How CAPE-OPEN technology is put to use

Michel Pons

Chief Technology Officer

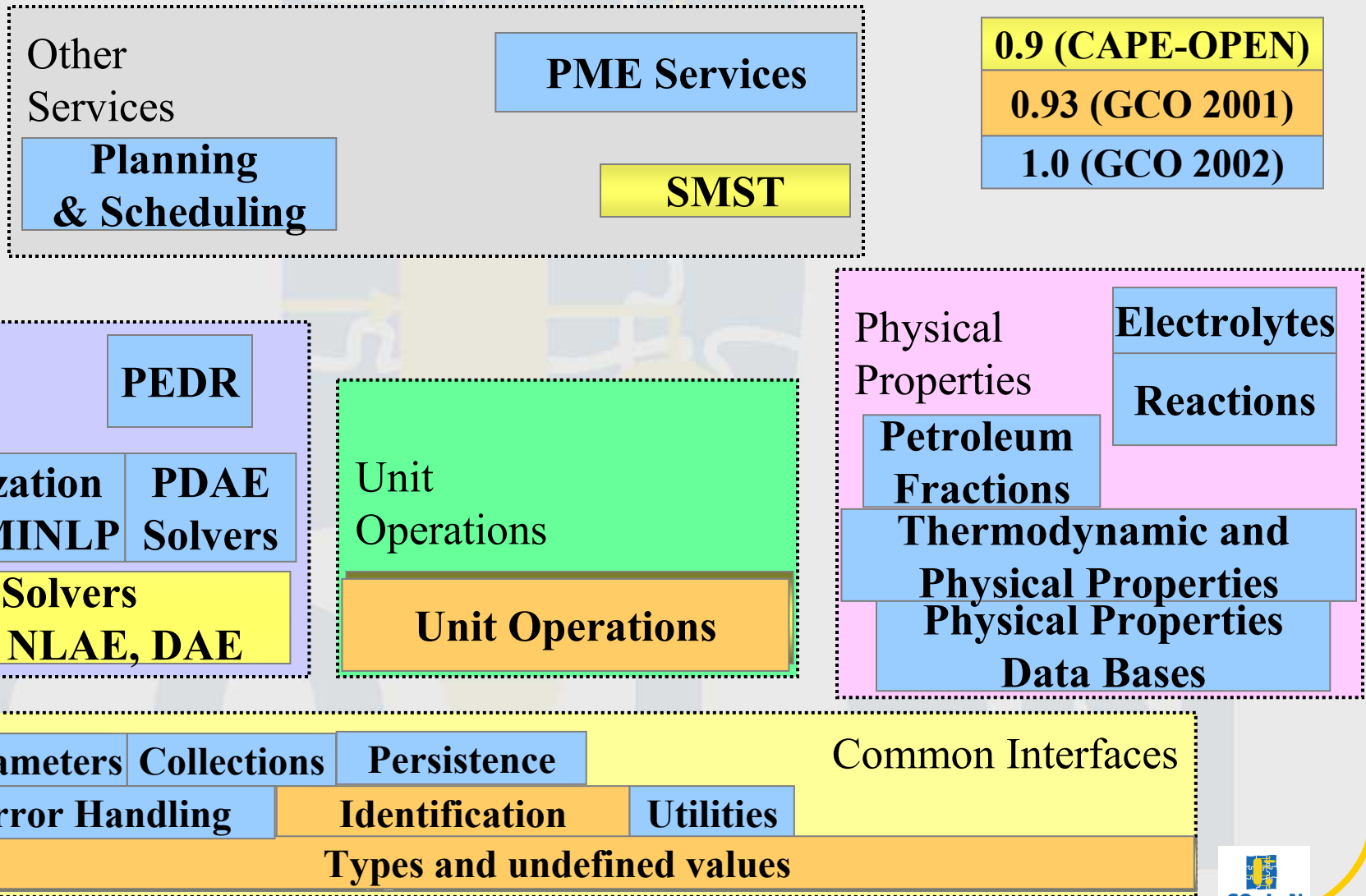**Calgary, August 21, 2006**

CAPE-OPEN: a technology for integration

♦ **A <u>freely</u> available industry standard for interfaces between software components making up process simulation tools**

♦ **A proven IT technology implemented in most process simulation tools**
- ➲ **Aspen Plus (AspenTech)**
- ➲ **Simulis Thermodynamics (ProSim SA)**
- ➲ **gPROMS (Process Systems Enterprise)**
- ➲ **Unisim Design (Honeywell)**
- ➲ **Xchanger Suite (HTRI)**
- ➲ **PRO/II (SimSci-Esscor)**
- ➲ **VMGThermo (Virtual Material Group)**
- ➲ **MultiFlash (Infochem)**
- ➲ **….**

CO interfaces releases

Other Services

PME Services

Planning & Scheduling

SMST

0.9 (CAPE-OPEN)
0.93 (GCO 2001)
1.0 (GCO 2002)

Numeric

PEDR

Optimization MILP, MINLP

PDAE Solvers

Solvers LAE, NLAE, DAE

Unit Operations

Unit Operations

Physical Properties

Electrolytes

Reactions

Petroleum Fractions

Thermodynamic and Physical Properties

Physical Properties Data Bases

Parameters | **Collections** | **Persistence**

Common Interfaces

Error Handling | **Identification** | **Utilities**

Types and undefined values

CO▾LaN
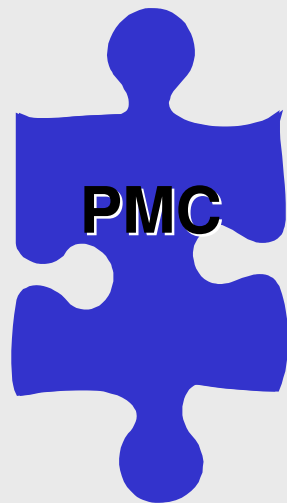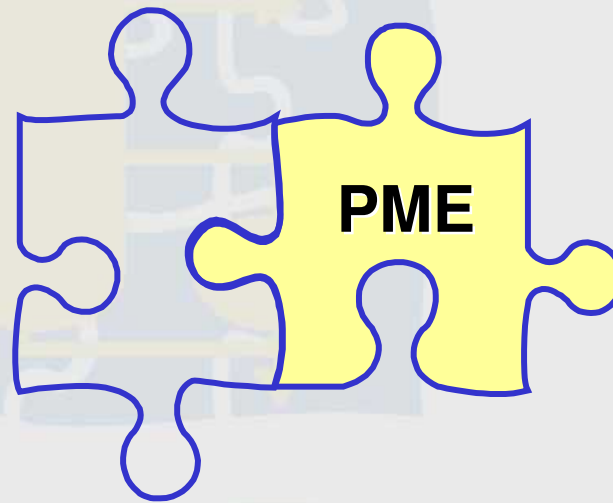
CAPE-OPEN Thermodynamic socket

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

PMC

PME

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

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

Usages

- ◆ **Once developed as a CO compliant Property Package, no additional coding required for using a component:**
  - ➲ **Works the same way everywhere**
- ◆ **Performance:**
  - ➲ **As for any interface, heavily depends on implementation: 3% overhead in best case so far**
- ◆ **Examples:**
  - ➲ **Air Liquide proprietary thermo models embedded in Simulis Thermodynamics as CO Property Packages**
  - ➲ **Shell proprietary thermodynamic models embedded in SPPTS**

Major result in heat exchanger domain

♦ **Thermodynamic consistency through the workflow.**

➲ **Same thermodynamic model used**

- **In process simulation (heat and mass balances)**
- **In detailed heat exchanger design**
- **In mechanical design?**

♦ **Thermodynamic models can be sent around together with Xist input/output data.**

CAPE-OPEN Unit Operation socket

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

PMC

→

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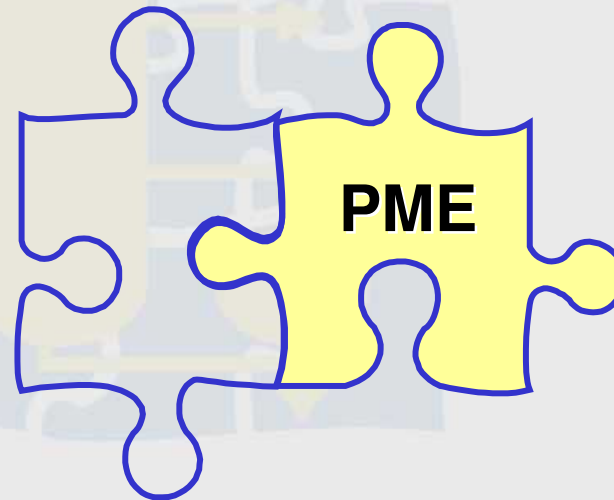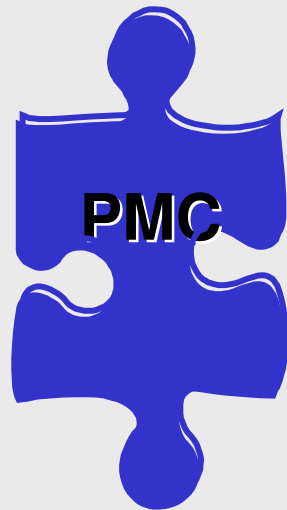
CAPE-OPEN PME:
Aspen Plus,
Aspen Hysys,
UniSim Design,
INDISS,
ProSim Plus,
PRO/II,
COFE

External CO Unit Operations:
(XChanger Suite,
Fluent models,
gO:CAPE-OPEN models,…)

CO▾LaN

Usage

♦ **Dow proprietary reactor models developed under gPROMS used within Aspen Plus.**

♦ **Alstom Power proprietary models developed under Fluent used within Aspen Plus by US DOE.**

♦ **IFP-TOTAL proprietary pipe models used within INDISS (RSI), PRO/II (SimSci-Esscor) and Aspen Hysys (AspenTech).**

♦ **Wizards made available to encapsulate quickly proprietary unit operation software codes into CO compliant Unit Operations**

  ➲ **Visual Basic, C++, Fortran, Delphi Borland**

Major result in heat exchanger domain

♦ **Impact of detailed heat exchanger design can be considered within a process simulation tool**

  ➲ **Available already with Xchanger Suite**

  ➲ **Why not also for mechanical design tools?**

*Expanding Process Modeling Capability
through Software Interoperability
Standards*

CO-LaN
CAPE-OPEN Laboratories Network

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

53 members as of August 2006

27 Software suppliers · 7 Operating Companies · 2 Governmental · 14 Universities · 3 Individuals
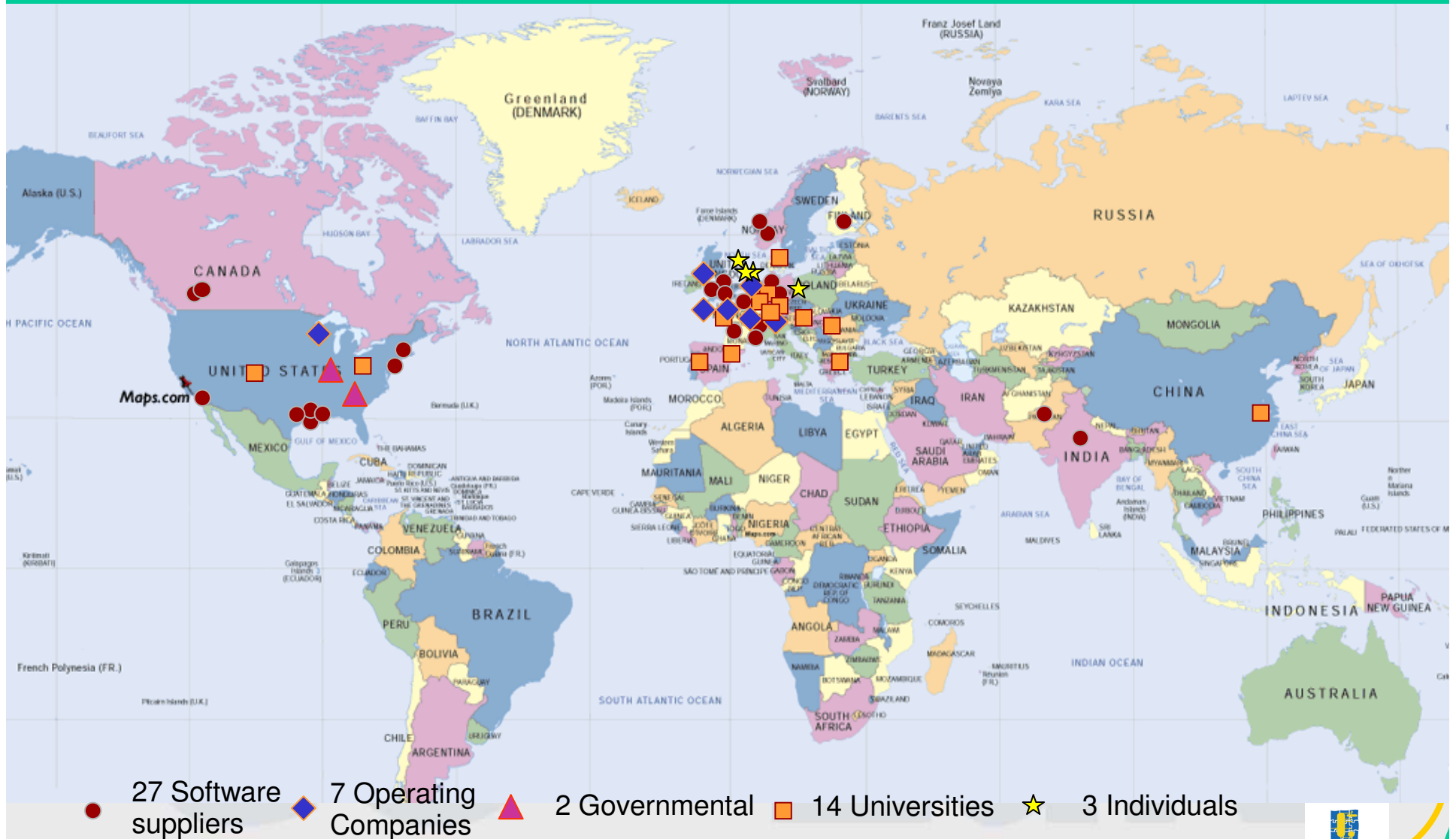
CO·LaN

Activities

♦ **Disseminate**

➲ **Web site, documents, CO Update Newsletter.**

➲ **« CAPE-OPEN Tour » days.**

♦ **Develop independent testers and support tools**

➲ **CO-LaN Tester suite, wizards, logger.**

♦ **Facilitate interoperability**

➲ **Use software made available in any combination.**

➲ **Sponsor consultancy by CAPE-OPEN experts.**

♦ **Organize targeted Special Interest Groups on standards**

➲ **Trigger projects.**

➲ **Open to all members.**

How CAPE-OPEN technology is put to use

Come and see CAPE-OPEN works