SOFA Technical Committee #8 Report

Date: 20/11/2019 - 22/11/2019
Location: EIT Digital, Paris
Please find here the slides of all presentations.

Attendees

- Omar Boukhris, Inria Strasbourg, France
- Jean-Nicolas Brunet, Inria Strasbourg, France
- Christian Duriez, Inria Lille, France
- Damien Marchal, Inria Lille, France
- Bruno Marques, Inria Lille, France
- Waseem Palliyali, Hamad Medical Corporation, Qatar
- Guillaume Paran, Consortium staff, France
- Erik Pernod, InfinyTech3D, France
- Vladimir Poliakov, University Leuven, Belgium
- Eligiusz Postek, IPPT PAN, Poland
- Tim Pusch, Fraunhofer IPA, Germany
- Frederick Roy, Freelancer, France
- Hugo Talbot, Consortium staff, France
- Félix Vanneste, Inria Lille, France
- Hyeonseok You, Asan Medical Center, Korea
Synthetic agenda of STC#8

Day 1 - Wednesday 20th November (pm)
14:00 - Opening STC#8
14:10 - Consortium activity
14:30 - SOFA activity (part 1)
   Roadmap tasks
16:00 - Coffee break
16:30 - SOFA activity (part 2)
   Out-of-roadmap tasks
   Roundtable
18:00 - End of Day 1

Day 2 - Thursday 21st November
09:00 - Defining v20.06 roadmap (part 1/2)
   Expected technical evolutions, among the possible topics
   Objective: determine what can be accomplished for v20.06
10:00 - Coffee break
10:30 - Defining v20.06 roadmap (part 2/2)
12:30 - Lunch
14:00 - Validating v20.06 roadmap
14:15 - Coding sprint
18:00 - End of Day 2

Day 3 - Friday 22nd November
09:00 - Coding sprint
15:30 - Closing STC#8
Reports and updates

SOFA report
You will find all information regarding the report on SOFA, its activity and the consortium activity within the STC#8 slides.

Roadmap task progress
All presentations and slides are publicly available here.

SofaPython3 - Damien Marchal
Following last STC, a lot of effort has been put into SofaPython3 developpement. Thanks to its contributors, the plugin is now ready to be used and tested on a larger scale. After a quick report from Damien, we discussed about what would be the right moment and the right way to officially switch to SofaPython3 in SOFA. Several things should be done: update the 8 python2 scenes in examples, update documentation, integrate SofaPython3 as an external project, enable SofaPython3 by default, hard break in a binary version, move SofaPython out of SOFA, ...

→ See the dedicated presentation for details.

SofaQtQuick - Bruno Marques
Connected to “SofaPython3” and “Data Updates” projects, SofaQtQuick has been in active developpement for 2 months. It is still a bit buggy but many fixes were done. Even though we won’t be able to release the complete final version of this project for v20.06, we discussed the possibility of a less ambitious stable version. Main thing to do in the next months is to refocus on homogenizing the “C++ to QML” and “C++ to Py3” bindings, to avoid the community using an unstable API.

→ See the dedicated presentation for details.

Multithreading - Federico Spadoni
The Multithreading plugin is ready and compliant with master version of SOFA. It now allows to implement a custom TaskScheduler launching parallel tasks. Additionnaly, a private plugin allowing for parallel constraint resolution has been developped. It also contains a custom TaskScheduler allowing to launch parallel tasks on GPU (not to be confused with SofaCUDA plugin). If anyone is interested in this private work, it can definitely be made available.

Topological changes - Erik Pernod
Also connected to “Data Updates” project, Topological changes continued on getting straight. For the next steps, we would be interested in a unified ForceField and removing the unuseful links to topologies (eg BeamFF).

→ See the dedicated presentation for details.
Out-of-roadmap important contributions

**Damien & Hugo: Data Updates**

Data update mechanism with getValue is robust and works well but it is impossible to change data field upon other data change. It’s a matter of personal expertise to know how a Component behaves and thus users have to learn by heart the inconsistencies.

Other topics linked: how to know if a Component is valid?

Proposal that should help in the init and traversal: define the link between Data including whether it is a read or read+write access with const. If read-only then it’s an input, if read-write then it can be an input or an output.

**Erik: SofaSphFluid + SofaWindowProfiler + SofaWindowDataGraph**

The SofaSphFluid plugin has been undusted (fixed and cleaned) for the last 2 months. This work did not evolve for years (implementation from 2007).

SofaWindowProfiler is a new widget in SofaGuiQt (with a dependency on QtCharts) that brings visualization on AdvancedTimer features. It permits to see the animation step duration (ms) in a graphView, then to navigate on the graph or on the sliders and see the different substeps executed during this animation step.

SofaWindowDataGraph is also a new widget in SofaGuiQt (with a dependency on NodeEditor) that permits to see graphically the links between all Components of a scene.

→ See the [dedicated presentation](#) for details.

**Fred: Qt3D**

Remove explicit dependency on OpenGL. Support dropped for MacOS.
Qt was Qt3D as a visualization wrapper, allowing to use Vulkan (as well as Metal) as visualization engine.
New DrawTools, now a Qt3DModel instead of OglModel.
Can be used on all platforms and already bring improvement in rendering performances

→ See the [dedicated presentation](#) for details.

**Jean-Nicolas: Caribou**

Can be used as a library and as a plugin
Create a separate work to separate mechanical constitutive law (with energy law), the topology element and geometry computation, with different orders.
Use this work to start unifying the geometry in SOFA? → roadmap task?
About Eigen, we should use Eigen broadly in SOFA → roadmap task?

→ See the [dedicated presentation](#) for details.
Guillaume: Architecture & CMake

To facilitate binary generation and distribution, important changes have been made to SOFA CMake API, adding new features like the possibility to obtain a clean plugin installation even when building it through SOFA.

→ See the dedicated presentation for details.
SOFA v20.06 roadmap

Here is the roadmap for the next 6 months that has been discussed and approved by the SOFA Consortium members.

Data Updates

Description
For the past several years, the data system has been undergoing a lot of changes in SOFA, growing its complexity. Today, it can be noticed that a scene designed driven by Data starts being orthogonal to the scene graph design.

Currently, SOFA components do not take full advantage of the potential of the Data system. This leads developers to rely a lot on the scene system. The scene graph is a wonderful tool to quickly construct a simulation and should remain a core feature of the framework. However, relying on it to glue components together with the use of graph visitors lead to invisible relations between them and computations based on implicit side effects. There is now a need to explicit more the Data dependency in simulations while keeping the graph design easing the scene creation and reading.

This proposal aims at refactoring the Data system in SOFA so that it becomes simpler to understand, use and exploit at its full potential. The relation between components should become much more explicit and each of them should not rely on side effects for the good computation of the simulation.

“Data Updates” v20.06 roadmap
1. Rollback the changes already done (Visitor solution)
2. Integrate the DataLink in BaseObject to explicit dependency between Data / Components
3. Create a first proof of concept of a DataGraph-oriented simulation on a SOFA subset
4. Test it on several use cases in research teams

After v20.06
5. Extend it for topological changes
6. Extend it for the entire open source code repository

More information
Main contact: Hugo Talbot
Gitter chat room: https://gitter.im/sofa-framework/data-update
SofaPython3

Description
Improving SofaPython has been in SOFA devs objectives for a long time. Latest roadmap objectives have been largely achieved and SofaPython3 is now bigger than SofaPython (more features, more bindings).

We now have to work on the migration from SofaPython to SofaPython3.

“SofaPython3” v20.06 roadmap
1. Update or migrate example scenes
2. Be able to work with both SofaPython and SofaPython3 at the same time
   → binary version of SOFA will not be bound to a specific version of SofaPython
3. Explain clearly at release this is the last release with SofaPython
4. Remove SofaPython from SOFA repo
   → See the dedicated Trello board

More information
Main contact: Damien Marchal
Gitter chat room: https://gitter.im/sofa-framework/SofaPython3

SofaQtQuick

Description
SofaQtQuick is the project of a new GUI for running simulations. Replacing runSofa by something more flexible and user friendly has been discussed for a long time. The project, now in alpha state, aims principally to go beta for v20.06.

“SofaQtQuick” v20.06 roadmap
1. Go from alpha state to beta state: something stable and usable
2. Internal/External Javascript + API
3. Runtime stability
4. Include more people after STC#9

More information
Main contact: Damien Marchal
Gitter chat room: https://gitter.im/sofa-framework/SofaQtQuick
More projects

Besides the main roadmap tasks, a lot of projects are going to evolve in the next 6 months.

User Experience

The whole community is working on making SOFA user experience better and better. Here are some objectives for v20.06:

- Improve documentation
  - More user doc in code
  - Integrate the theory and descriptions in the description string of components
  - Better doc packaging
- Improve tutorials
  - Have one (and one only) entry point
  - Factorize the different elements (doc, scenes, html, tuto)
  - Create video tutorials
- Launch SOFA Continuous Delivery and link SOFA Package Manager to its artifacts

DocBrowser

This project is held by Defrost team from Inria Lille. → See the DocBrowser branch for details.

Further to SOFA dev environment update (minimal supported versions of compilers and dependencies), DocBrowser features will be integrated in runSofa.
Coding sprint

As usual, a coding sprint was organised to finalize some pending tasks. The tasks were listed as GitHub issues and can still be accessed.

- #1153 CMake external dependency binaries are installed in the sofa lib directory → started
- #1216 Bug in Factory registering when the namespace ends with number → fixed
- #1209 Bug in sofa::defaulttype::Quat fromEuler method → fixed
- #1133 uninitialized variable → fixed
- #1100 MeshObjLoader how to handle handleSeams option generically → started