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Framework for automated testing CLEARSY Test Framework

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CLEARSY Test Framework

CLEARSY Test Framework is a software workshop designed to perform **black box** oriented **functional tests** of a system.

Main principles

A test stimulates inputs and checks outputs.

Complex conditions may be defined for the checking.

A set of test constitutes a scenario.

Scenarii are described into XML files open to user.

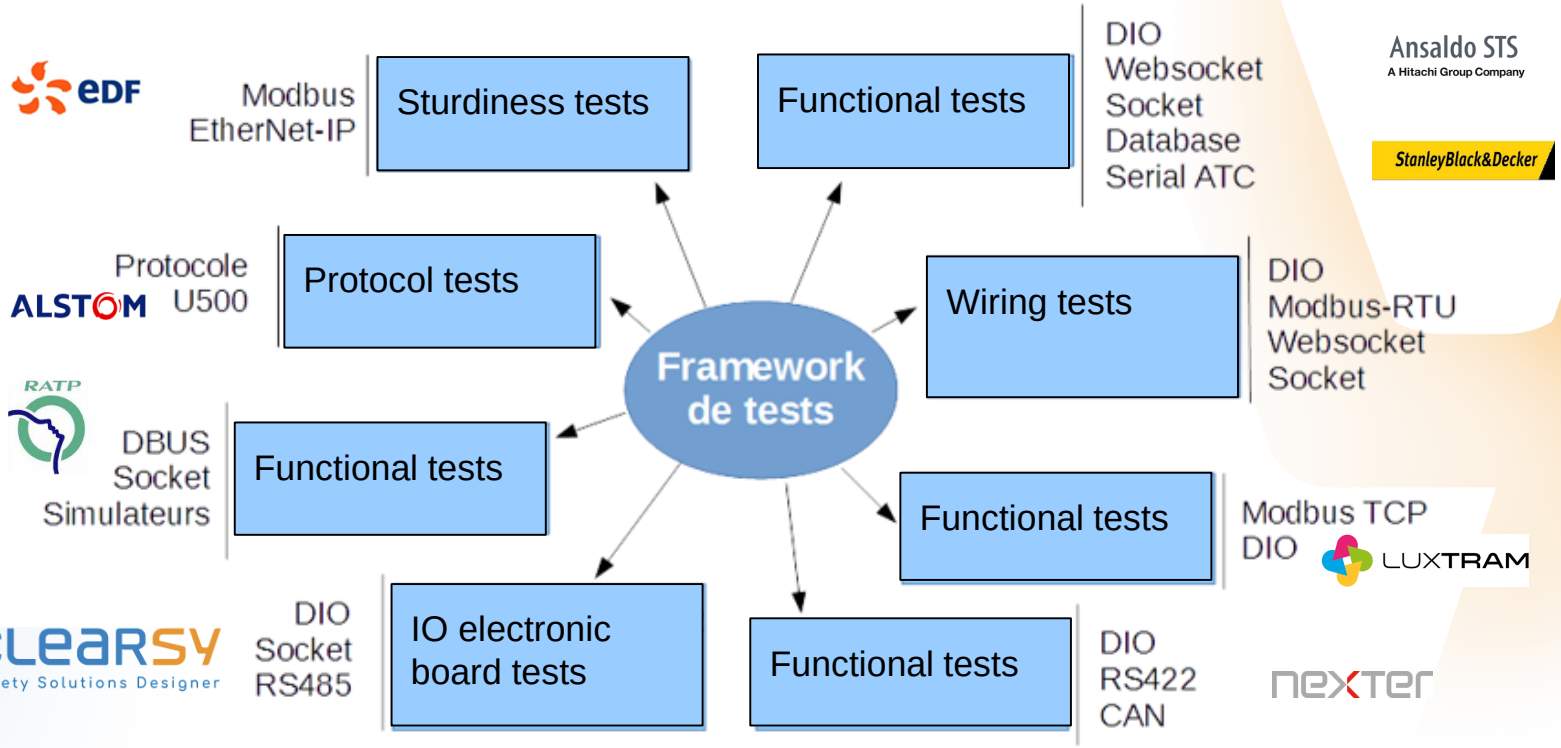
The ordering run of a set of scenarii is possible in order to perform non regressive tests.

Features

- Fits for industrial market :
  Qualified T2 CEI 61508 and EN50128 (for the generic part)
- Flexibility: fits to every test specificity
- Runs on a standard PC
- Windows and Linux
- XML and Xunit standards
- Generation of user formatted reports (docx)

- since 2014
- used on 20+ projects

Fields of use : Interfaces - References



Contents

Test structure

A test follows this pattern:

- According to a context (beginning status)
- If the Framework runs define actions to one or several interfaces
- Then it should detect define consequences on one or several interfaces

Components

CLEARSY Test Framework comprises:

- A **graphical user interface** which allows to launch tests and show results
- A **Runner** (the orderer, the core), available as a runtime
- **Mocks**, modules which extend Runner functionalities
  - A Mock typically implements the behaviour of a protocol
  - Mocks are instantiated and controller by the Runner
  - A Mock is dedicated to each interface to test

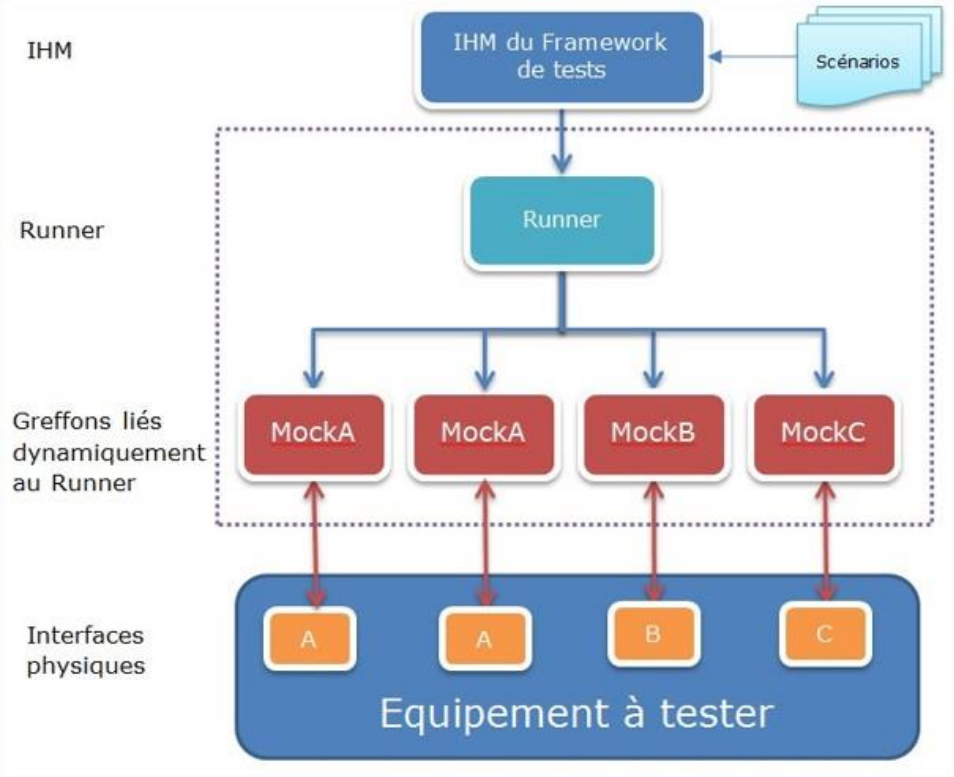
Environment:

Multi plateform : **Windows** or **Linux**

Architecture

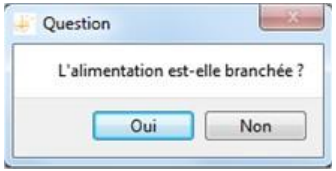
Mocks are dynamically linked to Runner exe

Physical IO

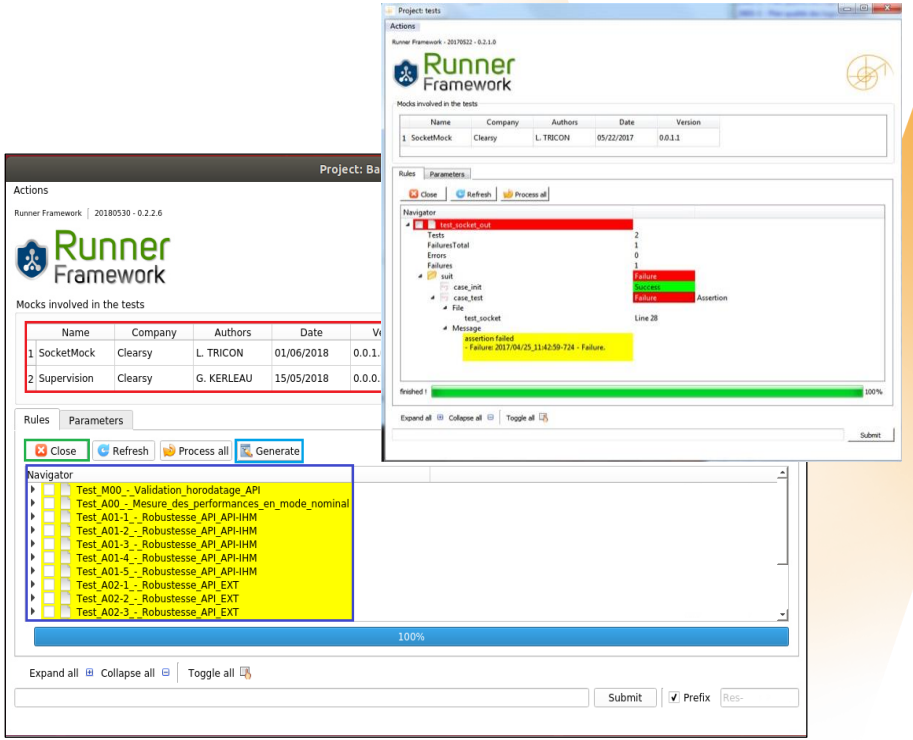


Graphical interface

- Loads the scenarios
- Launches the tests
- Shows user's pop-ups required by tests



- Generates tests reports



Test example (XML file)

Programmation of a test by an user (from an usual XML editor).

This test carries out two mocks « TCPModbus » which provide Modbus commands and informations (***set*** et ***timercompare***).

mocks to instanciate

```
<test_runner name="Test de la fonction Gestion d'aiguille motorisée">
  <tools>
      <tool id="modbus_CMD_API"   path="TcpModbusMock_API_CMD.dll"   init="mapping-API-CMD.xml"/>
      <tool id="modbus_INFOS_API" path="TcpModbusMock_API_INFOS.dll" init="mapping-API-INFOS.xml"/>
  </tools>
  <suits>
    <suit name="Fonctionnement de la sortie Cmmag" txt="Cette suite vérifie les filtrages de la sortie Cmmag">
        <case name="Filtrage de la sortie CmmAg à l'activation">
            <action tool="modbus_CMD_API"   exec="set E_Cmmag 1"/>
            <action tool="modbus_INFOS_API" exec="timercompare S_CmmAg 2000 0 1"/>
        </case>
        <case name="Filtrage de la sortie CmmAg à la désactivation">
            <action tool="modbus_CMD_API"   exec="set E_Cmmag 0"/>
            <action tool="modbus_INFOS_API" exec="timercompare S_CmmAg 500 1 0"/>
        </case>
    </suit>
  </suits>
</test_runner>
```

Test cas

Each action returns true or false

set updates the variable E_CmmAg with 0 value

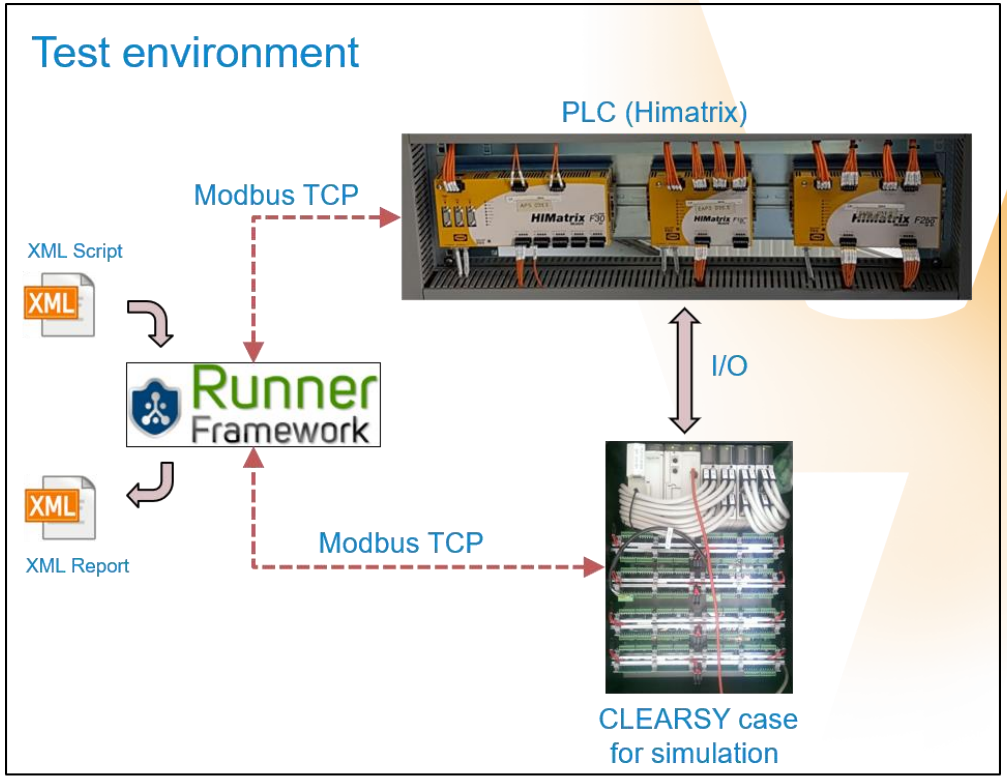
timercompare checks that the S_CmmAg variable has been changing after 500 ms from 1 to 0 value

Use case: SIL4 railway interlocking

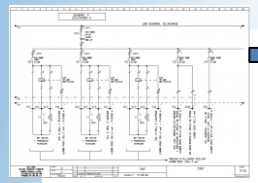
LUXTRAM

PLC signalling software test

Simulation of environment (lights, switches sensors, track circuits…) and set of functional tests in compliance with EN50128:SIL4



Use case: Electrical cabinet testing



Electrical diagrams

XML script
Refers to:
Mock_oscillo
Mock_doortalk
LUA script(s)

Test Framework
Shared variables
- Points array
- OK/KO flag

Runner (Core)

Mock_oscillo

Mock_doortalk

LUA script
Points treatment (max, min, avg..)
OK/KO flag set

LUA script:
Computation library developped by Stanley and called by XML scripts (use of shared variables)

XML Report
Points (csv)

Test Report

Test platform

ActiveX
Oscillo
Server

RS232
doortalk protocol

MC251
Engine controller

Eth

Oscillo

Electrical cabinet

Doors engines

Test bench of platform screen door command & control

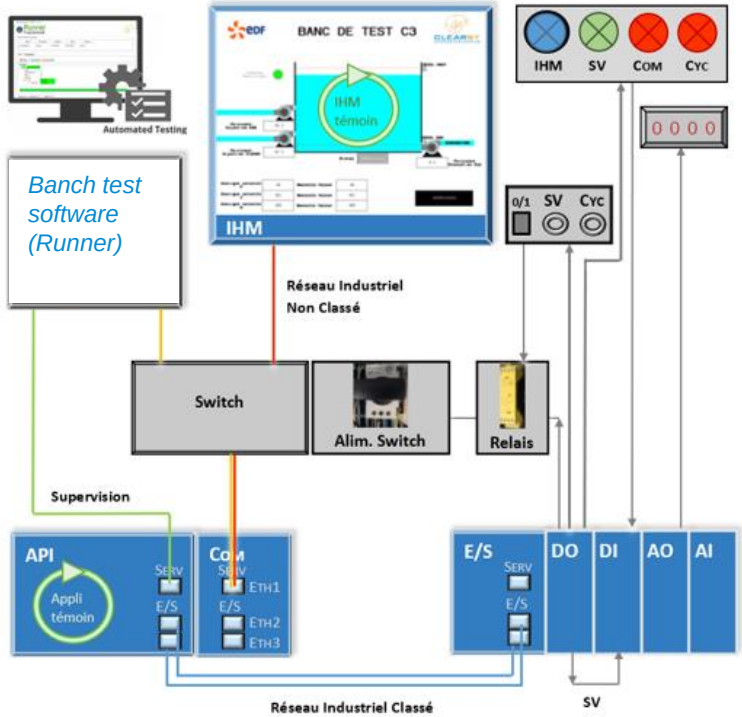
Automated verification of the wiring of electrical cabinets for Honolulu subway: compliance to electrical diagrams

Use case: C3 level communication qualification - Cybersecurity

Qualification of the robustness of a safe class PLC
regardness to pollution coming from an unclassed system (HMI)

Usable for cybersecurity tests (denial of service)

Qualification test case



Contents

MAIN

OPERATION

OUR OFFER

Our offer

- The generic solution (plug and play) comprises
  - Available protocols: Modbus/TCP, Modbus/RTU, CAN
  - Standard test conditions:
    Operations = < > on boolean values, integers or strings
- We develop your specific solution
  - Add on required protocols : interfaces et applicative layer
  - Add on test conditions
  - Custom formatted reports (docx)
- Proposed services
  - Co-definition of the needs
  - Development of the specific solution
    Delivery of executable and User Manual (includes installation, test langage and examples)
  - Development and delivery of a complete test bench
    or Support to the testbench development
  - Development of tests *or* Support to test development

CLEARSY Test benches home made: examples

Test benches realized from specification from technical specifications provided by end user customer or defined by CLEARSY

Test bench for RATP

Test bench for EDF

Advantages

- No user license if CLEARSY delivers the whole test bench
- Customized test bench defined from customer requirements and not a customization of the needs to an existing tool !
  - customization of interfaces, protocols, tests, reports
- Customer self sufficiency for tests creation & change
- Test bench reusable on other projects without limitation
- An unique contact on the project for hardware and software issues
- Short time-to-market
  - Average project duration: from 3 to 6 monthes

Contact

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https://www.clearsy.com/en/tools/testrunner/