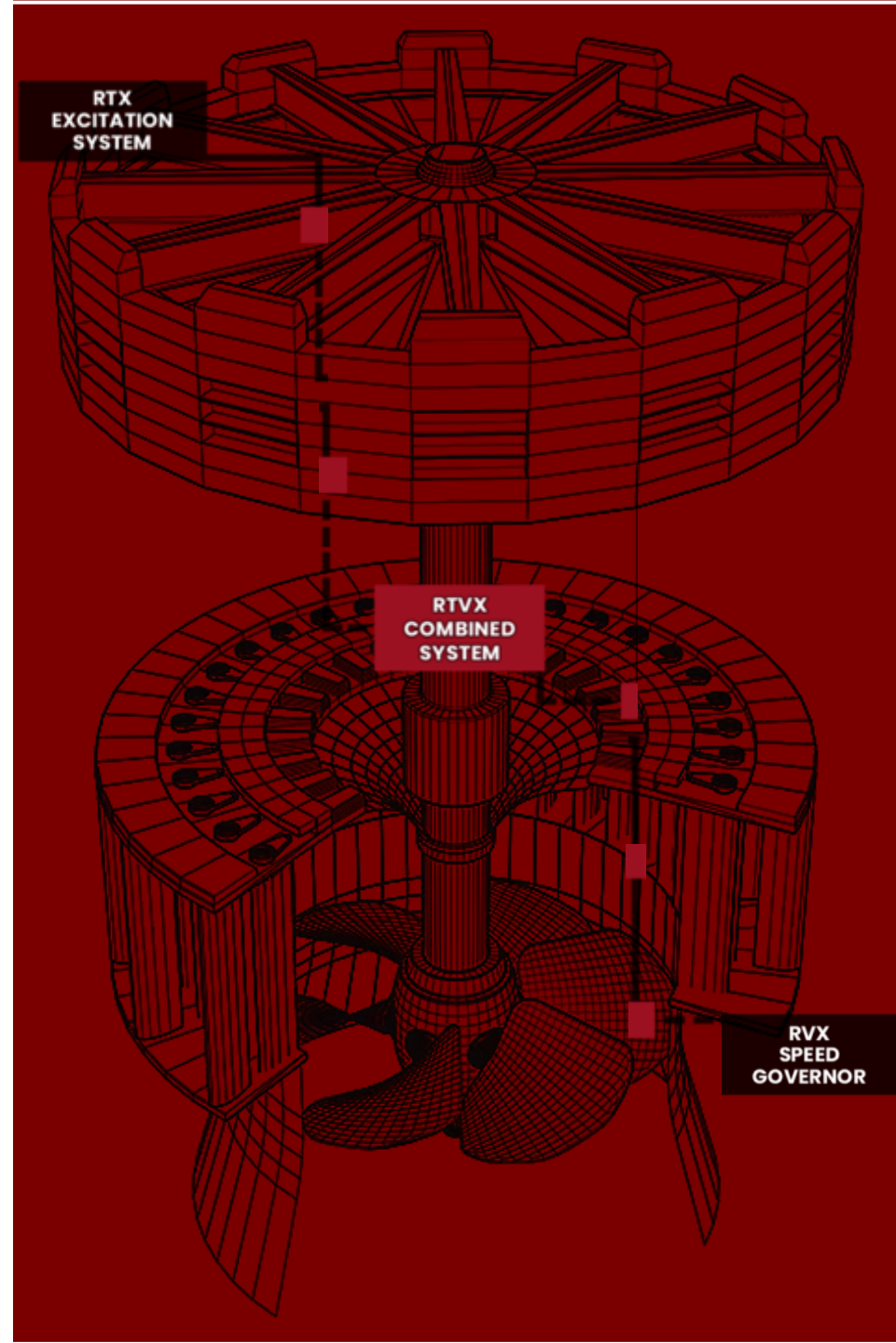




SEGURIDAD CIBERNÉTICA EN EL CONTROL Y AUTOMATIZACIÓN DE CENTRALES HIDROELECTRICAS

CRISTIANO BÜHLER
LEONARDO AUGUSTO WEISS



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2) EVOLUCIÓN TECNOLÓGICA

Redes Industriales

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3) REIVAX Y LA SEGURIDAD CIBERNÉTICA

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4) CASES

SEGURIDAD CIBERNÉTICA

MOTIVACIONES

- Tendencia en el mercado - Digitalización
 - Generación: operación remota
 - Transmisión: subestaciones digitales
 - Distribución: medidores inteligentes
 - IoT – Internet of Things
 - Industria 4.0
 - Datos
- Especificaciones
 - Equipos: hw, sw
 - RH: Profesionales Habilitados

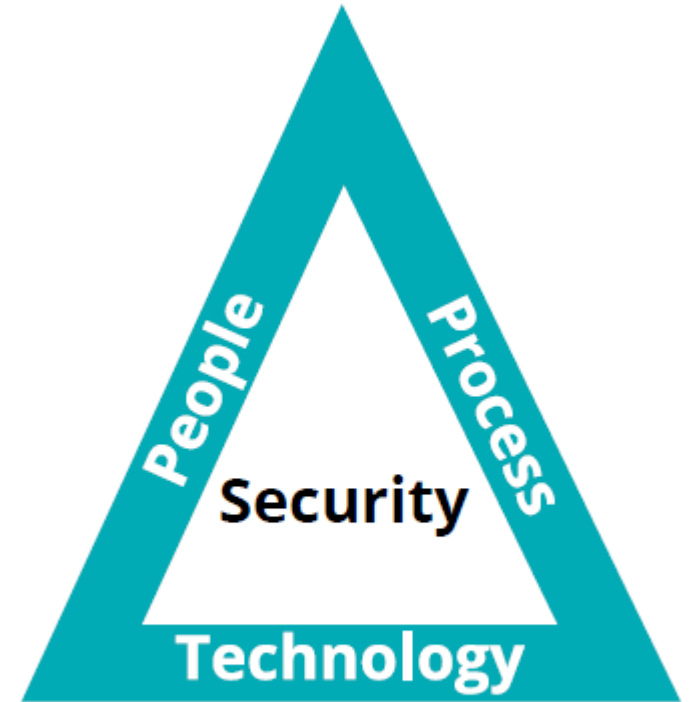
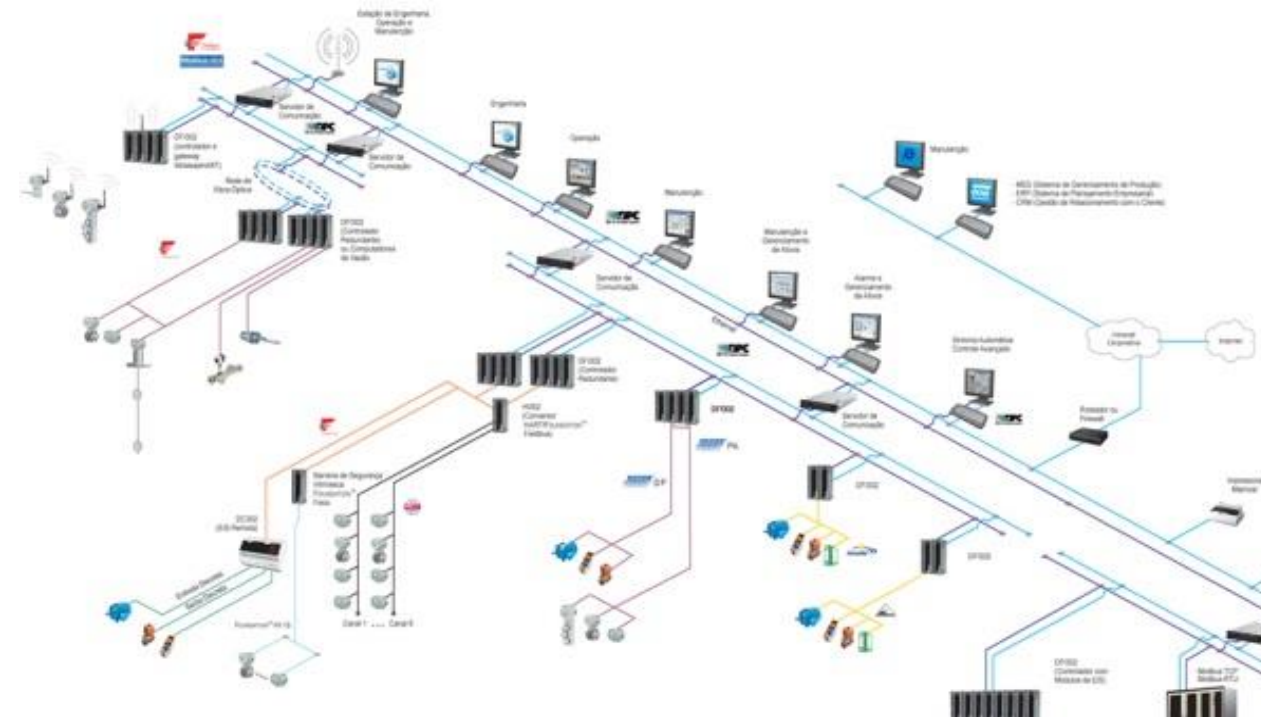
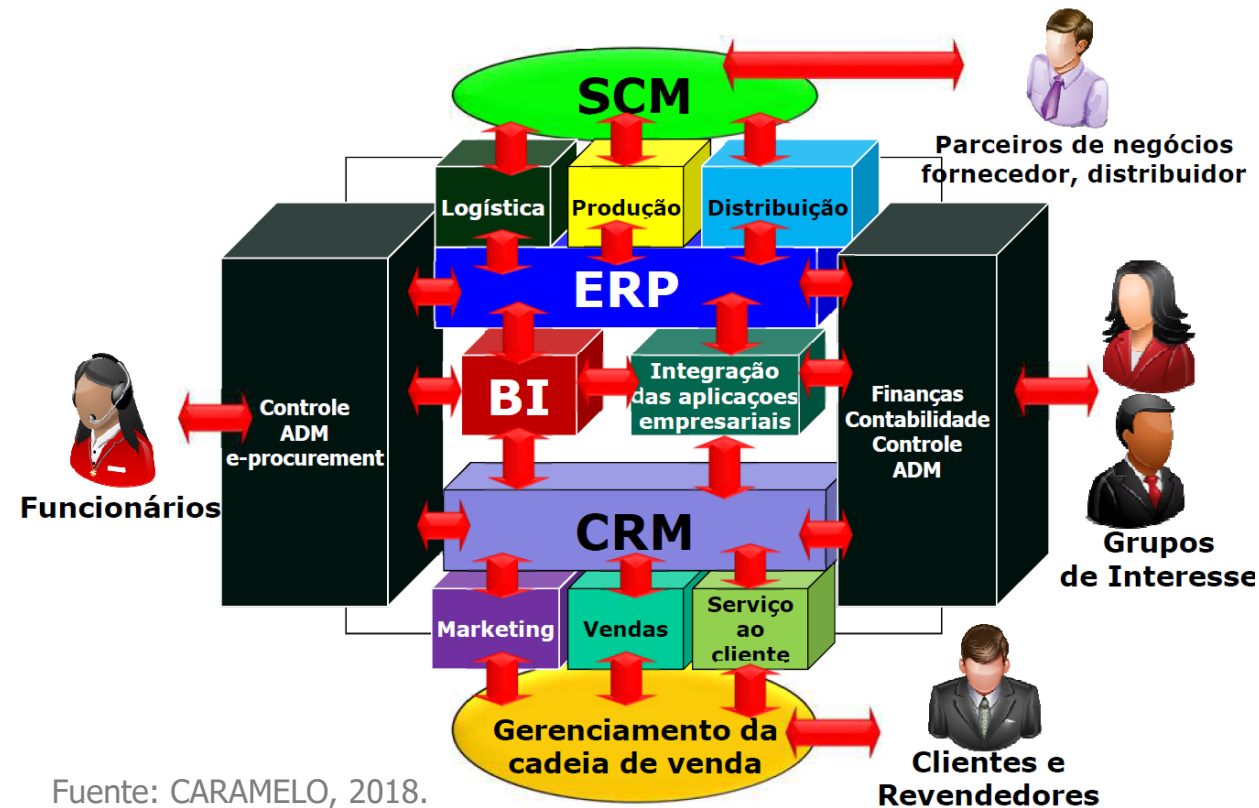


Figure 1:
The Security Triad

DEFINIÇÃO: TI x TO

Tecnología de la Información (TI)

Tecnología de la Operación (TO)



The background features a central padlock icon in a light blue color, surrounded by several concentric circles of varying shades of blue. These circles are composed of small, repeating geometric patterns, creating a sense of depth and complexity. The overall aesthetic is technical and digital.

Seguridad Cibernética Industrial

ATAQUES CIBERNÉTICOS

Motivaciones



Patrocinado por
el estado



Motivado
financieramente



Hacktivistas

CASOS CONOCIDOS



Fuente: <https://www.wired.com/2015/02/nsa-acknowledges-feared-iran-learns-us-cyberattacks/>



Fuente: <https://www.bbc.com/news/technology-38573074>



Fuente: <https://destination-yisrael.biblesearchers.com/destination-yisrael/2010/11/nuclear-iran-crumbling-by-the-stuxnet-malware-virus.html>

INSTITUTOS/NORMAS



NERC CIP

Cyber security framework to support reliable operation of the bulk electric system

NIST 800-53

Recommended security controls for federal information systems and organizations

NIST 800-82

Guide to Industrial Control Systems (ICS) Security (SCADA , DCS, PLC...)



IEC 62351: Cyber security standards for power system communications (IEC 61850, 60870, 61970, 61968).

- TC 57;
- Aproximadamente 11 partes.
- IEC 61850 / IEC 60870-5-104 / DNP3;



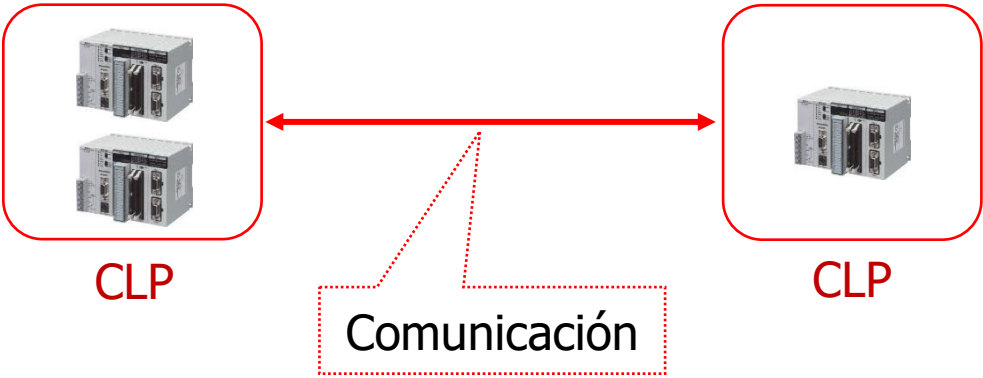
ISA 99 / IEC 62443: Security for industrial automation and control systems.

- TC 65;
- Aproximadamente 13 normas;
- Tecnologías, procesos, sistemas, desarrollo de productos, etc.

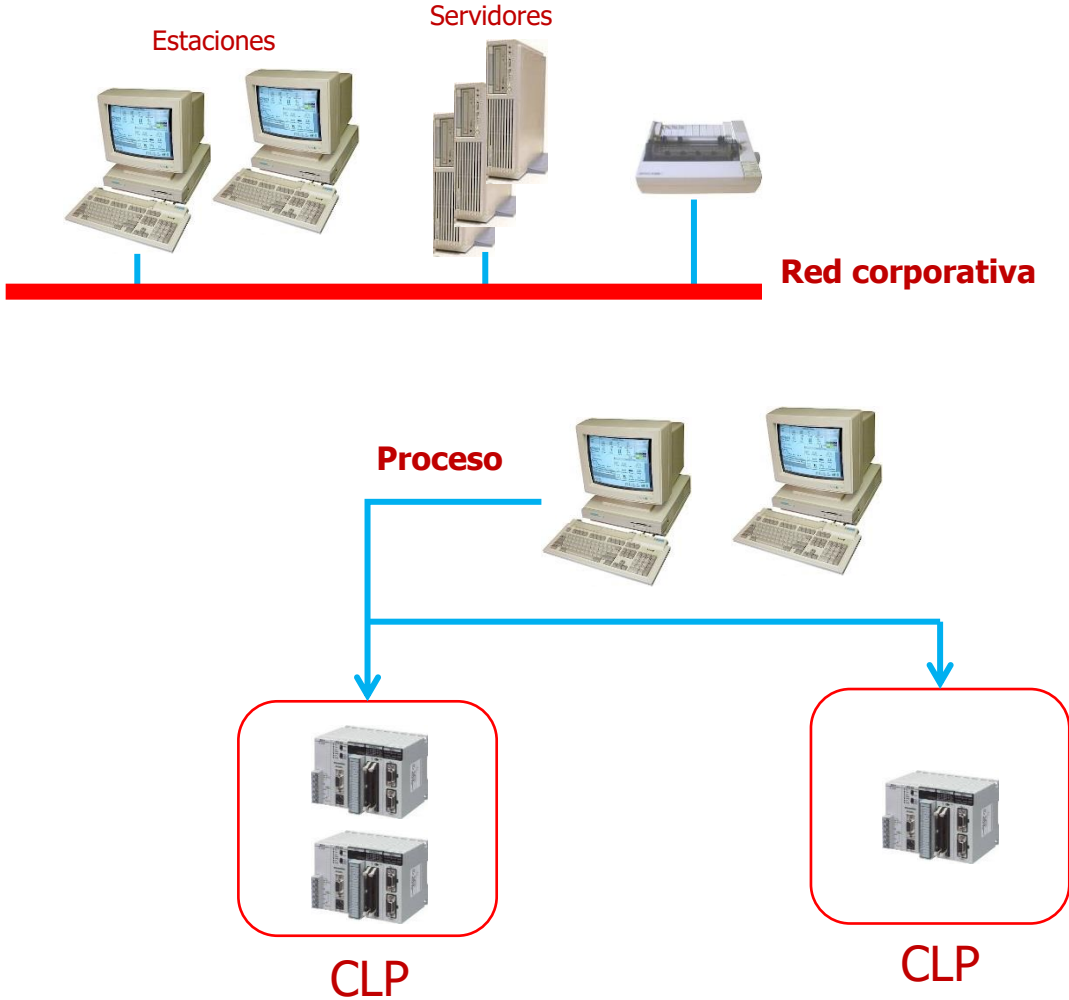
EVOLUCIÓN TECNOLÓGICA

EVOLUCIÓN TECNOLÓGICA EN REDES INDUSTRIALES

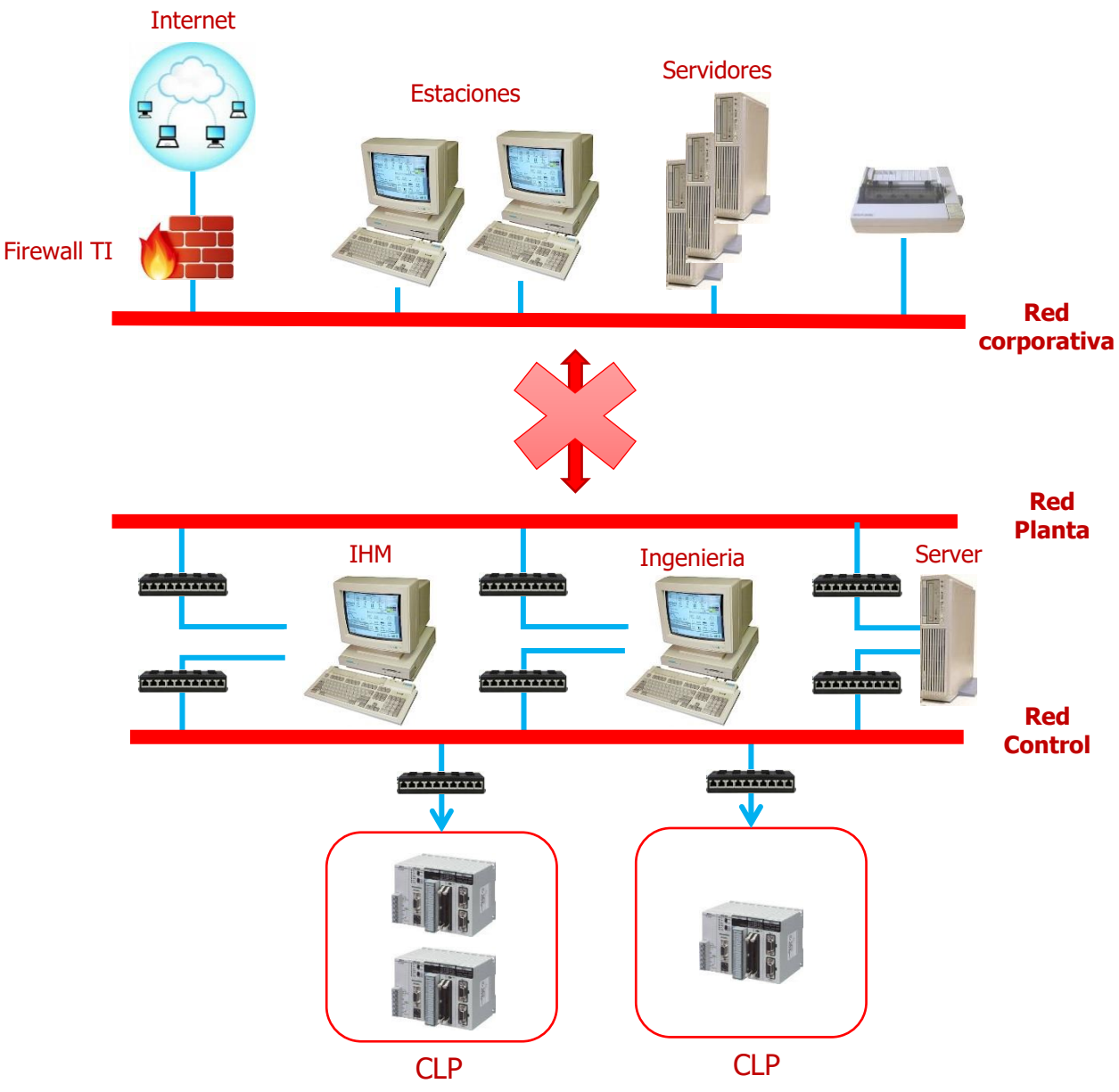
1980



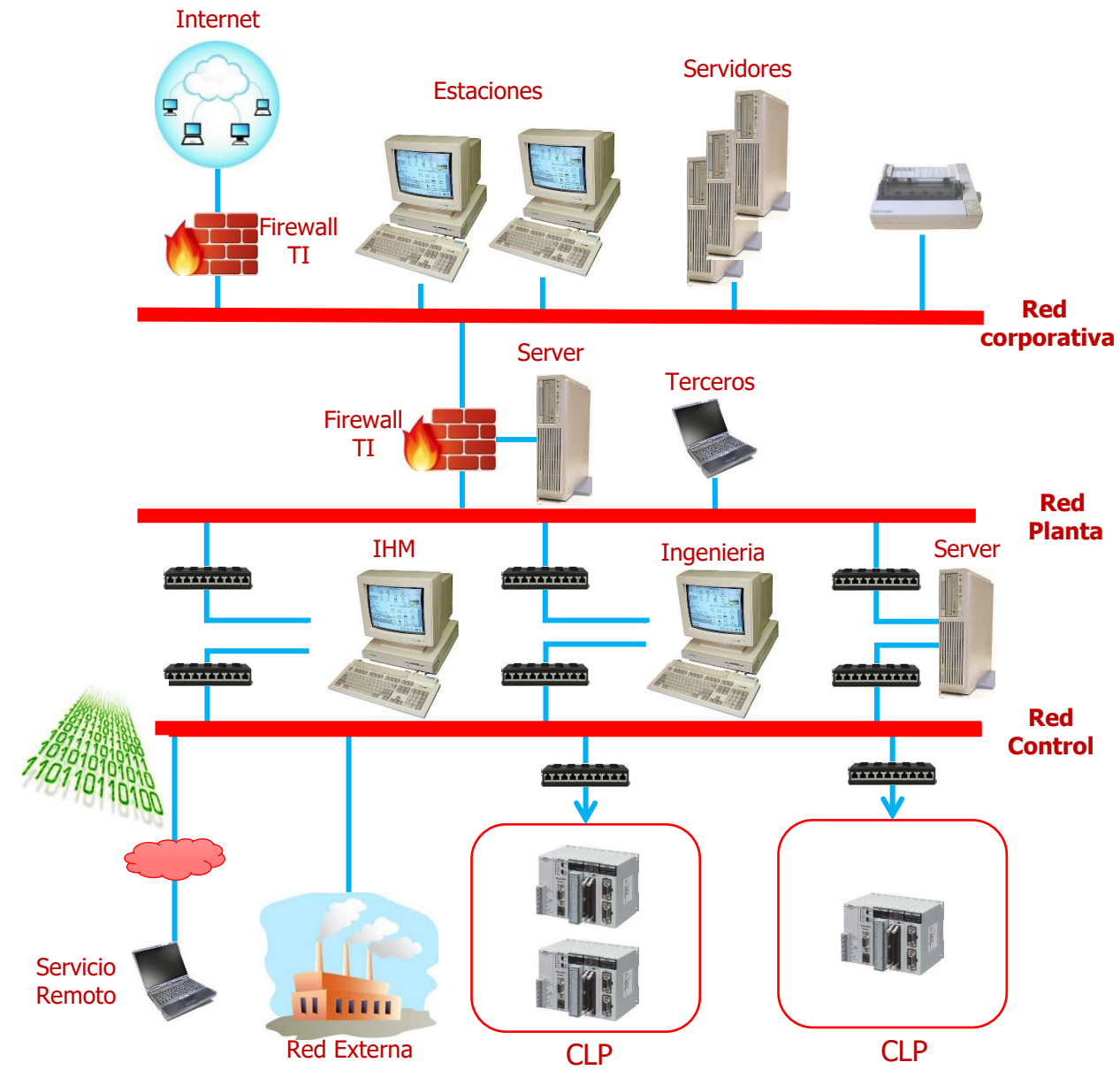
Inicio de los 1990



Final de los 1990



2000



EVOLUCIÓN TECNOLÓGICA EN EL CONTROL DE LA GENERACIÓN



Plataforma POWER (G1)

- Protocolo 1
- Protocolo 2
- Protocolo 3
- Protocolo 4
- Protocolo 5
- Protocolo 6
- ...

- Protocolo 1
- Protocolo 2
- Protocolo 3
- Protocolo 4

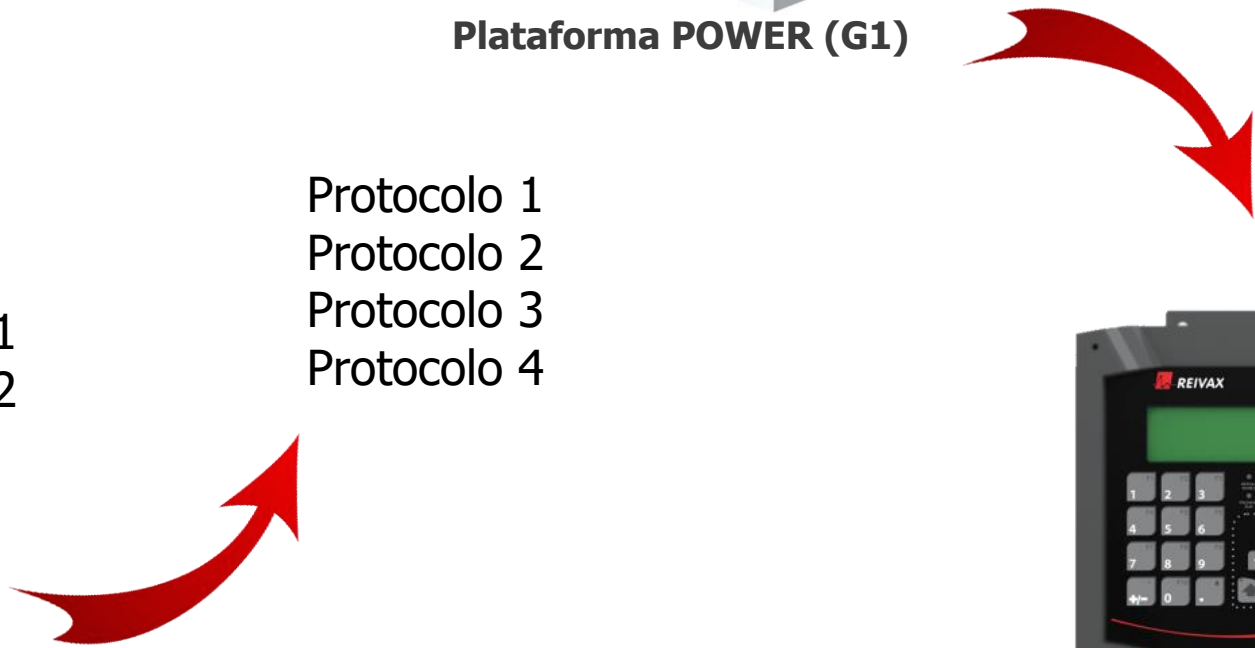


Plataforma RACK

- Protocolo 1
- Protocolo 2

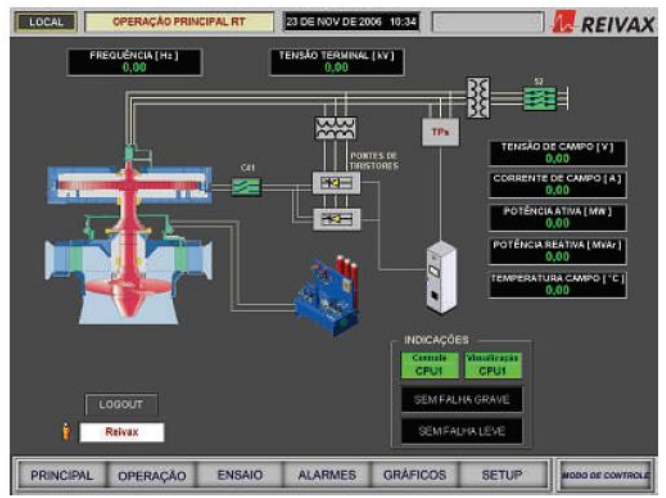
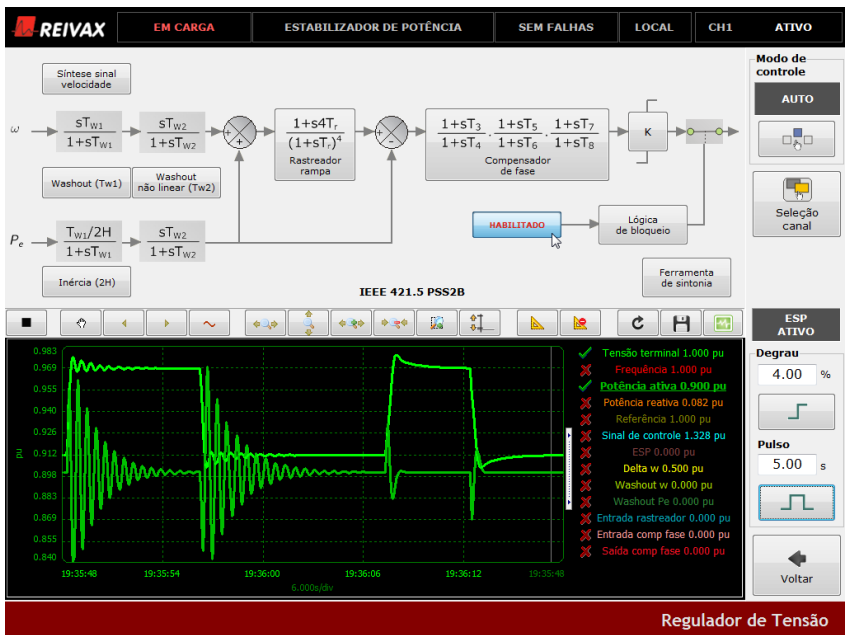
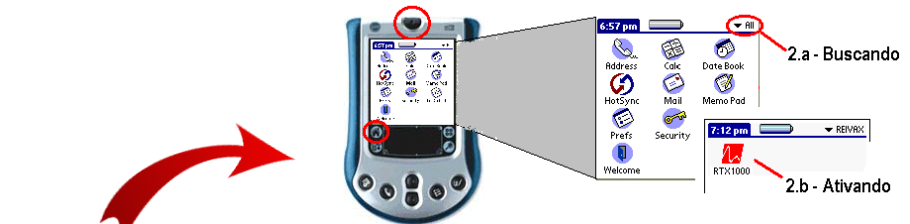


Plataforma POWER (G2)



EVOLUÇÃO TECNOLÓGICA EN EL CONTROL DE LA GENERACIÓN

IHMs



EVOLUCIÓN TECNOLÓGICA EN EL CONTROL DE LA GENERACIÓN

PPCRVT-U1



SINCRONIZADOR AUTOMÁTICO WOODWARD SPM D2-10



TFTP1-2-3 G1TP1-2-3

RELE DE PROTEÇÃO GERADOR SEL-700G
 - proteção elétrica
 - medição de energia operacional
 - cheque de sincronismo



G1TC4-5-6
 G1TC1-2-3
 TFTP1-2-3
 G1TP1-2-3
 G1TF1

MÓDULO FALHA TERRA ROTOR SEL-2664



SERIAL DATA

ESCOVA GERADOR

SWITCH RUGGEDCOM RS900



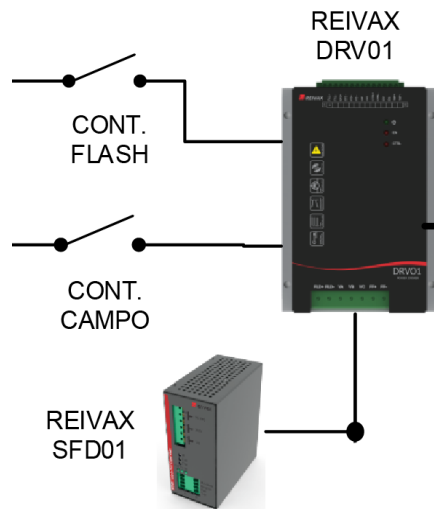
REIVAX CPX05



REIVAX TMP01 (X4) 32 RTD



ADAM 6017 (X3) 24 EA



REIVAX MAC

REIVAX MAC

REIVAX DIO

REIVAX DIO

G1TP1-2-3
 G1TC1-2-3

CANOPEN

MODBUS RTU

DNP3

MODBUS TCP

MODBUS TCP

DNP3

MODBUS TCP

MODBUS TCP

DNP3

MODBUS TCP

DNP3

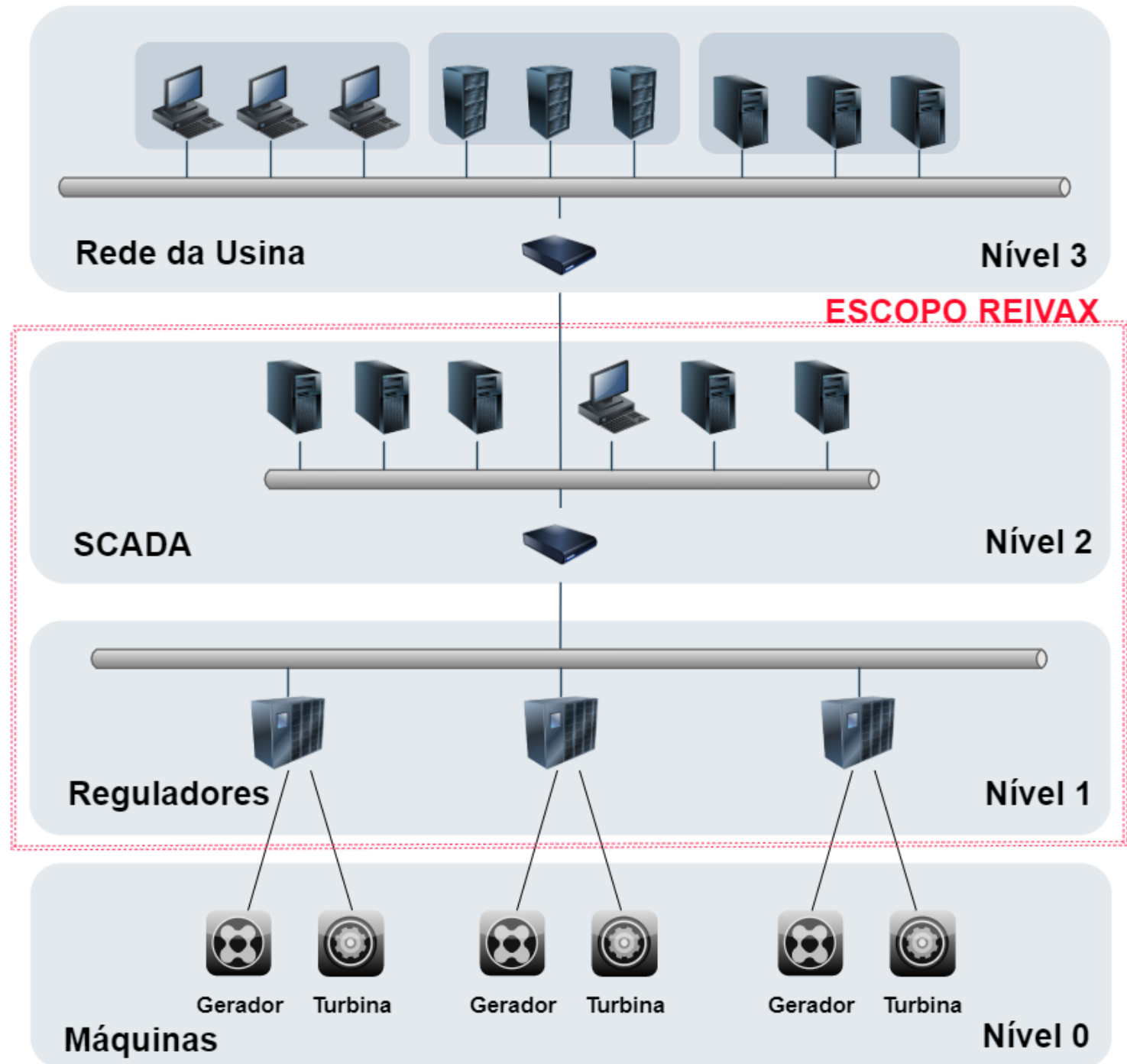
MODBUS TCP

IRIG-B

256 ED
 110 SD
 32 EA
 32 SA

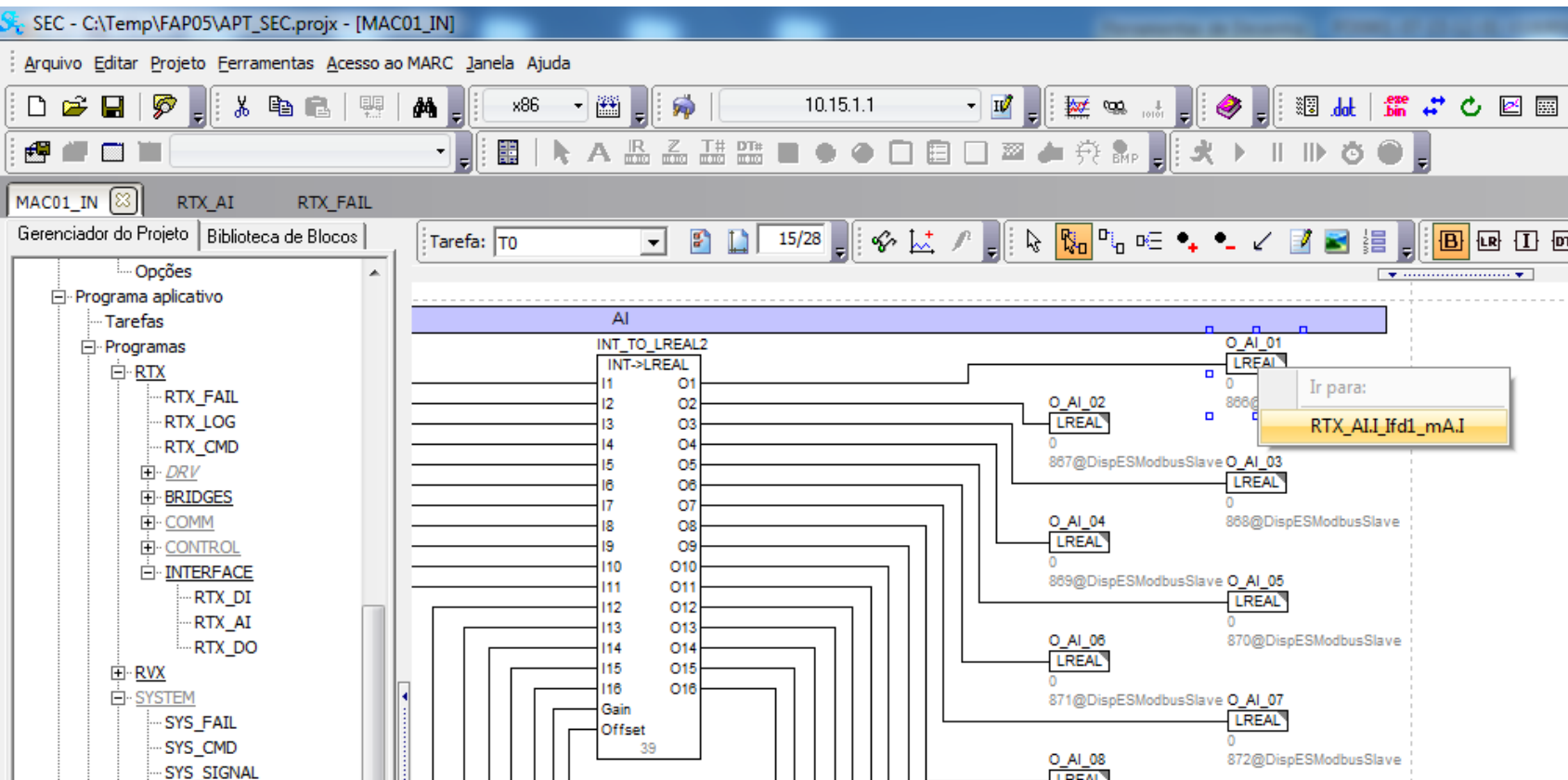
REIVAX Y LA SEGURIDAD CIBERNÉTICA

REIVAX Y LA SEGURIDAD CIBERNÉTICA



Basado en la norma IEC 62443.

CONTROLADORES

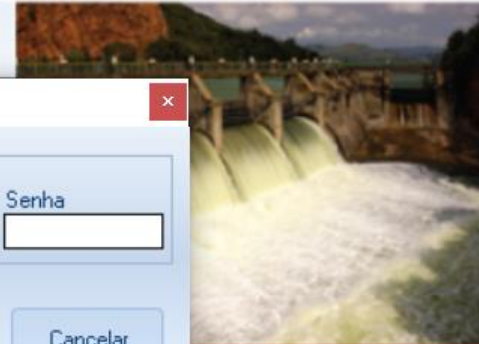


IHM



SEM FALHAS

29-set-2020 09:22:35 am



Acesso

Usuário

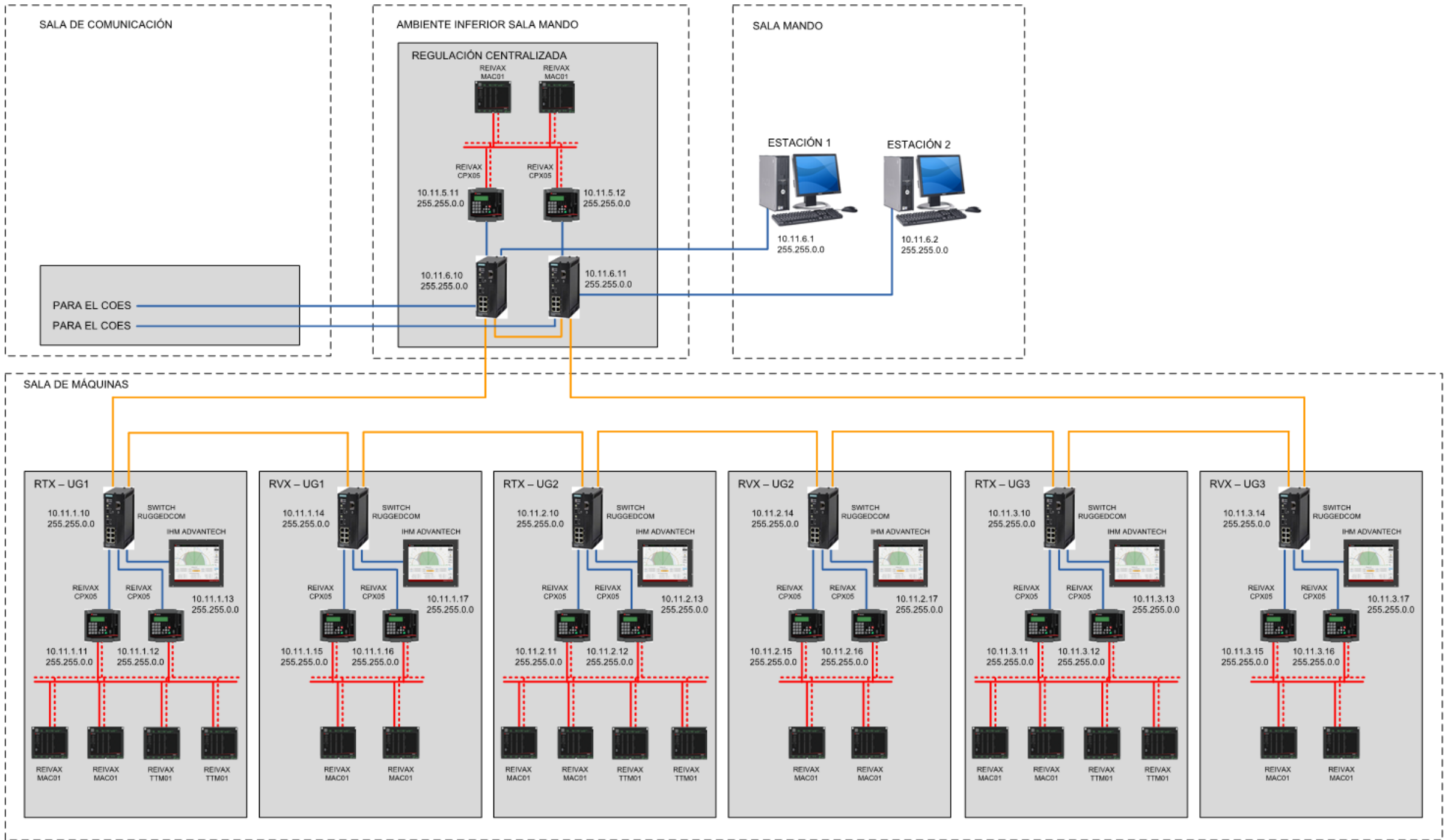
Nome Senha

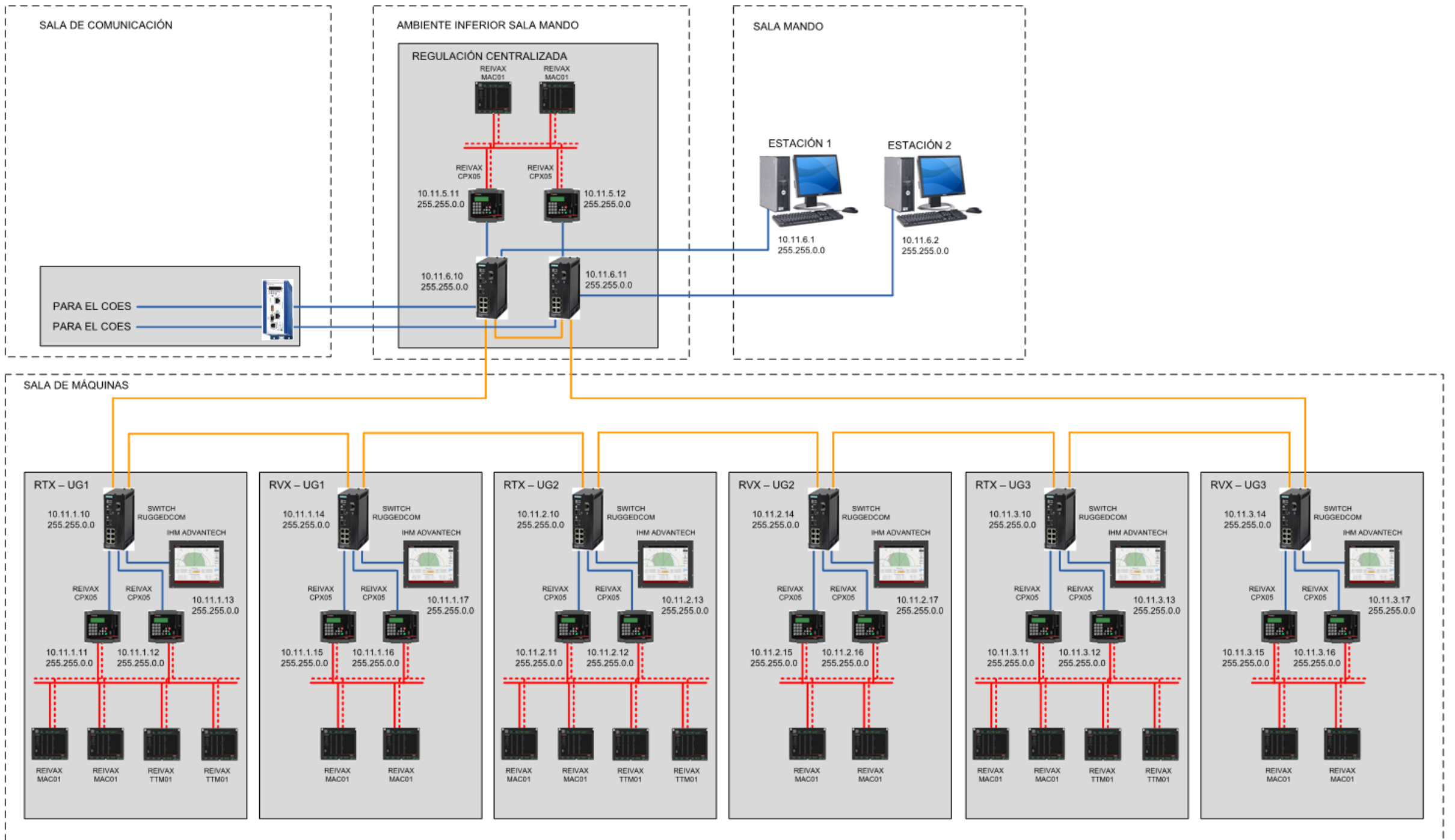
Entrar Cancelar

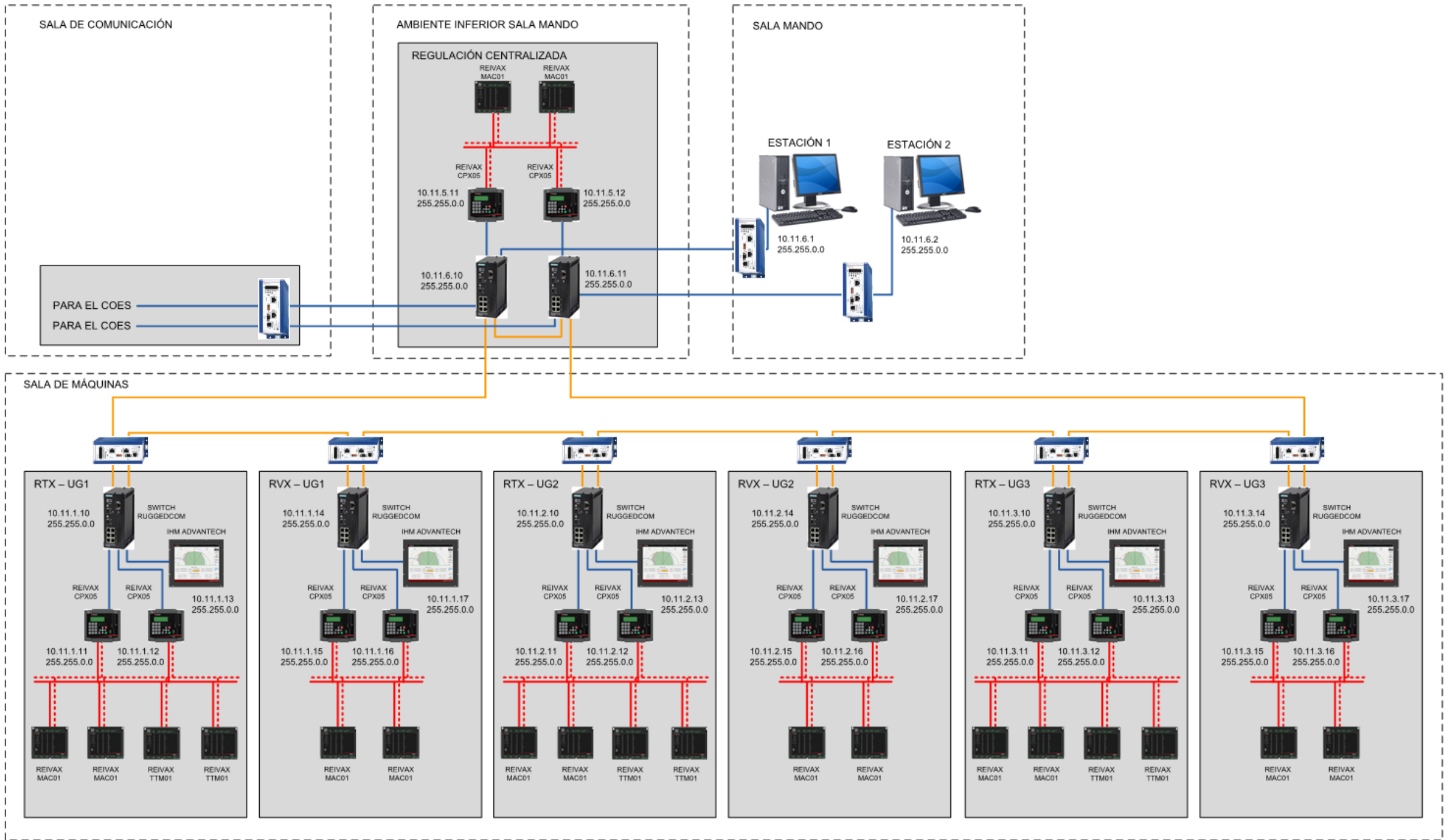
0,00	TENSÃO TERMINAL (kv)	0,06	FREQUÊNCIA (Hz)
0,0	CORRENTE DE CAMPO (A)	0,3	VELOCIDADE (rpm)
0,00	POTÊNCIA REATIVA (MVar)	0,00	POTÊNCIA ATIVA (MW)
1,0000	FATOR DE POTÊNCIA	0,00	ABERTURA (%)
0	CORRENTE ESTATÓRICA (A)	500,00	NÍVEL MONTANTE (m)



ENTRAR







POR ÚLTIMO...

- Resiliencia – Planes de Recuperación
- Implementación de Políticas de Seguridad
- Personas: Capacitación, capacitación, capacitación

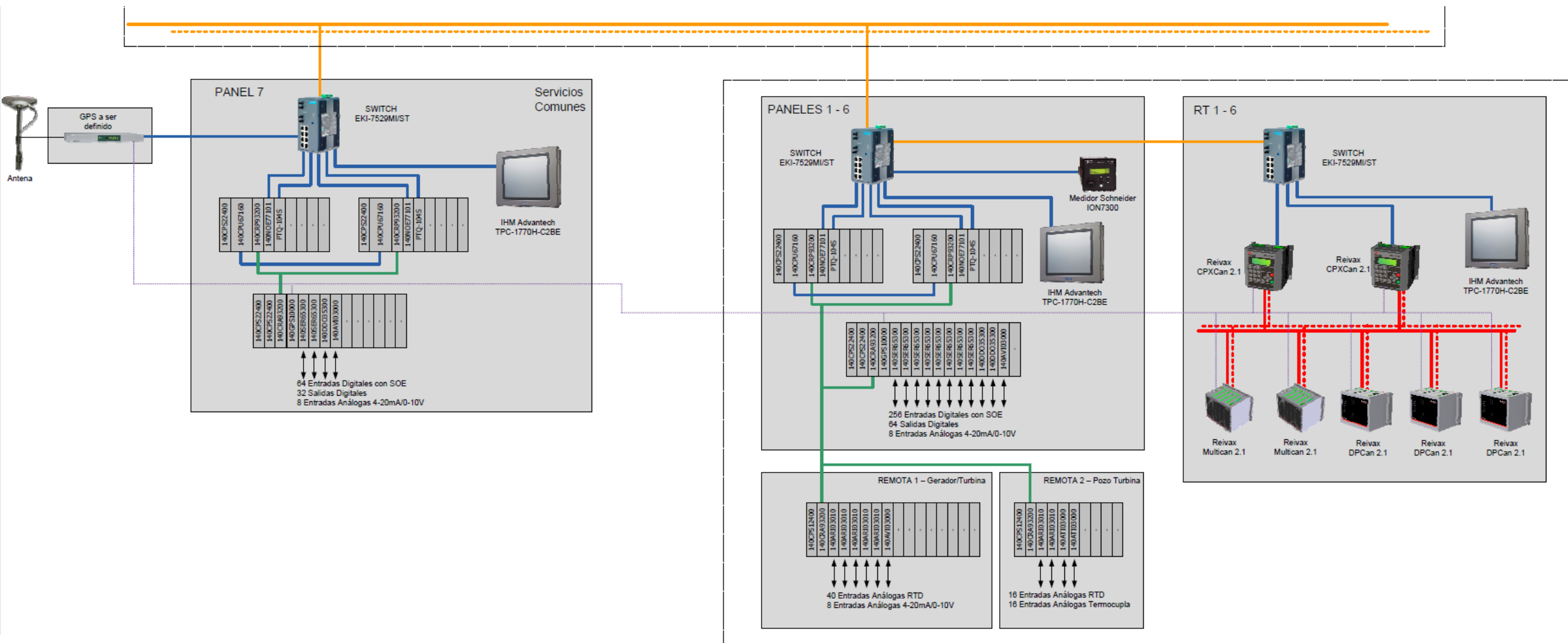
CASES

CASE: SEGURIDAD CIBERNÉTICA EN CENTRAL EN ARGENTINA



Fuente: <https://www.enel.com.ar/Home-Enel/enel-generacion-el-chocon/a201611-This-is-enel-generacion-el-chocon.html>

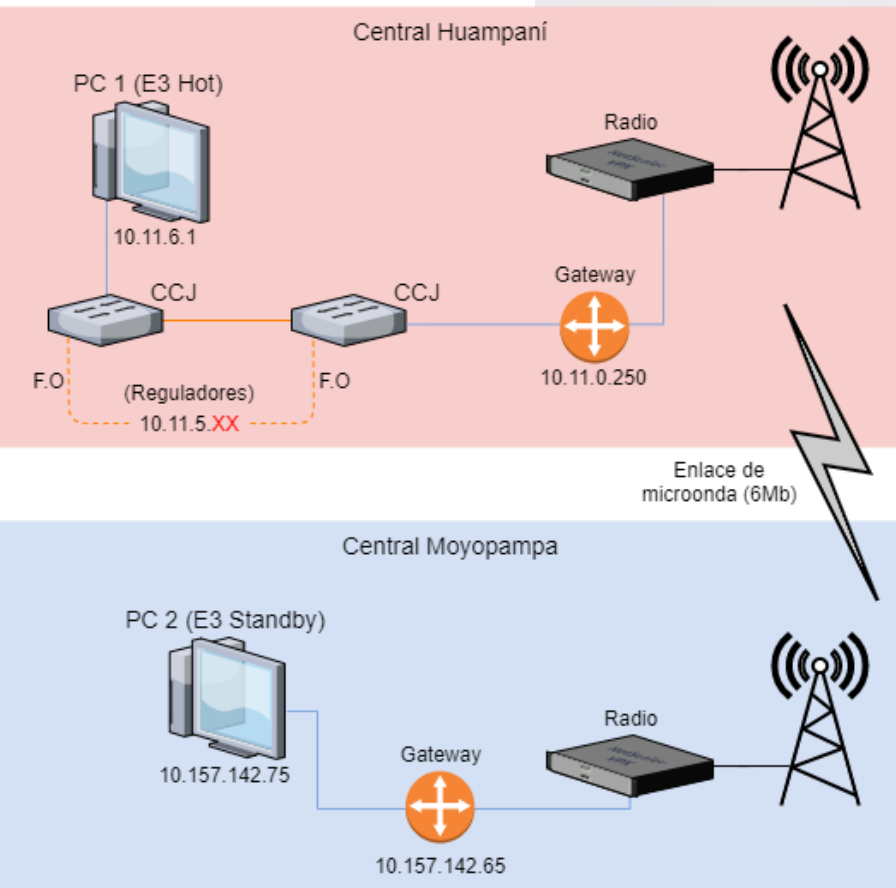
CASE: SEGURIDAD CIBERNÉTICA EN CENTRAL EN ARGENTINA



CASE: OPERACIÓN REMOTA DE CENTRALES HIDRO



CASE: OPERACIÓN REMOTA DE CENTRALES HIDRO



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- NIST . Disponível em: <https://www.nist.gov/> Acesso em Agosto de 2020.
- IEC 62443 standard. Disponível em: <https://webstore.ansi.org/Standards/IEC/IEC62443> Acesso em Setembro de 2020.
- ISAGCA Quick Start Guide FINAL.



www.reivax.com

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