

# A framework to provide the distributed execution of semantic and image analysis algorithms on different platforms and architectures



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# Virtual Specimenscout Project



- Achieves to provided a **diagnostic platform** for histological analysis on whole slide images
- Automatic **pre-analysis** of slides
- On **demand analysis** capabilities combined with virtual microscopes
- **Search engine** for diagnostic results which allows textual and image based requests and presents comparable **medical cases**

# Motivation



- **Need for cross-platform architecture because ...**
  - Different image analysis frameworks, tools and APIs are available (Definiens Developer, ImageJ, ITK,...)
  - Different clients (e.g. viewers) need to be integrated (written in different languages)
  - Different levels of skills can be problematic if only one platform is used
  - Wrong decision might cost a lot of money and time during projects
- **Conclusion**
  - We need a system which provides (distributed) platforms that encapsulate the framework specific algorithms
  - S<sup>4</sup> – Specimen Scout Service System

# Algorithm Execution Platform

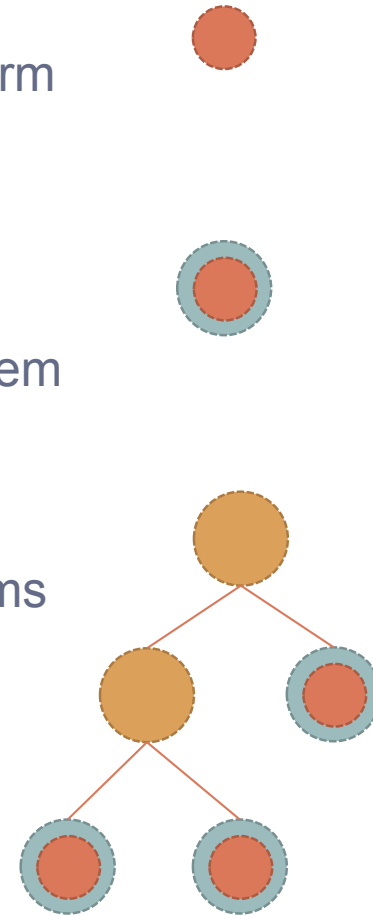


- Algorithm Processing Environment - APE
  - Every algorithm will be integrated in an Algorithm Processing Platform
  - Is a converter between particular platform and the S<sup>4</sup> interfaces
- Two types
  - Image Processing Environment - IPE
  - Semantic Processing Environment - SPE

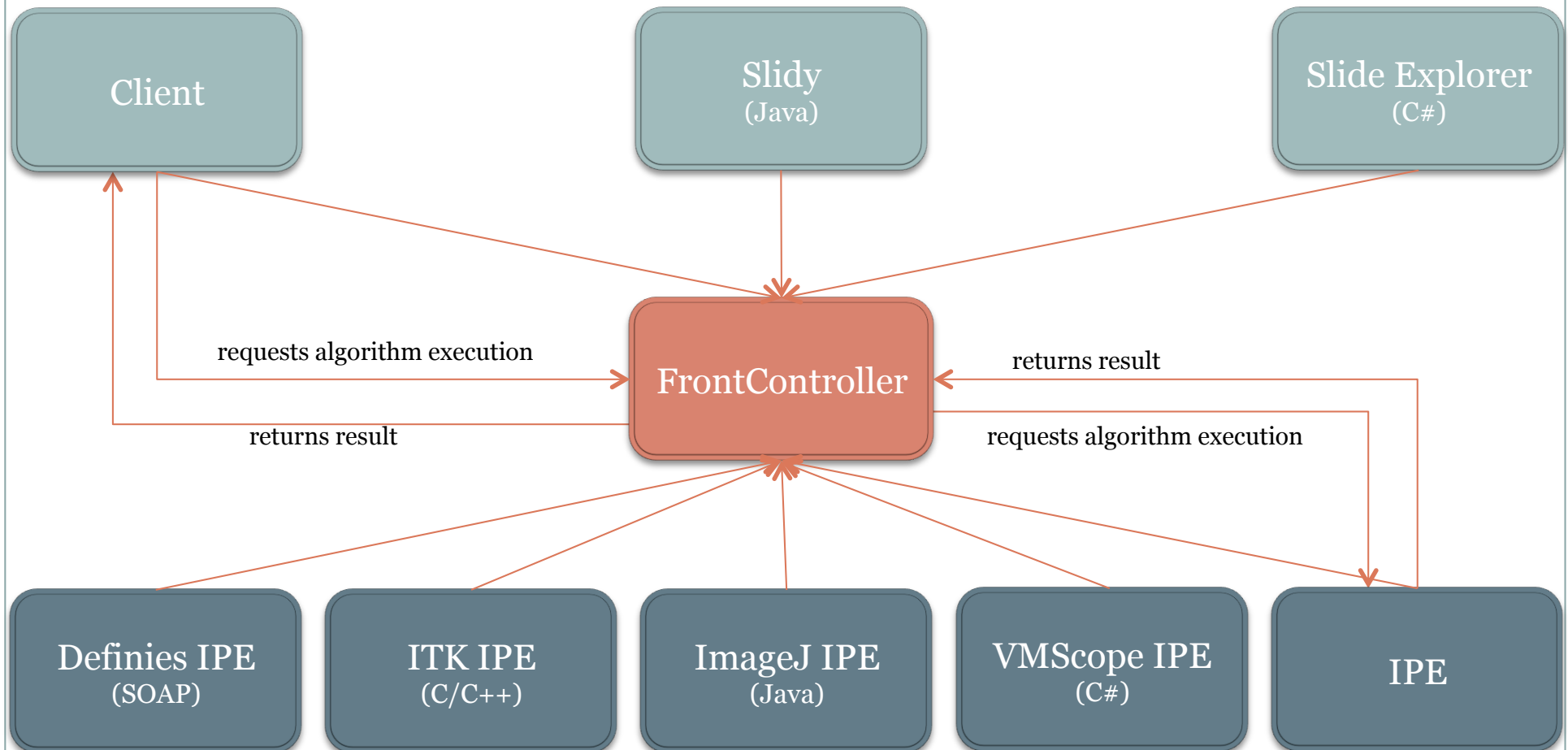
# Algorithms



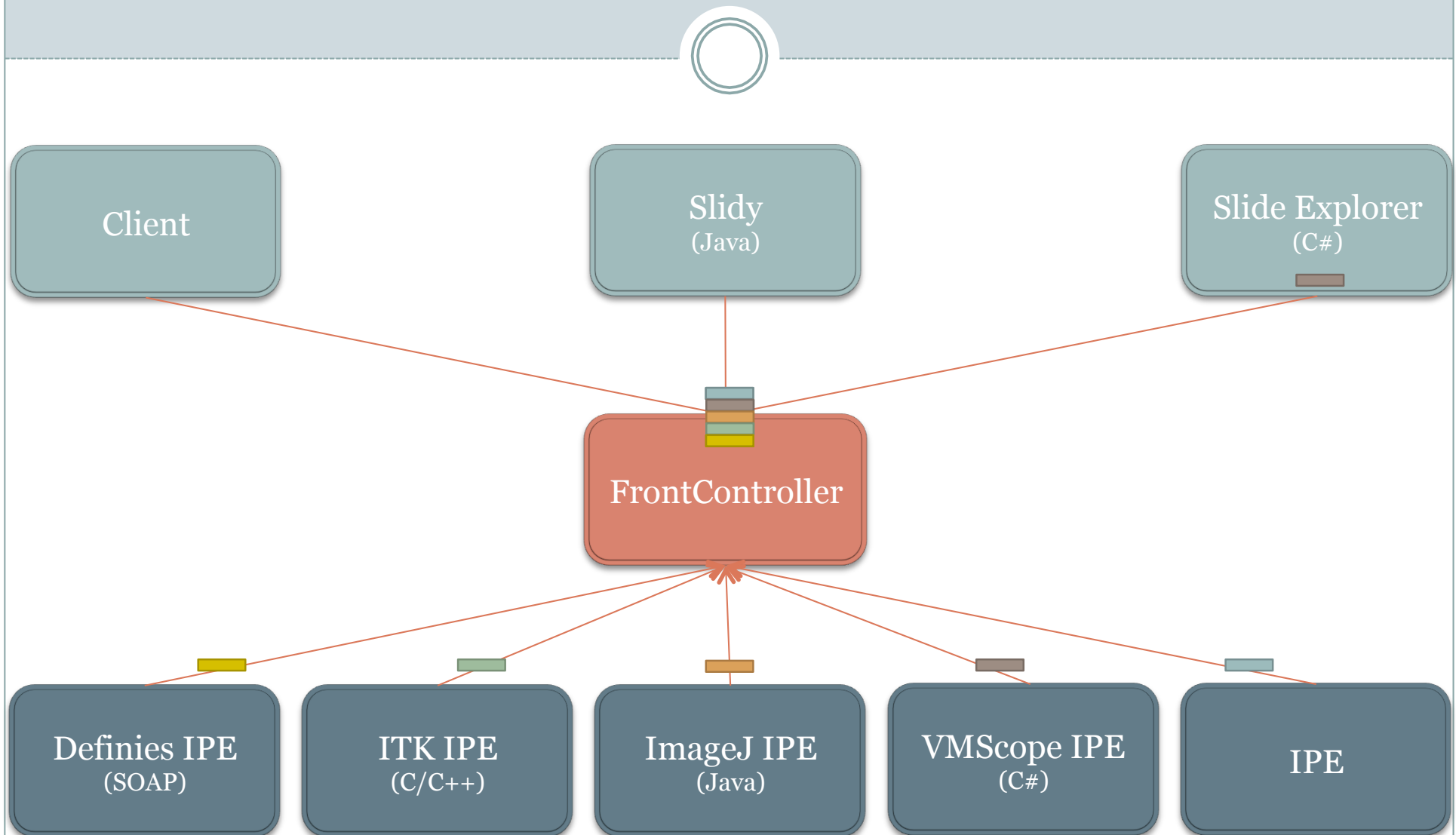
- **Elementary Algorithms**
  - The primitive algorithms provided by the particular platform
  - Written in platform specific language
- **Basic Algorithms**
  - Are encapsulating Elementary Algorithms
  - Translating the Elementary Algorithms and the core system
  - Written in IPE language
- **Compound Algorithms**
  - Consists of Basic Algorithms and/or Compound Algorithms



# Communication Infrastructure

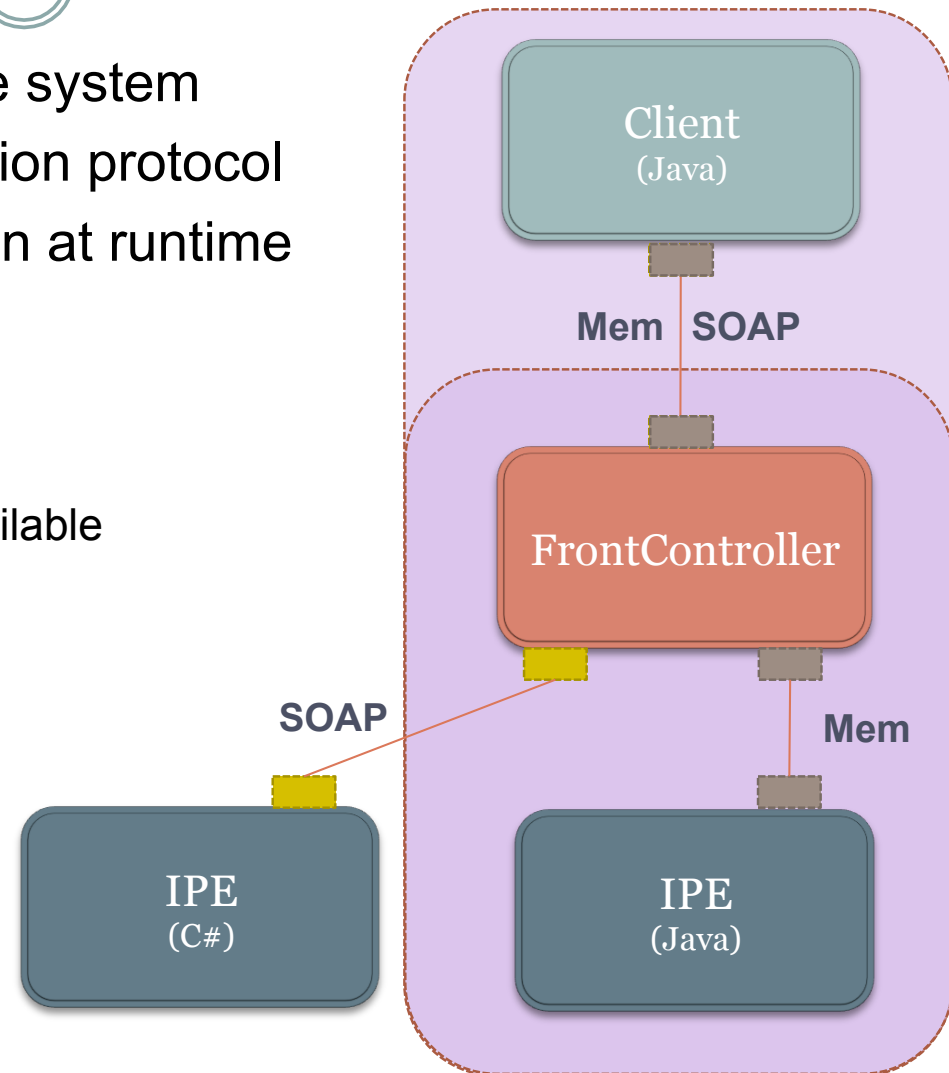


# Communication Infrastructure



# Communication connectors

- Connectors hide the access to the system
- Allows to change the communication protocol
- Even possible to switch connection at runtime
- Currently implemented
  - SOAP based access
    - ✦ Distributed and flexible
    - ✦ Generators for many languages available
  - Memory access
    - ✦ Locally on the server or client
    - ✦ Higher performance





## Tasks

- ALGORITHM
- PLATFORM
- STATUS



Slidy

File Admin Edit Navigation Run Tools Window Help

40x 20x 10x 5x 2.5x 1.25x

Typ I Typ IIa Type IIb

Navigation

- 821 ATPase TB 4
- 821 ATPase TB 5
- 905 ATPase Toluidinblau
- 922 ATPase TR 1

Outline

Annotation View

AnnotationDetailed View

Property	Value
[-] polygon prot...	
isSelected	false
isCurrent	false
isClosed	false

# Summary



- S<sup>4</sup> provides
  - The platform provides the potential to **simplify development** of image analysis algorithm
  - Especially useful for **prototyping** because algorithms can be exchanged
  - Use of common **distributed** technologies (e.g. SOAP) makes access quite easy
  - Flexible **connectors** allow multiple scenarios (e.g fully distributed)

# Outlook



- Integrate a bunch of useful algorithms
- Provide access to semantic frameworks
- Provide user interfaces for development (e.g. graphical editors)
- Provide own simple language to access the frameworks capabilities

## MyScript

```
{
```

```
Image image = ContentProvider.get(„myNiceImage“);
```

```
Image result = on ImageJ do GaussianFilter(image, 0.8)
```

```
Image result2 = on Definimens do Classification(result);
```

```
...
```

```
}
```



Thank you for your attention!

