

## Soleil Expert System

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- **Context**
- *SOLEIL Expert System Building Blocks*
  - *Passerelle*
  - *Drools*
  - *CDMA*
- *Use Case*

## ⇒ In daily operation an operator has to perform many manual checks

- Are the control system services working fine (is the archiving system really logging data)
- Is the alarm detected by a supervision application linked to a control system sub module or is it an equipment problem
- Is beam correctly delivered to beamlines

- Same kind of problems **analysis** to do again and again
- Many **different applications** to interact with
- operator **knowledge** dependent
- Very **error-prone**
- Why not **automate** all these tasks?

## ⇒ In case of abnormal operation (beam loss)

- Collect data for analysis (extract archived data, post-mortem data,...)
- Check the elog book or an accelerator expert to see what is the relevant recovery process to apply
- Perform in sequence the advised operation/rules for the given situation

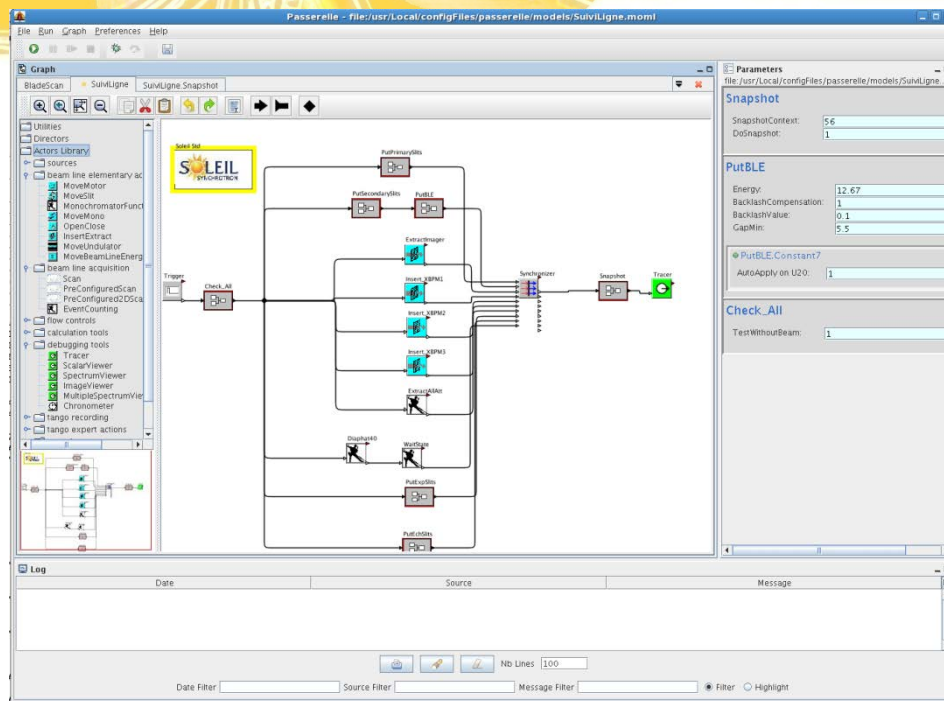
- No uniform to **collect data** from different sources
- Lack of centralization accelerator operation **expertise**
- Non automated repetitive **sequences** of operations
- Very **error-prone**
- Why not use an **expert system** ?

## ⇒ Automation of an analysis/diagnosis process workflow takes care of :

- Collecting and consulting the available data for analysis
- Formulating decisions/diagnosis rules
- Preparing advised actions to repair the problematic situation

- Need for a workflow modeling environment : **Passerelle**
- Need for a uniform data access layer : **CDMA**
- Need for a rules based environment : **Drools**

**PASSERELLE**  
allow to graphically  
design complex  
workflows and  
execute them



➤ **PASSERELLE is provided by a company called ISENCIA**

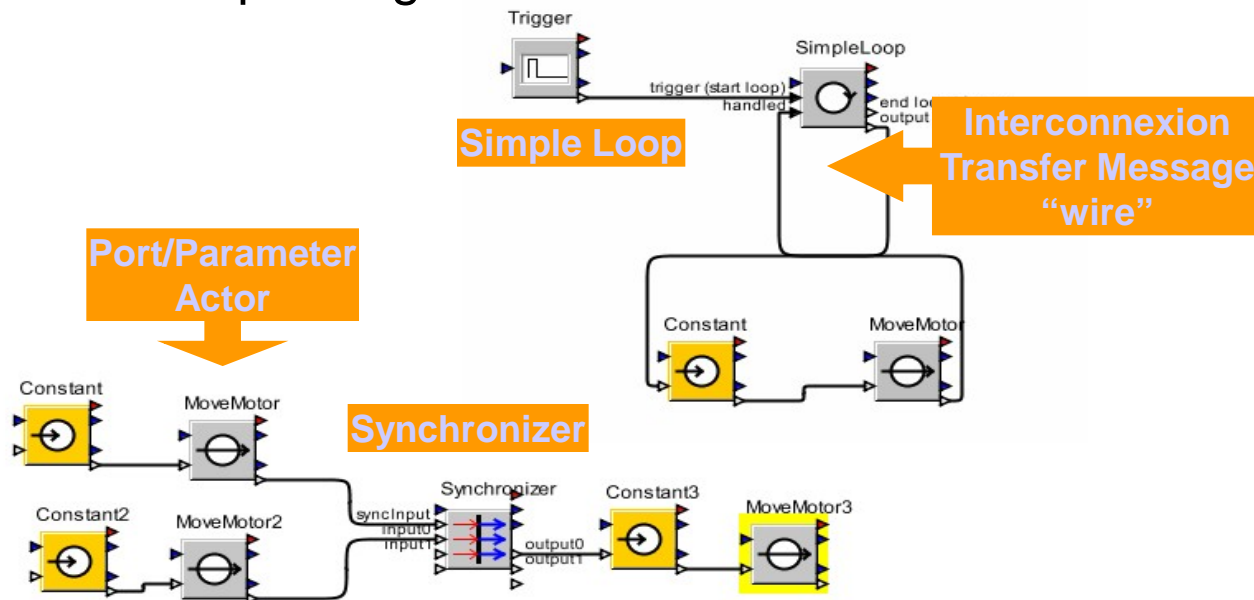
✓ Specialized in process driving for industrial companies.

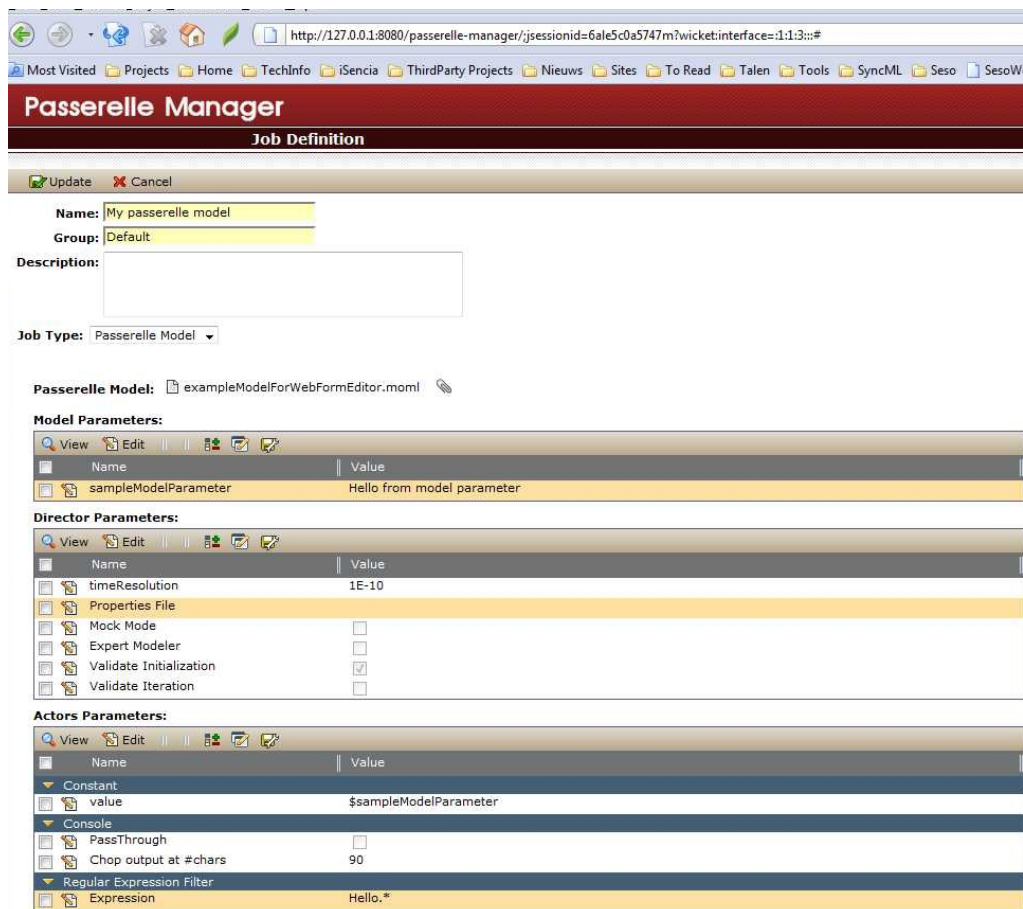
➤ **PASSERELLE is based on an environment for scientific modelisation and simulation: PTOLEMY (developed by the Berkeley University)**

<http://ptolemy.eecs.berkeley.edu/ptolemyII/>

- We connect « boxes » and « wires » :
  - The « boxes » are called **ACTORS**, they execute an action.
  - The « wires » are called **MESSAGES**, they transfer data.
- The graphic language for editing sequences provided all functionalities to build complex logics:

- Loops
- Comparison
- Error Management
- Parameterization





## Full-featured remote access via std web technology

- ✓ Collaborate on process design, execution, monitoring etc on a secure and robust server-based platform
- ✓ Automated scheduling of process executions
- ✓ Monitoring and diagnostics within same platform
- ✓ Base suite extensible "live" through OSGi bundle upload & integrated management console
- ✓ Process definitions, config data, analysis rules, traces & OSGi bundles all in relational DB



## ■ Rules engine

- ▶ “advanced if-then”
- ▶ Declarative programming model
- ▶ Evaluate collection of registered “facts” in a “knowledge base”
- ▶ New facts can be derived by the rules, and added to the knowledge base
- ▶ This can trigger (other) rules again
- ▶ Easy-to-use Java API to integrate Drools in a “normal” Java program

## ■ Specific actor library

### ▶ Data collection

- ▶ Adaptations of existing Tango actors (AttributeReader etc)
- ▶ SQL-DB-reader
- ▶ File reader
- ▶ Web-service adapters

### ▶ Analysis

- ▶ Request-based Drools Expert actor
- ▶ Stream-based Drools Fusion actor

### ▶ Diagnosis

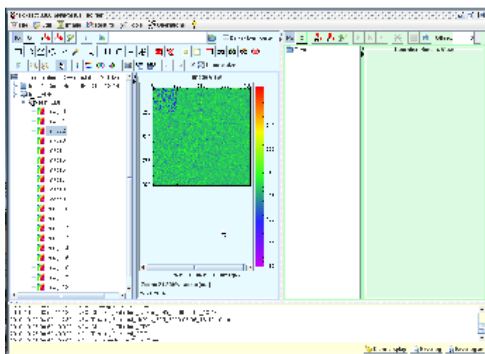
- ▶ Report generator (based on eclipse BIRT)
- ▶ Reuse request-based Drools Expert actor

A API aimed to provide to programmers a data access layer that is independent of the scientific datasets format.

Key points:

- A plug-in system that allows support of various data sources
- An abstract interface for navigation through data sets
  - ▶ Concrete classes are provided by data plug-ins
- A dictionary mechanism to retrieve measurements and technical values independently of the data structures

**It is intended to be the data access layer of data reduction applications.**



keywords  
Declaration  
file

```
<data-def name="Experiment name">
  <!-- ex: EXAFS, SAXS,... ->
  <item key="mono_energy">
  <item key="mono_type">
</data-def>
```

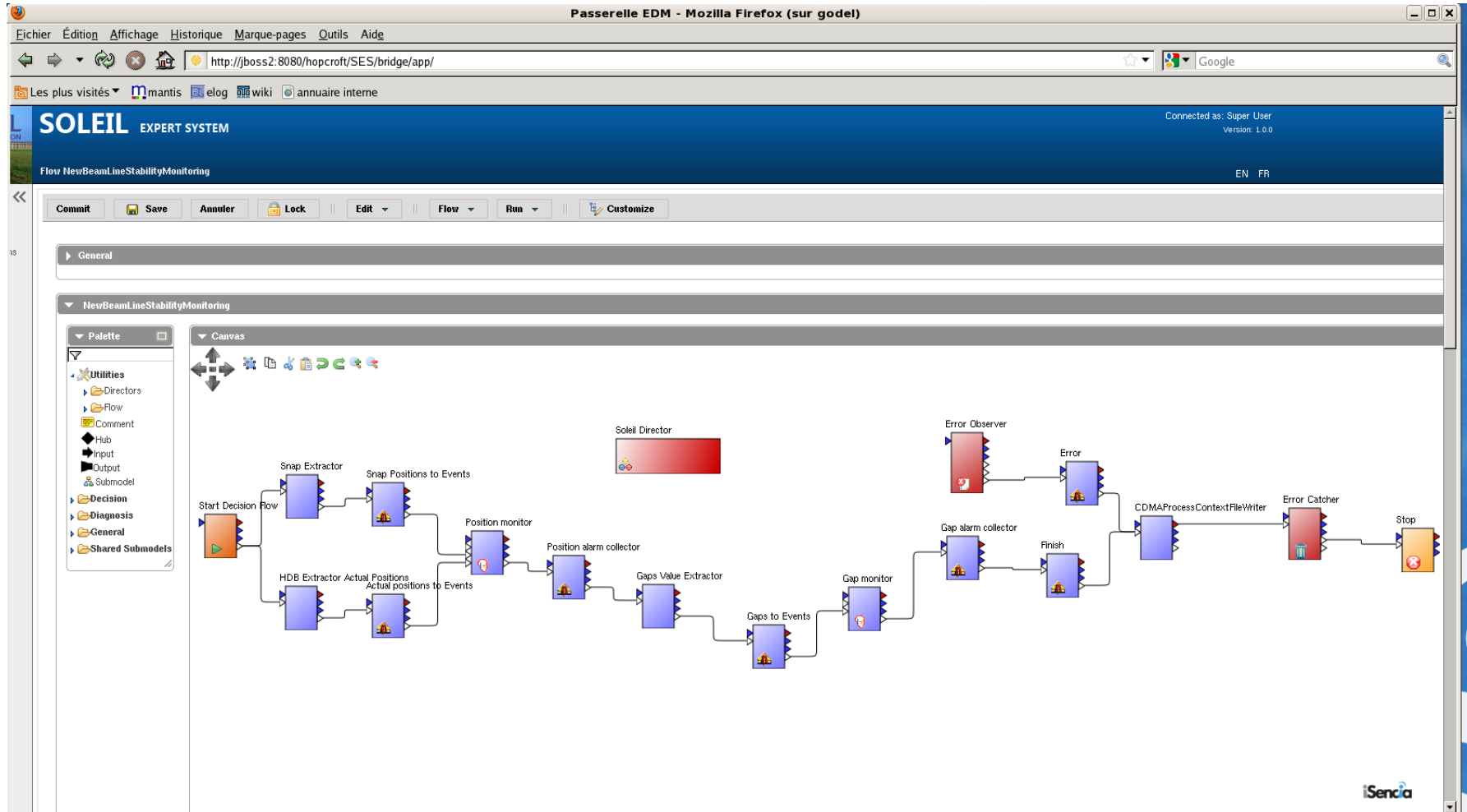
CDM

Files format plugin

keywords  
Mapping  
file

```
<map-def name="Experiment name">
  <!-- ex: EXAFS, SAXS,... -->
  <item key="mono_energy">
    <path>path/to/user/mono/energy</path>
  </item>
  <item key="mono_type">
    <path>path/to/user/mono/type</path>
  </item>
  ...
</map-def>
```

0100110  
1001110  
0100110  
11110...



Passerelle EDM - Mozilla Firefox (sur godel)

http://boss2:8080/hopcroft/SES/bridge/app/

Connected as: Super User  
Version: 1.0.0

EN FR

- [-] Expert
  - > Conversations
  - > Historiques des Conversations
- [-] Dépôt
  - > Images
  - > Translations
  - > Project
- [-] Séquences
  - > Conversations
  - > Séquences
  - > Alertes
  - > Sous-modèles partagés
  - > Batch Flows
  - > Groupes de Séquences
- [-] Définitions des Règles
  - > Modules de Règles
  - > Fichiers de Règles
- [+] Données de Test
- [+] Analyse
- [+] Rapports
- [+] Jobs
- [+] Simulateur
- [+] Système
- [+] Sécurité
- [+] Aide
- [+] Changer mot de passe
- [+] Déconnectez-vous

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**Id:** 7825  
**Creation TS:** 2013-09-27 15:48:41  
**Status:** FINISHED  
**Type:** Position alarm collector  
**Initiator:** .Position alarm collector  
**Executor:**

Name	Value
Case ID	78
Creator	.New Beam Line Stability Monitoring#sep7820.Position alarm collector
Request ID	7820

**Result Items** | **Result Blocks** | **Events** | **Tasks**

Recherche | Filter

Type: | Name: | Value: | Colour: |

Colour	Name	Value	Discriminator
Resultblock [id=109, type=Position alarms]			
<input type="checkbox"/>	ANS-C01/DG/CALC-SDL-POSITION-ANGLE#angleX	0.5091690973660326	STRING_RESULT
<input type="checkbox"/>	ANS-C01/DG/CALC-SDL-POSITION-ANGLE#angleZ	5.48083273116612	STRING_RESULT
<input type="checkbox"/>	ANS-C01/DG/CALC-SDL-POSITION-ANGLE#positionX	76.911	STRING_RESULT
<input type="checkbox"/>	ANS-C01/DG/CALC-SDL-POSITION-ANGLE#positionZ	4.8082668035461325	STRING_RESULT
<input type="checkbox"/>	ANS-C02/DG/CALC-SDM-POSITION-ANGLE#angleX	8.116821658788139	STRING_RESULT
<input type="checkbox"/>	ANS-C02/DG/CALC-SDM-POSITION-ANGLE#angleZ	24.34039012239571	STRING_RESULT
<input type="checkbox"/>	ANS-C02/DG/CALC-SDM-POSITION-ANGLE#positionX	3.570000000000009	STRING_RESULT
<input type="checkbox"/>	ANS-C02/DG/CALC-SDM-POSITION-ANGLE#positionZ	62.92255109105668	STRING_RESULT
<input type="checkbox"/>	ANS-C03/DG/CALC-SDM-POSITION-ANGLE#angleX	9.513143652612099	STRING_RESULT
<input type="checkbox"/>	ANS-C03/DG/CALC-SDM-POSITION-ANGLE#angleZ	28.479842111127027	STRING_RESULT
<input type="checkbox"/>	ANS-C03/DG/CALC-SDM-POSITION-ANGLE#positionX	55.75166517054227	STRING_RESULT

Passerelle EDM - Mozilla Firefox (sur godel)

Fichier Édition Affichage Historique Marque-pages Outils Aide

http://boss2:8080/hopcroft/SES/bridge/app/

Les plus visités mantis elog wiki annuaire interne

**SOLEIL** EXPERT SYSTEM Connected as: Super User  
Version: 1.0.0

EN FR

Expert

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- Historiques des Conversations

Dépôt

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Analyse

Rapports

Jobs

Simulateur

Système

Sécurité

Aide

Changer mot de passe

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Back

**Id:** 7828  
**Creation TS:** 2013-09-27 15:48:46  
**Status:** FINISHED  
**Type:** Gap alarm collector  
**Initiator:** Gap alarm collector  
**Executor:**

Name	Value
Case ID	78
Creator	.New BeamLineStabilityMonitoring#sep7820.Gap alarm collector
Request ID	7820

Result Items Result Blocks Events Tasks

Recherche Filter

Type: Name: Value: Colour:

Colour	Name	Value	Discriminator
	Resultblock [id=111, type=Gap alarms]		
	ANS-C07/EVM-HUS2.11/gap	2.3369	STRING_RESULT

**Thanks for your attention**

