

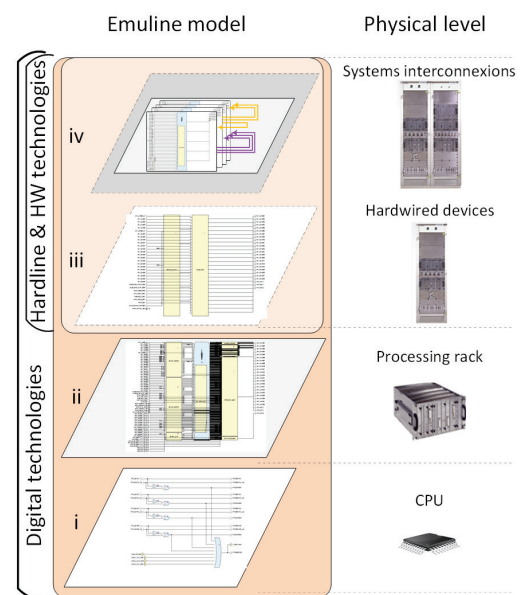
Proven technology provides the most accurate and flexible platform for testing systems prior to their installation

Challenge

In order to maintain the safety and reliability of existing power plants during instrumentation and control (I&C) system upgrades, it is critical to design and deliver comprehensive I&C systems that are thoroughly tested prior to installation. When converting a purely virtual concept into a concrete hardware implementation, the introduction of hardware, software, cabinet redundancies, networks, etc., can lead to significant deviations in the response of the I&C system which can disrupt power production. Plant owners must be able to deliver reliable systems despite project variables like different system design schedules, manufacturing delays, and late design modifications. Additionally, plant owners must have a platform upon which they can carry out additional licensing tests without disrupting site activities to allow operator training on the new systems before they are installed.

Solution

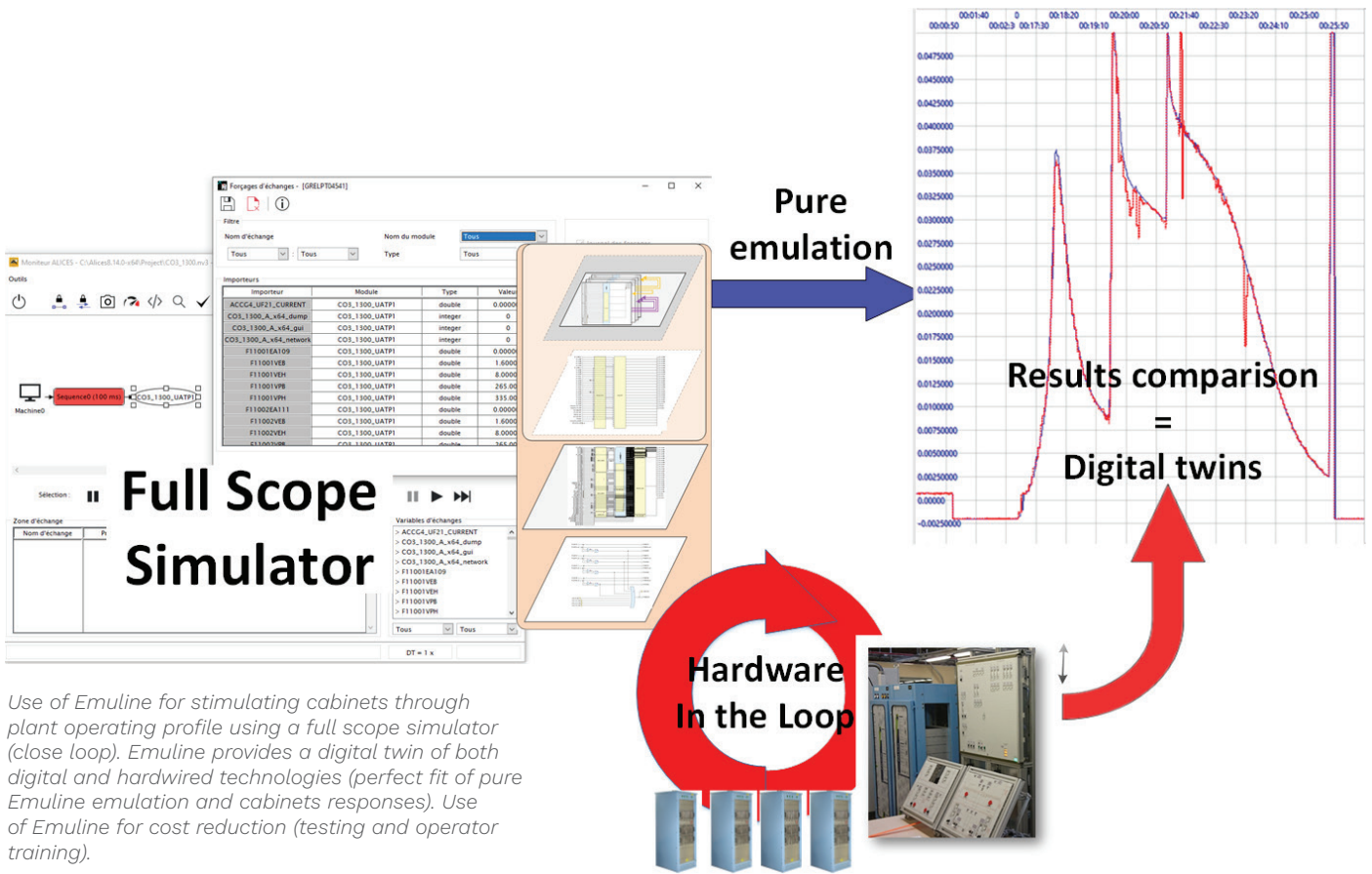
Framatome Emuline is the reliable multi-layer platform that provides precise simulation of digital technologies, Hardline and hardwired technologies including boards, networks, CPU asynchronisms and embedded software. It can model all common failures of the technologies, as well as connect to simulators through a custom or standard Functional Mock-up Interface. Emuline can also be connected to TELEPERM XS simulators for multi-technology simulations. The platform offers plant owners a flexible interface that allows open- or closed-loop tests on both simulators and actual cabinets, in any combination.



Technology modelling in Emuline: i) Final embedded software; ii) Application software scheduling and interfacing with IO boards and networks; iii) Hardwired device model (signal conditioning, relays, inhibition, votes, etc.); iv) Cabinet interconnexions (HW and Network). ©Framatome

Customer benefits

- Proven simulation technology provides the most accurate platform for testing systems prior to installation, giving plant owners greater confidence in the reliability of the system upgrades.
- Precision testing of new systems on the platform improves project schedule certainty – reduces the number of tests needed and gives operators the option of adding cabinets/systems “on the fly” on the test bay.
- Customization of the interface provides greater flexibility to better suit each plant’s needs.
- Operators experience improved system reliability since the platform incorporates operator training simulator capabilities.
- Due to the reduction in the necessary training platform, plant owners can save on training costs and resources.



Technical information

Framatome Emuline is interfaceable with all standard simulators.

Detail design:

- System interfaces consistency verification
- Algorithm tuning according to hardware response
- Hardware degraded modes analysis
- Commissioning and maintenance procedures verification and validation

Test bay (Hardware in the Loop):

- Reduction of test startup (emulation of missing cabinets)
- Reduction of number of tests by comparing emulated and real cabinets responses
- Cabinet tests following plant operational profile

Site (plant operation):

- Plant I&C troubleshooting on emulated platform
- Operator and maintenance trainings on emulated hardware
- Plant modification tests on emulated platform

References

• Finland nuclear plant installation

- Spline systems: Neutron Flux, Reactor trip/control/limitation systems;
- Hardwired systems: trip breaker, manual backup;
- PLC systems: automatic backup and monitoring.

Apros simulator connected to all cabinets using Emuline.

• Brazil nuclear power prototype lab

- Spline, Hardline and monitoring systems.

ALICES simulator connected to all cabinets using Emuline. Full scope simulator.

Your performance is our everyday commitment

Key Figures

2,100 I&C professionals at **20** sites in **10** countries
20 Emuline emulators successfully installed worldwide

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