up (1) OK	366 Up (1) OK	367 Up (1) OK
368 Up (1) OK	370 Down (0) OK	371 Up (1) OK	701 Down (0) OK	702 Up (1) OK	705 Down (0) 1 Problem	707 Down (0) OK	708 Down (0) 1 Problem	709 Up (1) OK	710 Down (0) OK	712 Down (0) OK	713 Down (0) OK	714 Up (1) OK		



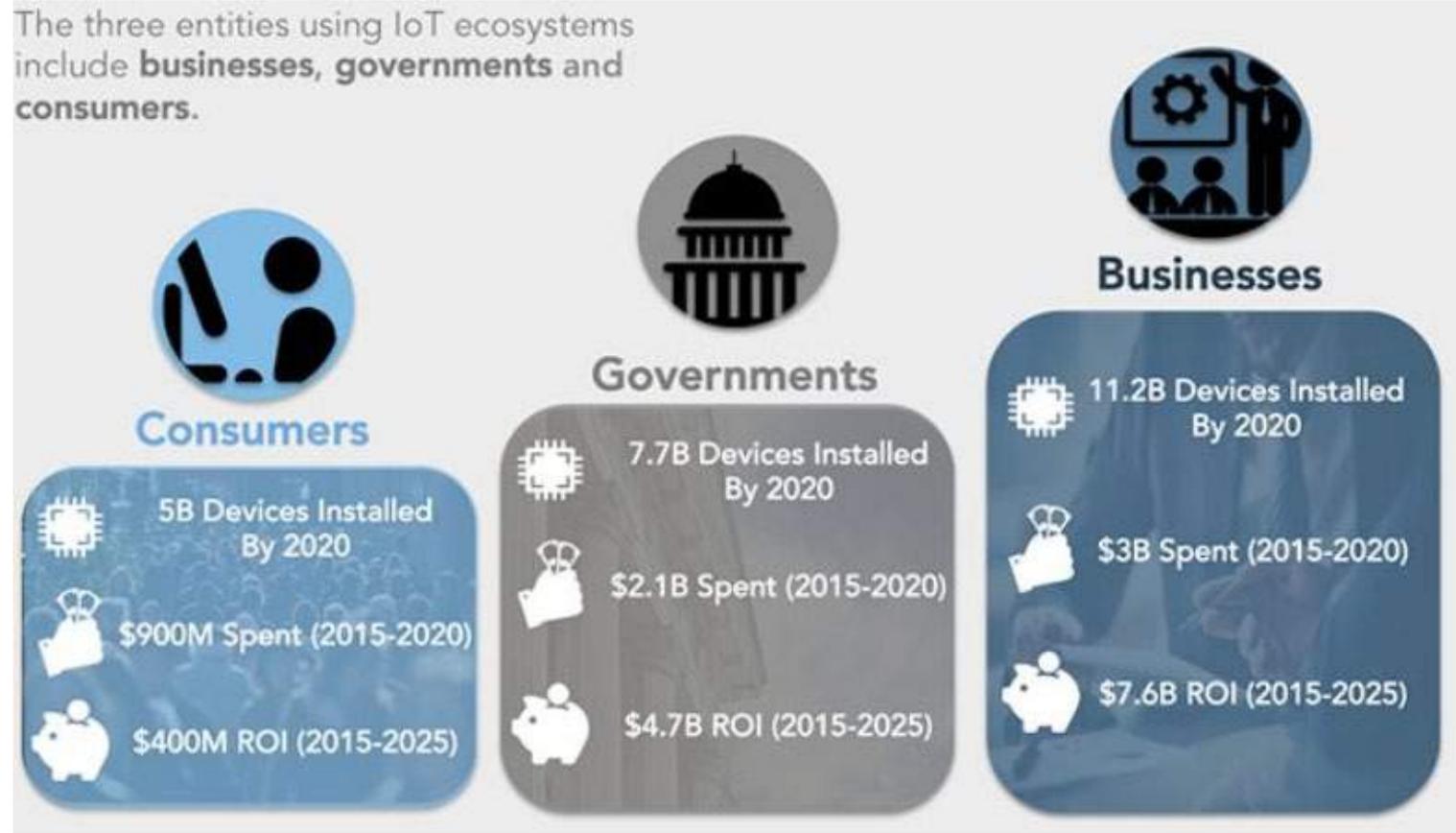
CARTES et COLLECTES SCADA



CARTES et COLLECTES SCADA



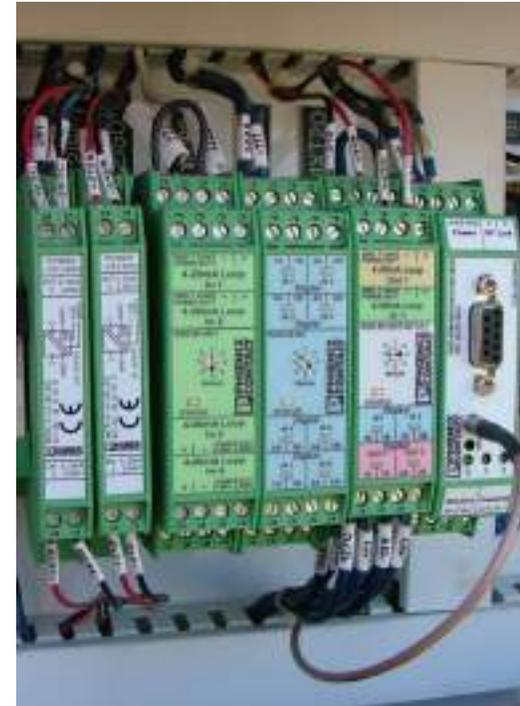
Solutions IOT pour l'industrie



Solutions IOT pour l'industrie

BESOINS :

- Réutilisation des investissements existants
- Fonctionnement HW dans un environnement complexe (EM, température, humidité, poussière...)
- Cycles de maintenance minimaux
- Réutilisation de la data collectée pour analyses spécifiques



Solutions IOT pour l'industrie

BESOINS :

- Support des protocoles SNMP et Modbus (parmi d'autres)
- Présence de réseaux Ethernet, WiFi, BLE, RFID
- WiFi Outdoor peu démocratisé
- La Gateway IOT doit être en mesure de collecter ou de transporter les data sur tous ces réseaux



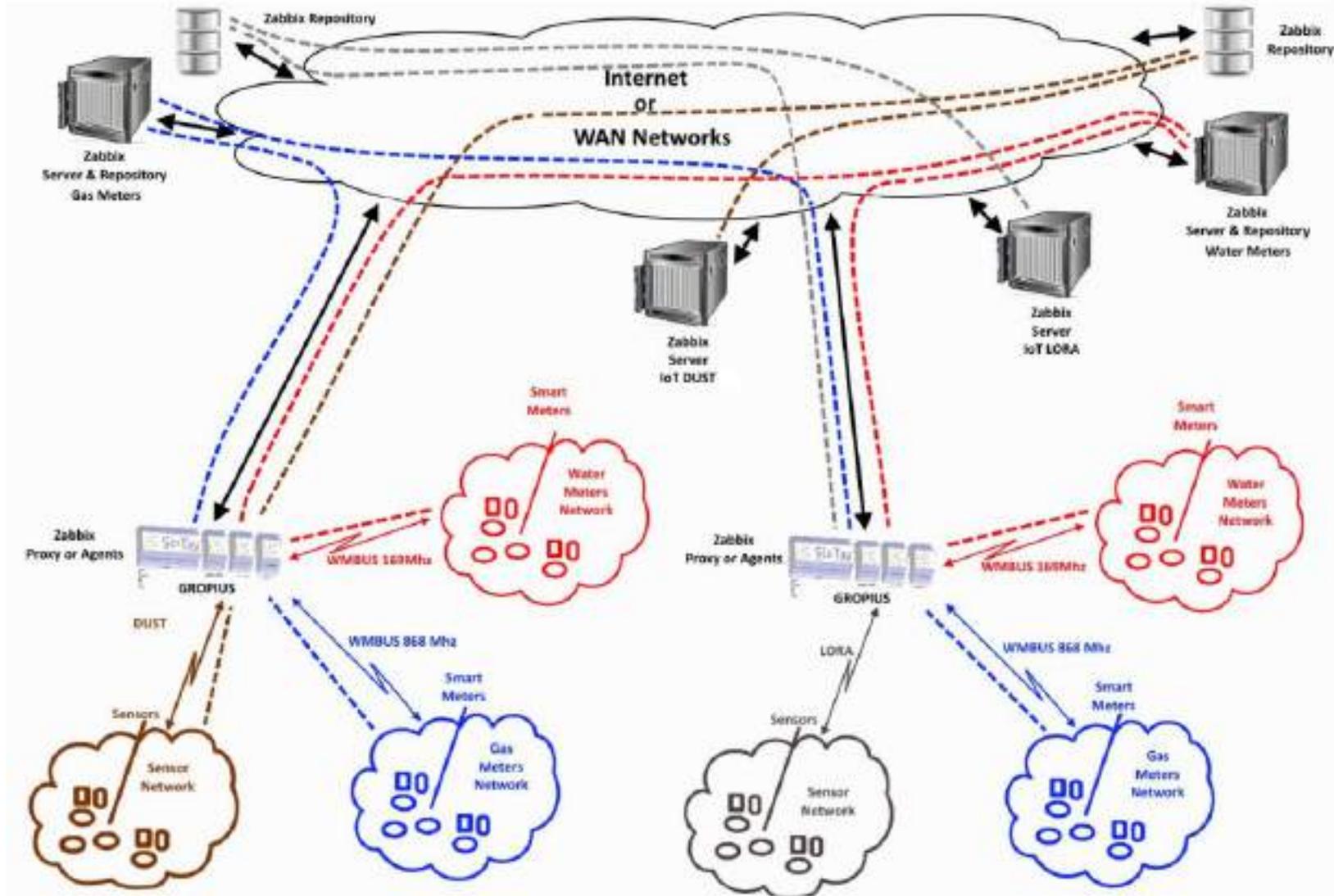
Téléométrie

Autonomie vs. Portée vs. Bande passante

Technology Comparison	2G GSM	3G UMTS	4G LTE	Wi-Fi 802.11n	Lora/Sigfox
Range	Long	Long	Long	Limited (<100m)	Long 1 - 100 Km
Topology	P2P	P2P	P2P	P2P/Mesh	P2P
TX Current Consumption 3.3V	30 – 400 mA	500 – 1000 mA	600 – 1100 mA	50 – 400 mA	<20 mA
Idle Current Consumption 3.3V	2 - 3 mA	4 – 5 mA	6 – 8 mA	35 - 45 mA	<0.009 mA
Energy Harvesting	No	No	No	No	Possible
Operating life on battery (2000mAh) A=active, I=idle	(A) 4-8 h (I) 36 d	(A) 2-4 h (I) 20 d	(A) 2-3 h (I) 12 d	(A) 4-8 h (I) 2 d	10+ years
Usable data rate	9.6 kbps	384 kbps	150 mbps	450 mbps	0.250 - 11 kbps

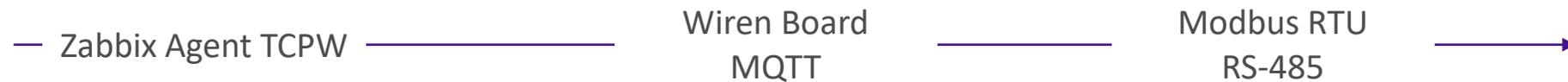


Télémetrie



MQTT

Collecte déportée sur bus RS-485



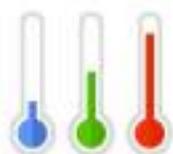
MQTT

```

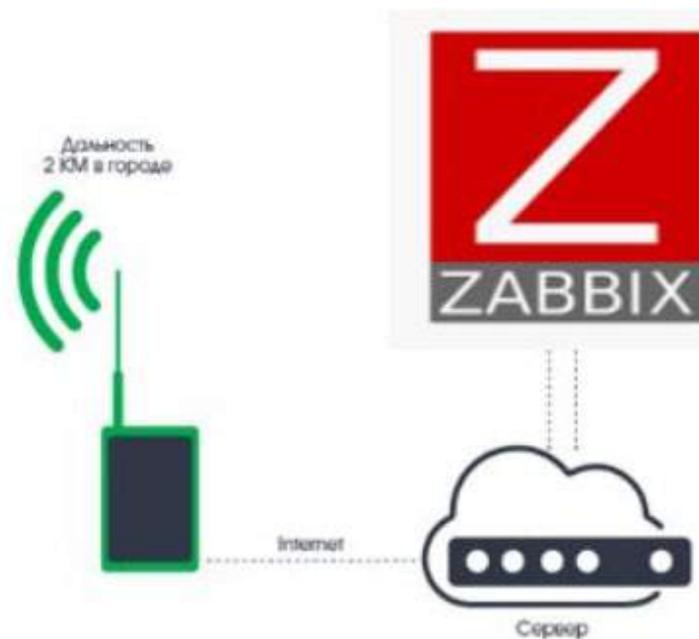
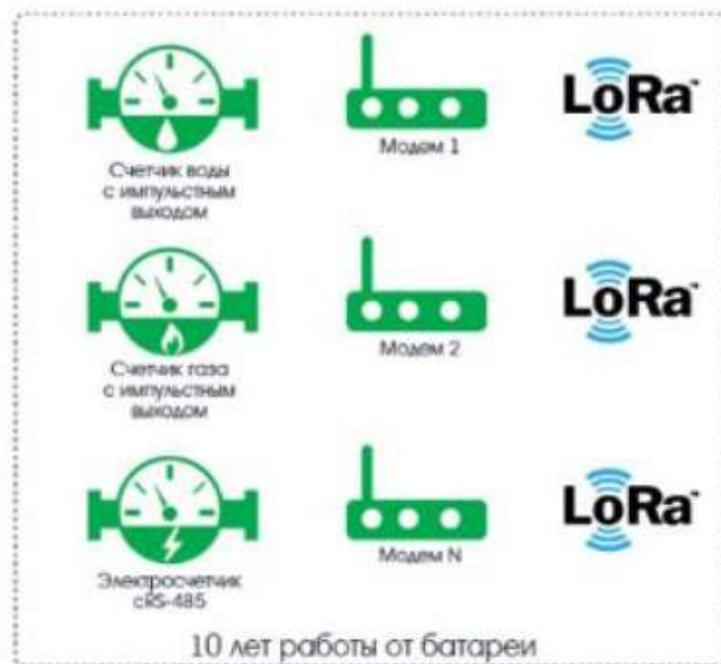
INFO: 1 all/meta/type: "value",
"/devices/wb-map12h_119/controls/Ch 3 Q L3/meta/type": "value",
"/devices/wb-map12h_119/controls/Ch 2 THIN I L3/meta/order": "61",
"/devices/wb-map12h_119/controls/Ch 1 RP energy L1": "1326.2899",
"/devices/wb-map12h_119/controls/Ch 2 RP energy L2": "852.7627",
"/devices/wb-map12h_119/controls/Ch 2 RP energy L3": "942.4655",
"/devices/wb-map12h_119/controls/Ch 3 P L1/meta/readonly": "1",
  
```



C (voltage)	2019-08-24 12:05:00	-119.7	-0.1
C (Phase) канал 1	2019-08-24 12:05:00	49.4	+0.5
B (voltage)	2019-08-24 12:05:00	120.5	-0.1
B (Phase) канал 1	2019-08-24 12:05:00	44.8	+0.9

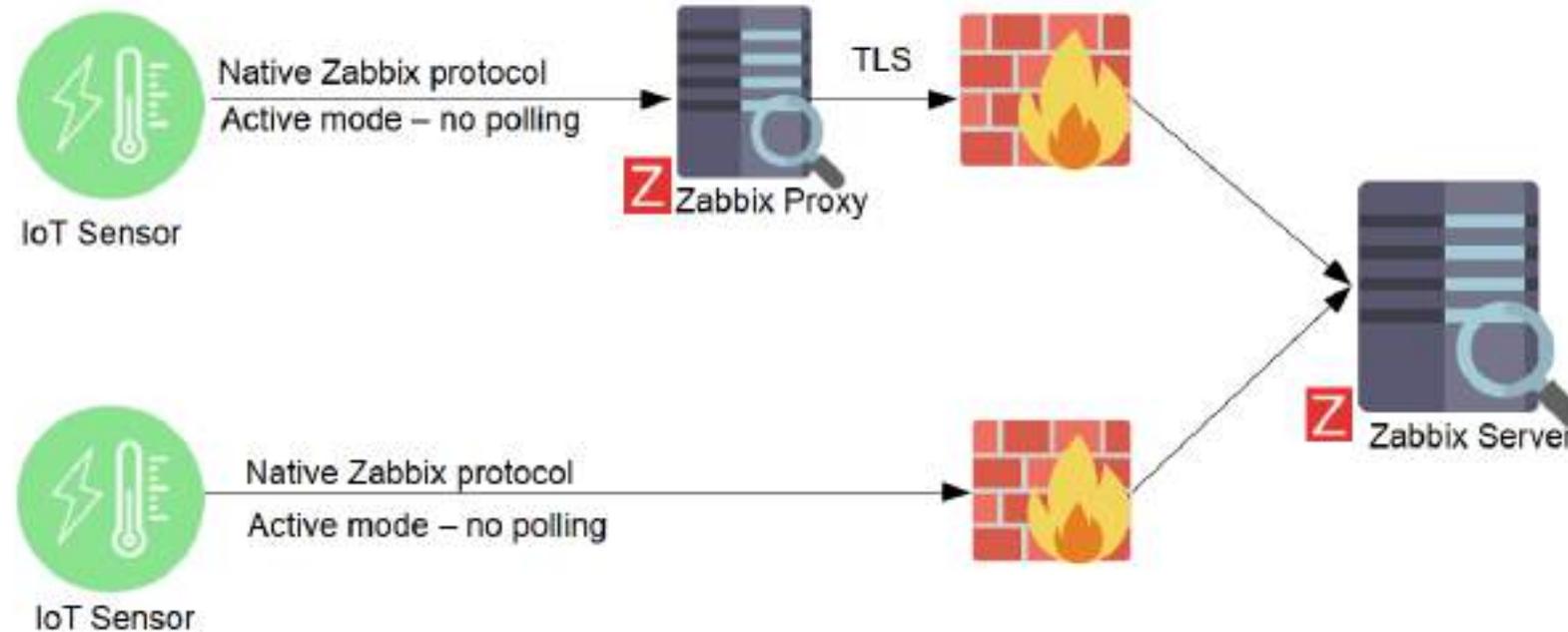


Vers un transport LORA?



Solutions IOT pour l'industrie

Collecte depuis un réseau WiFi



Connexion WiFi 2.4 GHz Wi-Fi préférée
(Disponibilité, portée, coût)
Communication IP Directe



Solutions IOT pour l'industrie

FHB original GmbH & Co.KG

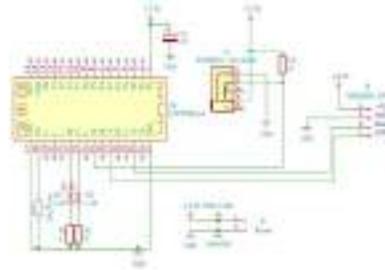


Solutions IOT pour l'industrie

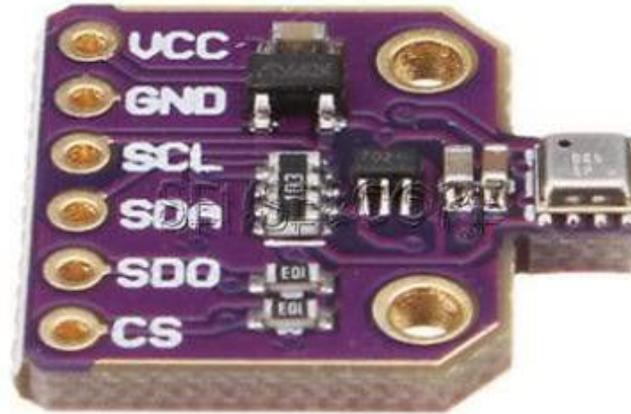
Name	Last check	Last value	Change	
Fails (4 Items)				
Fails [Wlan]	09/09/2018 05:53:54 PM	0		Graph
Fails [Transmission]	09/09/2018 05:53:54 PM	0		Graph
Fails [Sensor]	09/09/2018 05:53:54 PM	0		Graph
Fails [Connection]	09/09/2018 05:53:54 PM	0		Graph
Metrics (6 Items)				
Temperature [C]	09/09/2018 05:53:54 PM	22.88 C	+0.12 C	Graph
Temperature External [C]	09/09/2018 05:53:54 PM	23.75 C	-0.12 C	Graph
Indoor Air Quality [Index]	09/09/2018 05:53:54 PM	95 idx	-2 idx	Graph
Humidity [%]	09/09/2018 05:53:54 PM	52.33 %	+0.4 %	Graph
Dewpoint [C]	09/09/2018 05:53:54 PM	12.6 C	+0.22 C	Graph
Air Pressure [Pa]	09/09/2018 05:53:54 PM	101.4 KP	-10.5 P	Graph
Stats (4 Items)				
Wlan RSSI [dBm]	09/09/2018 05:53:54 PM	-61 dBm	+1 dBm	Graph
Wlan AP Connect Time [sec]	09/09/2018 05:53:54 PM	2.2 sec		Graph
VCC [V]	09/09/2018 05:53:54 PM	3.11	+0.01	Graph
Restart Reason	09/09/2018 05:53:54 PM	5		Graph



Construction d'un sensor



Microcontroller with Wi-Fi and I2C Bus.
(Espressif ESP32)



Sensor with I2C Bus
(Bosch BME280 / BME680)

“I2C” (Inter-Integrated-Circuit)
aka “TWI” (Two-Wire-Interface)



Firmware/Software that implements the Zabbix communication protocol

Pression

Poids

Mouvement

Humidité/PR

Distance

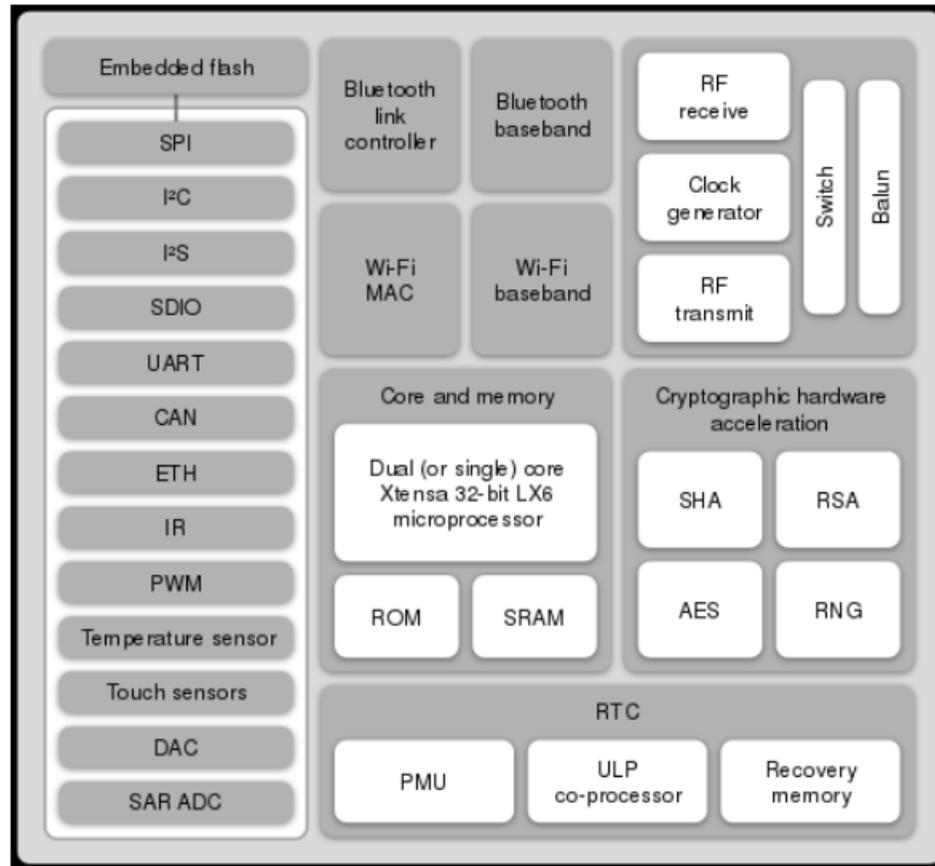
Courant

Champs EM

Gas



Espressif ESP32



FreeRTOS (Amazon)

C

C++

Python

Espressif native IDF

Lib Arduino



Modes d'opération Sensor

Setup

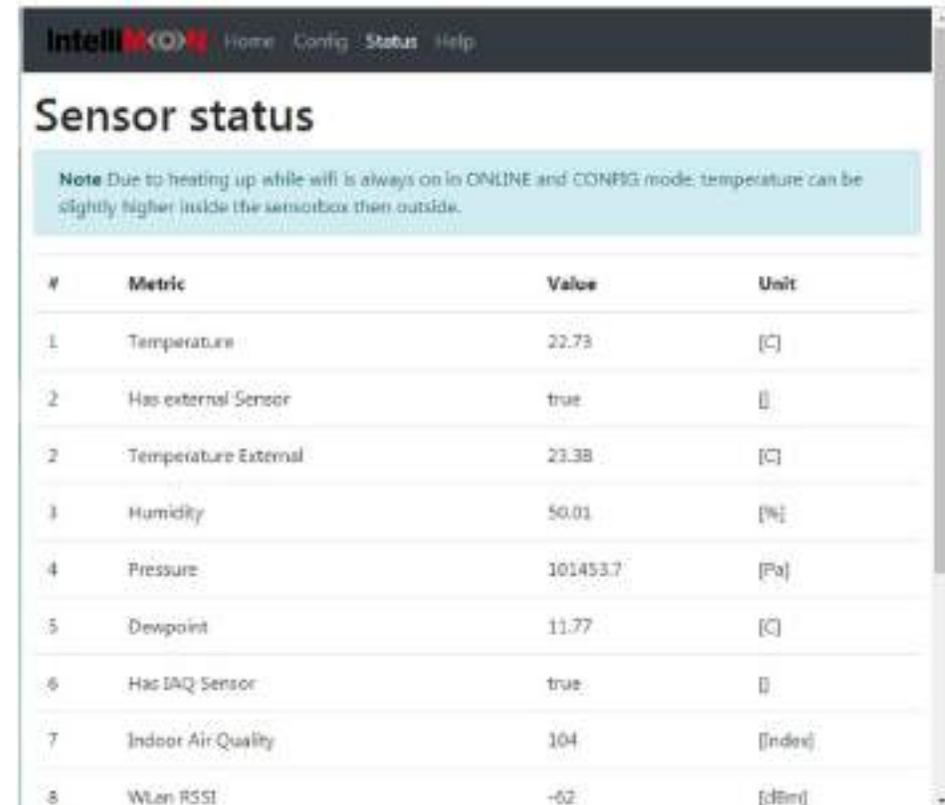
Connexion WiFi, DHCP, Server web
→ Configuration du senseur

Power save

Emulation d'un device Lora Type « B »
Connexion au réseau WiFi configuré, envoi des data, veille programmée
→ Augmentation de l'autonomie (> 12 mois sur LiFePo4)

Online

Connexion permanente avec accès REST



The screenshot shows the 'Sensor status' page of the IntelliKON web interface. The page has a dark header with the IntelliKON logo and navigation links for Home, Config, Status, and Help. Below the header, the title 'Sensor status' is displayed. A note in a light blue box states: 'Note Due to heating up while wifi is always on in ONLINE and CONFIG mode, temperature can be slightly higher inside the sensorbox than outside.' Below the note is a table with 8 rows of sensor data.

#	Metric	Value	Unit
1	Temperature	22.73	[C]
2	Has external Sensor	true	[]
2	Temperature External	23.38	[C]
3	Humidity	50.01	[%]
4	Pressure	101453.7	[Pa]
5	Dewpoint	11.77	[C]
6	Has IAQ Sensor	true	[]
7	Indoor Air Quality	104	[Index]
8	WLAN RSSI	-62	[dBm]



Solutions Matérielles

IntelliM  **N**
IMS-Smart

IntelliTrend
IT-Services

 **MOBILE
CONNECT
VIA WIFI**



THE SENSOR MEASURES:



WiFi



Temperature



CO2



Humidity



VOC



Air pressure

Sensor Data (16 items)		
Temperature External [C]		
Air Pressure [Pa]	99.99 kPa	-0.00 Pa
Depth [C]	11.2 C	-0.00 C
Equivalent Carbon Dioxide ECOC [ppm]	79 ppm	-30 ppm
Humidity [%]	41.40 %	-0.00 %
Seq Number	99997	
Temperature [C]	26.11 C	-0.00 C
Total Volatile Organic Compound TVOC [ppm]	34 ppm	-0 ppm
VCC [V]	3.33 V	
WiFi RSSI [dBm]	-70 dBm	-12 dBm

SMART VERSATILE WIFI BASED IOT ENVIRONMENT SENSOR WITH NATIVE **ZABBIX** SUPPORT

- ✓ Native Zabbix Support for 3.0+
- ✓ Out of the box Zabbix Templates
- ✓ Native Cloud connection support

- ✓ Central configuration management
- ✓ OTA (over the air) update
- ✓ OEM versions available

- ✓ Mobile operation up to 1 year
- ✓ Optional external sensor
- ✓ Optional 5V USB Power supply



Solutions Matérielles



Scaling .. IOT

500 000 Senseurs
7 Millions de métriques / 3 Millions d'alertes

Status of Zabbix					
Parameter		Value	Details		
Zabbix server is running		Yes	localhost:10051		
Number of hosts (enabled/disabled/templates)		500134	500006 / 0 / 128		
Number of items (enabled/disabled/not supported)		7000141	7000134 / 0 / 7		
Number of triggers (enabled/disabled [problem/ok])		3000060	2500060 / 500000 [2 / 2500058]		

		last	min	avg	max
■ Values processed by Zabbix server per second	[all]	53.68 K	53.68 K	56.64 K	59.59 K



Solutions IOT pour l'industrie

Le temps connecté au WiFi est significatif pour la consommation d'énergie

La qualité de la connexion WiFi (RSSI) devrait être maximisée (et supervisée par Zabbix)

Ces 2 facteurs sont une part importante de l'économie d'énergie

Le chiffrement TLS est plus lent et consommateur. Cette partie peut être déléguée au Proxy Zabbix

Le batteries AA et NiMH sont une mauvaise approche.

Sélectionner des cellules LiPo ou LiFePo4. ET superviser la batterie restante.



END CREDITS

Germany / Intellitrend – Wolfgang Alper

Italy / Systematica – Fabrizio Fantoni

Japan / NTT com - Takashi Fukushima

Russia / Picanta - Vladislav Mashura

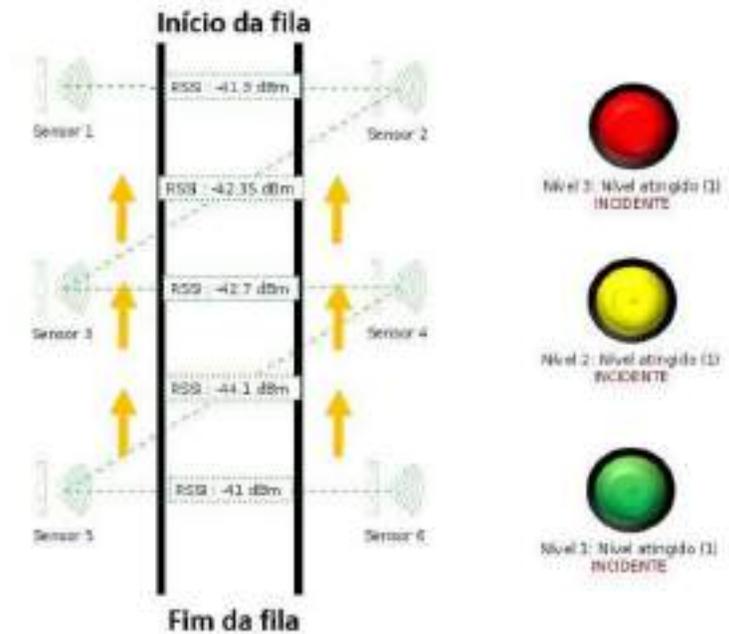
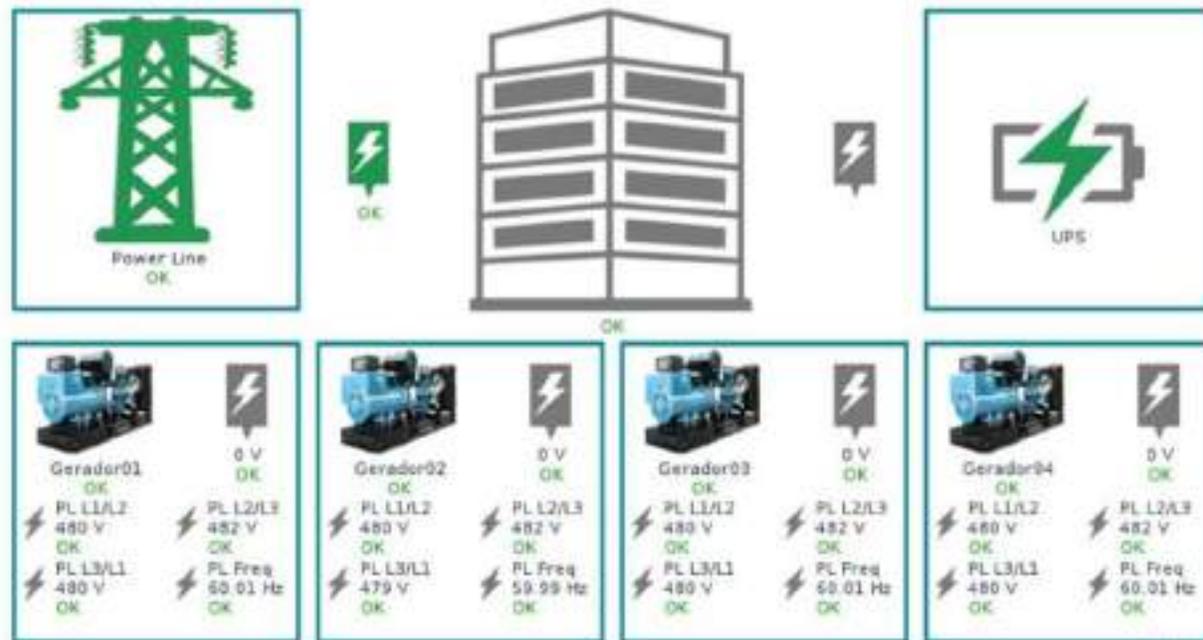
Zabbix SIA 😊



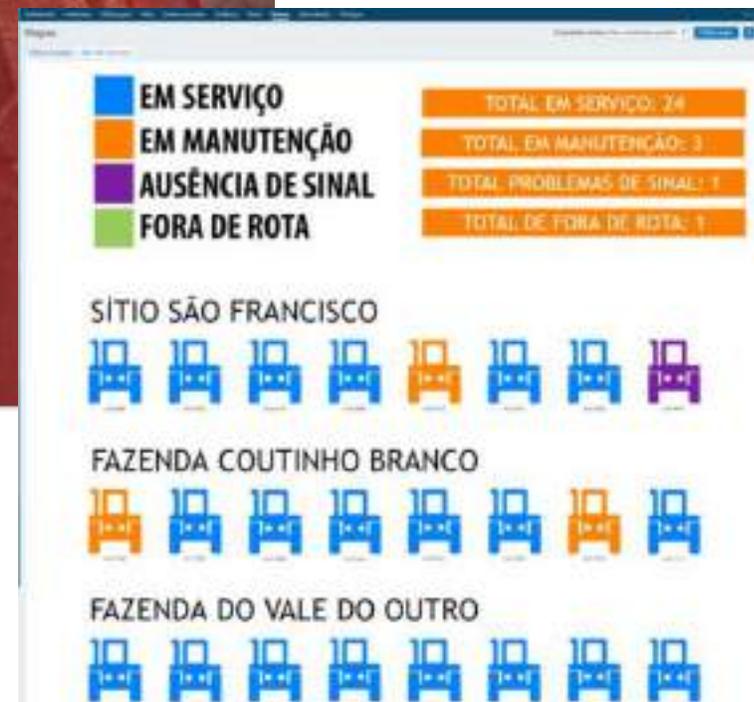
América do Sud

Raduino : Projet Open Hardware + IDE

Mapa de Energia Elétrica



América do Sud





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