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?

But why is this needed?

What is CAPE-OPEN?

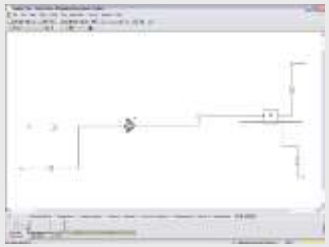
CAPE-OPEN defines rules and interfaces that allow CAPE (Computer-Aided Process Engineering) applications or components to interoperate

Process modelling

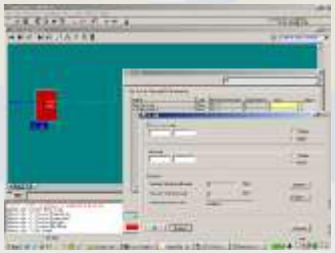
- Has become an important tool to plan and improve chemical processes and plants
  - Simulation
  - Optimization
- More and more tailored applications
  - Special process equipment
  - Degree of detail in unit operations
  - Advanced materials (solids, polymers, bio, …)
  - New products
- Providers
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

Extensions

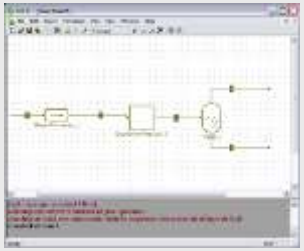
- Process simulators have extension interfaces
- Different tools have incompatible means for extension
  - A unit operation model for Aspen Plus will not work in PRO/II, …



Adapter Aspen



Adapter PRO/II

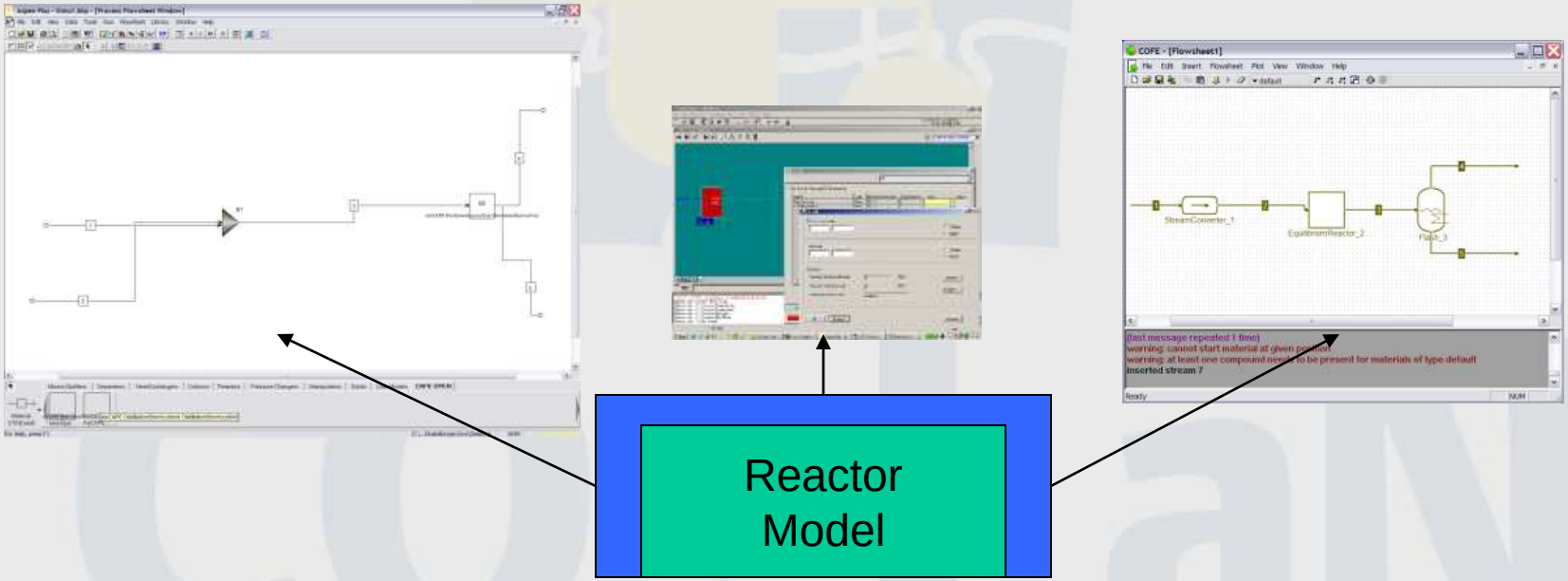


Adapter …

Reactor Model

Standards-based interoperability

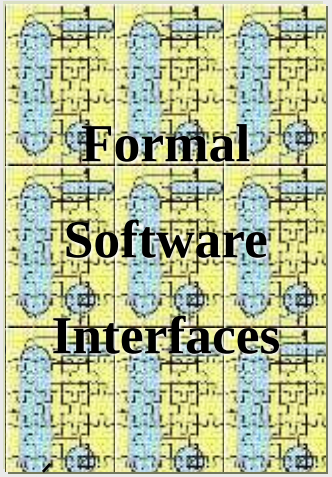
- **Standardization of extension interfaces**
  - **One interface to fit all**
  - **Reduced effort to interface various tools**



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



Process Modeling Environment

User interfaces

Communication via "middleware"

Unit operation model

Chemical kinetics

Numerical solver

Physical properties

Software Components ("objects")

Process Modeling Components

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

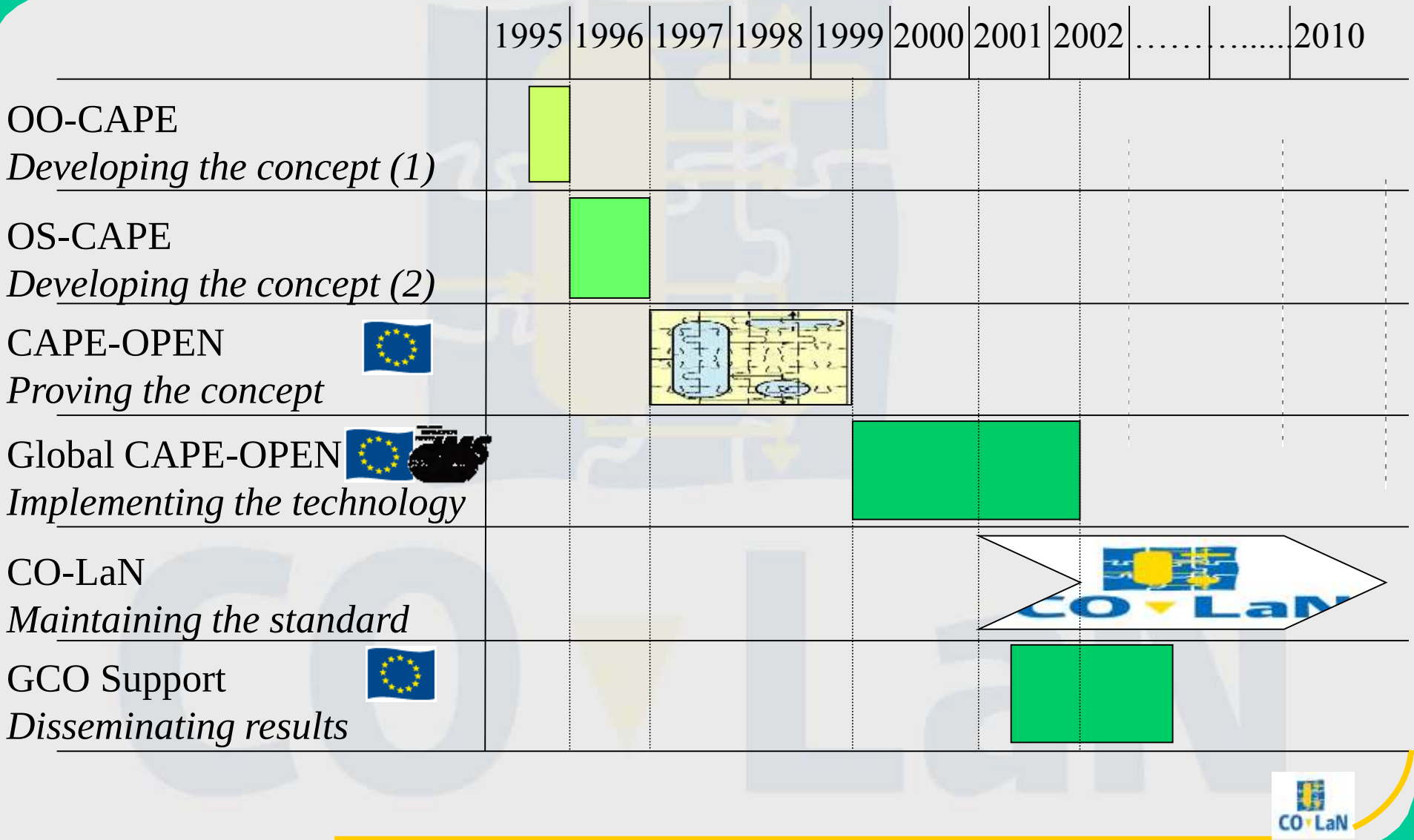
- Most importantly
  - An end-user of CAPE tools does not need to know anything about CAPE-OPEN in order to use it
    - A technology used by software to interoperate
    - End-users of process simulation tools should not know that CAPE-OPEN exists…
  - But a developer of CAPE tools needs to implement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

Why should my company be involved?

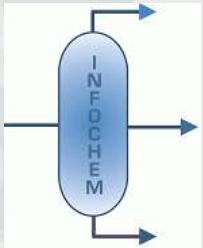
CO-LaN
CAPE-OPEN Laboratories Network

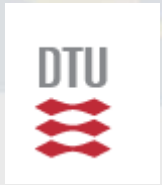
A group of end users taking responsibility for putting resources together to support ongoing work on the standard

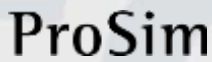
Making a visionary idea a reality



The CAPE community behind CAPE-OPEN

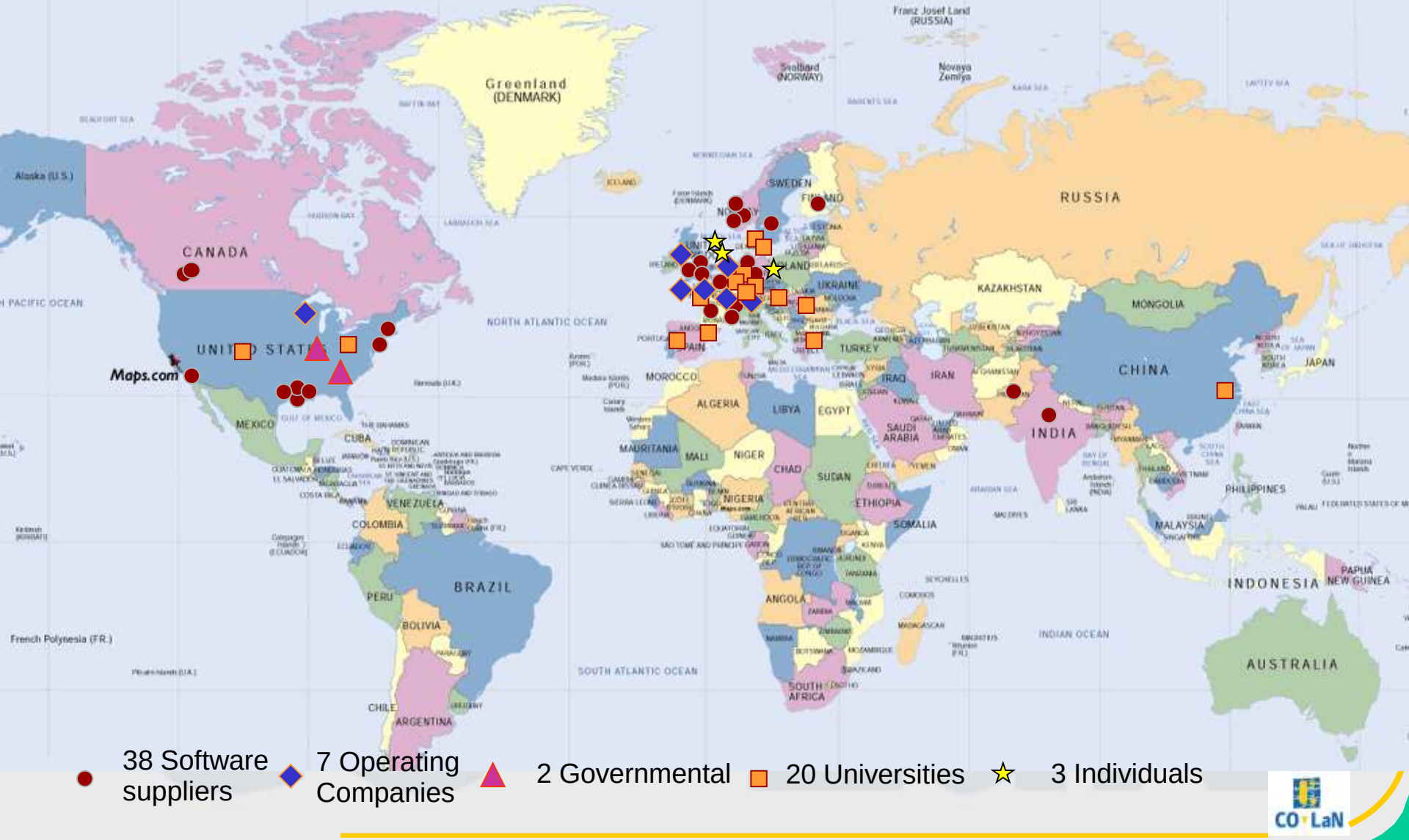






And quite a few more

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?

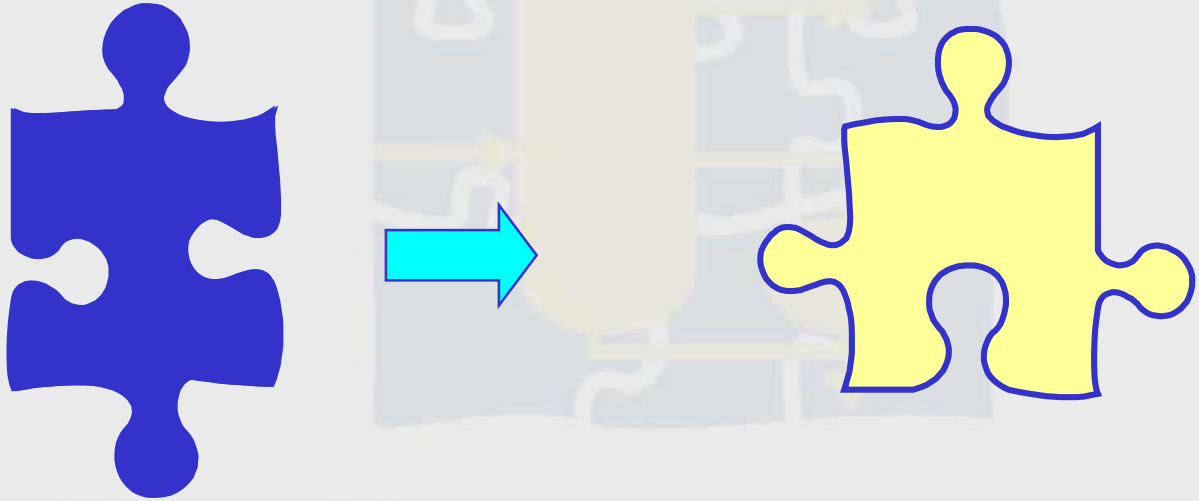
- BP uses HTRI software in any process simulator
  - Detailed heat exchanger models
- Dow uses Aspen Properties in gPROMS models
  - Advanced thermo models in detailed reactor models
- Air Liquide uses Simulis Thermodynamics models in all process simulators
  - Standardization of thermo models within 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?

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

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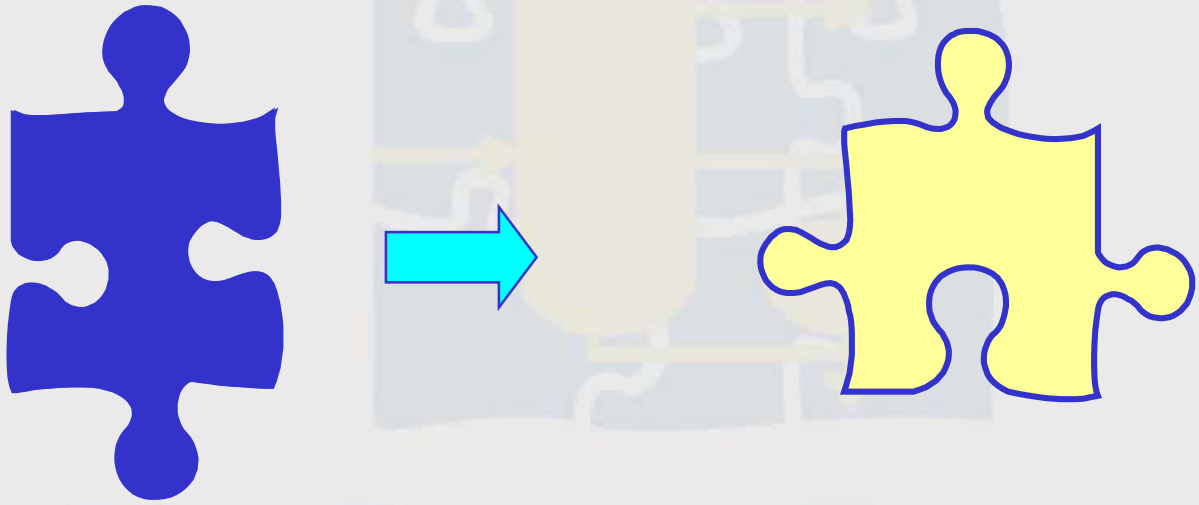
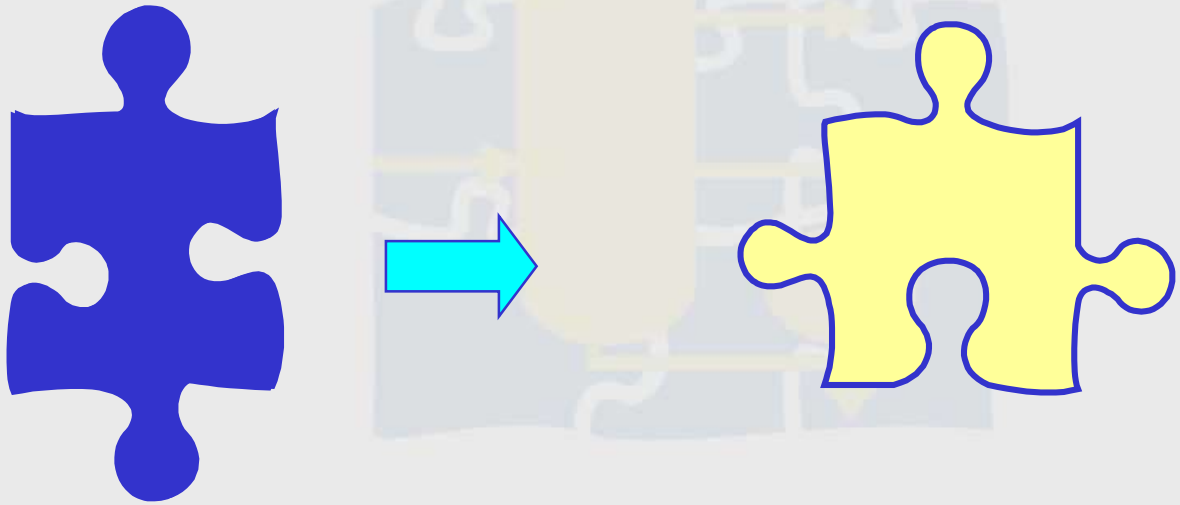


The most appropriate Thermodynamic model for a project:
Commercial
In-house R&D
Academic R&D

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

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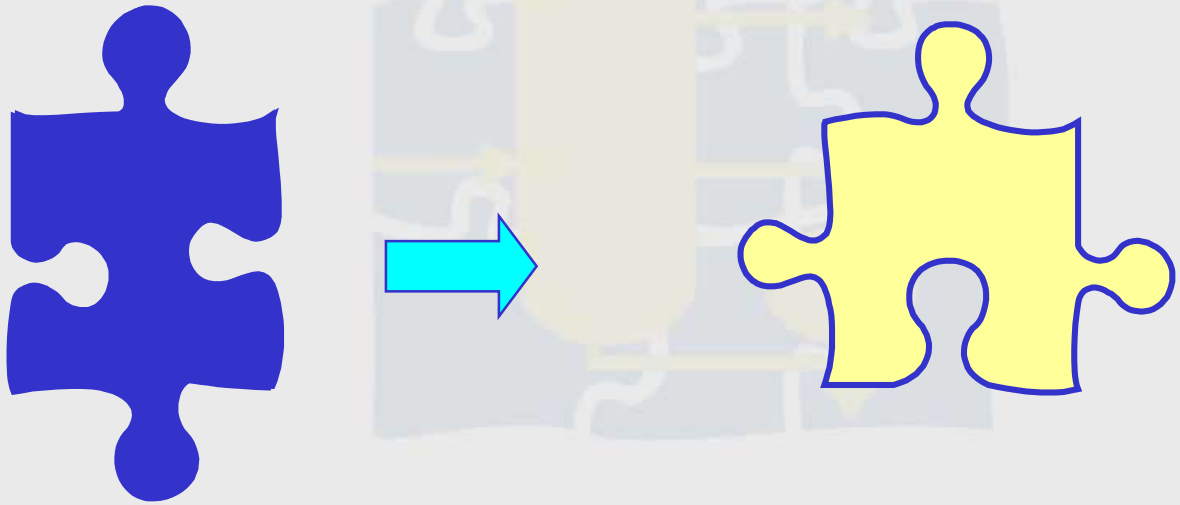

The most appropriate Unit operation model for a project: Commercial, In-House R&D, Academic R&D

The process simulator used in my company

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?