

Process-Industry CAPE-OPEN Software Standard Overview



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Co-Simulation (APECS)
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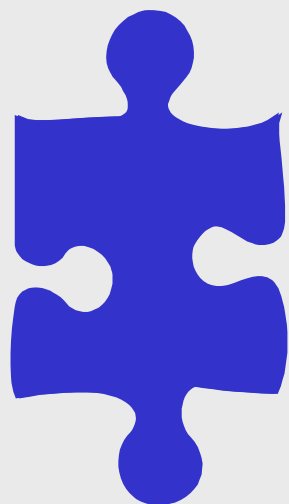
Expanding Process Modeling Capability through Software Interoperability Standards

What is CAPE-OPEN?

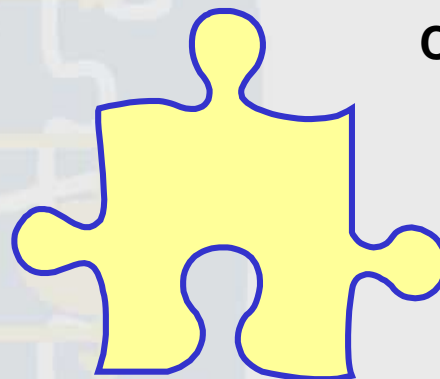
CAPE-OPEN defines rules and interfaces that allow CAPE (Computer-Aided Process Engineering) applications or components to interoperate

CAPE-OPEN Thermodynamic socket

- End-user can plug any CO compliant Property Package into a CO compliant Process Modeling Environment.



External CO Property Package:
(Aspen Properties,
PPDS,
UniSim COMThermo,
Aspen Hysys COMThermo,
Simulis Thermodynamics,
MultiFlash,
CO-SPPTS, TEA, GERG, ...)



CAPE-OPEN PME:

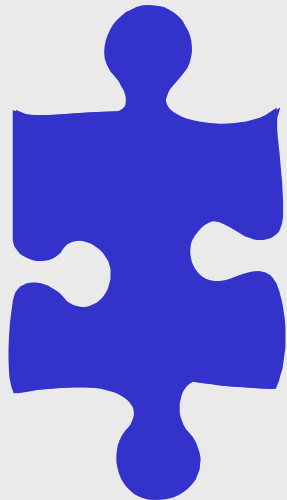
Aspen Plus,
Aspen Hysys,
COFE,
COMSOL,
gPROMS,
INDISS,
ProSim Plus,
PRO/II

UniSim Design,
Simulis Thermodynamics
SolidSim,
TUWAX,
Xchanger Suite

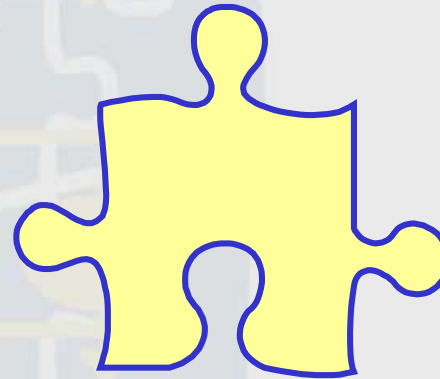


CAPE-OPEN Unit Operation socket

- End-user can plug any CO compliant Unit Operation into a CO compliant Process Modeling Environment.



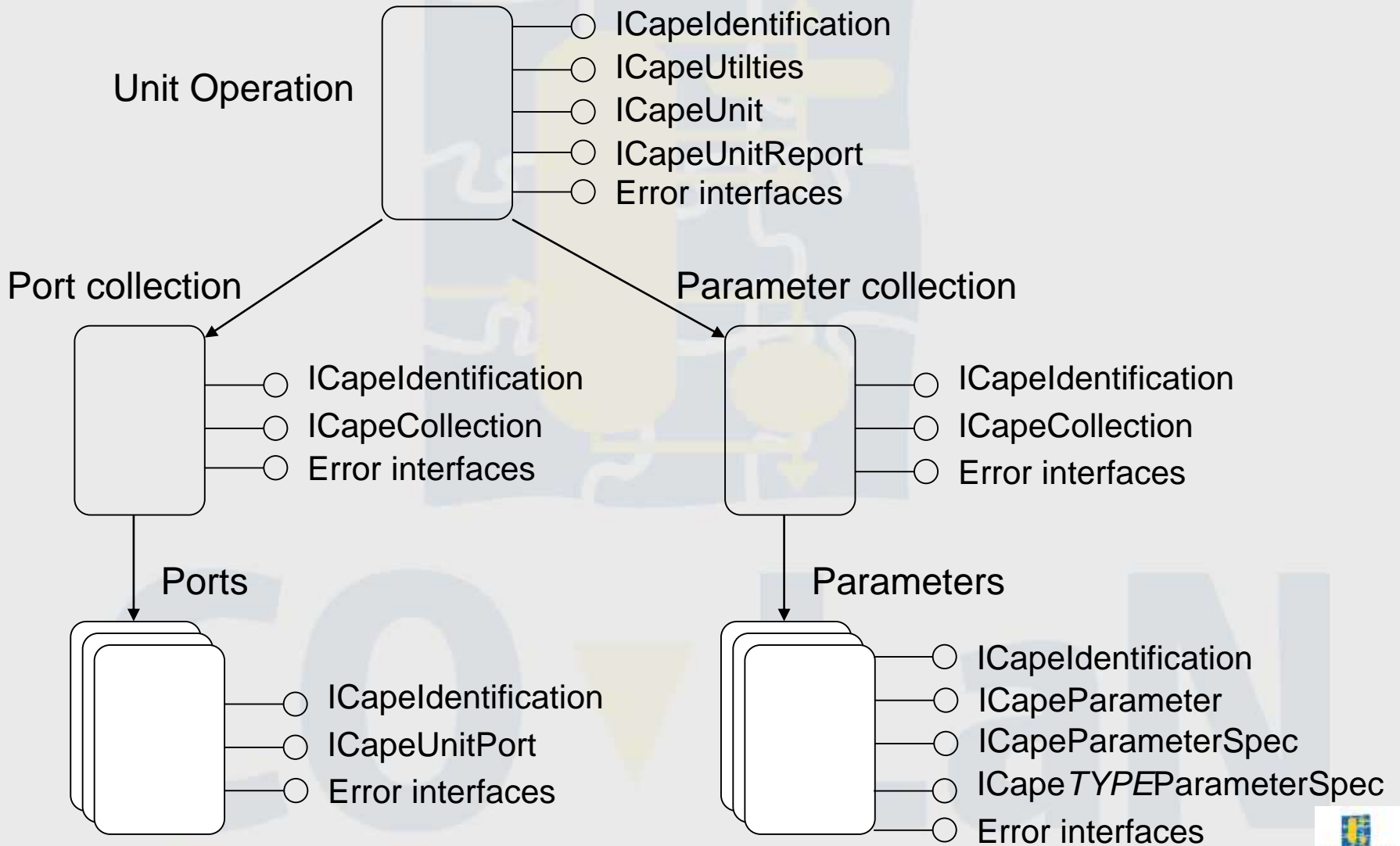
External Unit Operation:
(APECS,
ChemSep,
COUSCOUS, GLCC,
gO:CAPE-OPEN,
SolidSim,
TUWAX,
XChanger Suite ...)



CAPE-OPEN PME:
Aspen Plus,
Aspen Hysys,
COFE,
gPROMS,
INDISS,
Petro-Sim,
ProSim Plus,
PRO/II
UniSim Design,



CAPE-OPEN Unit Operation interface



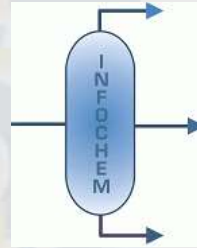
Expanding Process Modeling Capability through Software Interoperability Standards

CO-LaN

A group of end users, developers and academics putting resources together to support ongoing work on the standard



The CAPE community behind CAPE-OPEN



And quite a few more



81 members as of October 2009



- 42 Software suppliers
- ◆ 8 Operating Companies
- ▲ 2 Governmental
- 23 Universities
- ★ 6 Individuals



Missions

- **User priorities**
- **Exploitation and dissemination**
- **Life-cycle management**
- **Testing and interoperability facilitation**
- **Training and Migration facilitation**

User priorities for CO standards

- Support to developments in commercial, consortium and in-house applications
 - ⇒ **New CO compliant Process Modeling Environments**
 - **Thermodynamic socket in Matlab and Scilab**
 - ⇒ **New CO compliant Process Modeling Components**
 - **Excel-based Unit Operation, Matlab-based Unit Operation, Scilab-based Unit Operation**
 - ⇒ **Upgraded versions of PME and PMC wrt CAPE-OPEN**
 - **PRO/II 8.3, ProSim Plus 3.1, COCO 1.15, gPROMS 3.2, aspenONE v7.1, MultiFlash 3.8, ...**

Exploitation and dissemination

□ CAPE-OPEN European Conference series

⇒ April 2-3, 2009, Munich, Germany

- 30+ participants
- After Skopau, Germany (2004) – Como, Italy (2005), Cannes, France (2006) – Heidelberg, Germany (2007), Cambridge, UK (2008)

□ CAPE-OPEN US Conference series

⇒ November 11, 2009, Nashville, Tennessee

- After Cincinnati (2004), Morgantown (2005), San Francisco (2006), Salt Lake City (2007), Philadelphia (2008)

□ Forum (capeopen.forumer.com)

□ Website (www.colan.org)

Life-cycle management

□ Hydrodynamic SIG

- ⇒ Design of interface specification for hydrodynamic point model

□ Thermo SIG

- ⇒ Revision of Thermodynamic and Physical Properties interface specification 1.0 and 1.1 to clear them up

□ Methods & Tools SIG

- ⇒ Flowsheeting monitoring interface design

Testing and Interoperability facilitation

□ Interoperability

- ⇒ Interoperability is core of CO-LaN.
- ⇒ Large set of interoperability tests performed and reported in 2008:
 - Around 165 documented tests.
 - Continued effort on specific tests prioritized by full members.

□ Remote access to CO-LaN laptop

- ⇒ Equipped with 13 PME's and 20+ PMC's

□ Logging and Testing Tools

- ⇒ COLTT (v1.07) maintained by CO-LaN
 - Works in process. Open source (SourceForge)
- ⇒ OATS maintained by AmsterCHEM
 - Works out of process



Training and migration facilitation

- **As CAPE OPEN matures CO-LaN role is moving from organizing to facilitating training.**
 - ⇒ **CO-LaN can advise on training options and facilitate contacts for training providers.**
- **Wizards**
 - ⇒ **Automatically creates most of the code needed to make a CAPE-OPEN Unit Operation**
 - ⇒ **Visual Basic 6.0, C++, Fortran 90, Delphi**
- **Code examples**
 - ⇒ **Unit Operation: heat exchanger (M&T SIG)**
 - ⇒ **Property Package 1.1 (Thermo SIG)**

Conclusions and perspectives

- CAPE-OPEN recognized as THE non-proprietary interface standard in process simulation.
- End-users developing solutions involving use of CAPE-OPEN interfaces
 - ⇒ Proprietary thermo models
 - ⇒ Proprietary unit operations models
- Major effort underway by main PME providers to bring their CAPE-OPEN interface implementation to full compliance
 - ⇒ Push made by end-user organizations