User's request

Issue 2320, Improve feedback to user on XML errors:
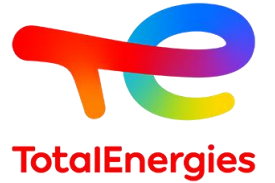
- **Indicate file & line of problems**
- **Better interpret syntax errors**
- **List alternatives**
- **Fix some unexplained crashes**

```
***** LOCATION: /GEOS/src/coreComponents/dataRepository/Group.hpp:355
***** Controlling expression (should be false): child == nullptr
***** Rank 0: Group m/Outputs doesn't have a child simpleReservoirVis
```

```
***** LOCATION: /GEOS/src/coreComponents/dataRepository/Group.hpp:355
***** Controlling expression (should be false): child == nullptr
***** Rank 0: Error while reading outputsEvent/target (line_2_simpleCo2Inj_smoke.xml, l.49):
Group Outputs (line_2_simpleCo2Inj_inc.xml, l.180) has no child named simpleReservoirVis
The children of Outputs are: { simpleReservoirViz, restartOutput, timeHistoryOutput }
```

Why did GEOS need a complete review of the error messages ?

- The user needs to write an XML to configure the simulation deck
  - Some use cases can be 10 000 lines long

- A lot of GEOS error messages were:
  - Incomplete or misleading
  - Not helping to find exactly which file / line / simulation object were causing it

- The user could waste a lot time when:
  - Pointing out error origin
  - Familiarizing with the GEOS XML syntax
  - Misconfiguring a setting
  - Doing typos
  - Searching for some options (can be hidden or hard to find in the docs)

Refactorization of (a lot of) error messages

Issue 2320
- Details of needed work on the errors feedback

Common base P.R.s

PR 2341
- Prevents crashes
- Alternative objects list

PR 2357
- Syntax error in string arrays
- Replaced *errors* by *exceptions* in LvArray parsing functions

PR 2404
- Provide « DataContext »
  → Allows to retrieve the file & line of Groups & Wrappers

Main error messages review

- 1258 reviewed error messages

- 100 modified files divided in 4 P.R.
  → *input parsing mostly*

PR 2448
→ *files in src/coreComponents/physicsSolvers*

PR 2450
→ *files in src/coreComponents/mesh*

PR 2447
→ *files in src/coreComponents/constitutive*

PR 2449
→ *other files*

Upcoming messages review

- More P.R. incoming

- At least 13 complex files left
  → *simulation execution mostly*

- Need to either:
  - Add DataContext reference to some simulation object,
  - Or to predict errors before they occur during simulation.

3

Exemple 1 :

```
45.    <PeriodicEvent
46.      name="outputs"
47.      timeFrequency="1e7"
48.      targetExactTimestep="1"
49.      target="/Outputs/simpleReservoirVis"/>
```

> The **target** named **simpleReservoirViz** doesn't exists.

Old Error	New Error
***** LOCATION: /GEOS/src/coreComponents/dataRepository/Group.hpp:355 ***** Controlling expression (should be false): child == nullptr ***** Rank 0: Group m/Outputs doesn't have a child simpleReservoirVis	***** LOCATION: /GEOS/src/coreComponents/dataRepository/Group.hpp:355 ***** Controlling expression (should be false): child == nullptr ***** Rank 0: Error while reading outputs/target (line_2_simpleCo2Inj_smoke.xml, l.49): Group Outputs (line_2_simpleCo2Inj_inc.xml, l.180) has no child named simpleReservoirVis The children of Outputs are: { simpleReservoirViz, restartOutput, timeHistoryOutput }
Error refactoring: o Added mention of file, line, object and attribute name, o Fixed "m/domain/..." path, o Listed the existing Outputs, including the one named simpleReservoirViz (which the user meant here).	

Exemple 2 :

```
62.    <CellElementRegion
63.      name="reservoir"
64.      materialList="{ fluid, rock, relperm }" />
```

The mandatory **cellBlocks** attribute is missing.
(something like **cellblocks="{ cb1 }"**)

Old Error	New Error
***** LOCATION: /GEOS/src/coreComponents/dataRepository/Wrapper.hpp:629 ***** Controlling expression (should be false): !m_successfulReadFromInput ***** Rank 0: Group m/domain/MeshBodies/cartesianMesh/meshLevels/Level0/ElementRegions/elementR egionsGroup doesn't have a child -1	***** LOCATION: /GEOS/src/coreComponents/dataRepository/Group.hpp:337 ***** Controlling expression (should be false): child == nullptr ***** Rank 0: Error while parsing region reservoir (line_3_simpleCo2Inj_inc.xml, l.62): XML Node CellElementRegion (line_3_simpleCo2Inj_inc.xml, l.62) with name=reservoir is missing required attribute 'cellBlocks'. Available options are:

Error refactoring:
- Added mention of file, line and object name,
- Made the error meaningful, with a list of the mandatory fields.

```
Available options are:
|         name          | opt/req  | Description
|_____|_____|_____
|  cellBlocks           | REQUIRED |
```

For more details, please refer to documentation at:
http://geosx-geosx.readthedocs-hosted.com/en/latest/docs/sphinx/userGuide/Index.html
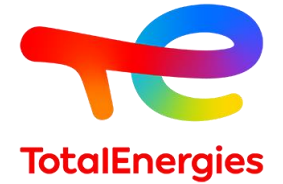
Exemple 3 :

```
10.    <CompositionalMultiphaseReservoir
11.      name="coupledFlowAndWells"
12.      flowSolverName="compositionalMultiphaseFlow"
13.      wellSolverName="compositionalMultiphaseWell"
14.      logLevel="1"
15.      initialDt="1e2"
16.      targetRegions="{ reservoir, wellRegion, }">
```

In `targetRegions`, a comma has been forgotten at the end.

Old Error	New Error

`***** ERROR`
`***** LOCATION: /GEOS/src/coreComponents/LvArray/src/input.hpp:92`
`***** Controlling expression (should be false): inputStream.peek() != '}'`
`closing } not found for input array: {reservoir wellRegion   }`
	`***** XML parsing error at node named coupledFlowAndWells, attribute`
	`targetRegions (line_5_simpleCo2Inj_inc.xml, l.16).`
	`***** Input value: '{ reservoir, wellRegion, }'`
	`***** LOCATION: /GEOS/src/coreComponents/LvArray/src/input.hpp:247`
	`***** Controlling expression (should be false): lastChar==','`
	`Character '}' follows ','. Closing brace must follow an array value.`

Error refactoring:
o Added mention of file, line, object and attribute name,
o Added a more specialized & meaningful error

Exemple 4 :

```
26.        <InternalWell
27.          name="wellInjector1"
28.          wellRegionName="wellRegion"
29.          wellControlsName="wellControls"
30.          meshName="cartesianMesh"
31.          polylineNodeCoords="{ { 500.0, 500.0, 6650.00 },
32.                                { 500.0, 500.0, 6600.00 } }"
33.          polylineSegmentConn="{ { 0, 1 } }"
34.          radius="0.1"
35.          numElementsPerSegment="2">
36.          <Perforation
37.            name="injector1_perf1"
38.            distanceFromHead="55"/>
39.        </InternalWell>
```

Here, **distanceFromHead** should not exceed 50 (because of the **polylineNodeCoord** z values and **referenceElevation=6650** in the **wellControls**)

Old Error	New Error
| ```
***** LOCATION: /GEOS/src/coreComponents/mesh/generators/InternalWellGenerator.cpp:419
***** Controlling expression (should be false): m_perfDistFromHead[iperf] > wellLength
***** Rank 0: Distance from perforation injector1_perf1 to head is larger than well polyline length for well wellInjector1
``` | ```
***** LOCATION: /GEOS/src/coreComponents/mesh/generators/InternalWellGenerator.cpp:435
***** Controlling expression (should be false): m_perfDistFromHead[iperf] > wellLength
***** Rank 0: injector1_perf1/distanceFromHead (line_8_simpleCo2Inj_smoke.xml, l.38):
Distance from well perforation to head (55) is larger than well polyline length (50)

You should check the following values:
  1 - injector1_perf1/distanceFromHead (line_8_simpleCo2Inj_smoke.xml, l.38)
  2 - the referenceElevation of the used WellControls named wellControls
  3 - wellInjector1/polylineNodeCoords (line_8_simpleCo2Inj_smoke.xml, l.27), Z values
``` |

Error refactoring:
- Added mention of file, line, object and attribute name,
- Displayed the `distanceFromHead` max value,
- Referenced the parameters that impact this max value.