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MARTe2 Users Meeting Configuration

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May, 2019

Object configuration

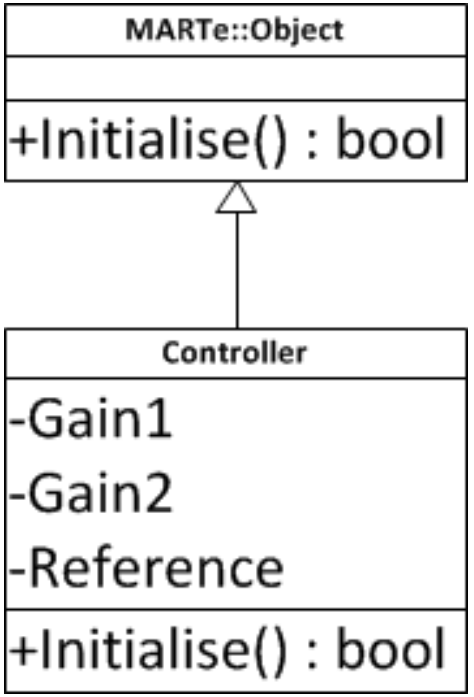
Build fully data-driven applications: from object instantiation to object configuration.

- **Objects** are configured using inputs from a (tree) **database**.
- The access to this database is abstracted by the **StructuredDataI** interface.
- Arbitrary user defined structure

```
//List of variables
Gain1 = -1.0
Gain2 = -3.0
Reference = {1, 2, 3}
```

OR

```
//Structure of variables
Gains = {
  Low = {
    Gain1 = -1.0
    Gain2 = -3.0
  }
  ...
}
...
```



StructuredDataI

Abstracts interface to the tree.

- Offers methods to
  - Navigate the tree;
  - Create/Delete nodes;
  - Read/write values from/to the tree leafs

```
...
virtual bool Initialise(MARTe::StructuredDataI &data) {
  bool ok = Object::Initialise(data);
  if (ok) {
     ok = data.Read("Gain1", gain1);
...
```

```
//List of variables
Gain1 = -1.0
Gain2 = -3.0
Reference = {1, 2, 3}
```

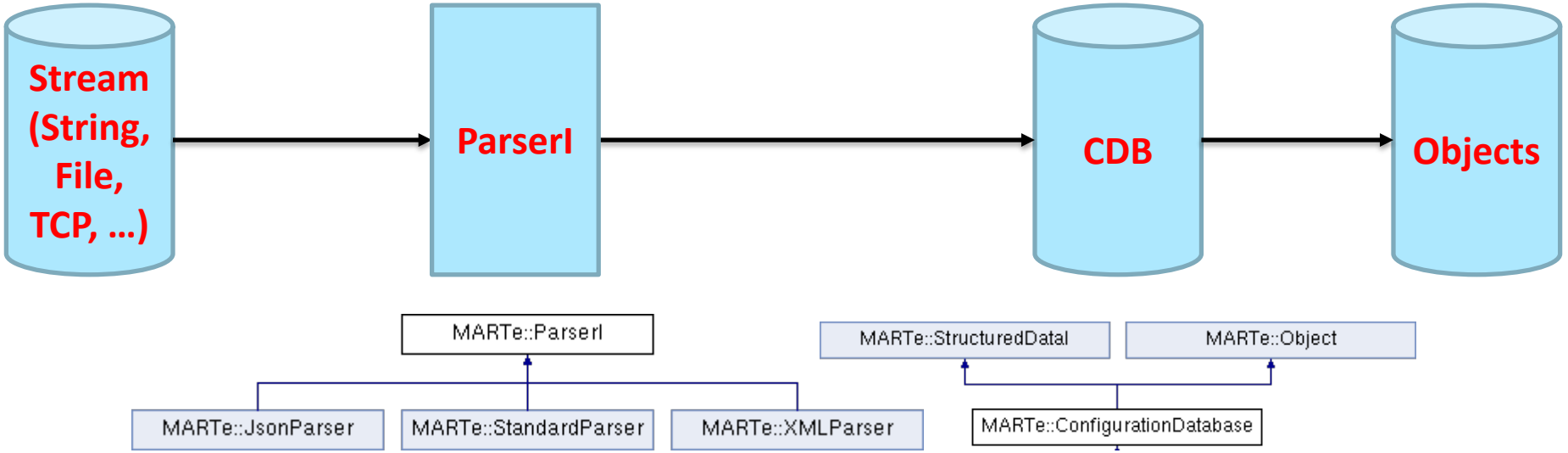
```
...
virtual bool Initialise(MARTe::StructuredDataI &data) {
  bool ok = Object::Initialise(data);
  if (ok) {
     ok = data.MoveRelative("Gains.Low");
...
```

```
//Structure of variables
Gains = {
 Low = {
  Gain1 = -1.0
  Gain2 = -3.0
 }
```

Parsers

Transform input configuration language into a ConfigurationDatabase.

Type	Meaning
StandardParser	MARTe configuration language.
XmlParser	XML
JsonParser	JSON



Configuration languages

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MARTe language

```
Gains = {
 Low = {
  Gain1 = -1.0
  Gain2 = -3.0
 }
 High = {
  Gain1 = 7.0
  Gain2 = 9.0
 }
}
References = {
 Slow = {
  Waveform = {
   Times  = {0 0.1 0.2 1}
   Values = {1 2   3   4}
  }
 }
 Fast = {
  Waveform = {
   Times  = {0 0.1 0.2 1}
   Values = {1 2   3   4}
  }
 }
}
```

XML

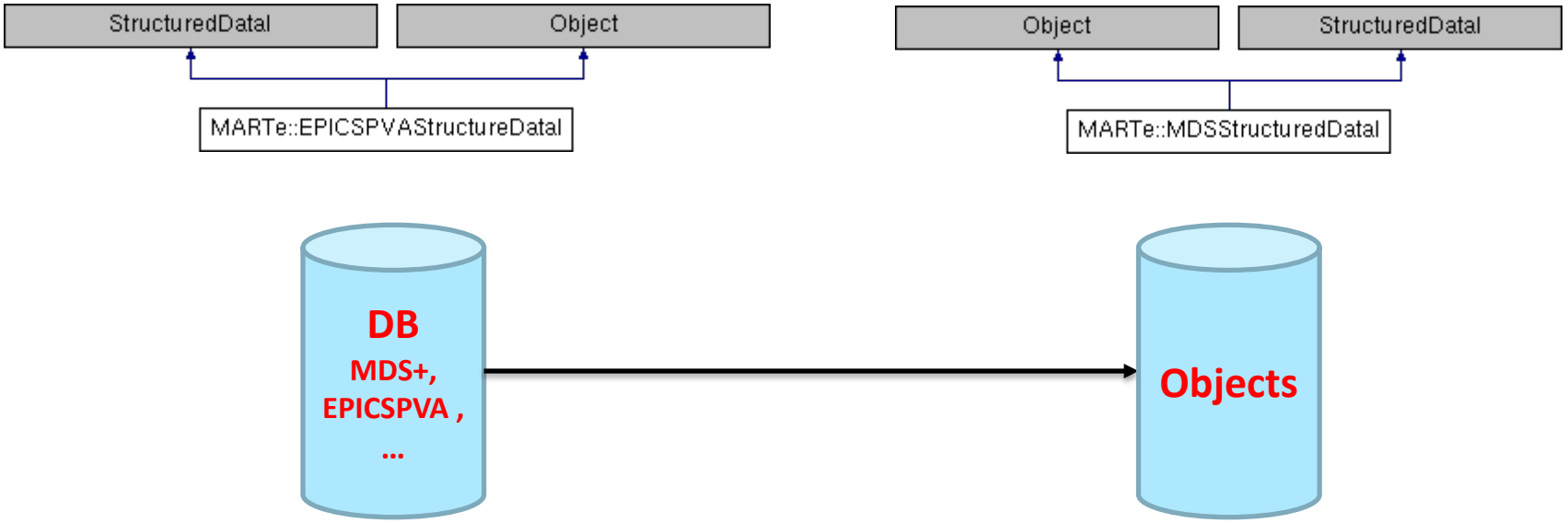
```
<Gains>
 <Low>
  <Gain1>-1.0</Gain1>
  <Gain2>-3.0</Gain2>
 </Low>
 <High>
  <Gain1>7.0</Gain1>
  <Gain2>9.0</Gain2>
 </High>
</Gains>
<References>
 <Slow>
  <Waveform>
   <Times>{0 0.1 0.2 1}</Times>
   <Values>{1 2   3  4}</Values>
  </Waveform>
 </Slow>
 <Fast>
  <Waveform>
   <Times>{0 0.1 0.2 1}</Times>
   <Values>{1 2   3  4}</Values>
  </Waveform>
 </Fast>
</References>
```

JSON

```
"Gains": {
 "Low": {
  "Gain1": -1.0,
  "Gain2": -3.0
 },
 "High": {
  "Gain1": 7.0,
  "Gain2": 9.0
 }
},
"References": {
 "Slow": {
  "Waveform": {
   "Times": [0, 0.1, 0.2, 1],
   "Values": [1, 2, 3, 4]
  }
 },
 "Fast": {
  "Waveform": {
   "Times": [0, 0.5, 1],
   "Values": [1, 0, 1]
  }
 }
}
```

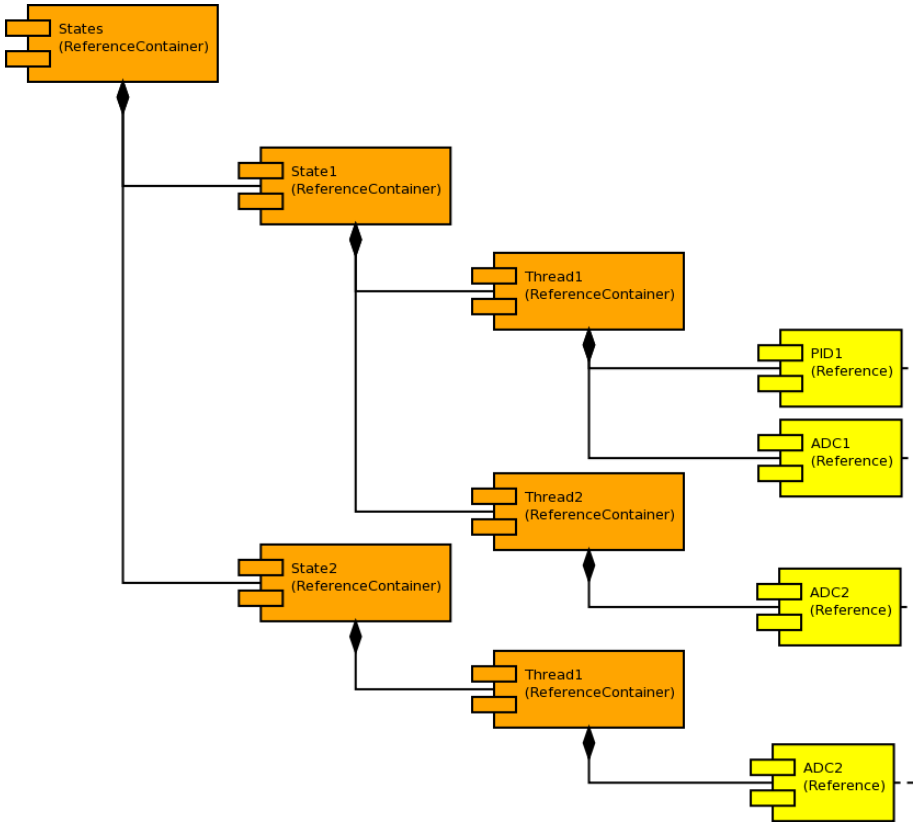
Wrappers

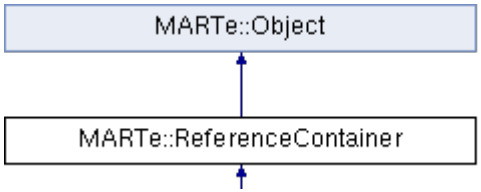
Implement the StructuredDataI over existent databases (e.g. MDS+, EPICSv7)



ReferenceContainer

Core Class that is a navigable container of (references to) objects





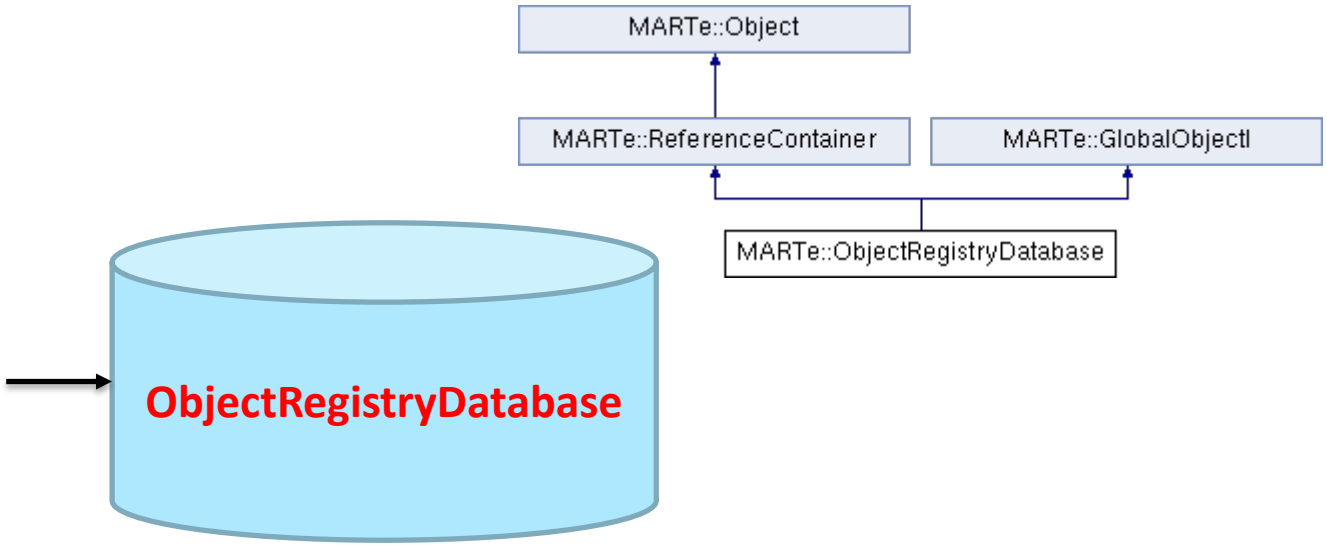

```
const char8 * const path = "State1.Thread1.PID1";
ReferenceT<Controller> myController = Find(path);
```

Full data driven apps

Framework automatically instantiates a tree of objects based on a configuration stream (e.g. a file).

- When the **+** character is found, the property Class=LIB::CLASS shall exist in the subtree.
  - **LIB** is the name of the shared library holding the compiled **CLASS**.
  - All instantiated Objects are automatically registered on a live Database
  - Any (reference to) object can be found in the ObjectRegistryDatabase

```
+A = {
  Class = AClass
}
+B = {
  Class = AClass
  +C = {
    Class = ALIB::CClass
  }
}
```



Exercises

- Run configuration in cdb, json and xml
- Use Initiliase to read from StructuredDataI different types
- Example with MDS+ interface
- Further reading and examples:
  - https://vcis.f4e.europa.eu/marte2-docs/master/html/core/configuration/configuration.html

Standard configuration file

Objective: load a standard configuration file

- Run the application

```
cd ~/Projects/MARTe2-demos-padova/Startup/
./Main.sh -l Loader -f ../Configurations/Configuration-1.cfg
```

- Modify Configurations/Configuration-1.cfg and change the Gains1.High.Gain1
- Run the application again
- Check that the value was updated

Success: application executes and (all the implemented) gains are displayed as expected

Initialise

Objective: load parameters from any configuration stream

- Modify Other/ControllerEx1/ControllerEx1.cpp
- Modify the Initiliase method to read the Gain2 and the Gains2 parameters
- Compile

```
cd ~/Projects/MARTe2-demos-padova/
export MARTe2_DIR=~/Projects/MARTe2-dev
export MARTe2_Components_DIR=~/Projects/MARTe2-components/
make -f Makefile.x86-linux
```

- Run the application
- Check that all the values are now shown in the console

```
cd ~/Projects/MARTe2-demos-padova/Startup/
./Main.sh -l Loader -f ../Configurations/Configuration-1.cfg
```

Success: application executes and all the gains are displayed as expected

XML configuration file

Objective: load an XML configuration file

- Run the application

```
cd ~/Projects/MARTe2-demos-padova/Startup/
./Main.sh -l Loader -f ../Configurations/Configuration-1.xml -p xml
```

- Modify Configurations/Configuration-1.xml and change the Gains1.High.Gain1
- Run the application again
- Check that the value was updated

Success: application executes and the gains are displayed as expected

JSON configuration file

Objective: load a JSON configuration file

- Run the application

```
cd ~/Projects/MARTe2-demos-padova/Startup/
./Main.sh -l Loader -f ../Configurations/Configuration-1.json -p json
```

- Modify Configurations/Configuration-1.xml and change the Gains1.High.Gain1
- Run the application again
- Check that the value was updated

Success: application executes and the gains are displayed as expected

MDSStructureDataI interface

Objective: initialize using any component that implements MDSStructuredDataI

- Browse the MDS+ configuration

```
cd ~/Projects/MARTe2-demos-padova/
export mdssdi_path=Trees
jTraverser mdssdi -1
```

- Run the application

```
cd ~/Projects/MARTe2-demos-padova/
export mdssdi_path=Trees
export LD_LIBRARY_PATH=.:$MARTe2_DIR/Build/x86-linux/Core/:Build/x86-
linux/Components/Other/ControllerEx1/
Build/x86-linux/Components/Other/MDSStructuredDataIEx1/MDSStructuredDataIEx1.ex
```

Success: application executes and the gains are displayed as in the pulse file

Learn more:

- Use jTraverser or tcl to modify the configuration values
- https://vcis-jenkins.f4e.europa.eu/job/MARTe2-Components-docs-master/doxygen/classMARTe_1_1MDSStructuredDataI.html

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