

CLEARSY

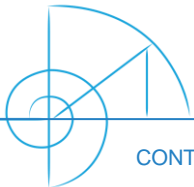
Safety Solutions Designer

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SIL2 Centralized Supervisor of Fire Safety Systems



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Fire safety

▶ Provided by Fire Safety Systems (FSS)

- ▷ They collect and process data from fire detection systems and then take necessary actions to put in safety the building

▶ Fire safety system equipment

- ▷ Fire detection systems
- ▷ Evacuation fire safety systems

▶ Objectives

- ▷ Ensure safety of people
- ▷ Ease firefighters interventions
- ▷ Prevent fire spreading

▶ Constraints

- ▷ Human supervision is necessary 24 hours a day
- ▷ One technical room per building monitored

SIL2 centralized supervision system of fire safety systems

- ▶ Concentrates from a Centralized Command Center (FSCC) the supervision (control / command) of fire safety and detection systems (does not require a local operator oversight)
- ▶ Acquires alarms and fire safety equipments states from the FSS towards the FSCC
- ▶ Realizes its own system status (including its power supplies)
- ▶ Informs officers in charge of fire safety, on a real-time basis about any events occurring on the supervised network.

SIL2 centralized supervision system of fire safety systems

- ▶ Supplies the operating helping system with all the necessary data for the first inspection prior emergency procedure
 - ▷ The system provides status and username of the equipment in alarm mode that allows to localize it on a 2D plan
 - ▷ Therefore the operator can visually control the fire outbreak before launching safety procedures
- ▶ Remotely controls in SIL2, the safety devices on site
 - ▷ Control of ventilators, motorized ventilation bay, fire-smoke devices, air curtain, etc
- ▶ Automates safety procedures
 - ▷ Facilitation and acceleration of the work of the fire safety officer
- ▶ Makes all the process more reliable (alarms, command execution)
 - ▷ Constantly controls data validity

Supervisor and regulation

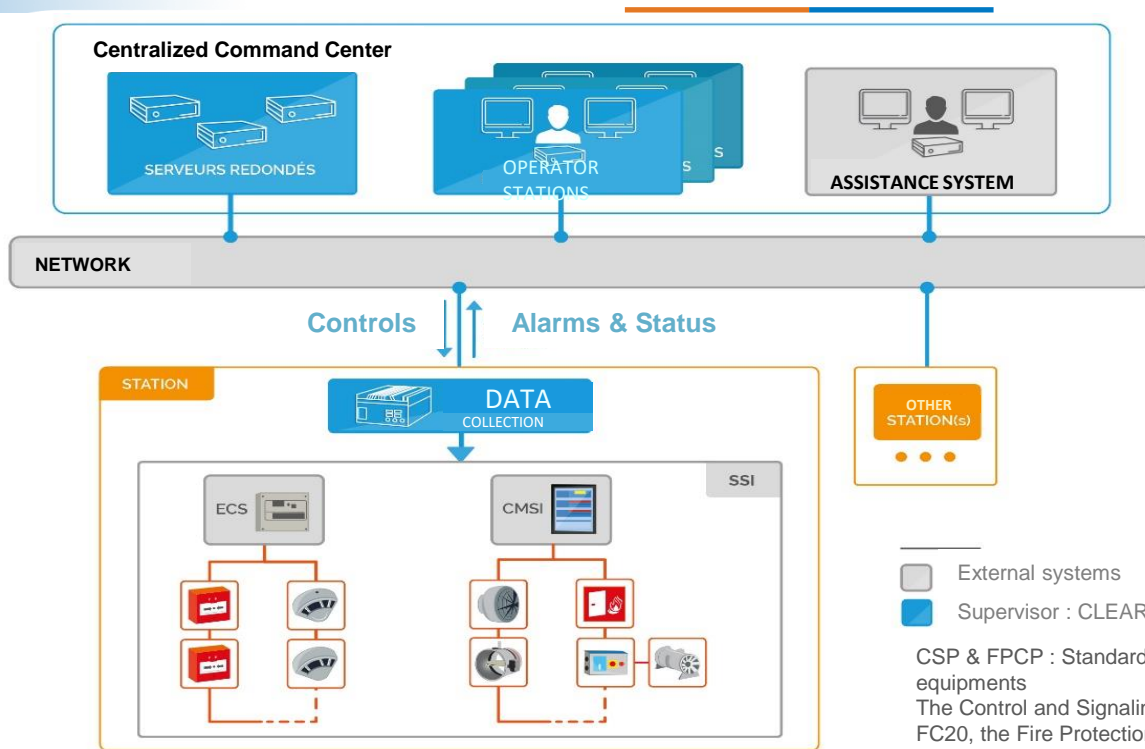
- ▶ **Suitable to supervise fire systems of public-access buildings from a Centralized Command Center (FSCC)**
 - ▷ **Conform to the Fire Safety Regulation**
 - “Buildings Receiving Public Station Type“
 - Suitable for Airport, Hospital, Commercial Centre
 - ▷ **Approved by the CNPP, the French association for risk prevention and control (GA44.2 article)**
 - Functionalities corresponding fire safety bay
 - Compatibility with certified fire safety equipment
 - ▷ **Centralized safety system (certified SIL2 by Bureau Veritas)**
 - Guarantees reliability of collected data (alarms and safety commands)
 - Doesn't need local exploitation anymore (except central system or network failure)
 - Independent of used material (insures better maintainability)
 - Conception intended for progressive deployment without any questioning of the certificate



Supervisor flexibility

- ▶ **Interoperable: work on hardware from any manufacturer**
 - ▷ DEF: Control and Signaling Panel (CSP) DIFORTE, Fire Protection Control Panel (FPCP) ANTARES4
 - ▷ SIEMENS: Control and Signaling Panel (CSP) FC20, Fire Protection Control Panel (FPCP) STT20
- ▶ **Flexibility of the FSS interface**
 - ▷ Designed to be interfaced with fire safety systems of different suppliers
 - ▷ The library of FSS interfaces can be enriched in order to increase system's interoperability (evolutions or new brand of FSS)

Centralized Supervisor Architecture



In blue:
CLEARSY SUPERVISOR

- External systems
- Supervisor : CLEARSY equipments

CSP & FPCP : Standardized names of FSS equipments
 The Control and Signaling Panel (CSP)
 FC20, the Fire Protection Control Panel (FPCP), and the Data collection system are grouped and located in a fireproof room

Main properties

- ▶ **Design: custom software and standard libraries provide:**
 - ▷ Upgradability
 - ▷ Independence from market software packages
 - ▷ Deep knowledge of safety critical software
- ▶ **Performance and reliability**
 - ▷ Supervise until 1024 fire detection systems
 - ▷ Centralized fire safety systems from up to 700 sites
 - ▷ Up to 3500 states modifications of the FSS per second
- ▶ **Deployment**
 - ▷ Optimised space for data centralization: one cabinet
 - ▷ Guaranteed maintainability: material can be easily replaced / exchanged

Main properties

▶ High system availability

- ▷ Choice of equipment with very low failure rate
- ▷ Redundancy: up to 2 data collection systems per FSS, 2 servers and 4 human machine interfaces (or more). Plug-and-play
- ▷ Commissioning of fallback command center without delay. Only a few technical checks are necessary
- ▷ Optimized resynchronization: after a failure, server history is updated from the date of its last saving

▶ Very low loss of service

- ▷ Loss of supervision for a critical station
Lower than $3 \cdot 10^{-2}$ failures per year
- ▷ Simultaneous loss of the supervision of 5 stations of the same line
Lower than $3 \cdot 10^{-2}$ failures per year
- ▷ Loss of supervision of the complete network
Lower than 10^{-2} failures per year

Equipments deployed

▶ In a station

▷ FSS data collection system

▶ In PCSI

▷ Servers

▷ Operators stations

▷ Regular displays

▷ Unit Power Saving (UPS)

24 V for collection systems and servers

230 V for the screens



Securing principles

- ▶ Securing of alarms and commands using communication protocol SIL2 designed by CLEARSY
 - ▷ Source and recipient control
 - ▷ Timeliness control
 - ▷ Data consistency control
 - ▷ Clocks drift control
- ▶ Securing of processing guarantees material independence regarding hardware and Operating System
 - ▷ Memories verification, reloading
 - ▷ Regular reboot
 - ▷ Code portions duplication with diversification
 - ▷ Regular self diagnostics

Human machine interface

- ▶ The operator has 2 screens



- ▶ Screen 1

- ▷ Events pending or being processed

- ▶ Screen 2: several tabs

- ▷ Network cartography
 - ▷ Virtual front face of Fire Safety Systems
 - ▷ View of smoke clearance equipment
 - ▷ System view: events and failures



Screen 1 – Being processed or pending

New fire alarms
Awaiting processing

The screenshot displays the CLEARSY interface with a top navigation bar containing logos for CLEARSY SYSTEMS ENGINEERING, KATP, and various system status icons (RSC, RSC, ALB, COM, etc.). The main content area is divided into two columns of event lists.

Left Column: ÉVÉNEMENTS EN COURS

- Événements catégorie 1: Alarmes Feu / Emission Extinction**

ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipement	Personne
53	18/04/2019 - 15:43:46	Alarme Feu	Alarme Feu ZD1/2 DM Déclencheur manuel2	Station Clearsy	M2L1DM2501	PCSI
53	18/04/2019 - 15:43:46	Alarme Feu	Alarme Feu ZD1/2 DM Déclencheur manuel2	Station Clearsy	M2L1DM2501	PCSI
- Événements catégorie 2: Perte de communication RSC -> ECS/CMIS**

ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipement	Personne
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de fraicheur	Station Clearsy	PLA1	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de fraicheur	Station Clearsy	S004	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de fraicheur	Station Clearsy	S003	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de fraicheur	Station Clearsy	S002	PCSI
- Événements catégorie 3: Autres événements**

ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipement	Personne
53	18/04/2019 - 15:43:46	Default alimentation	Problème secteur AES	Station Clearsy	AES BC2	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de corruption syst...	Station Clearsy	BC2	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Incohérence affichage écran 1	PCSI	PO1	PCSI
53	18/04/2019 - 15:43:46	Dérangement Rsc	Problème de fraicheur varia...	Station Clearsy	BC 5	PCSI

Right Column: ÉVÉNEMENTS EN ATTENTE DE TRAITEMENT

- Événements catégorie 1: Alarmes Feu / Emission Extinction**

ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipement	Traitement
537	18/04/2019 - 15:43:49	Alarme Feu	Alarme feu ZD2/4 DA OPTIQUE 2	Station Clearsy	M2L2DA25	☑
537	18/04/2019 - 15:43:49	Alarme Feu	Alarme feu ZD3/4 DA OPTIQUE 2	Station Clearsy	M2L2DA25	☑
- Événements catégorie 2: Perte de communication RSC -> ECS/CMIS**

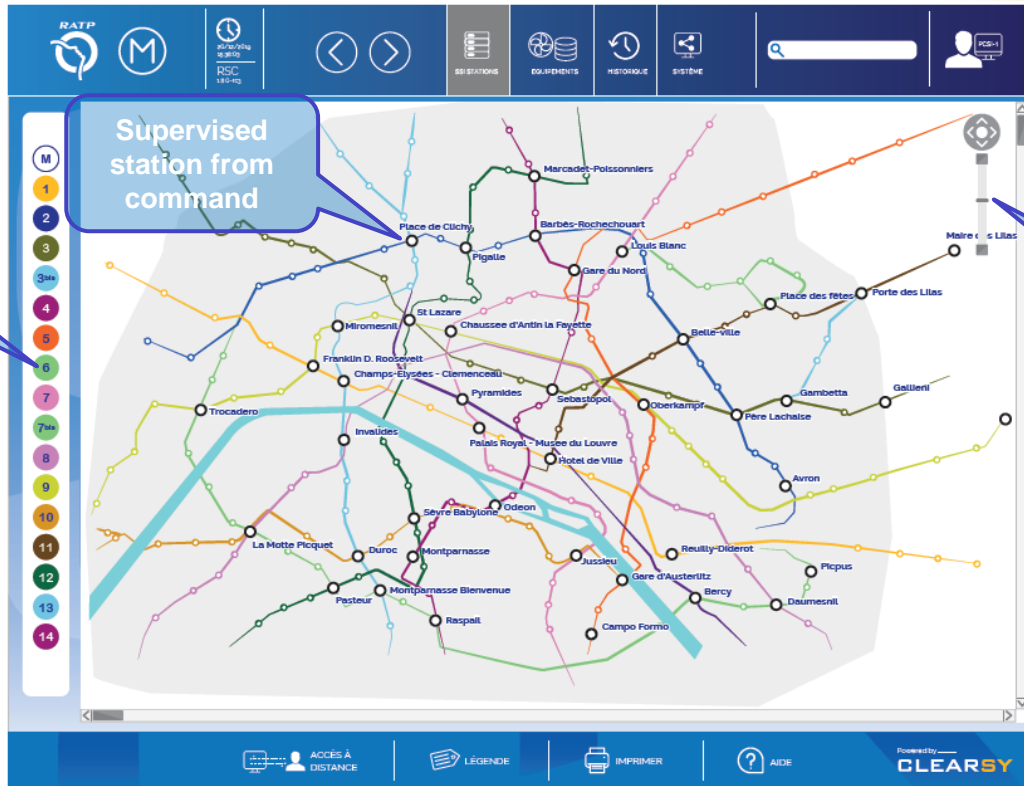
ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipement	Traitement
537	18/04/2019 - 15:43:49	Dérangement Rsc	SAE NON DISPONIBLE	PCSI	PO2	☑
- Événements catégorie 3: Autres événements**

ID Evt	Date - Heure	Type	Libellé	Localisation	Id équipe	Traitement
537	18/04/2019 - 15:43:49	Dérangement	Dérangement ECS	Station Clearsy	ECS	☑
537	18/04/2019 - 15:43:49	Default Alimentation	Problème batterie AES	Station Clearsy	AES BC2	☑
537	18/04/2019 - 15:43:49	Dérangement	Etat indéterminé Rarmement DF5	Station Clearsy	es56	☑

Events being processed

Categorization of events

Screen 2 – Network cartography



browsing possible by line

Supervised station from command

Several zoom levels to browse supervised network

Screen 2 – Virtual front face of FSS

Virtual station front face

Compartmentation and smoke extraction commands and areas states

Alarms Management Unit commands and states

The screenshot displays the CLEARSY interface for a virtual station front face. It features a top navigation bar with RATP and M logos, a central control area with 'STATION CLEARSY' and 'CMSI' sections, and a main control area with 'ZONES DE MISE EN SECURITE' sub-sections for 'COMPARTIMENTAGE' and 'DESENFUMAGE'. The interface includes various control buttons and status indicators for alarms, compartmentation, and smoke extraction.

Screen 2 – Zones details and detectors view

DETAILS ZONES - DETECTEURS

NOM ZONES / DAI / DIM

ZONES DE DETECTION

- Toutes
- Avec évènement uniquement

ZONES	DAI/DM	ETAT
<input type="radio"/> ZONE 1	<input type="radio"/> Z00s/A00s DI 1	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 2	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 3	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 4	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 5	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 6	<input type="radio"/> EN SERVICE
<input type="radio"/> ZONE 2	<input type="radio"/> Z00s/A00s SPRINKLER	<input type="radio"/> EN SERVICE
<input type="radio"/> ZONE 3	<input type="radio"/> Z00s/A00s DM 8	<input type="radio"/> EN SERVICE
<input type="radio"/> ZONE 4	<input type="radio"/> Z00s/A00s DI 9	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 10	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 11	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 12	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 13	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 14	<input type="radio"/> EN SERVICE
	<input type="radio"/> Z00s/A00s DI 15	<input type="radio"/> EN SERVICE

FERMER

Sensors and states

MISE EN SERVICE

MISE HORS-SERVICE

MISE EN ESSAI

FIN MODE ESSAI

Possible sensors commands

Screen 2 – Smoke extraction equipment

FILTRES

TYPE D'ÉQUIPEMENT

Ventilateurs Rideau d'air
 Site station motorisée Dispositif frein fumée

NOM D'ÉQUIPEMENT

LIGNE

Toutes

STATION

Toutes

ÉQUIPEMENTS: Ventilateurs (17)

NOM	LIGNE	STATION	ÉTATS			ACCÈS COMMANDES	
			ARRÊT	EXTRACTION	INSUFFLATION	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER
Ventilateur x	14	CLEARSY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	COMMANDES	ARRÊT POMPER

SUIVI ÉQUIPEMENTS EN COMMANDE

ACCÈS À DISTANCE | LÉGENDE | IMPRIMER | AIDE | **Powered by CLEARSY**

List of smoke clearance equipments

Detailed research of equipment, line, station

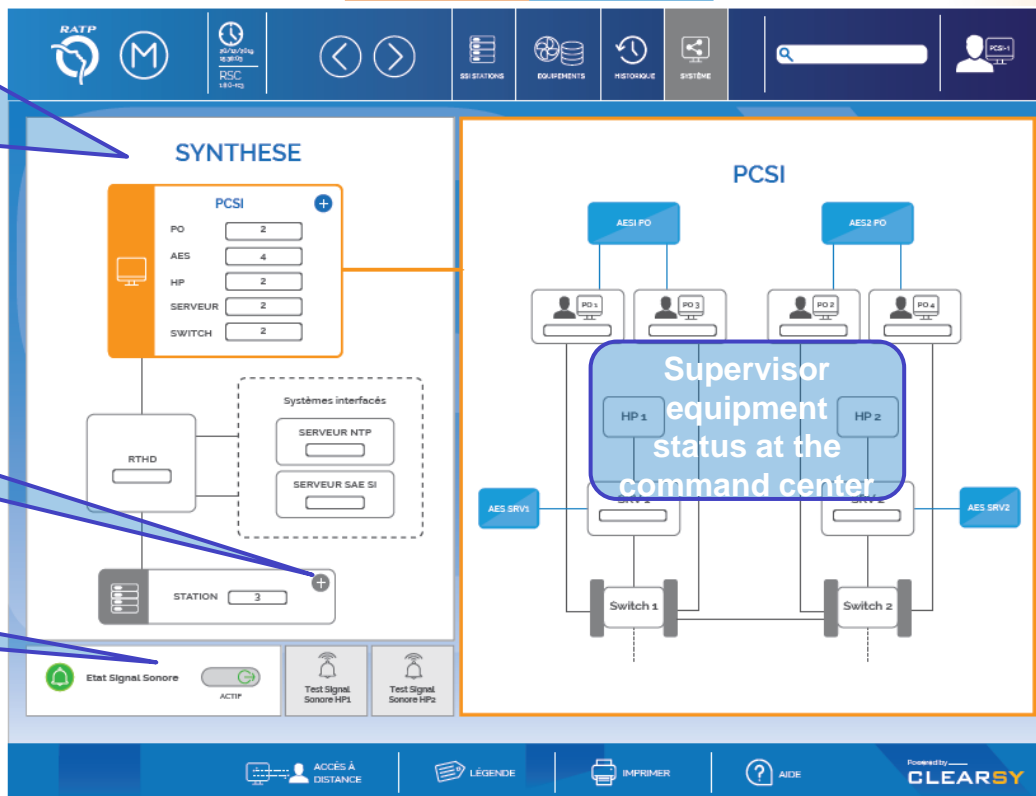
Tracking area of commanded equipments on network

Screen 2 – System view

Synthesis of network status: Command center and stations, systems in interfaces, communication network, ...

Unfold stations vision

Loudspeakers control



References

▶ Centralization of Paris metro fire safety for RATP (in deployment)

- ▷ L3/3bis
- ▷ L4
- ▷ L11
- ▷ L14



▶ Fire Safety supervision on “Grand Paris” lines for SGP (development on going)

- ▷ L15
- ▷ I16
- ▷ L17



SIL2 Certificate – Bureau Veritas



*Note: Symphonie RSC
is the RATP's Project name*