

CO-LaN Activities Report 2017/2018

**CAPE-OPEN 2018 Annual Meeting
BASF, Ludwigshafen, Germany
October 10, 2018**

CO-LaN Activities Report 2017/2018

CO-LaN Overview

- Current Members & Management Board
- Contracts and Software Licences

Usage & awareness

- Website, forum, new publications, wiki & training
- Survey

Special Interest Groups: overview and deliverables

Strategic activities:

- CAPE-OPEN certification
- Consultancy Service Scheme
- CAPE-OPEN middleware (COBIA)

CO-LaN Overview – Membership

❑ More than one hundred Members

- 6 Full Members
- 79 Corporate Associate Members
 - 49 Suppliers
 - 27 Academics
 - 3 Public & Federal Agencies
- 22 Individual Associate Members

❑ New members and new representatives 2017/18

- Peter Nellen, independent consultant.
- AVEVA (Krishna Penukonda), Belsim (Julie Couturier), Honeywell (Rasool Barouni), OGT (Nate Hatcher), TU Berlin (Erik Esche)

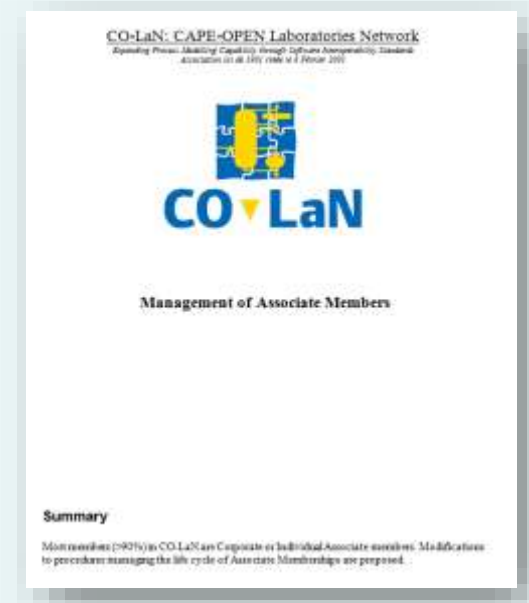
CO-LaN Overview – Membership

❑ CO-LaN appreciates very much the activity shown by a number of Members.

❑ CO-LaN expects each Member to contribute to its missions.

❑ Active Members sustain the life of CO-LaN

CO-LaN prepared a Memo on internal rules to support these objectives.



CO-LaN Overview – Membership

Objective:

- ❑ Ensure continuity of communication
- ❑ Increased participation of individual Associate Members
- ❑ Management of evolving interest in CAPE-OPEN

Proposed procedure:

- ❑ Approval of new members
- ❑ Annual confirmation of Associate Membership
- ❑ Cancellation of Associate Membership (e.g. 3 inactive years)
- ❑ Activity tracking

Timeline

- ❑ Memo published on website
- ❑ Comments are strongly encouraged
- ❑ Final internal regulations to be approved at AGM 2019.

CO-LaN Overview - Management Board

- ❑ Responsible for day to day running of CO-LaN
- ❑ Composed only of representatives of Full Members
- ❑ **Management Board (current)**
 - Shell Global Solutions Richard Baur (President and Secretary)
 - Air Liquide Philippe Arpentinier (Treasurer)
 - BASF Peter Mauer
 - BP Mick Lee
 - Dow Isaiah Huang
 - Linde Oliver Koch

- ❑ **Monthly conference calls of 1½ h, plus twice yearly physical meetings and additional meetings on specific topics.**

CO-LaN Overview - Contracts & Licenses

Annual contracts awarded by CO-LaN

❑ Michel Pons Technologie, CTO

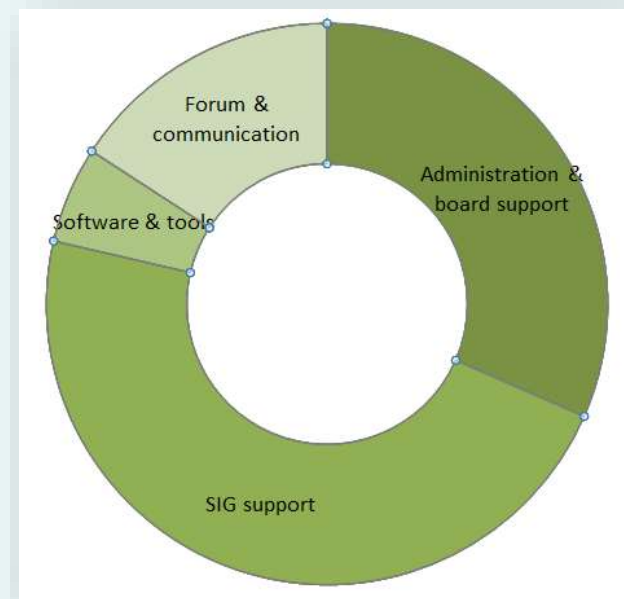
Administration, SIG management, interoperability testing etc.

❑ Michael Halloran

COLTT & Type Libraries/PIA

❑ Stenhouse Simulations Ltd

Secretarial support



Project related contracts awarded by CO-LaN

AmsterCHEM

COBIA phase II & consultancy service scheme (i.e. Intelligen project)

MRW Consulting

Project lead for certification & testing suite

Other services

COBIA training course by Jasper van BATEN and Peter NELLEN

CO-LaN Overview - Contracts & Licenses

❑ Licenses for testing & demonstration

All major vendors have continued to provide licenses to CO-LaN

For testing & demonstration purposes

Results of the testing are kept confidential to the vendor, the CO-LaN contractors and the Management Board

CAPE-OPEN usage and awareness

□ Numerous articles refer to, or use CAPE-OPEN, e.g.

- Prospects of using equilibrium-based column models in dynamic process simulation of post-combustion CO₂ capture for coal-fired power plant; *R Dutta et.al., Fuel 202 (2018) 85–97*
- Re-evaluating the CPA EoS for improving critical points and derivative properties description; *M.Palma et.al., Fluid Phase Equilibria 436 (2018) 85-97*
- Utilization of blast furnace flue gas: Opportunities and challenges for polymeric membrane gas separation processes *A. Ramirez-Santos, Journal of Membrane Science 526 (2018) 191–204*
- Automatic model reduction of differential algebraic systems by proper orthogonal decomposition; *Computers and Chemical Engineering 97 (2018) 104–113*

Extensive list of publications can be found

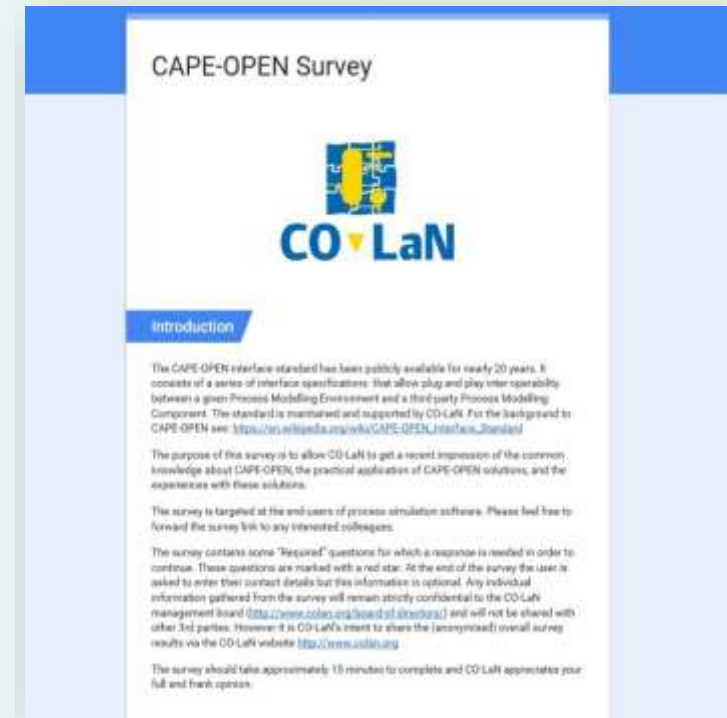
<http://www.colan.org/category/techpapers/>

CAPE-OPEN Survey

Objectives:

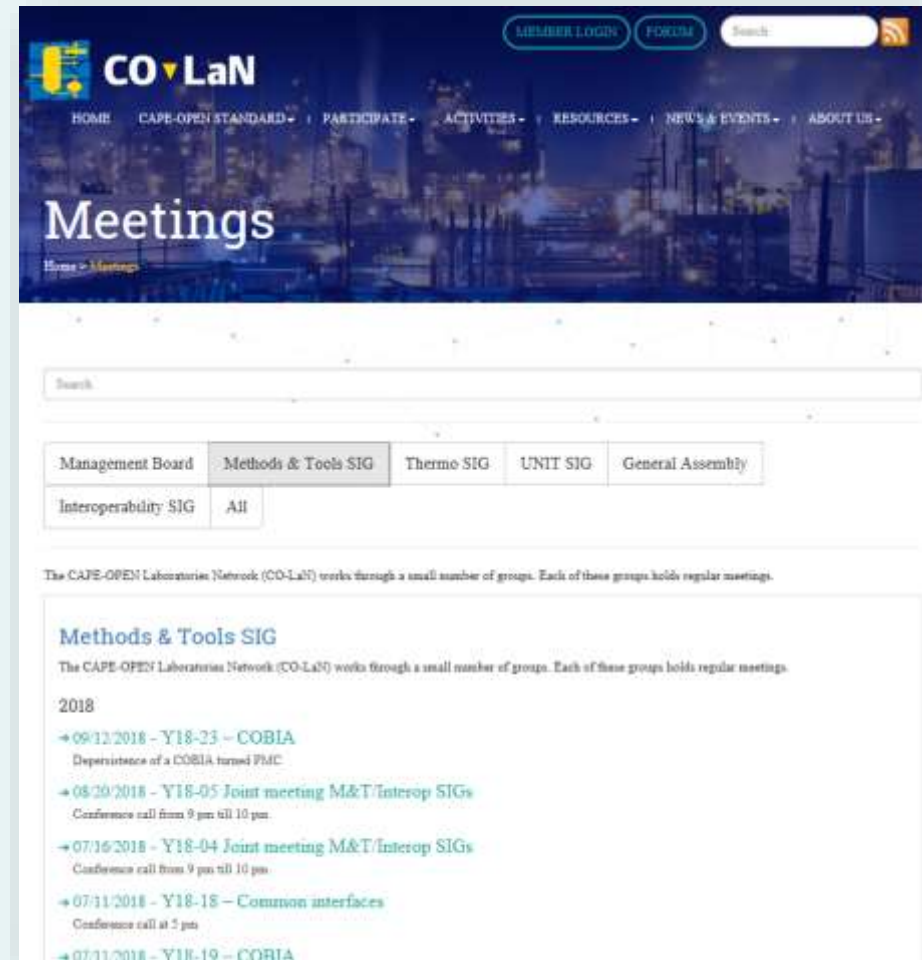
- ❑ Assess awareness of CAPE-OPEN and CO-LaN in the process simulation market
- ❑ Prioritise the future work of CO-LaN
- ❑ Identify interest in the work of CO-LaN and the SIGs

- ❑ Survey is still open! Please help us to distribute the survey to as many end-users as possible.



CO-LaN wiki & website

















- ❑ **CAPE-OPEN Wikipedia entry**
(last minor update June 2018)
- ❑ **Website: almost 1000 Posts**
 - Subscribe via RSS
 - Please browse and comment
 - Continuous update on SIG activities.
 - Check posts/entries about your PMEs and PMCs and contact CTO for up-dates



The screenshot displays the CO-LaN website interface. At the top, there is a navigation bar with the CO-LaN logo, a search bar, and links for MEMBER LOGIN, FORUM, and a search input. Below the navigation bar, the main heading reads "Meetings" with a sub-link "Home > Meetings". A search bar is positioned below the heading. A horizontal menu contains several categories: Management Board, Methods & Tools SIG (which is highlighted), Thermo SIG, UNIT SIG, General Assembly, Interoperability SIG, and All. Below the menu, a paragraph states: "The CAPE-OPEN Laboratories Network (CO-LaN) works through a small number of groups. Each of these groups holds regular meetings." The "Methods & Tools SIG" section is expanded, showing a list of meetings for the year 2018. The list includes: 09/11/2018 - Y18-23 - COBIA (Departure of a COBIA formed PME), 08/29/2018 - Y18-05 Joint meeting M&T/Interop SIGs (Conference call from 9 pm till 10 pm), 07/16/2018 - Y18-04 Joint meeting M&T/Interop SIGs (Conference call from 9 pm till 10 pm), 07/11/2018 - Y18-18 - Common interfaces (Conference call at 5 pm), and 07/11/2018 - Y18-19 - COBIA.

CAPE-OPEN forum

- ❑ Target audience: mainly developers
- ❑ In active use for support queries
 - Number of users: 201 (169 last October)
 - Number of topics: 363 (305)
 - Number of posts: 1858 (1640)
approx. one post per business day

GENERAL	TOPICS	POSTS	LAST POST
 Howto TAKE THE CAPE-OPEN SURVEY AND JOIN US AT THE CAPE-OPEN 2018 ANNUAL MEETING	7	12	by colancto  12 June 2018, 07:50
FORUM	TOPICS	POSTS	LAST POST
 Process Modelling Components Discusses use of CAPE-OPEN compliant Process Modelling Components Moderator: jasper	42	193	by jasper  21 August 2018, 09:00
 Process Modelling Environments Discusses use of CAPE-OPEN compliant Process Modelling Environments	251	1478	by Rodrigo  27 September 2018, 19:54
 Implementation and development	19	102	by jasper  31 July 2018, 16:40
 CAPE-OPEN Interface specifications	4	16	by bcbooo  04 September 2018, 08:43
 Activities of Special Interest Groups Contains discussion threads managed within each Special Interest Group at CO-LaN	24	29	by colancto  12 June 2018, 08:00
 Dissemination actions Discusses opportunities to communicate about use and implementation of CAPE-OPEN interfaces in PMCs and PMEs	14	16	by colancto  07 July 2018, 13:13
 News CAPE-OPEN related news	2	9	by jasper  25 September 2017, 07:21

Overview - SIGs

- ❑ **Responsible for maintenance and development of CAPE-OPEN interface standards**
- ❑ **Representatives of both Full and Associate Members**
 - **Interoperability**
 - Leader: Malcolm Woodman
 - **Methods & Tools**
 - Leader: Bill Barrett (USA EPA)
 - **Thermodynamics**
 - Leader: Sergej Blagov (BASF), Jasper van Baten (AmsterCHEM)
 - **Unit**
 - Leader: Krishna Murthy Penukonda (AVEVA)

Overview - SIGs

Involvement in SIG meetings represents:

- Thermo SIG: 8 man-hours per month
- Unit SIG: ½ man-hour per month (limited progress since Q2)
- Methods & Tools SIG: 6 man-hours per month
- Interoperability SIG: 1 man-hour per month

Plus whatever is done outside meetings...

Tendency is to do more outside online meetings

Overview - SIGs

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Thermo SIG progress report

❑ Custom Data interface specification

- Custom Data interface design revised and improved
- Request For Comments: new deadline is November 1st.

❑ Chemical Reactions interface specification v1.1

- Conventional heat of reaction: not suitable property for CAPE-OPEN
- Route to calculation of heat of reaction contribution documented
- Use Cases updated
- *Request For Comments* has been postponed.

❑ Errata Thermo 1.1

- Diffusion coefficients: unclear definition – round-table discussion

UNIT SIG report

- ❑ Refinement on the petroleum fraction specification continued
 - List of petroleum properties completed

- ❑ Limited progress due to other commitments of SIG members

- ❑ Back on track with regular meetings

Methods & Tools SIG

❑ COBIA

- Full native C++ implementation of COBIA Phase II
 - ⇒ Ready for release for testing and evaluation (Beta)
- Development of interface designs – to be finalized
 - ⇒ Parameters, Persistence, Reporting Interfaces
- Training session prior to this meeting
- Preparation for distribution of Phase II
 - ⇒ Distributions defined – installation specification to be finalized
 - ⇒ Licensing recommendation to management board.
- Scoping of Phase III planned for 2019.

❑ Interaction with Interoperability SIG

- Versioning, support to certification, COBIA testing against specs

❑ Flowsheet Monitoring interface specification

- Request For Comments starts November 1, 2018

Interoperability SIG

- ❑ CAPE-OPEN standard versioning
 - ⇒ Success criteria developed, consensus not yet reached on proposal, working with M&T

- ❑ Working with M&T on COBIA deployment

- ❑ Looking at a minor issue with TLB/PIA installer

- ❑ Self-certification moved to separate activity, led by Malcolm WOODMAN

- ❑ No development of CAPE-OPEN Logging and Testing Tool (COLTT)

- ❑ Discussion on middleware quality assurance: risks involved
 - ⇒ Mostly in place for documentation: Request For Comments process
 - ⇒ Not in place for software, e.g. middleware, COLTT, Type Libraries

Deprecating Thermo Version 1.0

Thermo Version 1.0 has been depreciated by Dec. 31st 2017

- ❑ CO-LaN has ceased Maintenance of Thermo v1.0 stopped (no more errata and clarifications; no more funding for projects)
- ❑ Advice from Interop/M&T SIG to stop the distribution for Thermo v1.0 in type libraries, PIAs beyond 2019 is still pending.

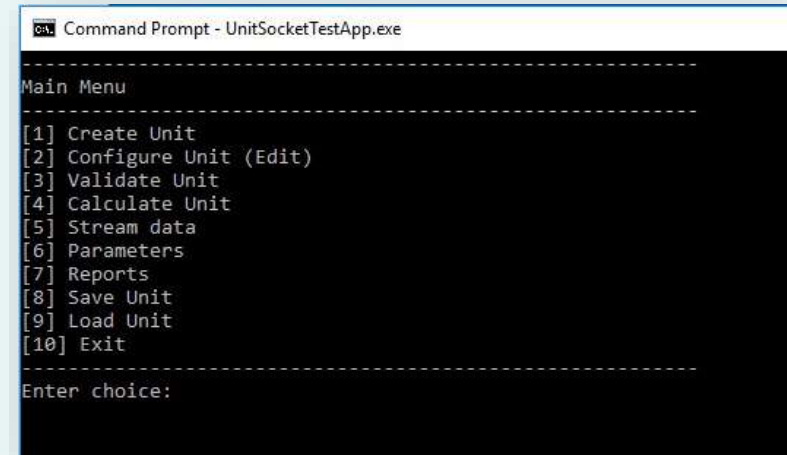
Challenges:

- Thermo v1.0 & v1.1 type libraries/PIAs are closely linked and cannot easily be separated.
- Documentation for v1.1 is not self-contained.

Consultancy Service Scheme (2017/2018)

Intelligent CAPE-OPEN socket delivered

- Example for CAPE-OPEN Unit Operation socket
- Command line driver of UO socket
 - To illustrate the implementation in SuperPro Designer
 - Thermo provided by Ideal Thermo Module (and earlier CO-LaN delivery)
- Documentation under development

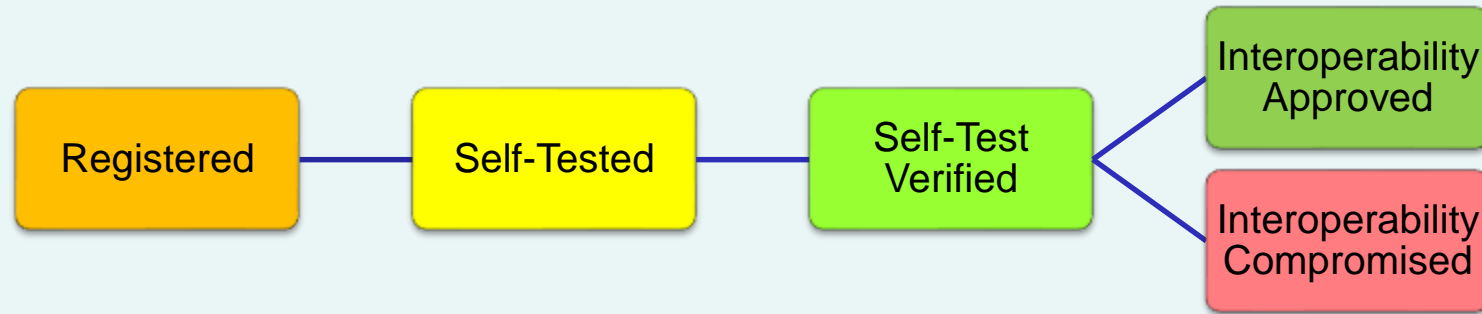


```
Command Prompt - UnitSocketTestApp.exe
-----
Main Menu
-----
[1] Create Unit
[2] Configure Unit (Edit)
[3] Validate Unit
[4] Calculate Unit
[5] Stream data
[6] Parameters
[7] Reports
[8] Save Unit
[9] Load Unit
[10] Exit
-----
Enter choice:
```

**Code of UO socket is an implementation example,
owned by CO-LaN, to be made available to Members**

Note, socket is as general as possible, however not all thermodynamic properties are implemented, no energy & information streams

CAPE-OPEN Certification



Contract with MRW Consulting established (July 2018)

Objectives

- ❑ Develop the charter
- ❑ Establish certification steering groups
- ❑ Define strategic plans
 - For the establishment of the Certification SIG
 - For the procedures of certification
- ❑ Commission the development of CAPE-OPEN self-testing suite prototype and develop prototype for one interface

COBIA development project

- ❑ **Phase I completed 2016: demonstrated feasibility**
- ❑ **Phase II delivered 2018: Beta version and documentation**
 - ❑ Officially approved & completed
 - ❑ Redesign of number of interfaces (strong data typing)
 - ❑ First prototype implementations

Decisions to be taken:

- ❑ Make COBIA an open-source project
or keep the project within the CAPE-OPEN community.
- ❑ Choose licensing scheme (e.g. MIT-license)

Distribution to membership once licence scheme resolved

Conclusions & Perspectives

❑ Review of Milestones from AGM 2017:

× CAPE-OPEN certification

- Develop charter for SIG
- Start to develop self-testing suite

✓ COBIA assessment of phase II

- Peter Nellen implemented a test Unit Operation.
- Training session delivered

✓ Consultancy Service Scheme 2018

- CAPE-OPEN socket delivered to Intelligen
- Prepared socket as example

Conclusions & Perspectives

Milestones for 2019:

□ CAPE-OPEN certification

- Develop charter for SIG
- Establish technical steering group
- Strategic plan for SIG formation

□ Testing Suite

- Develop vision for self-testing suite
- Commission prototype

□ COBIA phase III

- M&T SIG to refine implementation plan over the next years
- Start with implementation

□ Consultancy Service Scheme 2019

How you can help

- Develop your request for consultancy scheme 2019**
 - **Submit by January 31, 2019**
- Contribute to CAPE-OPEN certification process**
- Contribute solutions for CAPE-OPEN self-test suite**
- Evaluate and feedback on COBIA Phase II**
- Participate in SIGs and comment on specifications**
- Disseminate the CAPE-OPEN survey and encourage end-users to complete it**
- Promote CAPE-OPEN to your colleagues & customers**