A WORKFLOW IN SALOME
MODELLING PHYSICAL SYSTEMS
MODELLING PHYSICAL SYSTEMS

- The CAD module SHAPER
  - Active developments for a first end user delivery in 2018
  - Improvements to be noted in 2016:
    - 3D parts construction from 2D sketches
    - Improvement of the sketcher and integration of the constraints solver PlaneGCS (from FreeCAD)
    - Implementation of a Python scripting (high level API) and a dump feature
    - Creation of axes, planes
MODELLING PHYSICAL SYSTEMS

- Maintenance of GEOM in optimal operational conditions
  - Maintenance and active support up to the end of 2019 at least
MODELLING PHYSICAL SYSTEMS

- SMESH: integration of new algorithms and additional tuning parameters
  - GMSH for 2D transpatch features (http://gmsh.info)
  - MeshGems-Hybrid for hybrid meshes massively hexaedric (http://www.distene.com)
HANDLING DATA
HANDLING DATA

- Overview of the MED framework
  - med-fichier: data model and files i/o
    - Optimization for fields containing a lot of timestamps (10000)
    - Optimization for mesh containing a lot of groups (1000-10000)
    - Inter-process data exchange through memory (memory dump)
    - Work in progress for a « downward compatibility »
  - med-coupling: data handling and processing
    - Multi-process execution for complex data processing
    - Introduction of fields of integers to handle discrete data
  - med-calc: graphical interface of med-coupling
    - Experimental SALOME module for graphical data handling
    - Use PARAVIS modular features for visual checking

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HANDLING DATA

- Input data setting using model-based graphical user interfaces

```plaintext
FORME_GEOMETRIE=OPER(name="FORME_GEOMETRIE",sd_pred=forme,op=op).

Forme=SIMP(statut='f',type='TYP',intv=[ 'carre', 'cercle', 'triangle'],default='carre'),
Bloc_Pour_Carre = BLOC ( condition = 'Forme='carre'),
Bloc_Pour_Cercle = BLOC ( condition = 'Forme='cercle'),
Rayon=SIMP(statut='f',typ='I'),
```

- Towards model-driven components in SALOME
  - XSD/XML description of the data, Generation of software components based on the data model
  - Technical and economical efficiency of application development projects
DATA ANALYSIS AND VISUALIZATION
DATA ANALYSIS AND VISUALIZATION

- Visualization of fields (PARAVIS)
  - Remote parallel visualization
    - Improvement of HPC connectivity for end users
    - Ghostshell generator to remove multi-processor artefacts
  - Visualization of parametric data for statistical analysis
    - Parallel coordinate plot for multi-dimensional analysis
    - Matrix plot view to explore relashionship among variables

- Visualization of data series (CurvePlot)
  - New component for 2D plotting (TUI and GUI)
ORGANIZING PARAMETRIC COMPUTING

Experimental plan

Parametric computation

Analysis of parametric results

Geometry → Meshing → Visualization

Computation unit

\[ X_i \quad Y = f_c(X) \quad (X_i, Y_i) \quad ut \]

- Distribution of computation units
- Optimisation of HPC usage
- Management of failover

- Meta-modeling
- Statistical analysis
- Visualisation

Paramètre X1, Paramètre X2
ORGANIZING PARAMETRIC COMPUTING

- **SALOME** provides dedicated functions to run experiment plans
  - Design of the computation unit as a YACS graph
  - Distribution of computation units on HPC with failover management
  - Integration with advanced softwares as OpenTURNS (design, meta-modeling, statistical analysis)
Applications

- Sensibility analysis of a model to identify influencing parameters
- Evaluation of the propagation of uncertainties on parameters
- Validation of equipment/structure specifications by simulation of worse-case scenarios

Off-shore wind turbines

- Analysis of the foundations of offshore wind turbines

Flooding studies

- Uncertainty quantification on bathymetry (water depth, friction)
- Salomé – Hydro (Télémac)
- 25 000 simulations

Experiment plan
Norme CEI 61400-3
37500 points

Code FAST
DOMAIN SPECIFIC SOLUTIONS

- SALOME = an open framework to build domain specific solutions

SALOME-HYDRO (free surface hydraulics)

ALAMOS (thermonuclear reactor modeling)
SALOME BY NUMBERS

- Traffic on salome-platform in 2016
  - Visits (228 000), downloads (78 000)

- Maintenance
  - 4 versions (7.7 → 7.8 → 8.1 → 8.2)

- Development Team
  - 30 regular developers with a core team EDF-CEA of 10 developers
Thank you