Warsaw University of Technology

BalticLSC: Software Development Platform for Large Scale Computations

BalticLSC Platform Technical Workshops

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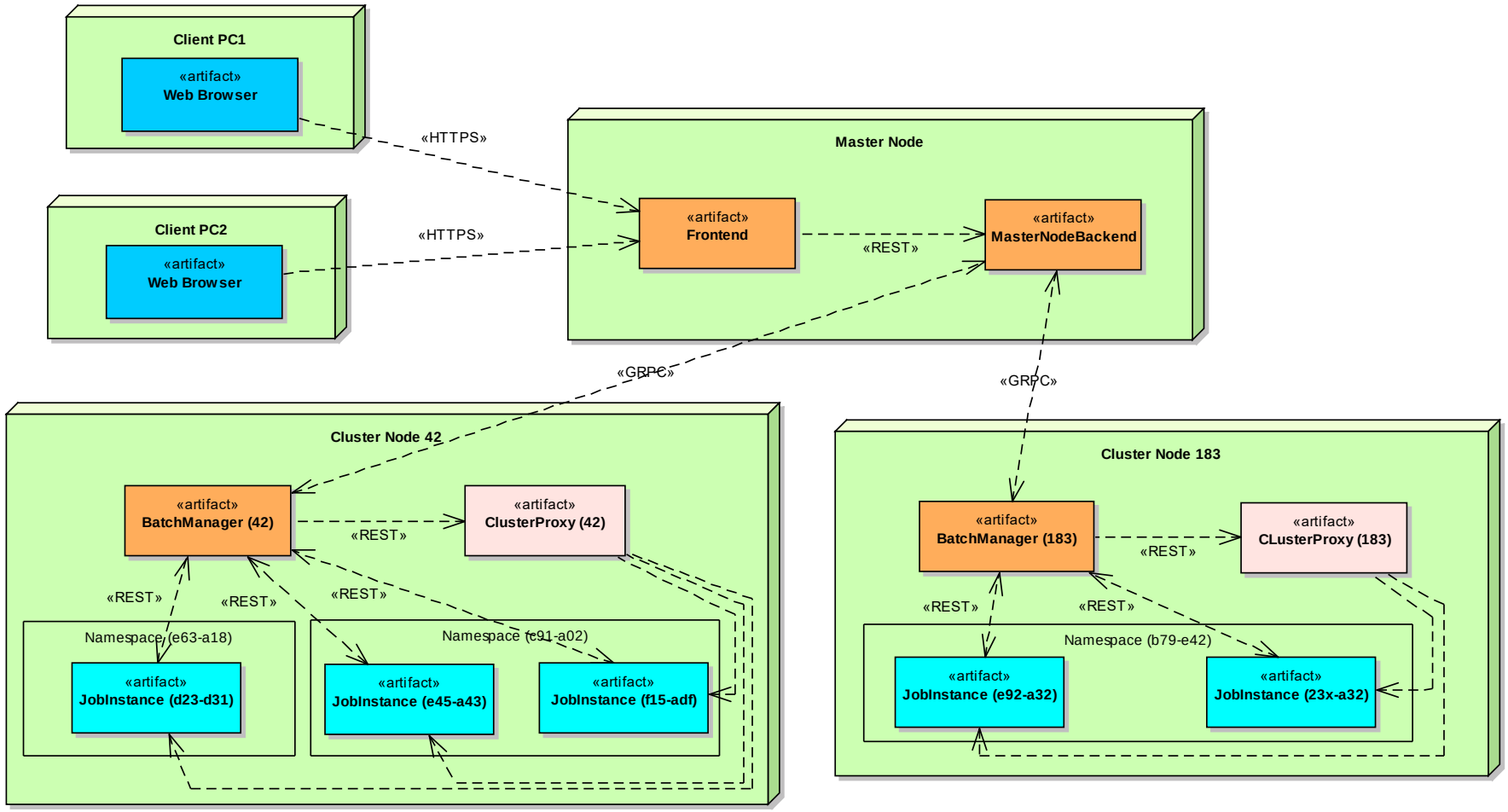
Introduction

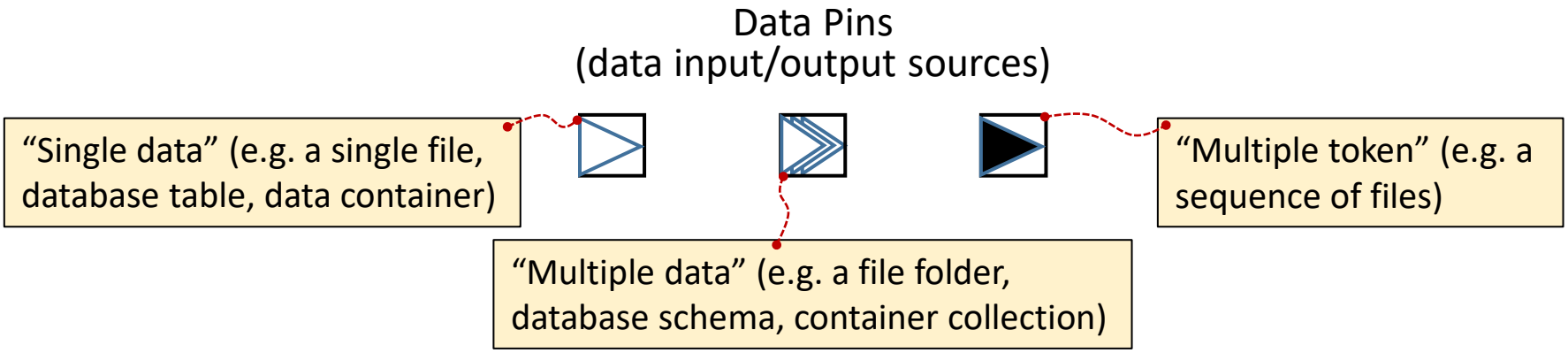
- Computation systems
  - **High Performance Computing system** – a big, centralized supercomputer (typically: homogeneous system), dedicated software
  - **Large Scale Computing system** – a network of many interconnected computation clusters (typically: heterogeneous), based on standard orchestration solutions
- Low-code software development
  - High-level, graphical programming language – programming = building visual models
  - Model-Driven Web Engineering – development of web applications using visual models
  - In LSC – creating computation applications visually, through a web development interface

BalticLSC Architecture

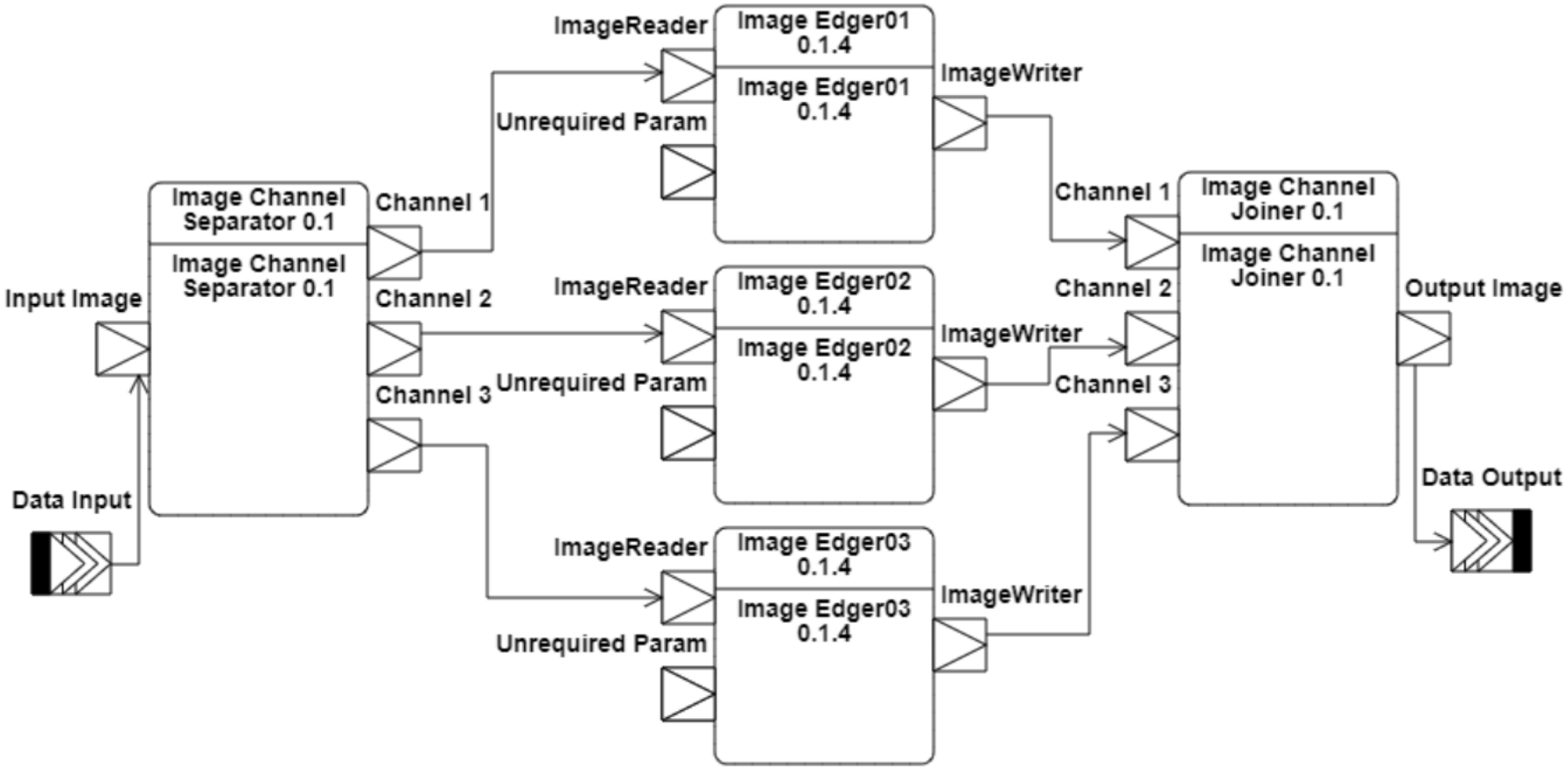


BalticLSC Applications

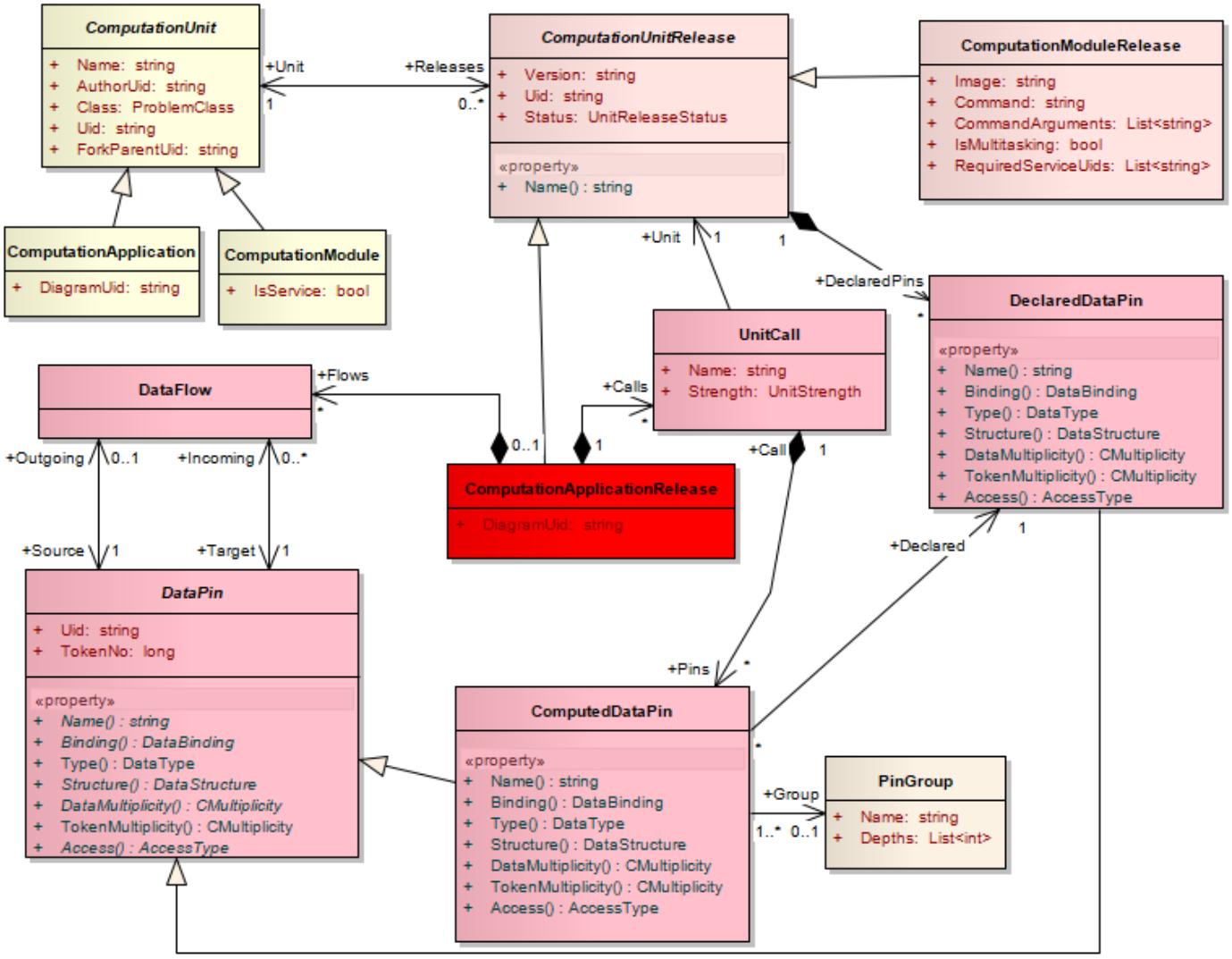
- Computation Application Language – a visual (graphical) low-code language



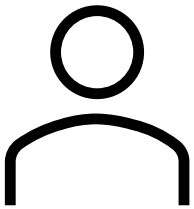
CAL Example App (Image Edger)



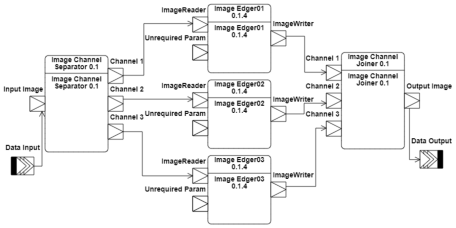
CAL abstract syntax



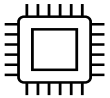
CAL translation and execution



End-user



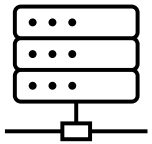
CAL Program



Computation Engine

```
Task uid=t001
  JobBatch uid=b001
    DataToken "Video Input" no=1 RequiredStrong data=Single token=Single
    DataToken "Subtitle Input" no=2 RequiredStrong data=Single token=Single
    DataToken "Output Film" no=3 Provided data=Single token=Single
    Job "Video Colorizer" uid=j001
      DataToken "input" no=1 RequiredStrong data=Single token=Single
      DataToken "output" no=4 Provided data=Single token=Single
    Job "Subtitle Translator" uid=j002
      DataToken "input" no=2 RequiredStrong data=Single token=Single
      DataToken "output" no=5 Provided data=Single token=Single
    Job „Subtitle Mixer" uid=j003
      DataToken "video" no=4 RequiredStrong data=Single token=Single
      DataToken "subtitles" no=5 RequiredStrong data=Single token=Single
      DataToken "film" no=3 Provided data=Single token=Single
```

CAL-Exec Program



Computation Clusters

Job Broker

CAL Executable example

```
Task uid=t001
    JobBatch uid=b001
        DataToken "Video Input" no=1 RequiredStrong data=Single token=Single
        DataToken "Subtitle Input" no=2 RequiredStrong data=Single token=Single
        DataToken "Output Film" no=3 Provided data=Single token=Single
        Job "Video Colorizer" uid=j001
            DataToken "input" no=1 RequiredStrong data=Single token=Single
            DataToken "output" no=4 Provided data=Single token=Single
        Job "Subtitle Translator" uid=j002
            DataToken "input" no=2 RequiredStrong data=Single token=Single
            DataToken "output" no=5 Provided data=Single token=Single
        Job „Subtitle Mixer" uid=j003
            DataToken "video" no=4 RequiredStrong data=Single token=Single
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            DataToken "film" no=3 Provided data=Single token=Single
```
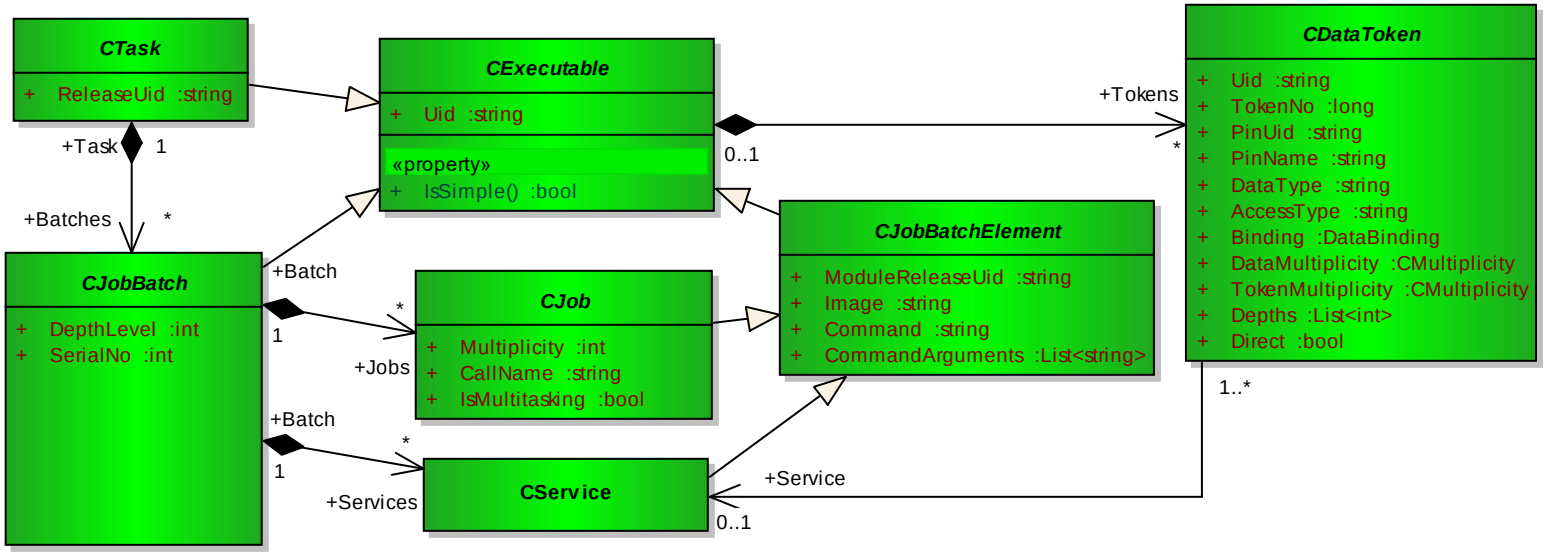
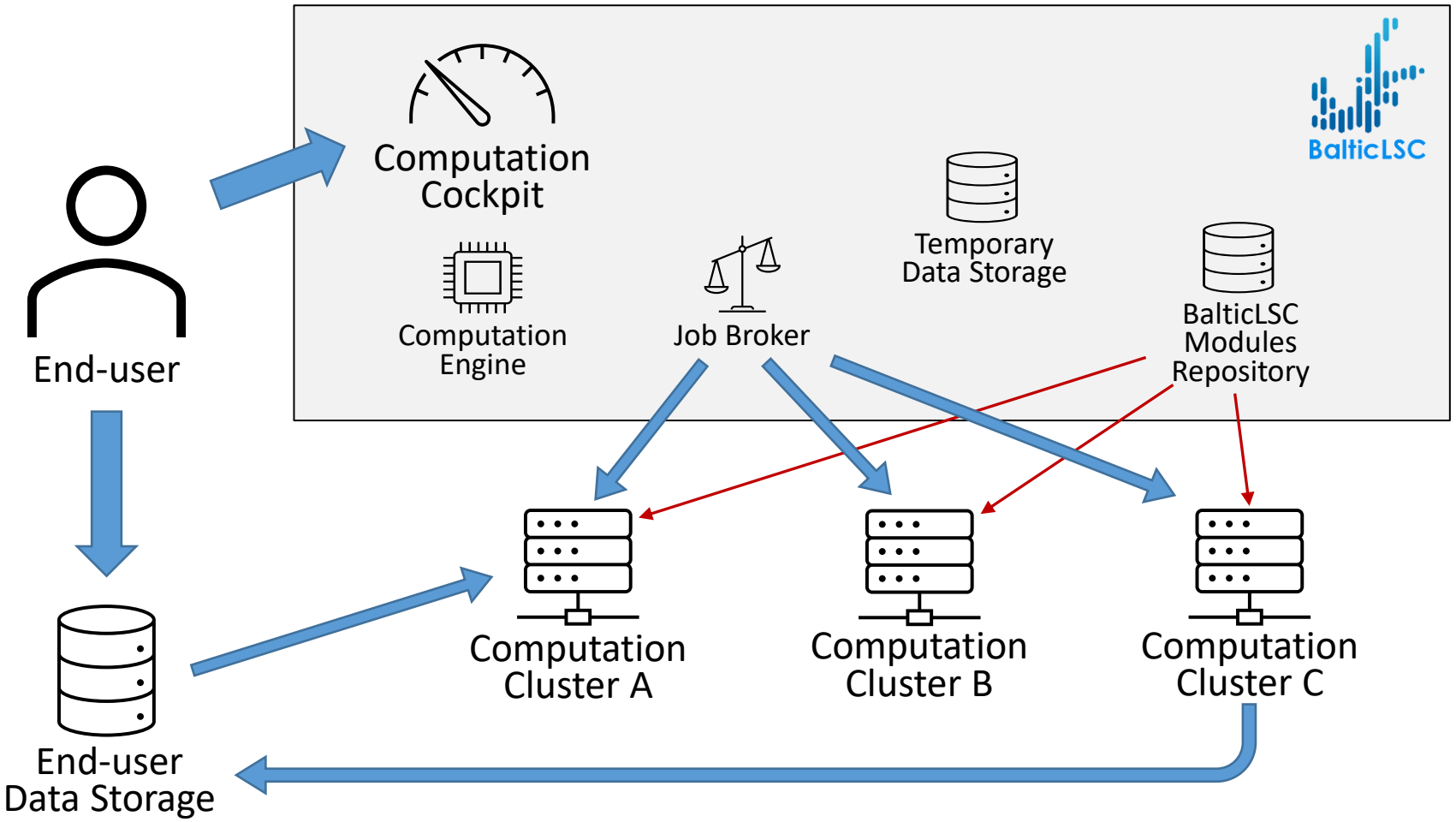
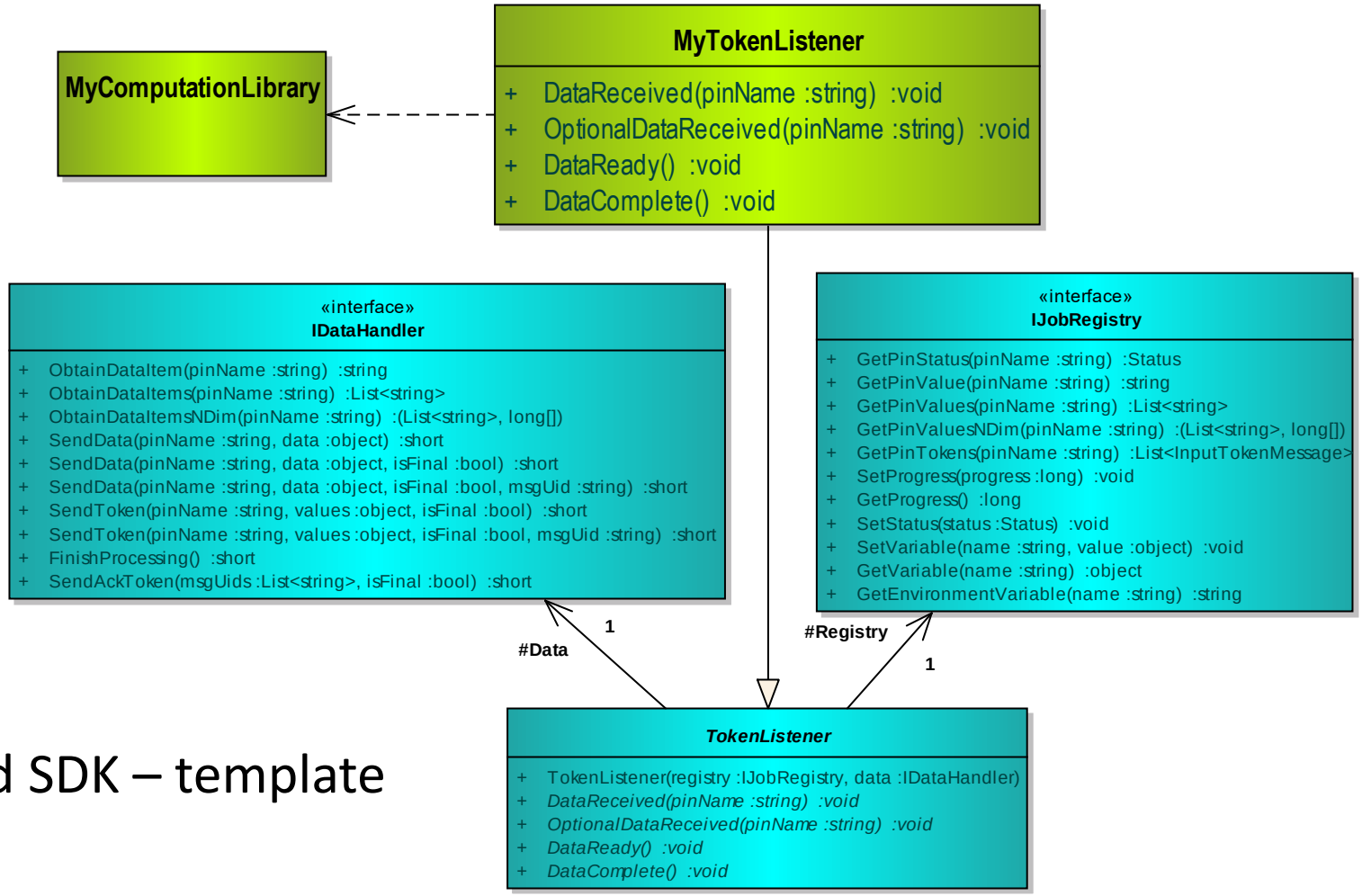

CAL Executable abstract syntax



Executing applications in BalticLSC



Developing Computation Modules



Standard SDK – template

Providing your computation code

- Read data items from tokens
- Perform computations
- Write data items and pass tokens

```
public class MyTokenListener : TokenListener
{

    // (...)

    public override void DataComplete()    {
       Registry.SetStatus(Status.Working);
       string folder = Data.ObtainDataItem("Image Folder");
       string[] files = Directory.GetFiles(folder);
       Log.Debug($"Read folder: {folder}");
       for (int i=0; i<files.Length; i++)
       {
          Log.Debug(files[i]);
          Data.SendDataItem("Images", files[i], files.Length - 1 == i);
          Registry.SetProgress((i+1)/files.Length*100);
       }
       Data.FinishProcessing();
    }
}
```

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BalticLSC

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