

Tools available for support to migration to CAPE-OPEN standard



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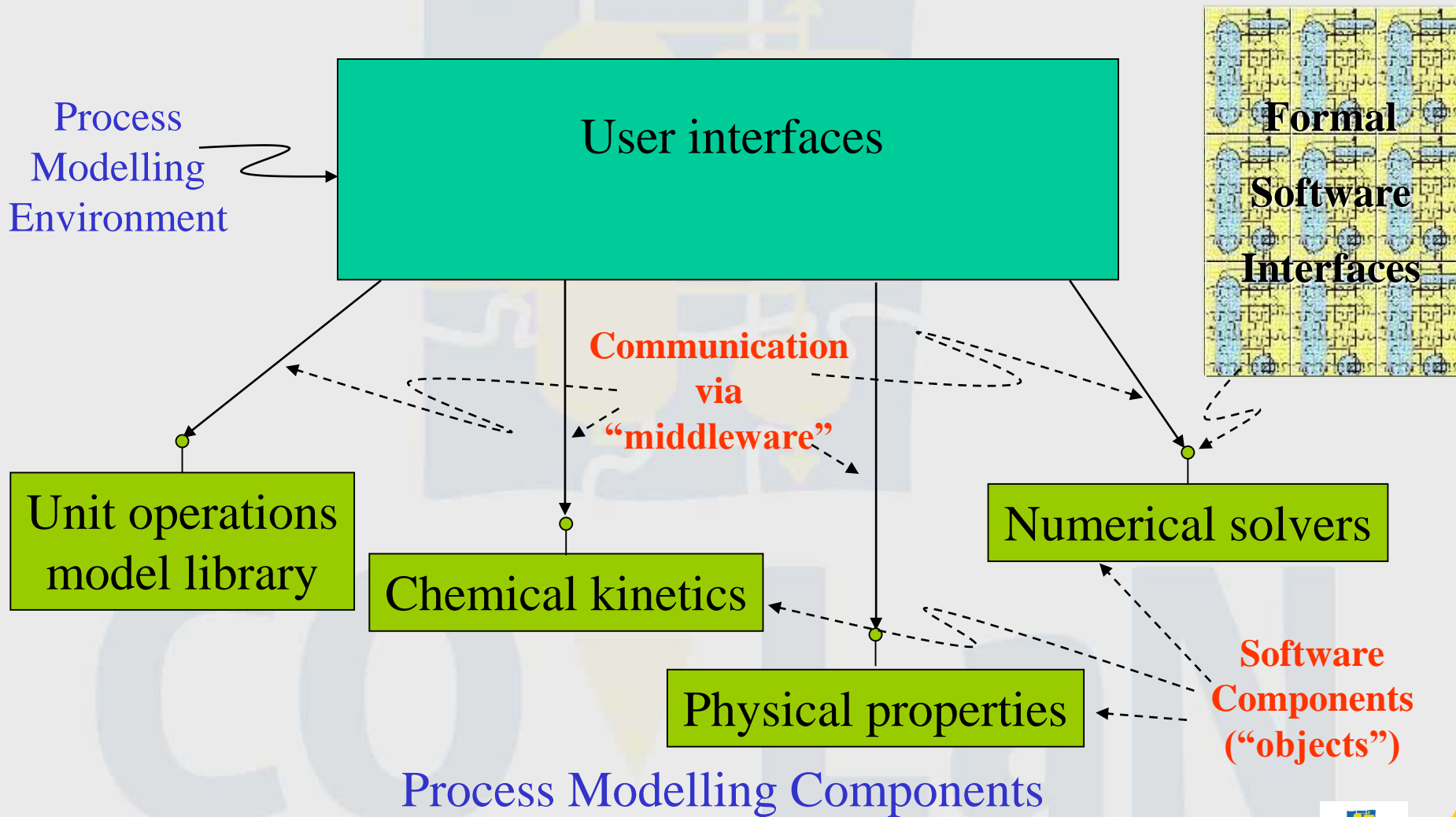
ICheaP-7, Giardini di Naxos – Taormina, 15-18 May 2005



Outline

- **Introducing CAPE-OPEN**
- **Presenting tools available**
 - ⇒ **Documents**
 - ⇒ **Software**
 - ⇒ **Actions**
 - ⇒ **Meetings**
- **Conclusion & perspectives**

CAPE-OPEN



CAPE-OPEN documentation set

Other
Services

External Interaction
Session

Planning
& Scheduling

Operations
& Control

SMST

Numeric

PEDR

Optimization
MILP, MINLP

PDAE
Solvers

Solvers
LAE, NLAE, DAE

Unit Operations

Hybrid Units

Unit Operations

Physical
Properties

Electrolytes

Reactions

Petroleum
Fractions

Thermodynamic and Physical
Properties

Physical Properties
Data Bases

Common Interfaces

Parameters Collections

Persistence

Error Handling

Identification

Known Objects Utilities

Types and undefined values



Adoption is steadily growing

- **Thermodynamic components**
 - ⇒ PPDS (TUV-NEL), SIMULIS (ProSim), CPA (IVCSEP), MultiFlash (InfoChem), VMGThermo (VMG)
- **Unit Operations components**
 - ⇒ Xist (HTRI), ChemSep, Shortcut Toolbox (AixCAPE), gO: CAPE-OPEN (PSE), Fluent
- **Solvers**
 - ⇒ IPOPT (CMU)
- **Process simulators**
 - ⇒ Aspen Plus, HYSYS.Process, Aspen Distil, PRO/II, ChemCad, INDISS (RSI), D-SPIICE (Fantoft)

A software market is developing based on CAPE-OPEN (CO) software components

Helping developers

- **Migration cookbook**
 - ⇒ **Strategy of CAPE-OPEN implementation**
- **Optimization tricks for COM CO components**
 - ⇒ **Addresses CPU performance issues**
- **Wizards**
 - ⇒ **Provides quick wrappers for UNIT and Thermo**
- **Tester suite**
 - ⇒ **Checks CO compliance of software components**
- **Consultancy scheme**
 - ⇒ **Provides CO expertise at no cost**
- **Interoperability workshops & targeted conferences**
 - ⇒ **Gathers current and would-be CO developers**

Migration cookbook (public document)

- **Propose goals**
 - ⇒ Migrate the legacy system as a whole or decompose it during migration ?
- **Discuss issues**
 - ⇒ Check whether documentation is available and up-to-date
- **List possible strategies**
 - ⇒ Automated code generation, copy & paste approach, wrapping approach, full reimplementation
- **Show paths**
 - ⇒ Middleware, language integration

Optimization tricks (for members only)

	Workaround	Improves
GetComponentList	Reuse of SafeArrays	19%
GetProp	Reuse of SafeArrays	10.7%
String comparison	Case insensitiveness	1.3%
String comparison	Keep internal numbers/enum	3.5%
String comparison	Use a custom method	20%
Compiler optimization	Setting the right compiler options	37%

UNIT Wizard purpose

- **Make it simpler and faster for an engineer to build a CAPE-OPEN compliant unit operation model using the Microsoft COM version of the interface standards**
 - ⇒ **Simpler because:**
 - **No need to know as much about COM as an engineer trying to develop a unit operation from scratch would.**
 - ⇒ **Faster because:**
 - **The tool generates a complete Microsoft Visual Basic project, to which the engineer only needs to add a user interface form, a calculation routine and a validation routine.**

Example of Parameter details

The screenshot shows a dialog box titled "Parameter Details" with a close button (X) in the top right corner. The dialog contains the following fields and controls:

- Name:** A text input field containing "TRAY_TYPE".
- Description:** A text input field containing "Type of trays".
- Type:** A dropdown menu with "Option" selected.
- Default value:** A dropdown menu with "Sieve tray" selected.
- Option List:** A list box containing three items: "Dual flow" (highlighted in blue), "Sieve tray", and "Bubble tray".
- Restrict parameter value to options list:** A checked checkbox.
- Buttons:** "Add", "Edit", and "Delete" buttons are located to the right of the Option List. "OK" and "Cancel" buttons are at the bottom of the dialog.

UNIT Wizard

- Helps developers get started with new Unit Operations
 - ⇒ Creates a Visual Basic Project
 - ⇒ Creates an Install/Uninstall program
 - ⇒ Developer has to complete:
 - **Validate method**
 - **Calculate method**

- AspenTech made the Wizard freely available

- Downloadable from CO-LaN website

CO Tester Suite: general purpose

Self-testing of PMCs

- **Help to software development**
 - ⇒ **Preliminary debugging**

- **Screening before consultancy action**

- **Screening before use**
 - ⇒ **Provide details on software components**
 - **Property Package chemical compounds, properties, phases, etc...**

CO Tester suite: technical description

- **Stand-alone Windows application**
- **Provided with Install and Uninstall**
- **Developed in Visual Basic 6.0**
- **Graphical User Interface**
- **Contextual help**

CO Tester main features

Launch of Basic test

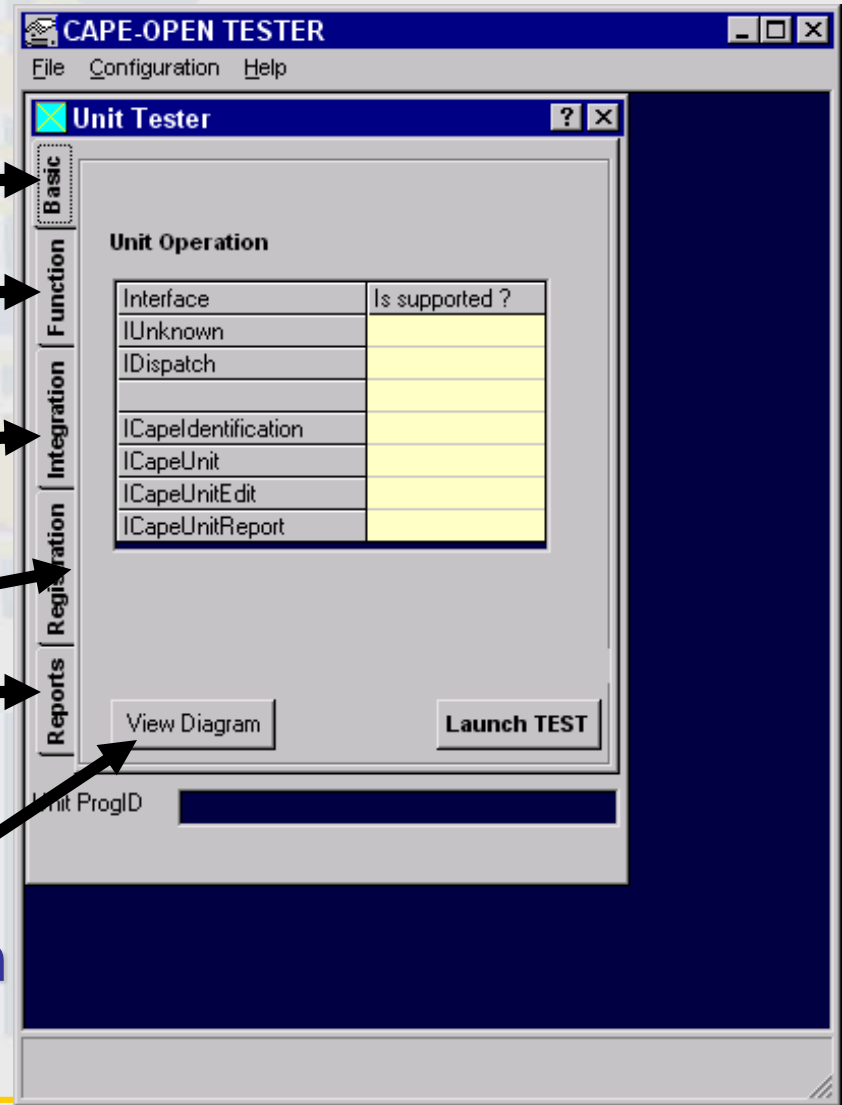
Launch of Function test

Launch of Integration test

Selection of component to test

Access to reports

Corresponding Interface Diagram



CO Tester reports

```
File Edit : D:\CAPE-OPEN\TESTER\CAPEOPENVALIDATIONNR... X
File
*****
CAPE-OPEN VALIDATION TESTS: BASIC
*****
Time: 31/10/00 15:10:22
IDL: VERSION 0.9
*****
STARTING TEST
Instantiating : ATCOMixNSplit.MixNSplit
COM Interfaces are supported by this Unit Operation
ICapeIdentification Interface is supported by this Unit Operation
ICapeCapeUnit Interface is supported by this Unit Operation
ICapeCapeUnitEdit Interface is supported by this Unit Operation
ICapeCapeUnitReport Interface is supported by this Unit Operation
*****
```

Unit Tester [?] [X]

Basic | **Function** | **Integration** | **Registration** | **Reports**

Unit BASIC test report available

View Report

View Report

View Report

View Report

Unit ProgID: CO.Fiber.1

Reporting done in plain ASCII text files

CO Tester in perspective

- Targeted
 - ⇒ UNIT, THRM, PPDB, SMST, MINLP interfaces
- Downloadable from CO-LaN website
- Applicable to COM components
- Development
 - ⇒ Initially done by IFP
 - ⇒ Then contracted by CO-LaN to:
 - Adduce GmbH
 - ProSim SA
 - University of Catalunya
- An on-going development from CO-LaN

Consultancy Scheme

- CO-LaN recognizes the need for expert advice in implementing CAPE-OPEN interfaces
- Four CO consultants have been selected and approved by CO-LaN: AspenTech, UPC, RSI, INPT-ENSIACET
- Up to two days of consultant time paid up by CO-LaN per action
- Since mid 2004:
 - ⇒ ShortCut toolbox (AixCAPE e.V.)
 - ⇒ SolidSim (TUHH project leader)
 - ⇒ ChemSep (ChemSep.org)
 - ⇒ CosmoTherm (Cosmologic GmbH)

Interoperability workshops

- One-to-one Interoperability tests needed between CAPE-OPEN plugs and sockets
- Focused discussions in small groups



Annual event organized by CO-LaN

LaN



US Annual CAPE-OPEN meetings

□ Series of events

- ⇒ August 04, hosted by US E.P.A.
- ⇒ 2nd event: May 05, hosted by US D.O.E.

□ Targeted at

- ⇒ explaining CAPE-OPEN
- ⇒ showing CAPE-OPEN working
- ⇒ launching implementation initiatives
 - Chemstations with ChemCad
 - ChemSep.org with ChemSep
 - Carnegie Mellon University with IPOPT

Conclusion & perspectives

- **Tools, documents, meetings are available to help implementation of CAPE-OPEN technology**
- **Never sufficient: new tools needed**
 - ⇒ **CO-LaN has begun development of a CO logger.**
 - ⇒ **Acts in between a Process Modeling Environment and a Process Modeling Component.**
 - ⇒ **Logs automatically all interactions through CAPE-OPEN interfaces.**
 - ⇒ **AspenTech contracted for prototype development.**
 - ⇒ **Prototype version already available and distributed to PSE, SimSci-Esscor, HTRI, RSI, SHMA, Shell.**



Thank you
Questions?

CO  LaN

