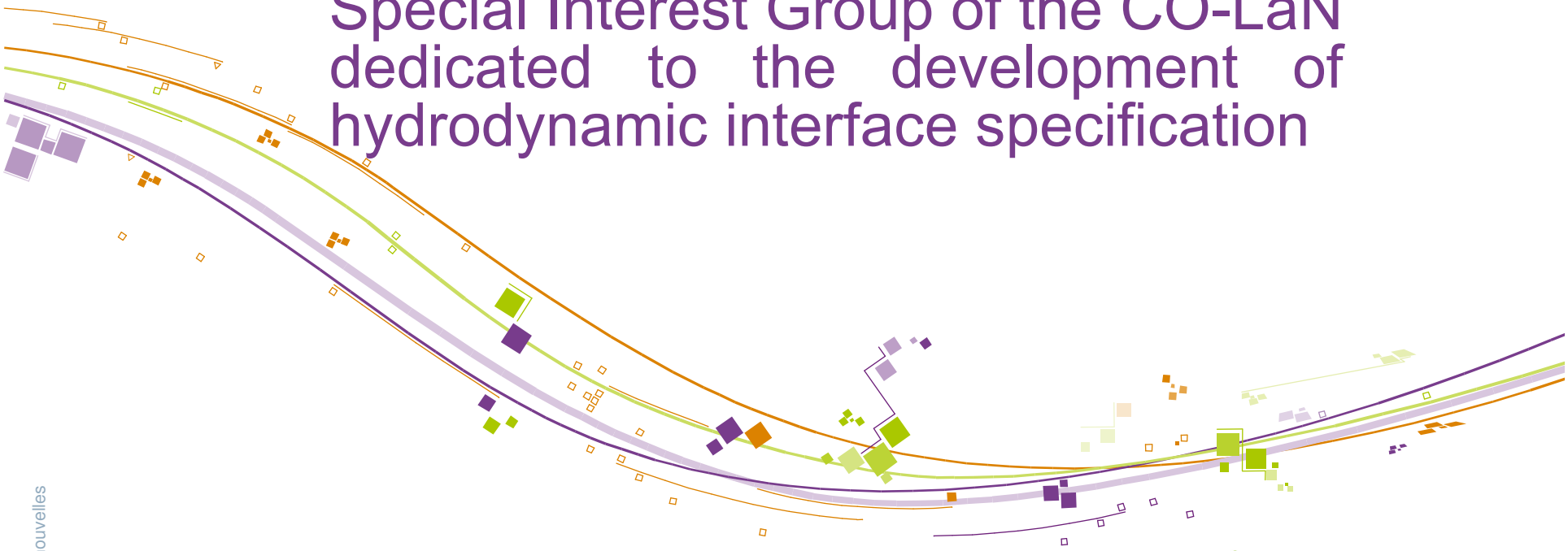
Hydro SIG

Special Interest Group of the CO-LaN dedicated to the development of hydrodynamic interface specification



CAPE-OPEN standard basics

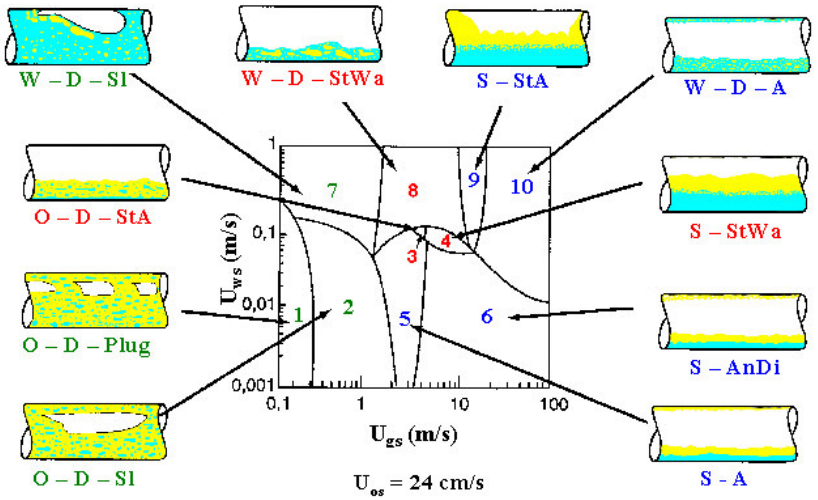
- CAPE-OPEN defines rules and software interfaces that allow CAPE (computer-aided process engineering) applications and components to interoperate
  - For Thermodynamic modules (Physical Property Packages)
  - For Unit operations (process equipment modules, sub-networks, ...)

- CAPE-OPEN adopted by most of the software industry involved in process simulation

- CO-LaN (CAPE-OPEN Laboratories Network)
  - Neutral industry and academic organization promoting the standard
  - Free use of the standard and documentations : www.colan.org
  - Special Interest Groups (SIGs) supervise standard evolutions
    - Thermo SIG, Unit SIG, Method and Tools SIG, Hydro SIG

Context

- Pipeline hydrodynamics
  - Multiphase flow through pipes



- Hydrodynamic Point Models
  - 1 dimension correlations for characterizing flow within a pipe element
    - Calculate phase hold-ups, Average pressure drop, Flow pattern, ...
    - Empirical models: Taitel, Beggs&Brill, ...
    - Semi-mechanistic models: OLGAS 2P/3P (SPTGroup), TACITE Hydro (IFP Energies nouvelles), Leda Point Model (SINTEF), Unified Model (TULSA university), academic developments
  - Correlations are used as closure laws by steady state and transient pipeline software modules

Objectives

- Why a software standard for hydrodynamic point models?
  - To make easier the use of hydrodynamics
    - "Plug and play" with hydrodynamic components

- How to specify software interfaces for hydrodynamic point models?
  - Define relationships between hydrodynamic components, unit operations and process modeling environment
  - Take into account multiphase flow specificities such as emulsion, solid, bed and deposit
  - Specifications should be as general as possible to take into account both developer's and user's needs

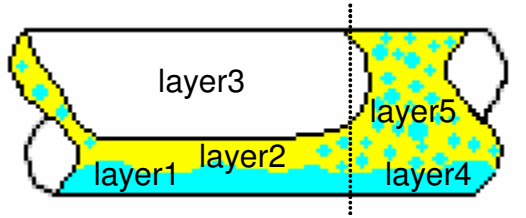
Hydro SIG charter

- Charter for 2010
  - Develop hydrodynamic interface specification
- Key Responsibilities
  - Manage the development of the hydrodynamic interface specification
  - Develop prototypes to prove the applicability of the standard
  - Contact organizations and companies that may be interested in hydrodynamic interfaces and propose then to join the SIG (CO-LaN membership mandatory)
- Deliverables for 2010
  - Didactic documentation to promote the utility of the standard
  - Document describing the hydrodynamic interface specification and the main scenarios of usage for these interfaces
  - Scope of work, responsibilities and planning for the implementation of prototypes
  - Prototypes implementing the interface specification

Accomplishment

- Current SIG members
  - IFP Energies nouvelles (SIG leader up to now), SPT Group, Total, Kongsberg O&G Technology, RSI-Dynamic Simulation Solutions, Infochem Computer Services, SINTEF
- A draft of specification document now completed
  - Glossary: standard based on Layer, Field and Phase concept
  - 10 Use Cases identified
    - UC-001: HPM
    - UC-002: HPM association
    - UC-003: HPM validation
    - UC-004: Hydrodynamic calculation
    - UC-005: Impose flow regime
    - UC-006: Hydrodynamic specific property calculation
    - UC-007: Input properties
    - UC-008: Delivered properties
    - UC-009: Calculation initialization
    - UC-010: HPM tuning
  - This document needs to be reviewed and accepted by a large group of organizations involved in hydrodynamics

Slug flow example



Present phases
water *liquid* *gas*

Layers		Fields	
Label	*layer_1*		
Volumetric fraction	value		
Field labels	*field_1*	**Label** *field_1*	
Volumetric fraction	value [1]		
Stratified | Annular	Stratified	**Phase labels**	*water*
Slug | Pocket | Continuous	Pocket	**Volumetric fraction**	value [1]
Dispersed	No	**Velocity**	value
Continuous field	*field_1*	**Emulsion**	No
Length Fraction	value	**Continuous phase**	*water*
Interface perimeters	values [1]		
Wet perimeter	value		

Current interfaces

- Hydrodynamic interfaces so far
  - Existing thermodynamic interfaces used if possible
  - Interface proposal

Current interfaces

- **Example**

Interface Name	ICapeHydroFlowRoutine
Method Name	**CalcFlow**
Returns	**CapeError**

Description
The Calculate method is used to compute the standard hydrodynamic properties: pressure drop, phase velocities and phase holdups.
Arguments

Name	Type	Description
[in] *specification1*	CapeString	First specification identifier for hydrodynamic calculation. below for details.
[in] *specification2*	CapeString	Second specification identifier for hydrodynamic calculation. below for details.
[in] *flowRegime*	CapeString	Specified flow regime identifier for calculation. May be UNDEFINED if no flow regime is specify for calculation.

How to participate

- To become a SIG member
  - Industrial/academic organization should become a Corporate Associate Member of the CO-LaN
    - Membership is open to all process companies, process simulation and modelling software suppliers as well as academic organisations using, developing CAPE tools
    - No member fee for Corporate Associate Member
    - In kind contribution by participating to the activities
      - Telecom meeting, review of document, testing, prototyping, ...

- For more information
  - Visit: www.colan.org
  - Contact
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Thank you for your attention!