Maintenance & Monitoring system for IEC 61850 substations
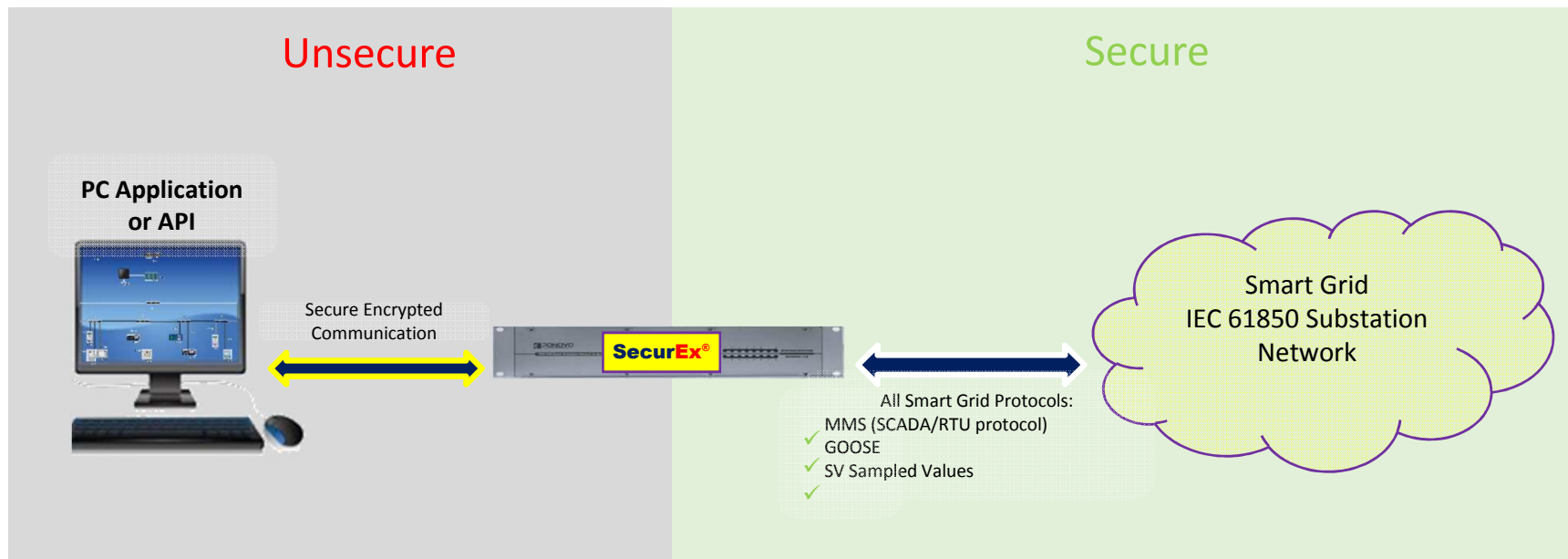
Romain DOUIB

- The **SecurEx** system insure security in maintenance procedures and allow monitoring processes within Smart Grid Power substation networks.

- It acts as an inteligent gateway/firewall for IT systems, but this system is targeted to Power substations.

- **SecurEx** allow to connect safely a standard PC to the Smart Grid Networks, the communication is encrypted, and the PC is able to perform divers test routines "live" (Performance, Maintenance, Logging, Control, Debugging,…)
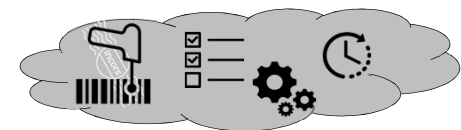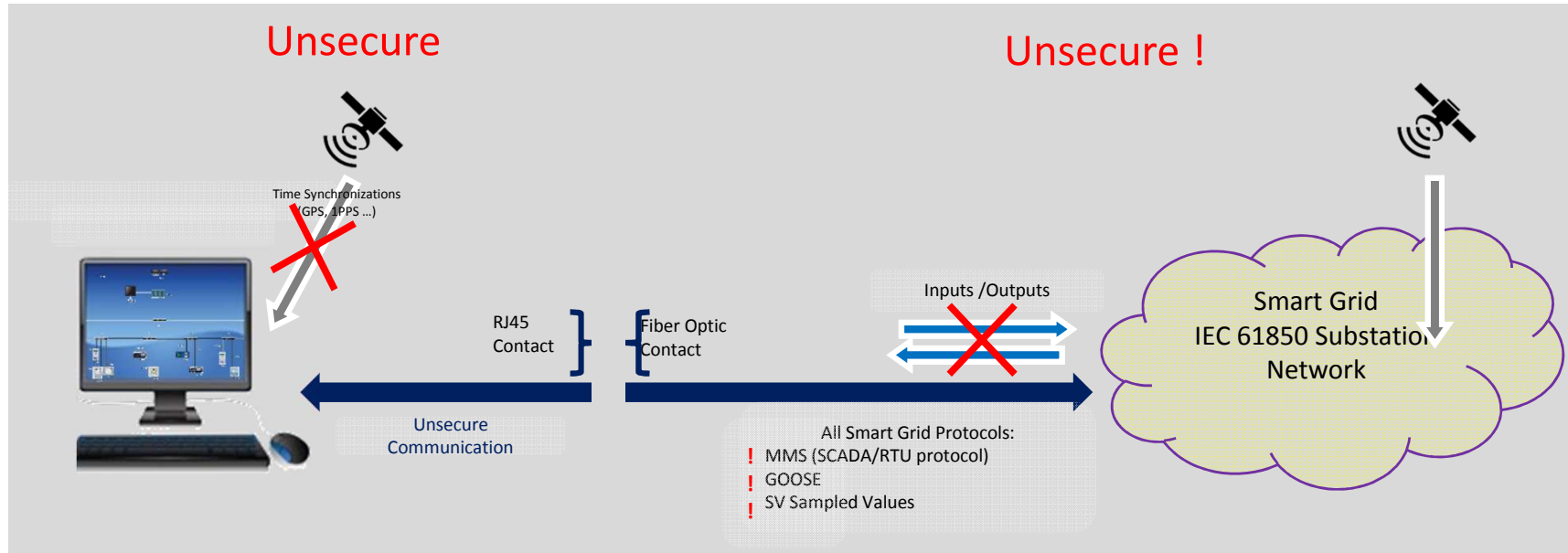
- The System is unsecure. (Delays, Malware, Uncontrol,…) *PCs are more and more banned from "live" stations.*

- PCs ETH don't have the right contacts, can't be properly synchronized

- PCs can't be trigged, switch contacts and send out analogue values.

Unsecure

Secure

(Full system model, decision of maintenance tests)

(Advanced task handler)
(Secure Executer)

Time Synchronizations
(GPS, SNTP, 1PPS …)

Secure Encrypted
Communication

SecurEx®

Inputs /Outputs

Smart Grid
IEC 61850 Substation
Network

All Smart Grid Protocols:
✓ MMS (SCADA/RTU protocol)
✓ GOOSE
✓ SV Sampled Values
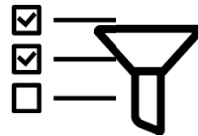
Examples of intelligent process tasks

list of functions non-exhaustive

- Ability to create the **Filtered list of IEC 61850 messages** that are available on the network

- Creating **Event List** based on signal interpretation/decoding of IEC 61850 communication messages (like Circuit Breaker Open, Relay Protection Operated, Measuring Equipment out of service etc.).
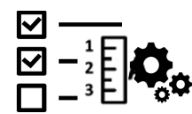
- Event list: Ability to **recognize the correct time synchronization / propagation** of the devices in the substation
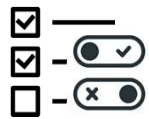
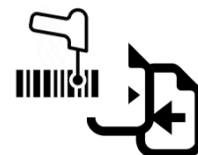- List: Ability to **verify if a device / IP# in the substation is on-line** (in service or not) , **list of IP#**

- List: Ability to **recognize anomalies in the data traffic**
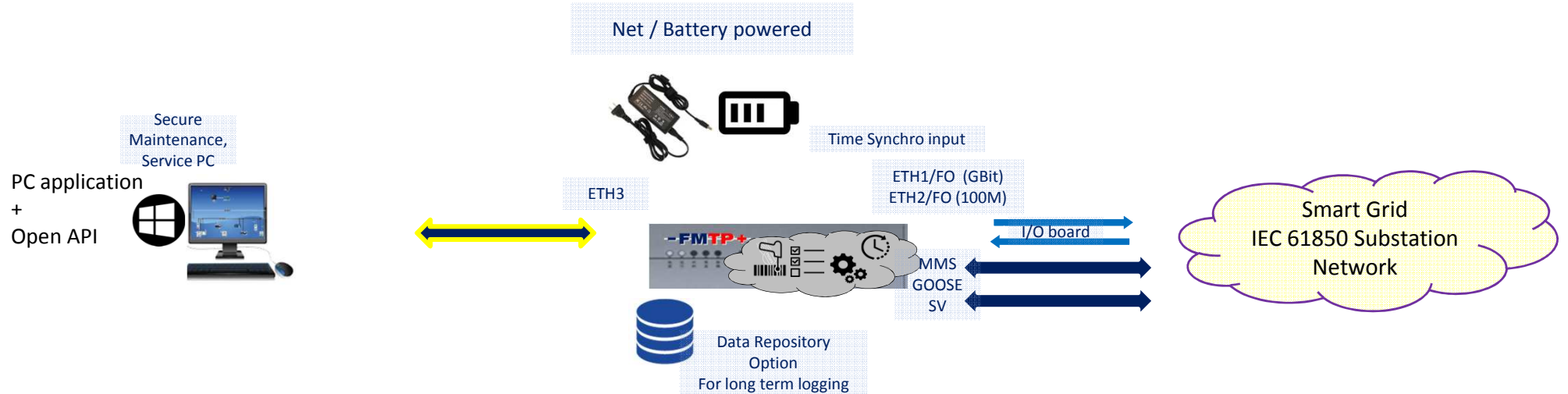
- Ability to **interact with analog information** of the power system, whenever available (like position of objects given as **open/closed contact information**)

- Ability to **compare data traffic with design files in SCD, ICD** (Configuration)

SecurEx

−FMTP+

Portable (semi-stationary)

Net / Battery powered

Time Synchro input

ETH1/FO (GBit)
ETH2/FO (100M)

Secure Maintenance, Service PC

PC application
+
Open API

ETH3

−FMTP+

I/O board

MMS
GOOSE
SV

Smart Grid
IEC 61850 Substation
Network

Data Repository
Option
For long term logging

Installed in Substation 19''

Station powered

Time Synchro input

ETH1/FO (GBit)
ETH2/FO (100M)

Customer
Control Center

−FMTP+

I/O board

MMS
GOOSE
SV

Smart Grid
IEC 61850 Substation
Network

Customer Secure
Proprietary
Transfer

Data Repository
Option
For long term logging

Display
Option

−FMTP+

Customer
Repository &
Cloud solutions

ETH3
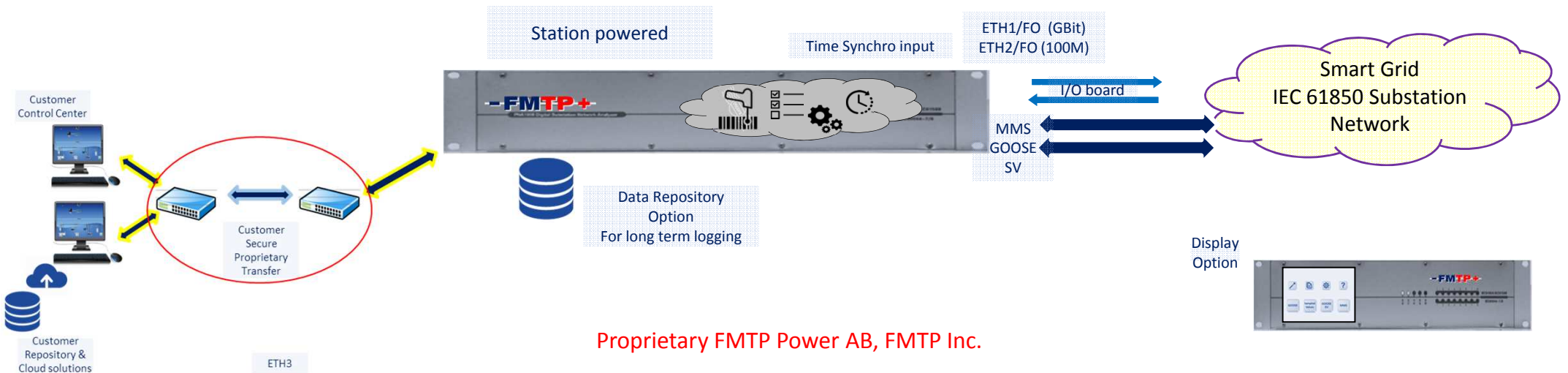
Proprietary FMTP Power AB, FMTP Inc.

SecurEx + PC Application

- **SecurEx** allow to <u>connect safely</u> a standard PC to the Smart Grid Networks, the communication is <u>encrypted</u>, and the PC is able to perform Divers tests (Performance, Maintenance, Logging, Control, debugging,...) With an **PC based High level application**, that contains the entire Subs topology and com. structure, and can decide the tasks to be performed by **SecurEx**

- **SecurEx** understands all 3 SG protocols, is time synchronized, rugged for 24/7 operation, compatible with redundancy networks,... With it's smart built-in test routines, it report to the PC <u>status</u>, <u>list of events</u>, <u>traffic</u> analysis, <u>hardware status</u>, <u>compare SCL</u> files with Traffic, perform <u>long term logging</u> of traffic...

F.ex: engineering/troubleshooting maintenance, check all com links, verify com settings, perform long time recordings, scanning,... Simulation of Subs or part of Subs ex. bay tests,... Test of Scada systems,... Schedule of periodical "silent" tests, ...

Thank you for your attention!

Where/When **SecurEx** is usefull

- IEC 61850 Substations
- Engineering & Design of Substations
- Scada system tests
- Commissioning, Troubleshooting
- Substation Maintenance 24/7
- Subs Monitoring 24/7
- Engineering Upgrade projects
- FAT, SAT (Factory/Site acceptance Tests)

Hardware Features (prel.) −FMTP+

- 3 SG protocols : MMS, GOOSE, SV
- Real time performance
- Linux Embedded (encrypted)
- Secure and Encrypted communication "ETH3"
- 1GBit High speed Ethernet "ETH1/FO"
- 100 MB High speed Ethernet "ETH2/FO"
- 19'' version (fix mounted version) IEC61850-3 Station approved...
- Net / Battery driven (portable version)
- Time Synch 1PPS, IEEE1588 Slave, GPS
- Compatible redundant networks PRP / HSR
- Optional Display
- Optional Data repository SSD