



Self certification workshop

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What is (or would be) software certification?

- Certification definition ?
 - ✓ [Wikipedia](#)
 - ✓ V&V / IEEE 1012 : Validation : software fulfills its intended purpose
 - ✓ [ISTQB definition of compliance testing](#)
- Considered as exam or audit-based validation
 - ✓ The software should be valid for common use
 - ✓ Respects the norms it is based on
- Calculation software produce numerical results. This is not easy to deal with!
- Interactive software (GUI) are known to be hard to test/validate

Organization of the workshop



A very limited set of slides essentially for theoretical elements



Interactive session – mind maps, end-user feedback and open discussions



Some recreational slides will be thrown to wake you up



You can interrupt me or the speakers at any moment!

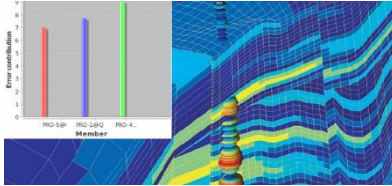


Means that I will need your direct feedback to add more elements to the slides



I will write a recap after the meeting

Why HALIAS ?



We are interested in software validation through our QTS platform (scientific software validation platform based on numerical processing of results)

We signed a major agreement with TECH'advantage for joint development on validation activities:

- ✓ IFP-EN subsidiary specialized in Oil&Gas software development activities (reservoir modeling)
- ✓ ISTQB certification





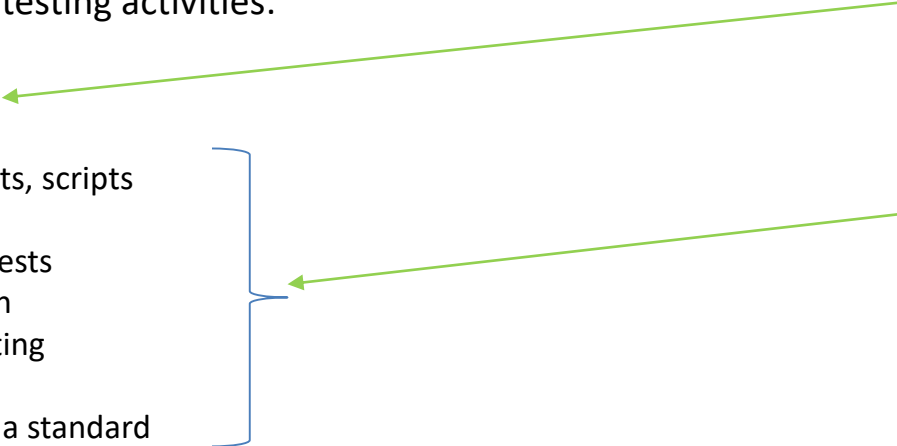
Software Verification for certification

➤ Different kinds of testing activities:

- ✓ Unit tests
- ✓ integration tests, scripts
- ✓ GUI tests
- ✓ performance tests
- ✓ crash detection
- ✓ regression testing
- ✓ platform tests
- ✓ compliance to a standard

White box testing (with source code)

Black box testing



Available tools for each kind of testing activity, but it's not only about tools! Processes, human resources/costs, software availability, ...

Certification involves a lot of testing activities, probably black box only.



Example of certification: the OPC certification



- OPC is an industrial standard for interoperability of software and hardware.
- An extensive effort has been done on certification due to the wide variety of OPC providers
 - OPC Enhanced Certification program
 - OPC CTT : Compliance Test Tool
 - OPC Certification Lab



OPC Enhanced Certification program

- Specific business model
 - For foundation members : free for 1-4 products depending on the member subscription level
 - For non foundation members : 1k\$/day, needs 3-4 days for typical use
- The software must pass the basic tests before being submitted
- The standard compliance is manually tested by 3rd party companies
- The Test Suites are specified by the OPC standardization board



OPC certification

Main differences wrt CAPE-OPEN

- OPC software can be run in headless mode (no GUI)
- Predictable outputs (watchdogs etc)

Similarities wrt CAPE-OPEN

- Complexity prevents full interoperability guarantees
- Complex interaction scenarios
- Existing basic testing tools



Other examples

- From micro-electronics
 - I²C (hardware interoperability based on protocols) : compliancy is directly tested in the EDA tools (equivalent to PME)
 - Z-wave alliance (wireless communication) : tester tool



- FMU Compliance checker
 - + Test FMUs are provided
 - based on a reference implementation at the library level (a ref lib is provided by the consortium)

Different actors



Actor	Interop. Incentives	hindrances
PME software editor	Sales, mkt shares	The solutions works without CAPE-OPEN
PMC software editor	Be used in major PMEs	Integration complexity
Engineering	No profit loss due to software not working	Limited leverage on software suppliers
CO-LaN	No comments!	Cannot substitute to the above stakeholders, liability



How can we achieve CAPE-OPEN compliance for a PMC ?

Remember the CAPE-OPEN Tester?

Pros	Cons
Results easy to interpret	Testing scenarios are too simplistic!
Basic testing scenarios described in the standard <ul style="list-style-type: none">• Presence of interfaces• Operations can be performed without errors• Types consistency	More complex scenarios → Diagnosis tools ?
Easy to install and to use	Inadequate programming language



Evolutions of the CO-Tester in order to achieve a first certification tool dedicated to PMCs ...



Other possibilities

Use COCO to verify that a PMC is compliant

- compliancy page on [COCO website](#)
- applicable to consultancy scheme?
- COCO is a *de facto* reference implementation

	Company	Product	Tested version	Compliance
	AixCAPE contact: Marcus Soemers web: http://www.aixcape.org/ phone: +492418094860	Props	1.0	Thermo v1.0 plug compliant
	amsterCHEM contact: Jasper van Balen web: http://www.amsterchem.com/ phone: +34670863337	Excel CAPE-OPEN Unit Operation	1.0.56.0	Unit operation v1.0 plug compliant (thermo 1.0) Unit operation v1.0 plug compliant (thermo 1.1)
		SciLab CAPE-OPEN Unit Operation	1.0.2.0	Unit operation v1.0 plug compliant (thermo 1.1)
		Matlab CAPE-OPEN Unit Operation	2.0.0.5	Unit operation v1.0 plug compliant (thermo 1.0) Unit operation v1.0 plug compliant (thermo 1.1)
		SciLab CAPE-OPEN Thermo Import	1.0.2.0	Thermo v1.1 socket compliant (logging enabled)
		Matlab CAPE-OPEN Thermo Import	1.0.2.0	Thermo v1.1 socket compliant (logging enabled)
		OpenOffice Calc CAPE-OPEN Thermo Import	1.0.0.0	Thermo v1.1 socket compliant

- Well suited for software editors
- Very good first step in a global compliancy certification approach
- From a user point of view, no warranty that a given PMC will just work in a given PME.
- Combinatorial complexity? Scalability?



From PMCs to PME

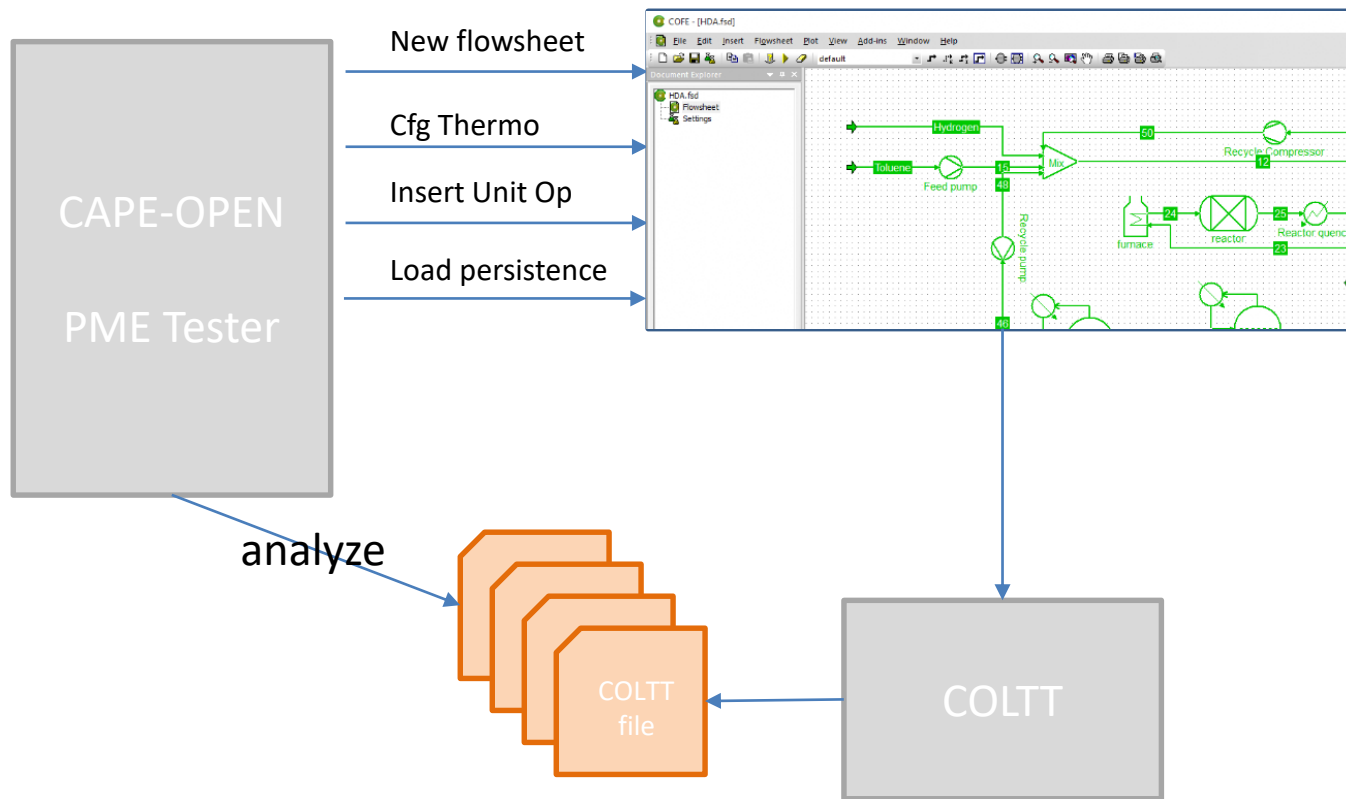
- PMCs are quite easy to test wrt PMEs !
 - Verification automation
 - Very complex verification sequences
 - All results are numerically different
 - The verification tasks are done by the PME editor in its own ways and must be performed again by end-users (in production!)
- There exists a reference implementation of the standard : COFE





An automated way of PME certification ?

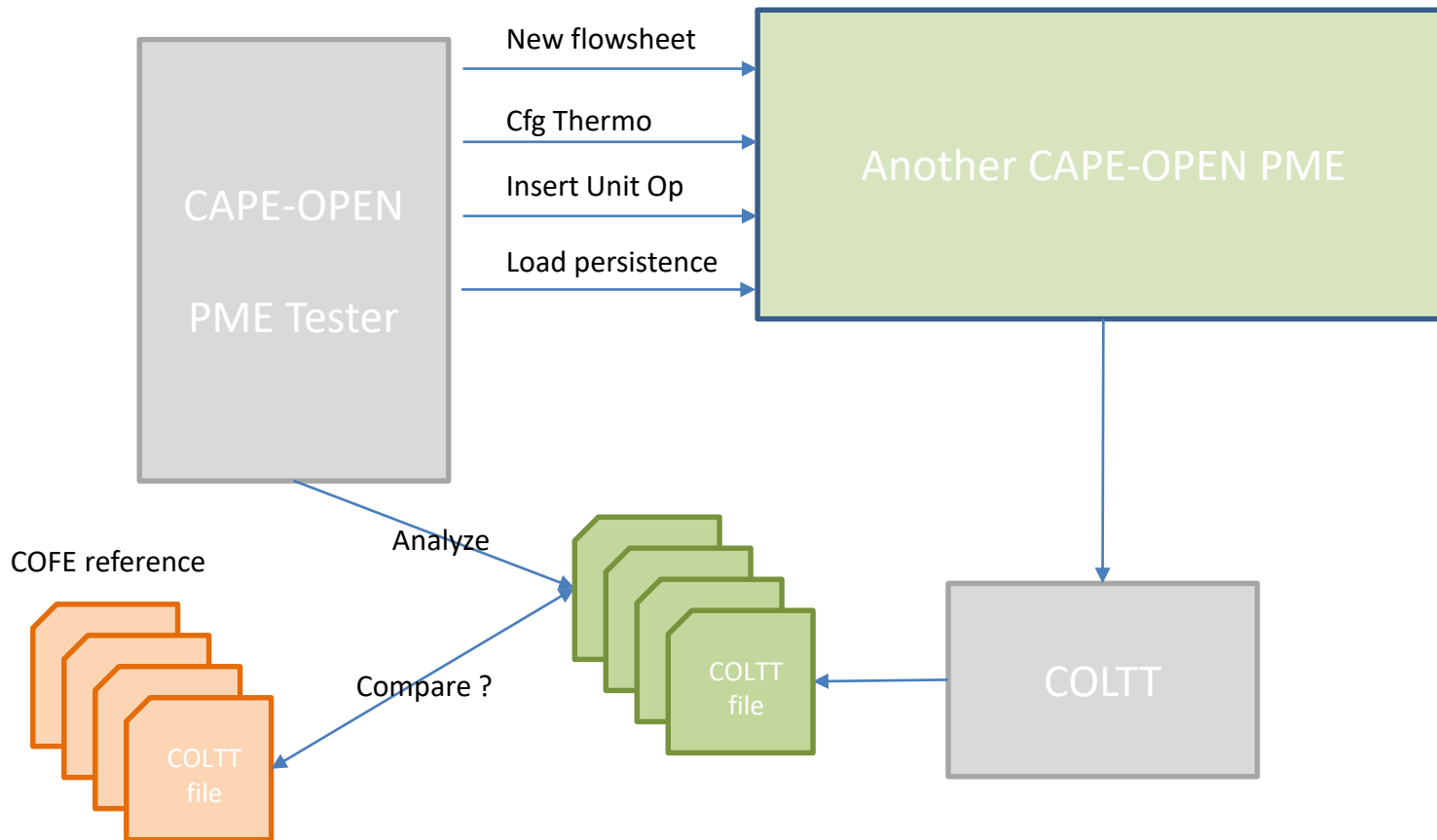
Step 1 : set up a reference scenario with COFE and PMCs





An automated way of PME certification ?

Step 2 : replicate the scenario with a PME and the same PMCs





An automated way of PME certification



Existence of APIs for PMEs? Low-level compatibility of the call sequences



The main interest of these kinds of systems relies in the interest of tasks automatic : CAPE-OPEN regression detections during development.



Would such a system be of great help for PME or PMC developers?



PME editors have probably different APIs call sequences for test purposes: contribute to a common code base?



PME certification from end users point of view

Open discussion

What's next



Thank you for your participation!

Any question?

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Role the CO-LaN

- The CO-LaN is an independent (vendor neutral) entity
- It should provide ways to facilitate the CO-LaN members to certify the CAPE-OPEN compliance of their software configuration (PME, PMC, combination):
 - organisational
 - methodological
 - practical

... but that is not a reason not to do anything !



Help us define the role of the CO-LaN !

$T_0 + 110 \text{ min}$