



Remote operation of CAPE-OPEN compliant software

The Diabolo framework



About Halias

- Located in Grenoble, France
- Consulting & software development company
 - Scientific computing & software engineering
- Clients in process engineering, micro-electronics (simulation)
- Contact : contact@halias.fr / www.halias.fr

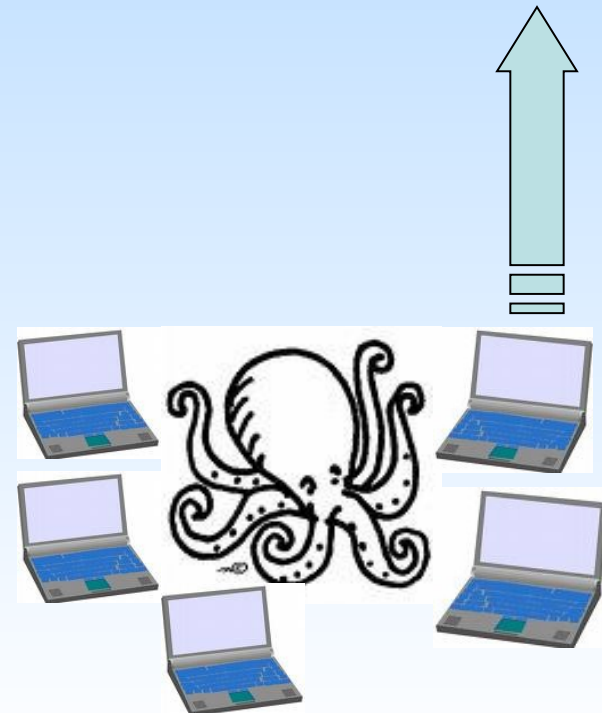
Motivations

- The user of software is generally physically using the computer the software is running on.
- There exist many situations where this is not a really pleasant experience 😊



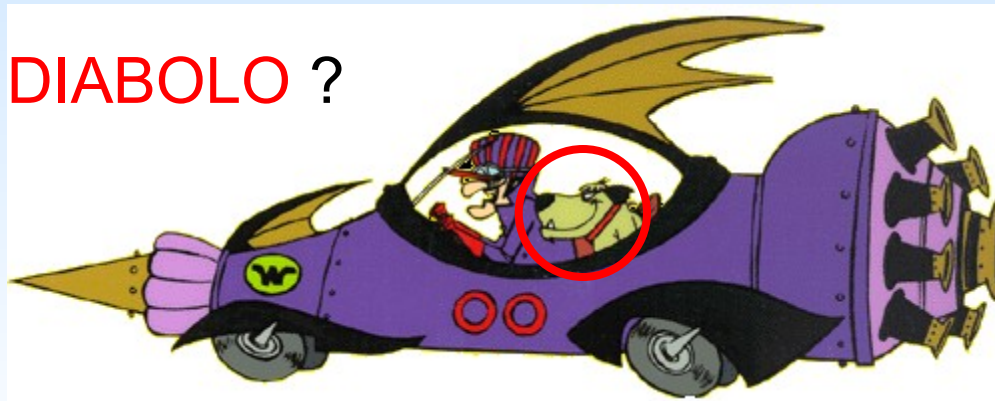
Motivations

- Many situations arise where users cannot simply use the computer which their simulation is running on
 - (really) big (super) computers
 - Many software at the same time
 - Economic models incompatibilities (Internet, ASP...)



Motivations

- We present the **DIABOLO** framework
 - open framework for data acces and visualization
 - works over the Internet
 - relies on standard protocols and tools
- Application in the Process Engineering domain
- Who is **DIABOLO** ?





Presentation Overview

- Motivations (done)
- The **DIABOLO** framework
 - Architecture and main features
 - Demo with COCO
 - Advanced features
 - Demos with INDISS
- Applications
- Conclusions



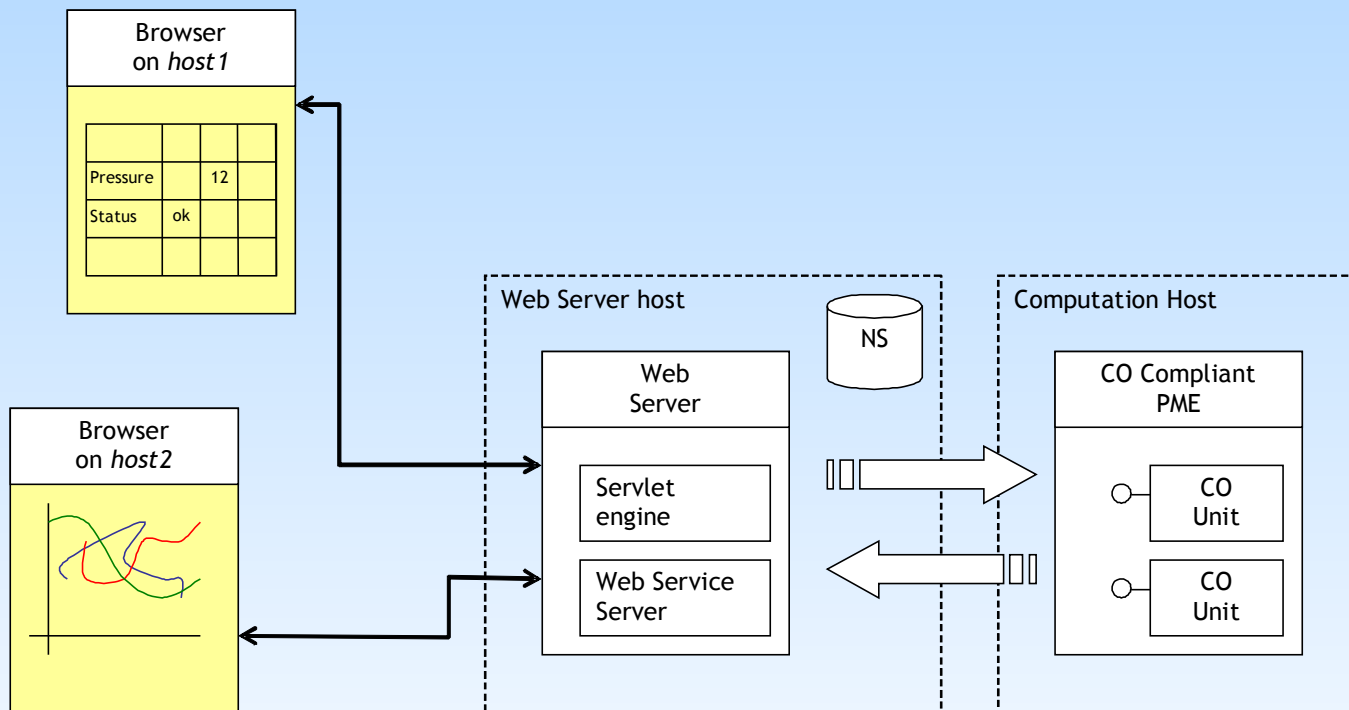
The **DIABOLO** framework Principles

- Provides mechanisms for communication between web applications and custom software for common visualization tasks ...
 - Client-side graphical elements and animation scripts (javascript)
 - Servlet engine : programmatic extensions
 - Webservice server : universal data access
- Standard tools and protocols
 - Client : Web navigator (Firefox, IE7)
 - Server : Apache (tomcat, axis)

⇒ Installs in virtually **any** network infrastructure



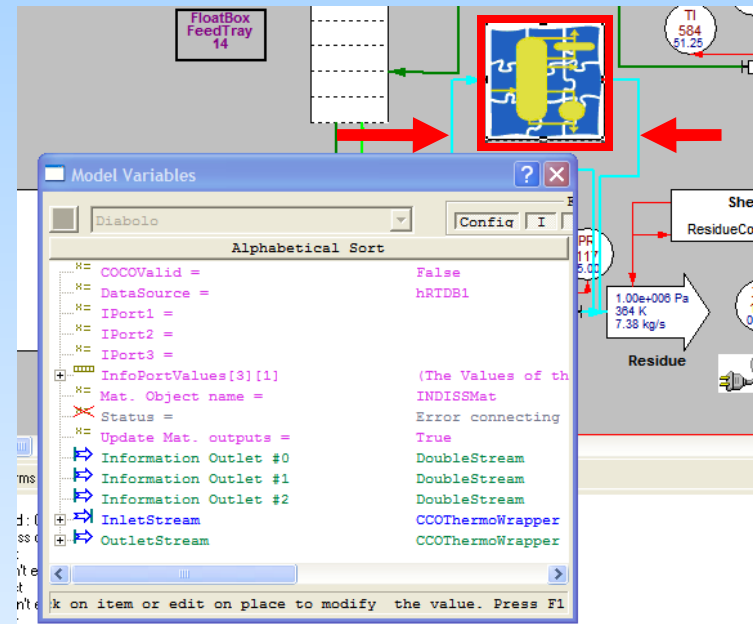
The **DIABOLO** framework architecture





The **DIABOLO** framework the CO Unit Operation

- Provides a DataSource abstraction
 - Read/Write, historized
 - Independent / the middleware
- Implementation of a DataSource as a CAPE-OPEN compliant Unit Operation co-developed with INDISS team (RSI)
 - DCOM version
 - ⇒ Provide access to the contents of Material Object, INFO Ports, ...
- Can be run with any CAPE-OPEN compliant PME
 1. Insert the UO in the flowsheet
 2. Connect the ports
 3. Watch results on the web



Valve

	Enter a value :
Valve opening	0.0

Results

Property name	Property Value	Unit
Pressure	101325.0	Pa
Temperature	300.0	K
mole Fraction [WATER]	0.25	

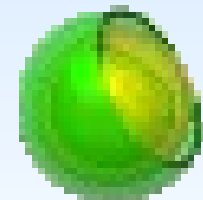


The **DIABOLO** framework features

- Basic features
 - Read/Write values
 - Presentation of values on “rich” tables
 - ⇒ **Application : Export contents of Input Material Port**

```
- <Cell>
  <Class>ValueCell</Class>
  <Type>Double</Type>
  <Access>Read</Access>
  - <Action kind="text">
    <Expr kind="eval" src="hRTDB1">Material.moleFraction[Ethane]</Expr>
  </Action>
</Cell>
```

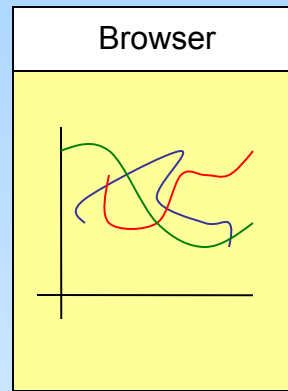
- Demo 1 ...
 - Instantiation of the **Diabolo** UO in COCO
 - Use of Material Ports
 - Custom Real-Time historized Database



The **DIABOLO** framework features

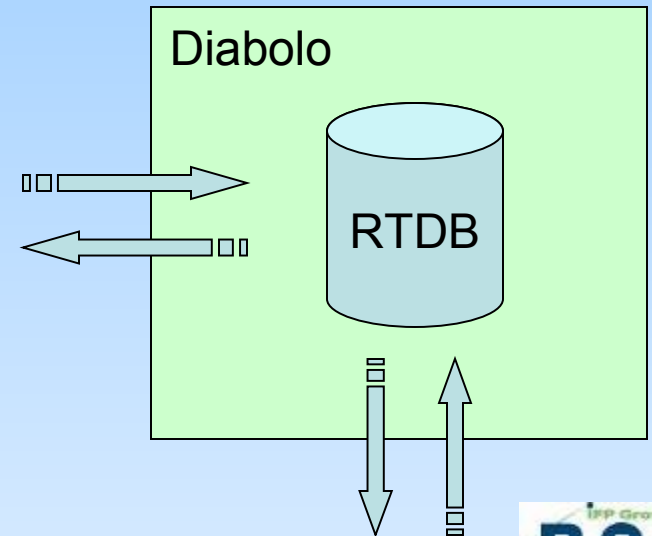
- Features

- Read / Write
- Display process trends

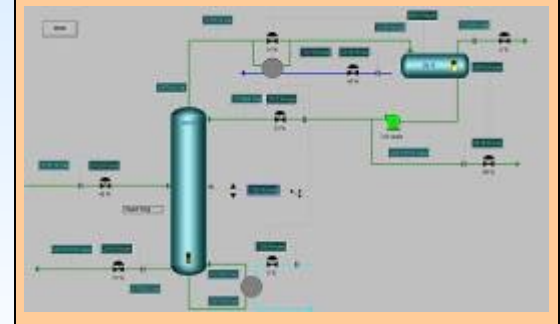


- Demo 2 ...

- Use with INDISS (dynamic simulation)
- Depropanizer simulated with INDISS
- **Diabolo** UO has *Dynamic* extensions
- RT-Curves **Diabolo** extension



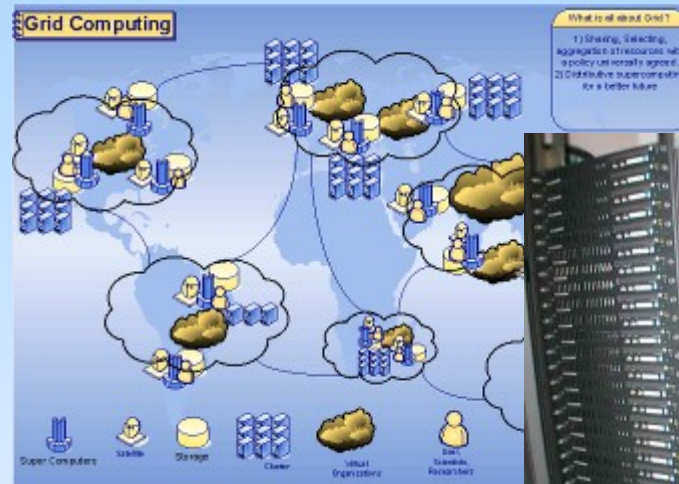
INDISS
Simulator



Application 1

High Performance Computing

- Hardware architectures
 - Supercomputers
 - Clusters
 - Grids
- Users do not have access to the computers
- Computers do not have graphical displays
- UNIX Operating systems (or exotic ones...)





Application 1

High Performance Computing

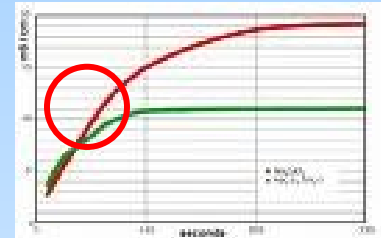
- Tasks that can be done with Diabolo
 - Computations configuration
 - Modification of some parameters of the Unit Operations
 - Thermo parameters
 - Solver configuration modifications
 - Graphical visualization of results
 - Reports
 - Curves
 - Graphical displays



Application 2

QA systems

- QA related tasks on a project, tests automation
 - Automatic comparisons of different versions
 - Non-regressions testings for a new integration :
Sub-flowsheets, CO components (thermo, UO), Solvers...
- Perform runs on different hosts, and compare with reference values
- Examples in micro-electronics
 - A test suite for a simulation tool is 10000 test cases !
 - Clusters of 20 PCs as target architecture for automatic tests of software vendors ...





Licensing model

- The DIABOLO framework has a year based license
- Customization of the framework for specific needs as fixed price software development and consulting services
- No other « hidden » license costs
 - Free tools
 - Usual Operating Systems (windows XP/linux)
 - No expensive client-side installations



Conclusions

- **Diabolo** is a commercial grade product
 - Can be installed as a network appliance
 - First on-site installation at the end of the month (process supervision)
 - Many business applications : HPC, QA, e-learning (SCORM) & ASP
- Support several hundreds of values / sec and can be further optimized
- About the CAPE-OPEN standard :
 - Practical application of the interoperability of software Components
 - Gain wide acceptance of our product from the Process Engineering community by allowing it to be used from major PMEs
- Many custom applications for process Simulation : contact@halias.fr for any inquiries !

Use with COFE

COFE - [Testatounet.fsd]

File Edit Insert Flowsheet Plot View Window Help

Unit operation Diabolo_204:

Status Edit Balance Ports Info

Parameter	Value	Unit
DataSource	hRTDB1	
Mat. Object name	Material	
Update Mat. outputs	False	
CCCDValid	True	
Status	Tags created	
IPort1		
IPort2		
IPort3		
InfoPortValues	<invalid value>	

Show GUI

warning: Material object error in SetProp: invalid calctype for fraction in SetProp; NULL expected
 [last message repeated 1 time]
 warning: Material object error in SetProp: invalid calctype for phase fraction in SetProp; NULL expected
 [last message repeated 1 time]
 warning: Suspect value for property heatcapacity (phase Liquid, calctype mixture, basis mole), index 1: 1.2669e+054
 converged in 1 evaluation
 Solve finished

Editing unit operation

NUM

08:18



View COCO values

Mozilla Firefox

Laurent.Testard

http://localhost:8080/RTDBPageServ/rtdb?l

Gmail GCal my Yahoo! Groups LinkedIn Google Press BD BD2 Blogs

MAIN COCO INDISS UTIL

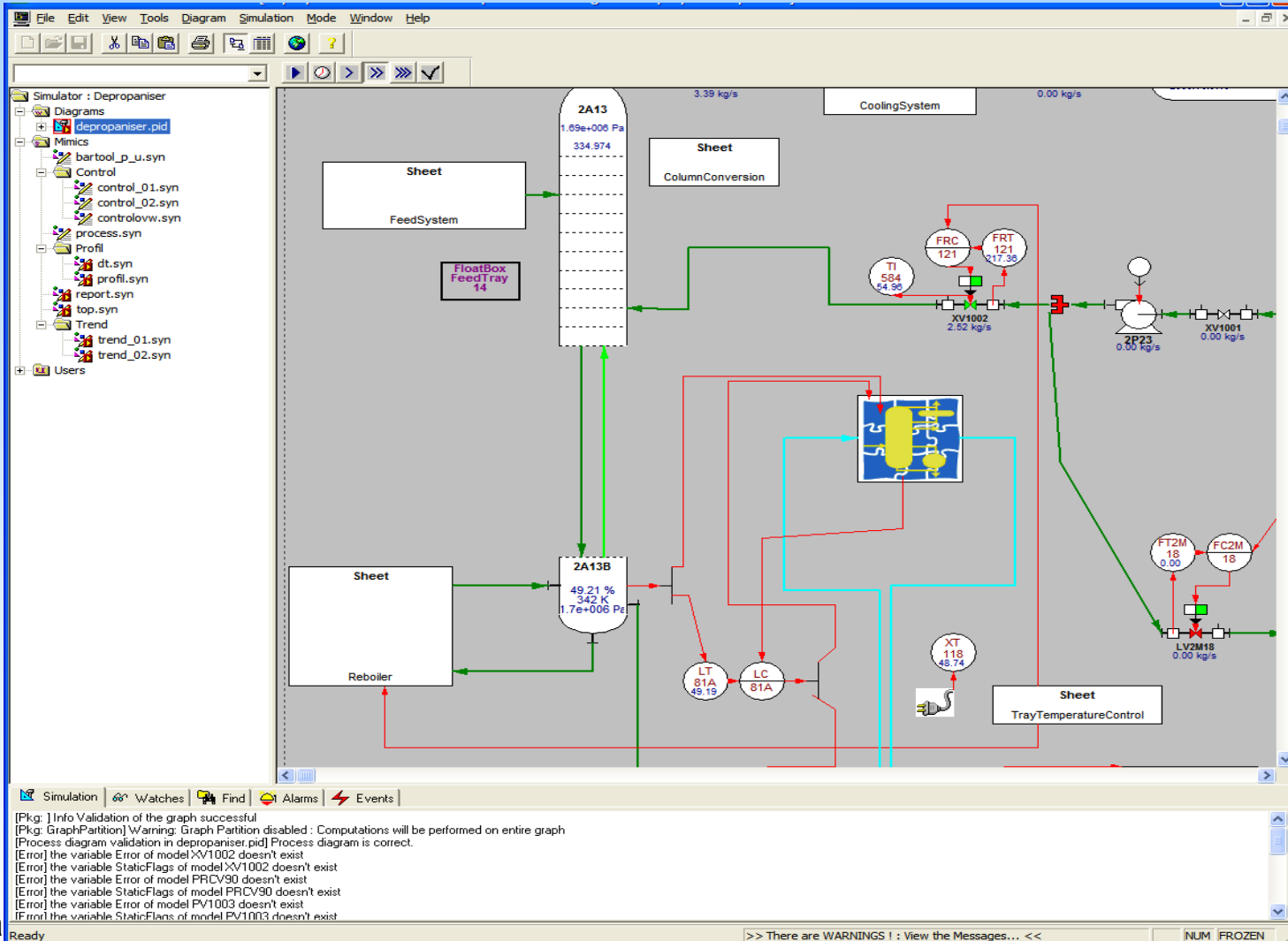
Overall Props

Overall Properties

Property name	Property Value	Unit
Pressure	1962938.1719928149	Pa
Temperature	332.3286182438143	K
mole Fraction[Nitrogen]	0.011038950450382369	
mole Fraction[Methane]	0.10077077901326624	
mole Fraction[Ethane]	0.11371379472450002	
mole Fraction[Propane]	0.11804037495440657	
mole Fraction[Isobutane]	0.025447059488361814	
mole Fraction[N-butane]	0.0603835096308479	
mole Fraction[Isopentane]	0.0265122288624051	
mole Fraction[N-pentane]	0.03684840443104988	
mole Fraction[N-hexane]	0.05272514051900448	
mole Fraction[N-heptane]	0.07547340007435246	
mole Fraction[N-octane]	0.05273070158117596	
mole Fraction[N-nonane]	0.0474641583657531	
mole Fraction[N-decane]	0.023604626361919786	
mole Fraction[N-undecane]	0.03443949181245162	
mole Fraction[Carbon dioxide]	0.20336420637353425	
mole Fraction[Hydrogen sulfide]	0.01744317413146276	
Flow	0.6136912868557001	kg/s
MW	62.61460684711903	

Terminé

INDISS Depropanizer with Diabolo Extensions






INDISS Deprop. Export control & material values

Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils ? Laurent.Testard

http://localhost:8080/RTDBPageServ/rtdb?ID_View=Depropanizer

Gmail GCal my Yahoo! Groups LinkedIn Google Press BD BD2 Blogs config localhost Halias MVACWeb externe

 **MAIN** **COCO** **INDISS** **UTIL**

Edition example
Depropanizer

Controler LC81A

Property	Value	Unit
Process Value	49.187279188355596	%
Set Point	50.0	%
Controller Output	14.12939161909452	% Opening

Output Material Stream

Property	Value	Unit
Pressure	101325.0	Pa
Temperature	341.50352725166425	K
Flow	7.114259087311471	kg/s
MW	0.050322046276943214	kg/mol
mole Fraction[ETHANE]	9.999998830913392E-21	
mole Fraction[PROPANE]	0.556227537076955	
mole Fraction[n-BUTANE]	0.3445196416453853	
mole Fraction[ISOBUTANE]	0.09925282127765972	

Terminé 0



INDISS Deprop. View as Real Time curves

