

CAPE-OPEN: Expanding Process Modeling Capability through Standards-based Interoperability



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Akzo Modeling Seminar
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Outline

- ◆ **What is CAPE-OPEN?**
- ◆ **Why should my company be involved?**
- ◆ **What advantage is CAPE-OPEN bringing to you?**

CO  LaN



But why is this needed?

What is CAPE-OPEN?

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

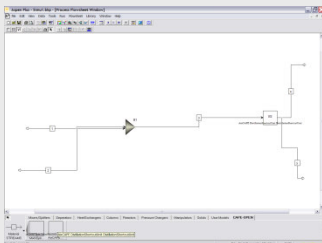


Process modelling

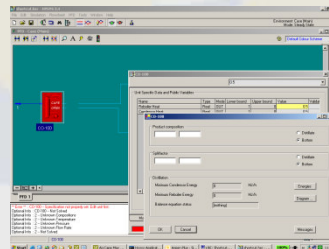
- ◆ **Has become an important tool to plan and improve chemical processes and plants**
 - ⇒ **Simulation**
 - ⇒ **Optimization**
- ◆ **More and more tailored applications**
 - ⇒ **Special process equipment**
 - ⇒ **Degree of detail in unit operations**
 - ⇒ **Advanced materials (solids, polymers, bio, ...)**
 - ⇒ **New products**
- ◆ **Providers**
 - ⇒ **In-house research, universities, focused suppliers**

Extensions

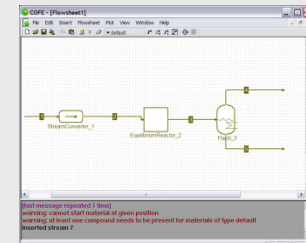
- ◆ Process simulators have extension interfaces
- ◆ Different tools have incompatible means for extension
 - ⇒ A unit operation model for Aspen Plus will not work in PRO/II, ...



Adapter
Aspen



Adapter
PRO/II

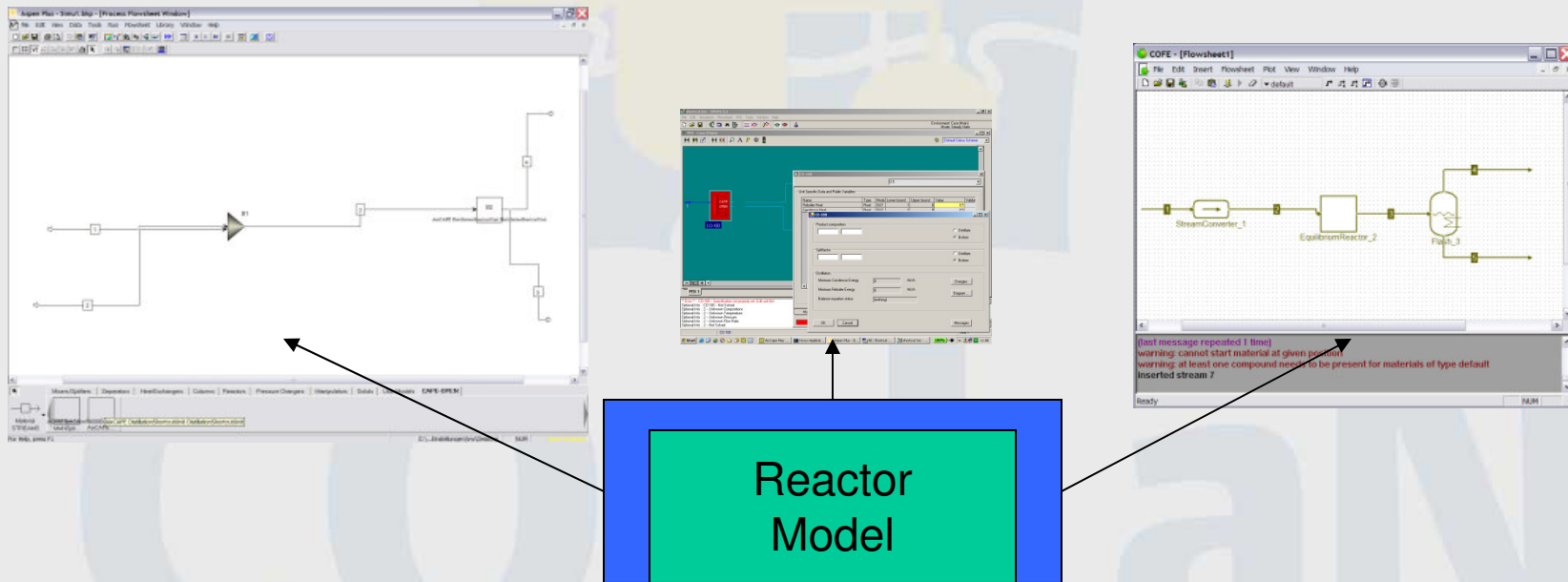


Adapter
...

Reactor
Model

Standards-based interoperability

- ◆ **Standardization of extension interfaces**
 - ⇒ **One interface to fit all**
 - ⇒ **Reduced effort to interface various tools**

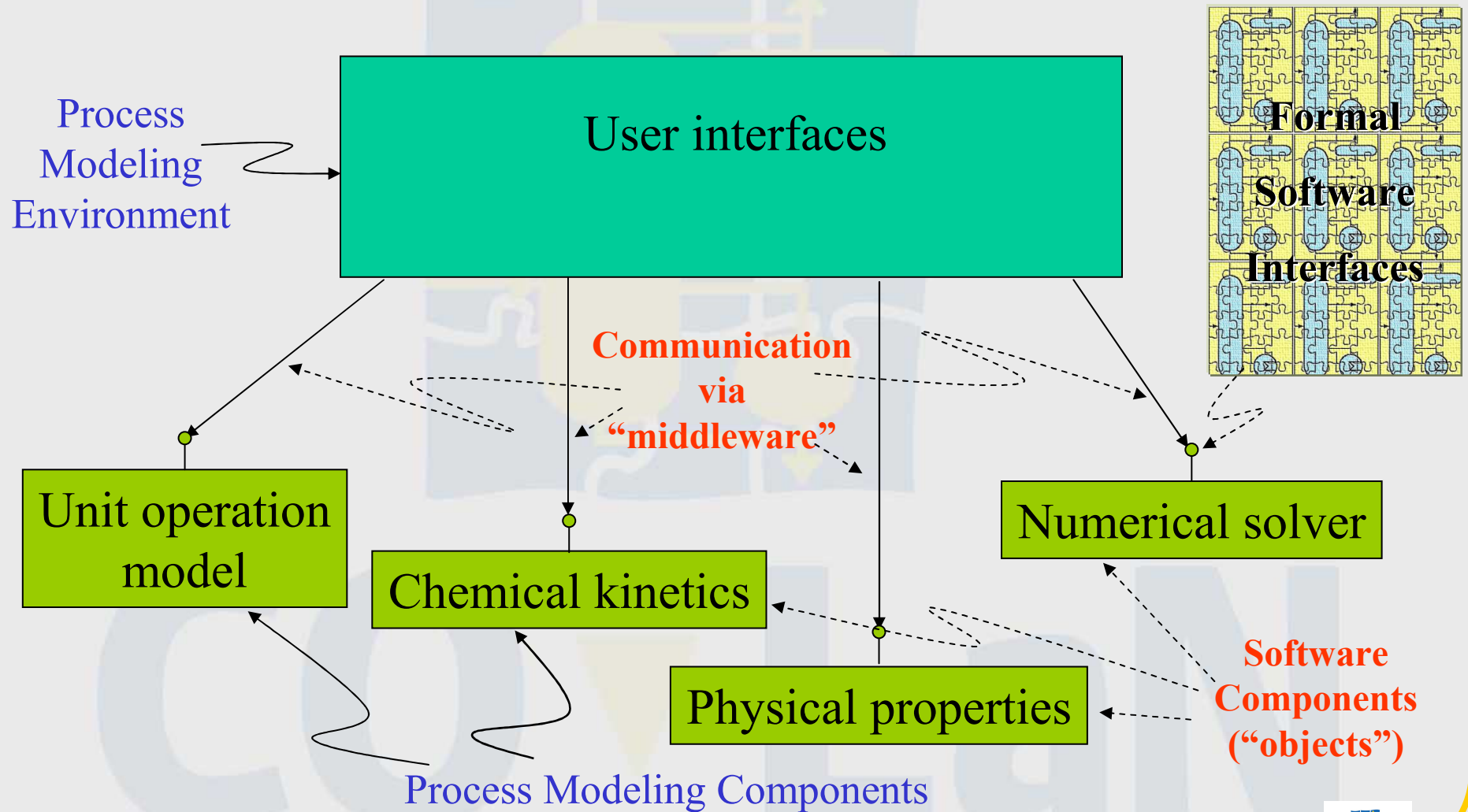


CAPE-OPEN: a technology for integration

- ◆ A freely available industry standard for interfaces between software components making up process simulation tools
- ◆ The success of a collaboration between software vendors, end-users and academics
- ◆ A proven IT technology implemented in most process simulation tools
- ◆ A growing adhesion by process simulation market leaders and niche software providers



CAPE-OPEN is a software solution



What is CAPE-OPEN?

- ◆ But CAPE-OPEN is not a piece of software
- ◆ CAPE-OPEN is a textual document used to specify a piece of software
- ◆ Most importantly
 - ⇒ An end-user of CAPE tools does not need to know anything about CAPE-OPEN in order to use it
 - A technology used by software to interoperate
 - End-users of process simulation tools should not know that CAPE-OPEN exists...
 - ⇒ But a developer of CAPE tools needs to implement the CAPE-OPEN interfaces in his/her software

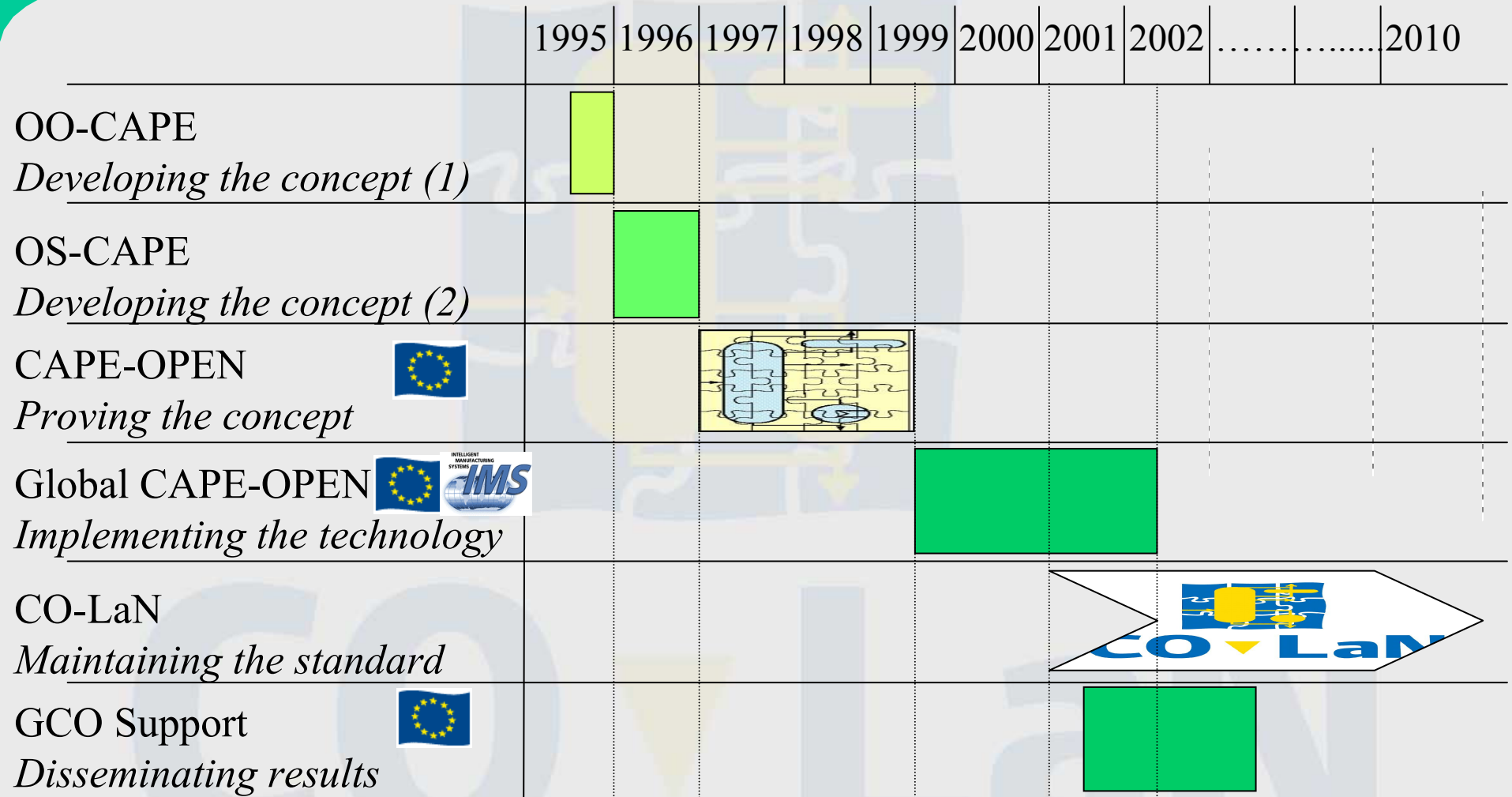
Why should my company be involved?

CO-LaN CAPE-OPEN Laboratories Network

**A group of end users taking responsibility
for putting resources together to support
ongoing work on the standard**



Making a visionary idea a reality

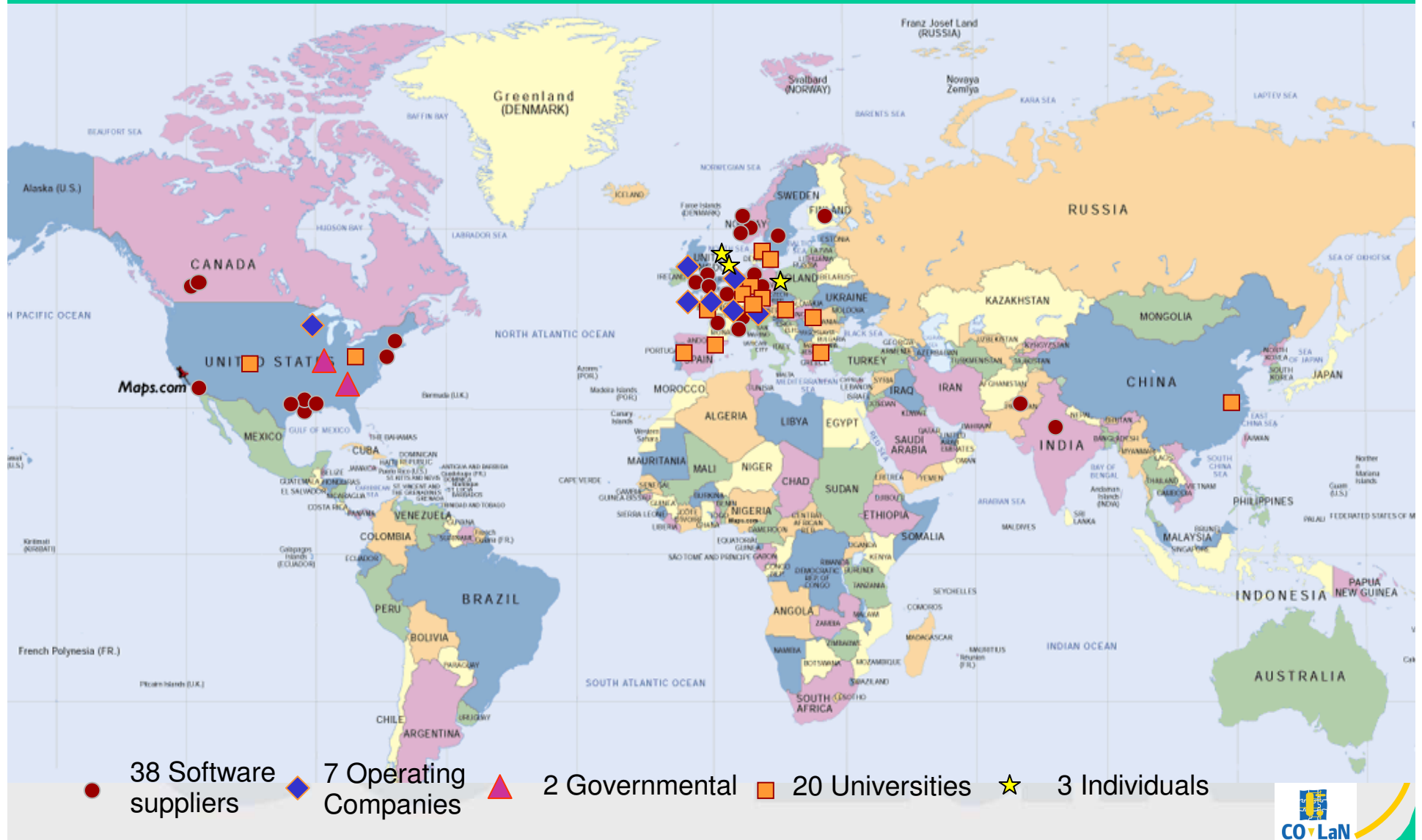


The CAPE community behind CAPE-OPEN



And quite a few more

70 members as of November 2007



Activities

- ◆ **Organize targeted Special Interest Groups on standards**
 - ⇒ Trigger projects open to all members
- ◆ **Develop independent testers and support tools**
 - ⇒ CO-LaN Tester suite, wizards, logger
- ◆ **Disseminate**
 - ⇒ Web site, documents, newsletter
 - ⇒ CAPE-OPEN European and US Conferences
- ◆ **Facilitate interoperability**
 - ⇒ Use software in any combination
- ◆ **Deliver training**
 - ⇒ Three training courses organized / sponsored so far



Why join this organization?

- ◆ CAPE-OPEN lets end-users use freely whatever 3rd party piece of code in any process simulator
- ◆ Means freedom of choice....
- ◆ Uncomfortable situation for most software vendors
- ◆ But source of progress for end-users
- ◆ So resistance to CAPE-OPEN exists on software vendors side even if they implement CAPE-OPEN
- ◆ End-users have to bring together their will and power to encourage, push for CAPE-OPEN implementation



What means progress?

- ◆ **BP uses HTRI software in any process simulator**
 - ⇒ Detailed heat exchanger models
- ◆ **Dow uses Aspen Properties in gPROMS models**
 - ⇒ Advanced thermo models in detailed reactor models
- ◆ **Air Liquide uses Simulis Thermodynamics models in all process simulators**
 - ⇒ Standardization of thermo models within company
- ◆ **US DOE uses Fluent models in Aspen Plus**
 - ⇒ Advanced 2D and 3D models incorporated



***Expanding Process Modeling Capability
through Software Interoperability
Standards***

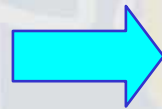
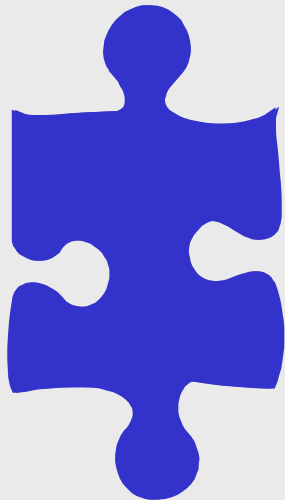
What CAPE-OPEN is bringing to you?

CO  LaN



What can be done with CAPE-OPEN?

- ◆ End-user can plug a CAPE-OPEN compliant thermodynamic server into any CAPE-OPEN compliant process simulator.



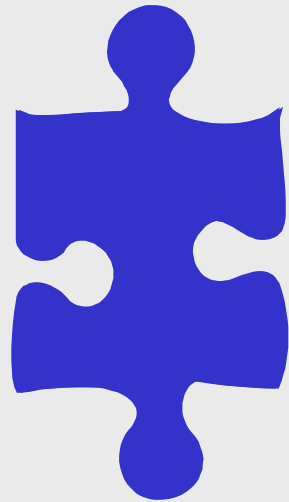
**External CO Property Package:
(Aspen Properties,
PPDS,
UniSim COMThermo,
Aspen Hysys COMThermo,
Simulis Thermodynamics,
MultiFlash,
CO-SPPTS, ...)**

**Aspen Plus,
Aspen Hysys,
UniSim Design,
INDISS,
ProSimPlus,
gPROMS,
PRO/II,
COFE,
ChemCad,
Xchanger Suite**



What can be done with CAPE-OPEN?

- ◆ End-user can plug a CAPE-OPEN compliant thermodynamic server into any CAPE-OPEN compliant process simulator.



The most appropriate
Thermodynamic model for
a project:
Commercial
In-house R&D
Academic R&D

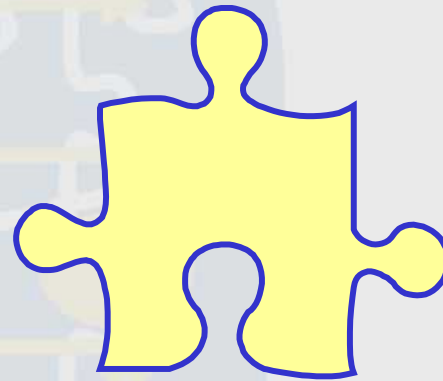
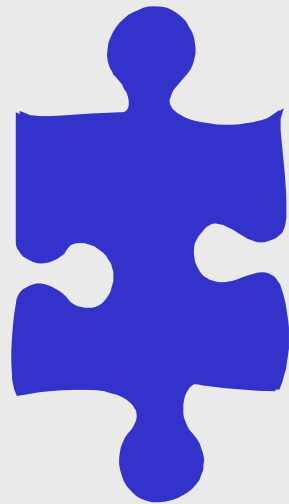


The process
simulator used
within my
company



What can be done with CAPE-OPEN?

- ◆ End-user can plug a CO compliant Unit Operation into any CO compliant process simulator.



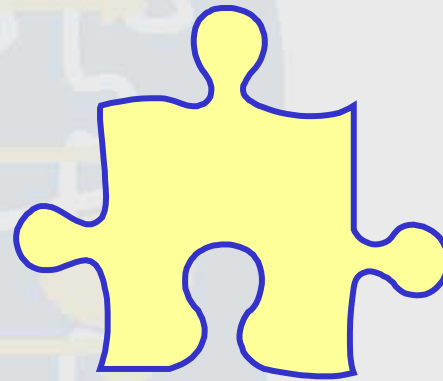
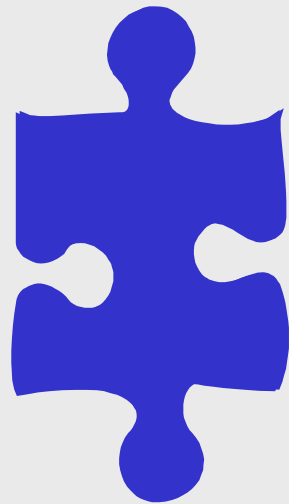
External CO Unit Operations:
(XChanger Suite,
APECS/Fluent models,
gO:CAPE-OPEN models,
in-house components...)

**Aspen Plus,
Aspen Hysys,
UniSim Design,
INDISS,
ProSimPlus,
PRO/II,
COFE**



What can be done with CAPE-OPEN?

- ◆ End-user can plug a CO compliant Unit Operation into any CO compliant process simulator.



The process simulator used in my company

The most appropriate Unit operation model for a project:
Commercial,
In-House R&D,
Academic R&D




Conclusion & perspectives

- ◆ **CAPE-OPEN recognized as THE interface standard in process simulation**
- ◆ **Most commercial PMEs now CAPE-OPEN compliant**
- ◆ **Solution adopted by end-users for in-house tools**
 - ⇒ **IFP, SASOL, Air Products,**
- ◆ **Next push from CO-LaN:**
 - ⇒ **Develop more PMCs**
 - ⇒ **Get PMEs to adopt CAPE-OPEN as their interoperability technology of choice**





Thank you
Questions?

CO  LaN

