

Opening unit operations for process engineering software solutions

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presented by Michel PONS
ATOFINA & CO-LaN



Available CO-compliant software

❑ Commercial software providers

- ⇒ AspenTech: Aspen Plus 10.2, 11.1, 12.1, HYSYS 2.4, 3.0, COM Thermo
- ⇒ SimSci: Pro/II v6 (1T03)
- ⇒ PSE: gPROMS 2.1, 2.2
- ⇒ Belsim, Infochem, ProSim, RSI, HTRI, Fluent...

❑ Operating companies

- ⇒ IFP, Total, BASF, Norsk Hydro, Shell...

❑ Universities

- ⇒ DTU, INPT, RWTH.LPT

❑ CO-LaN

- ⇒ Tester Suite

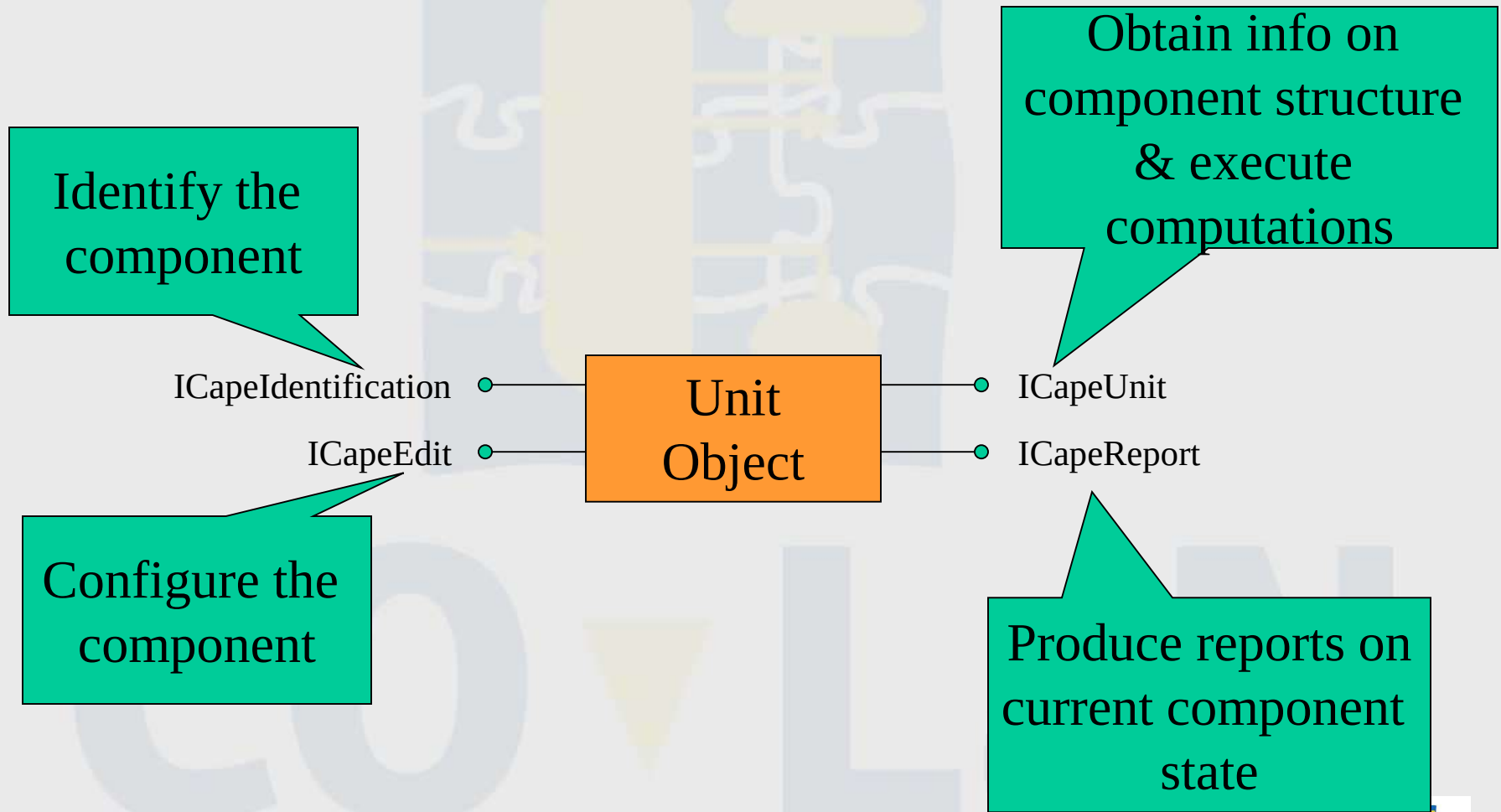
Outline

- Key CAPE-OPEN concepts
- CAPE-OPEN compliant component development
- Conclusion

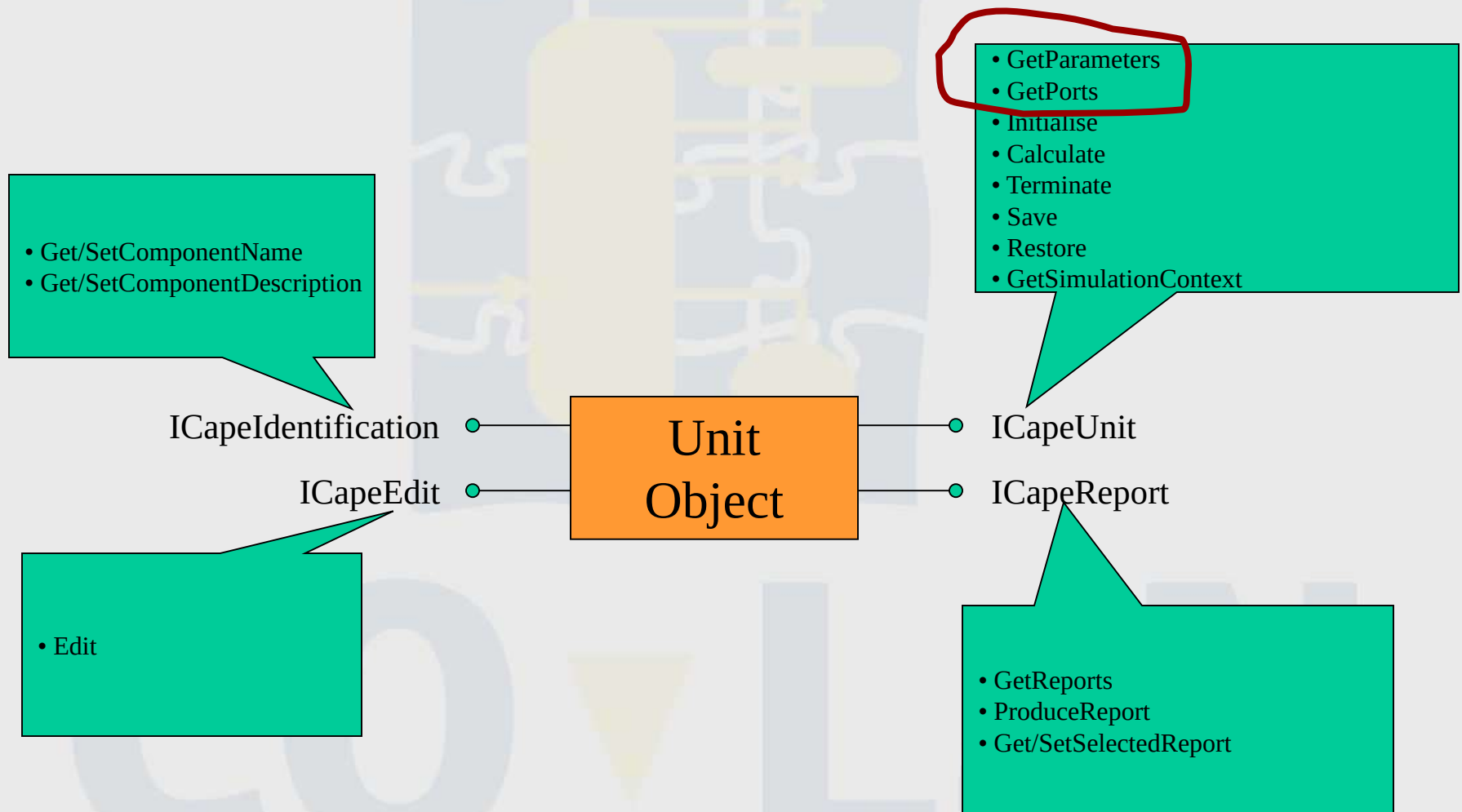
CAPE-OPEN UNIT OBJECTS

- A “CO unit object” may be
 - ⇒ a single unit operation
 - ⇒ a plant sub-section
 - ⇒ a whole plant
- ...connected to its environment via “ports” carrying material, energy or information
 - ⇒ input ports
 - ⇒ output ports
- ...and characterised by “parameters”
 - ⇒ input parameters
 - ⇒ output parameters
- Unit object behaviour
 - ⇒ given input port information and input parameter values
 - ⇒ compute output port information and output parameter values

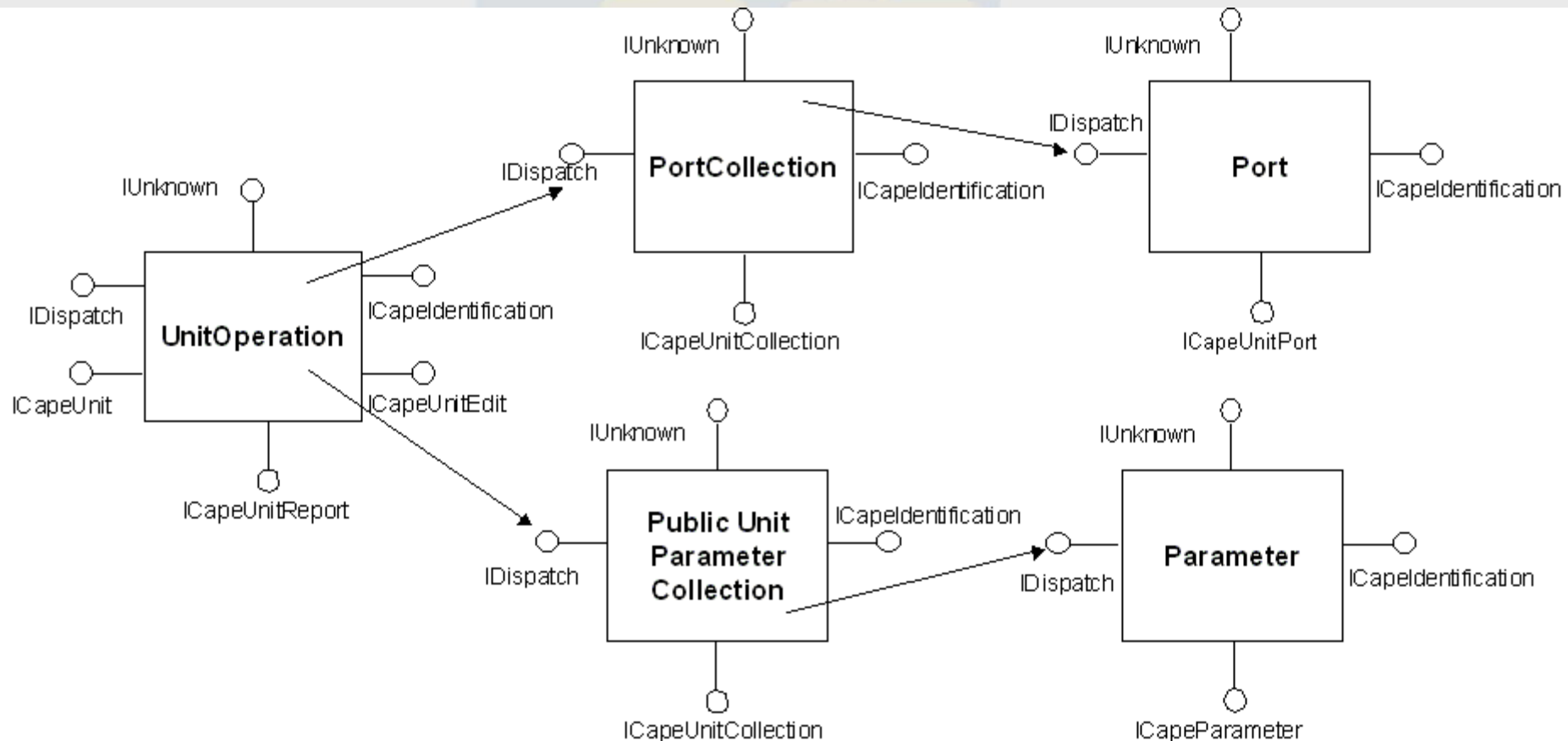
CAPE-OPEN Unit Object Interfaces



CAPE-OPEN Unit Object Interfaces



Units, ports and parameters



CAPE-OPEN Unit Port Interfaces

- Get/SetComponentName
- Get/SetComponentDescription

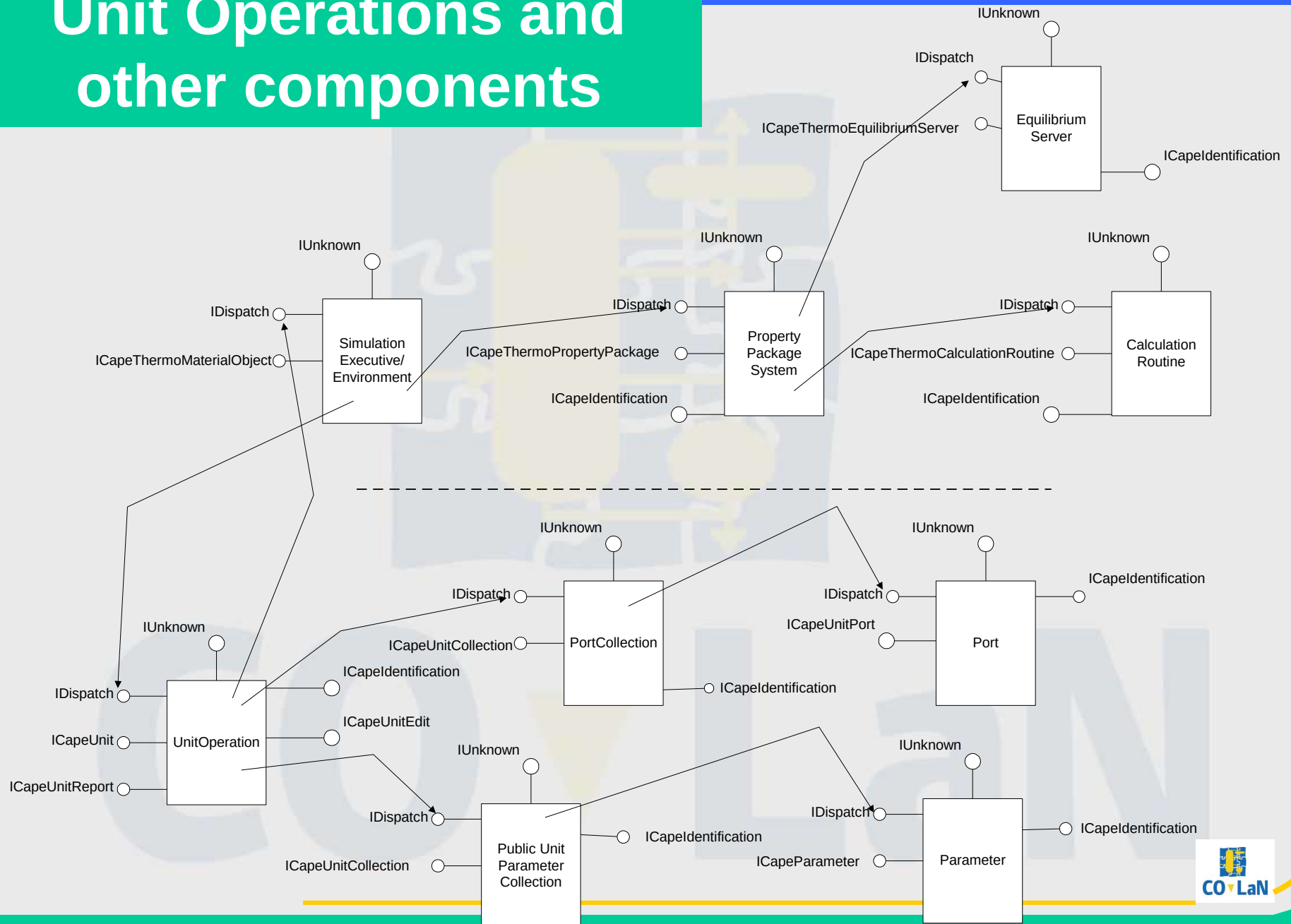
ICapeIdentification

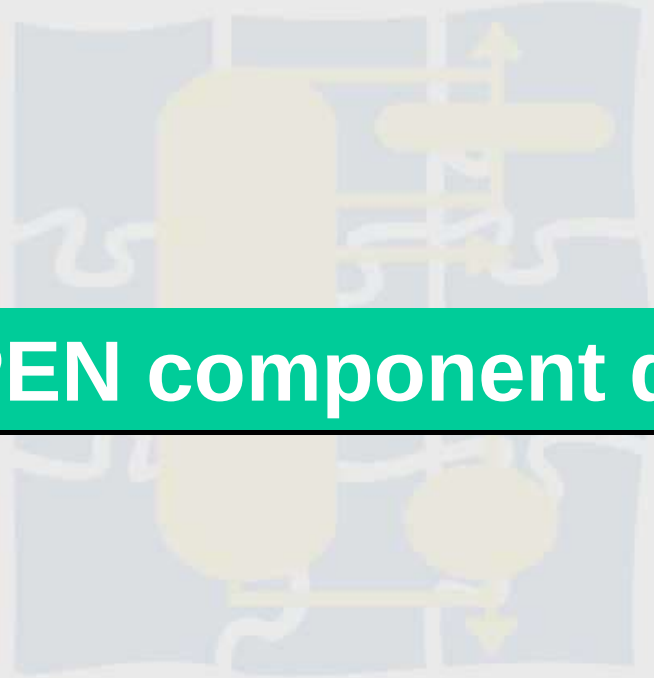
ICapeUnitPort

Port
Object

- GetConnectedObject
- Connect
- Disconnect

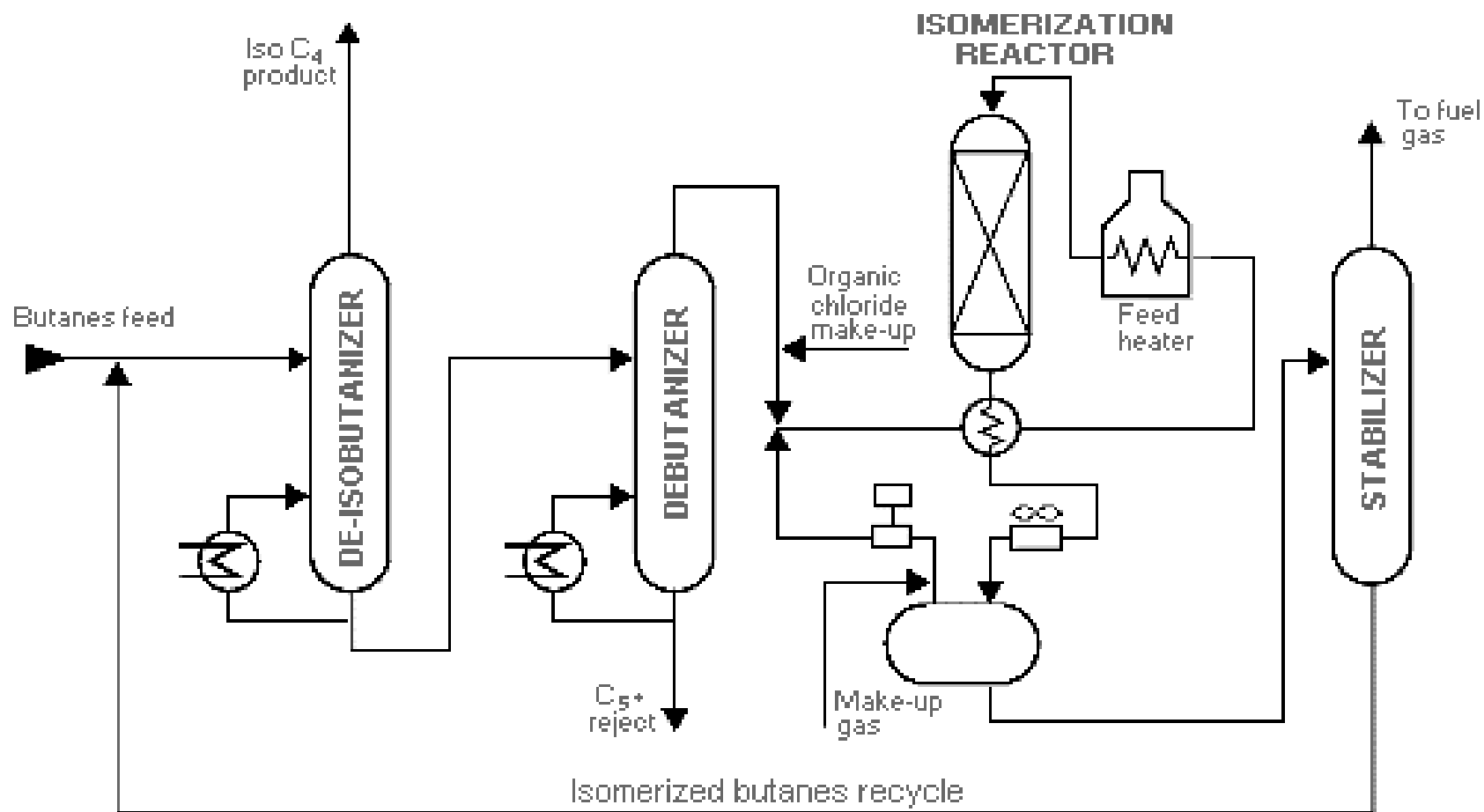
Unit Operations and other components



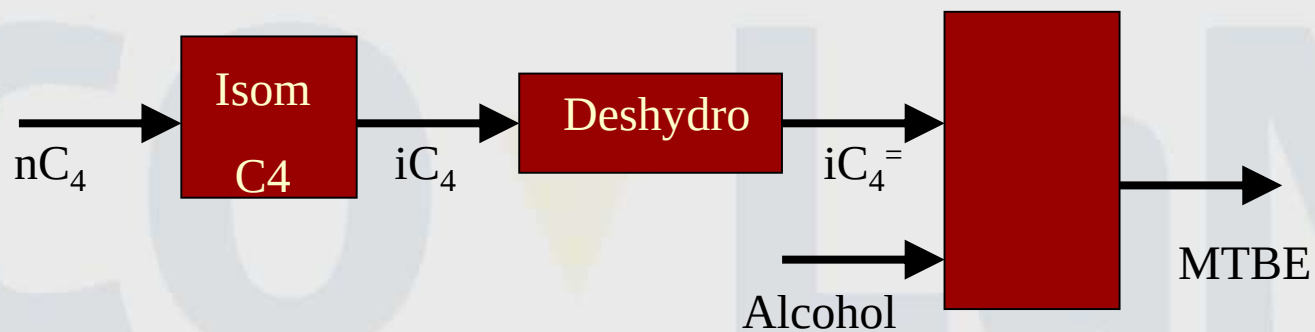
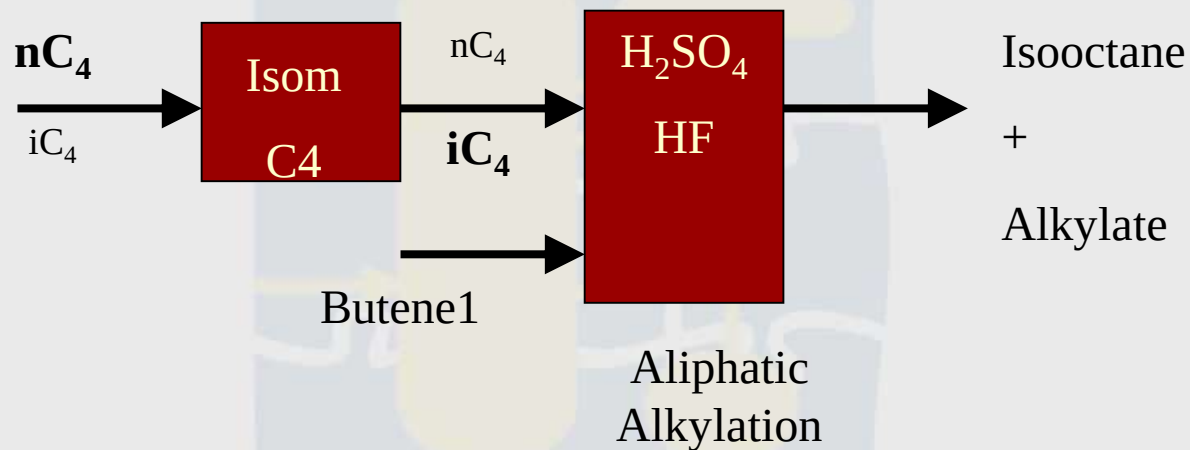


CAPE-OPEN component development

C4 isomerization flow diagram



Industrial Applications



Process Technical Description

□ Thermodynamic

- ⇒ Isobutane formation is promoted at low temperature
- ⇒ Catalyst to work at low temperature

□ Catalyst

- ⇒ Butane is less reactive than long paraffins
- ⇒ Catalyst must provide important acidity
- ⇒ No zeolith catalyst

□ Reaction mechanism

- ⇒ A bimolecular mechanism is modelled:
 - a reaction intermediate C8 produces i-butane
 - cracking product (C1- C3)
 - disproportionation product as C5 i-C5

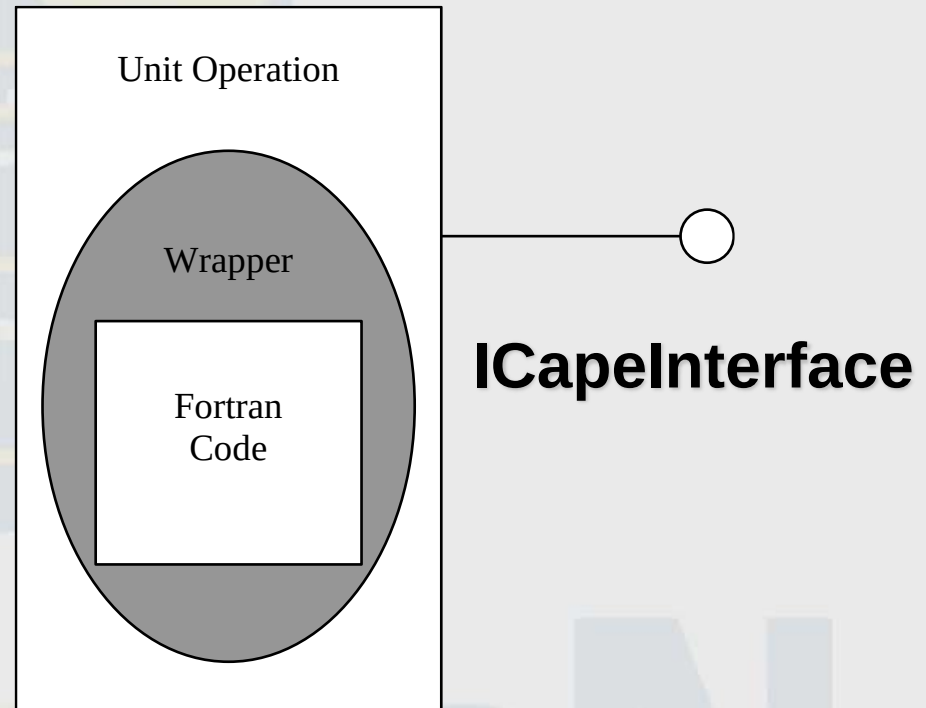
CO Compliant component development

□ Introduction

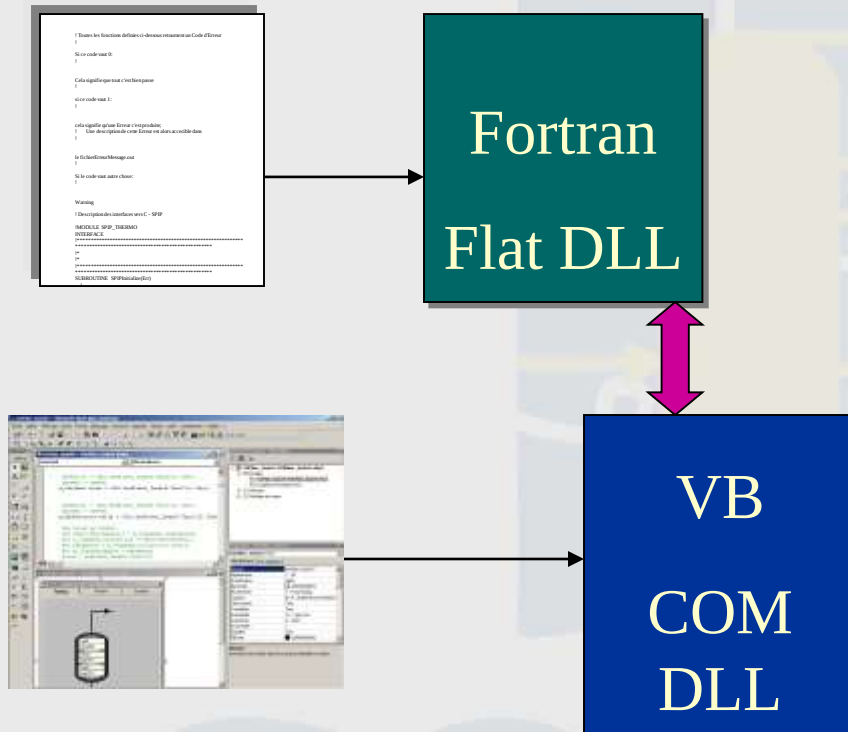
- ⇒ **Migrating a FORTRAN 90 Reactor Model to the CAPE-OPEN standard.**

□ Description

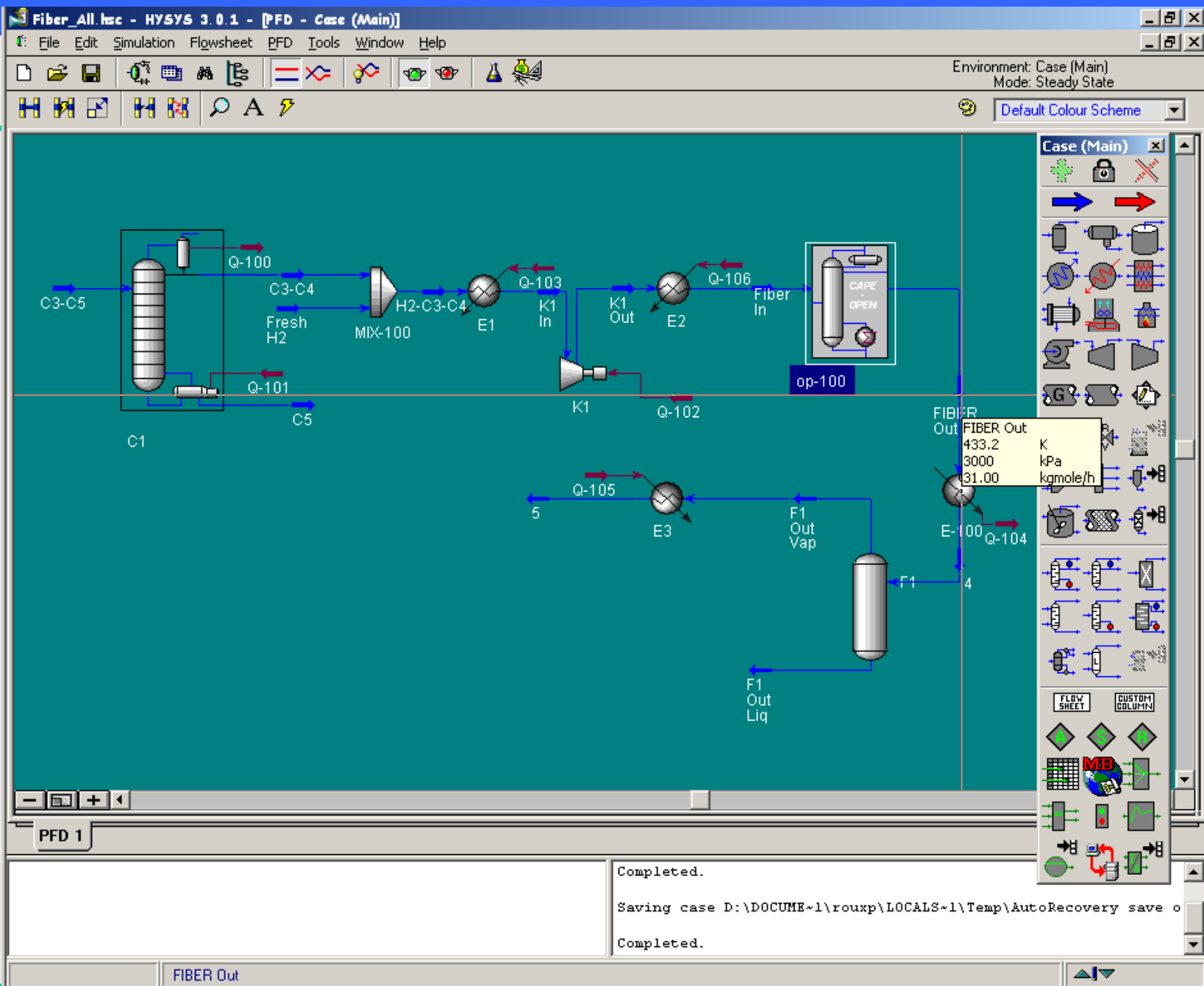
- ⇒ **IFP / CAPE-OPEN BIP Reactor architecture:**

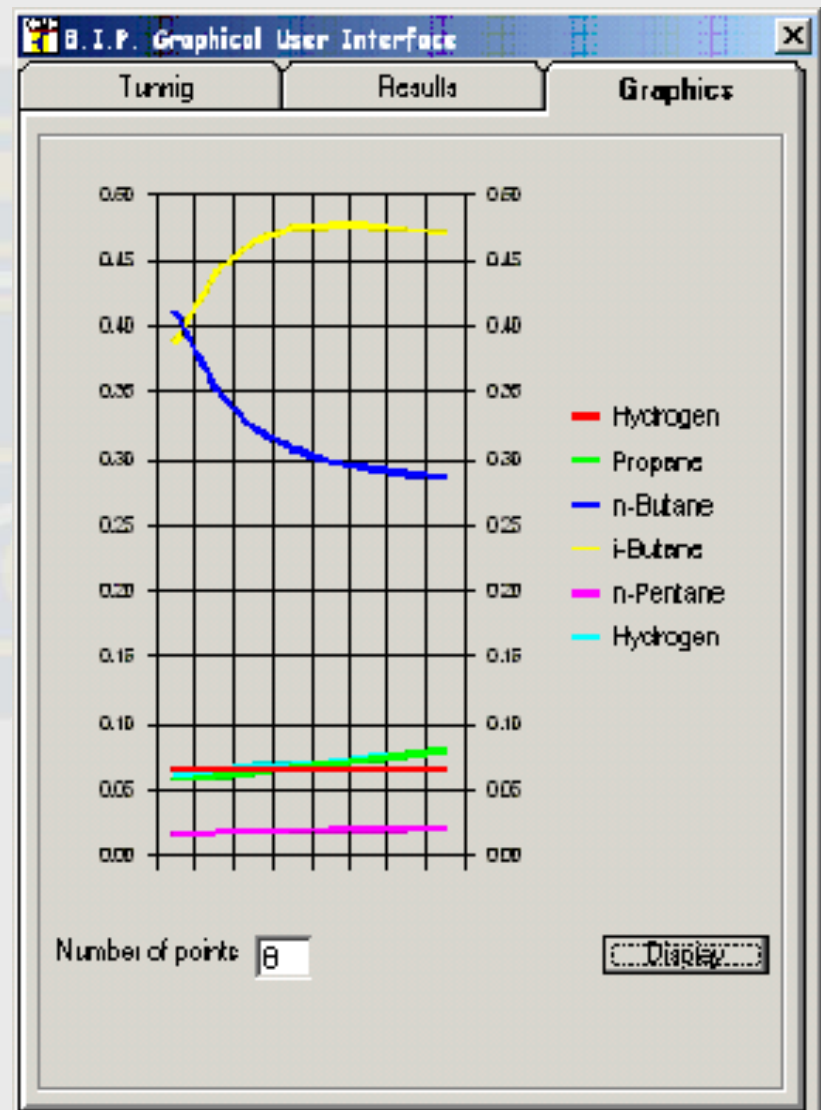
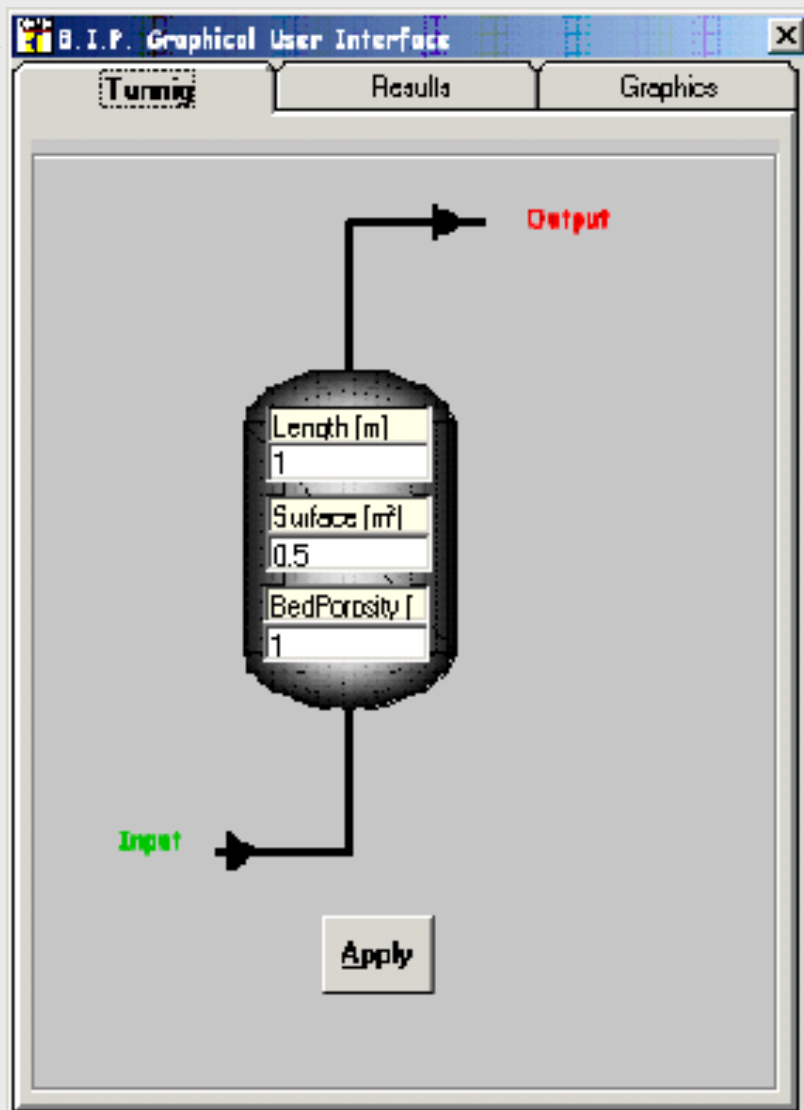


Implementation Description



1. Create a Fortran DLL with Source file of the standalone Model.
2. Create a COM DLL using CO Unit Wizard
3. Connect these two DLLs





Conclusion

- ❑ **CAPE-OPEN: an enabling technology for plug & play process simulation**
- ❑ **For developers: increased CAPE tool usage and reduced development time**
- ❑ **Development efficiency: UNIT CAPE-OPEN wizard provides the skeleton for CAPE-OPEN compliant Unit Operations**
- ❑ **Wizard available from the CO-LaN web site free of charge**