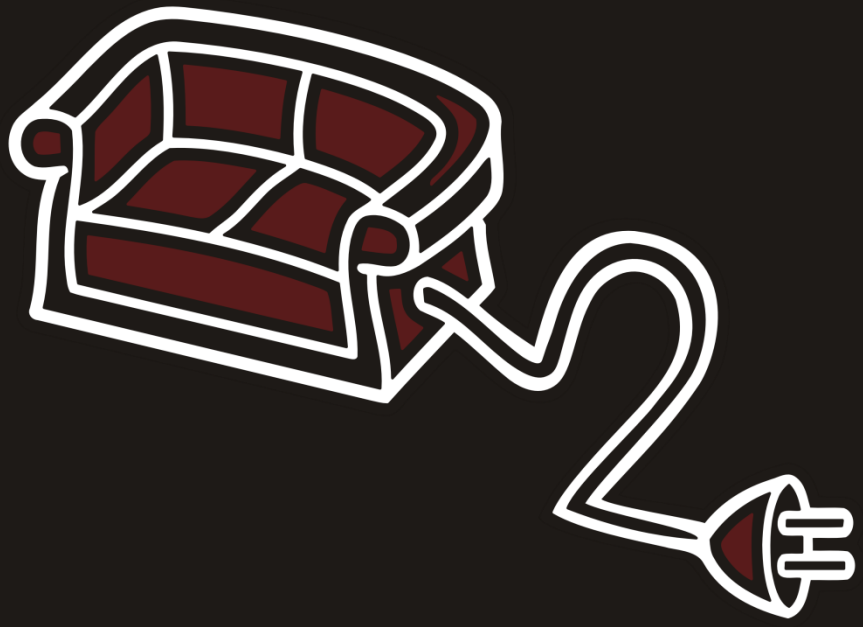
JavaScript

python™



SOFA 2 RUNTIME SUPPORT FOR DYNAMIC LANGUAGES

Jaroslav Keznikl

1. Why should you be interested?
    - Overview of the current SOFA 2 controllers
    - Cool features for easy component development

2. What I’m expecting from you?
    - Feedback, comments
    - Notify me when I’m speaking fast/slowly/softly

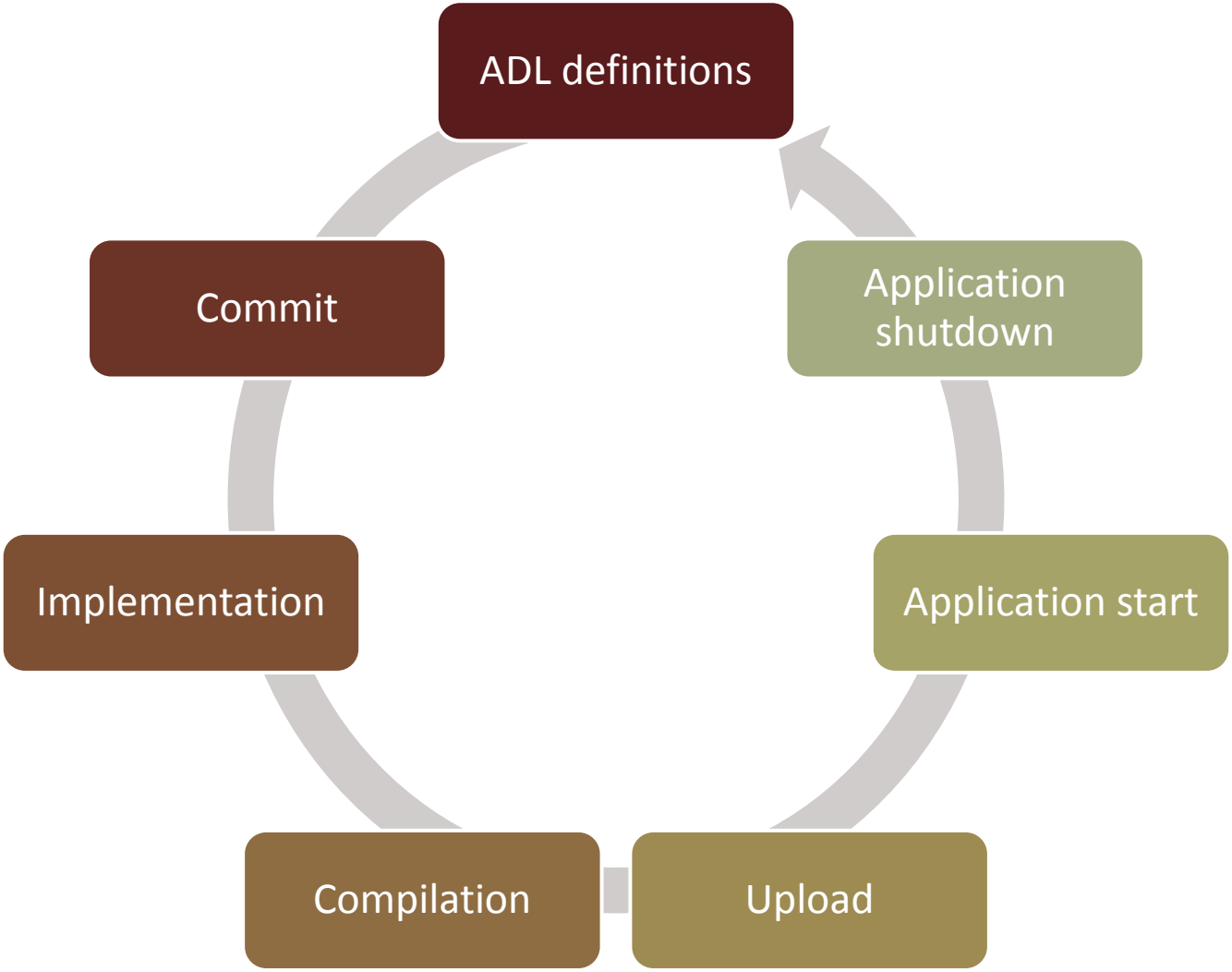
1. Motivation & Goals

Why dynamic (scripting) languages?

Long turnaround of SOFA 2 component development cycle

- Code compilation, uploading, application restarts, …

SOFA 2 component development cycle



Why dynamic (scripting) languages?

Long turnaround of SOFA 2 component development cycle

- Code compilation, uploading, application restarts, …

Implementation changes at runtime

- Rapid prototyping

Are more suitable for some tasks

- GUI, parsing, …

Easy to learn

Goals

1. Support for scripted primitive components
   - Seamless integration with the original development cycle
   - Uses Java Scripting API
2. Implemented using component aspects
   - To avoid changes in the core runtime implementation
   - Scripting support should be an optional extension
3. Support for implementation changes at runtime
   - Command line tool
4. Component aspect mechanism evaluation

2. SOFA 2 component aspects overview

Component aspects & micro-architecture

Runtime extension mechanism

Implements the control logic

- All basic controllers implemented as aspects

Orthogonal to the business logic

- Similar to AspectJ

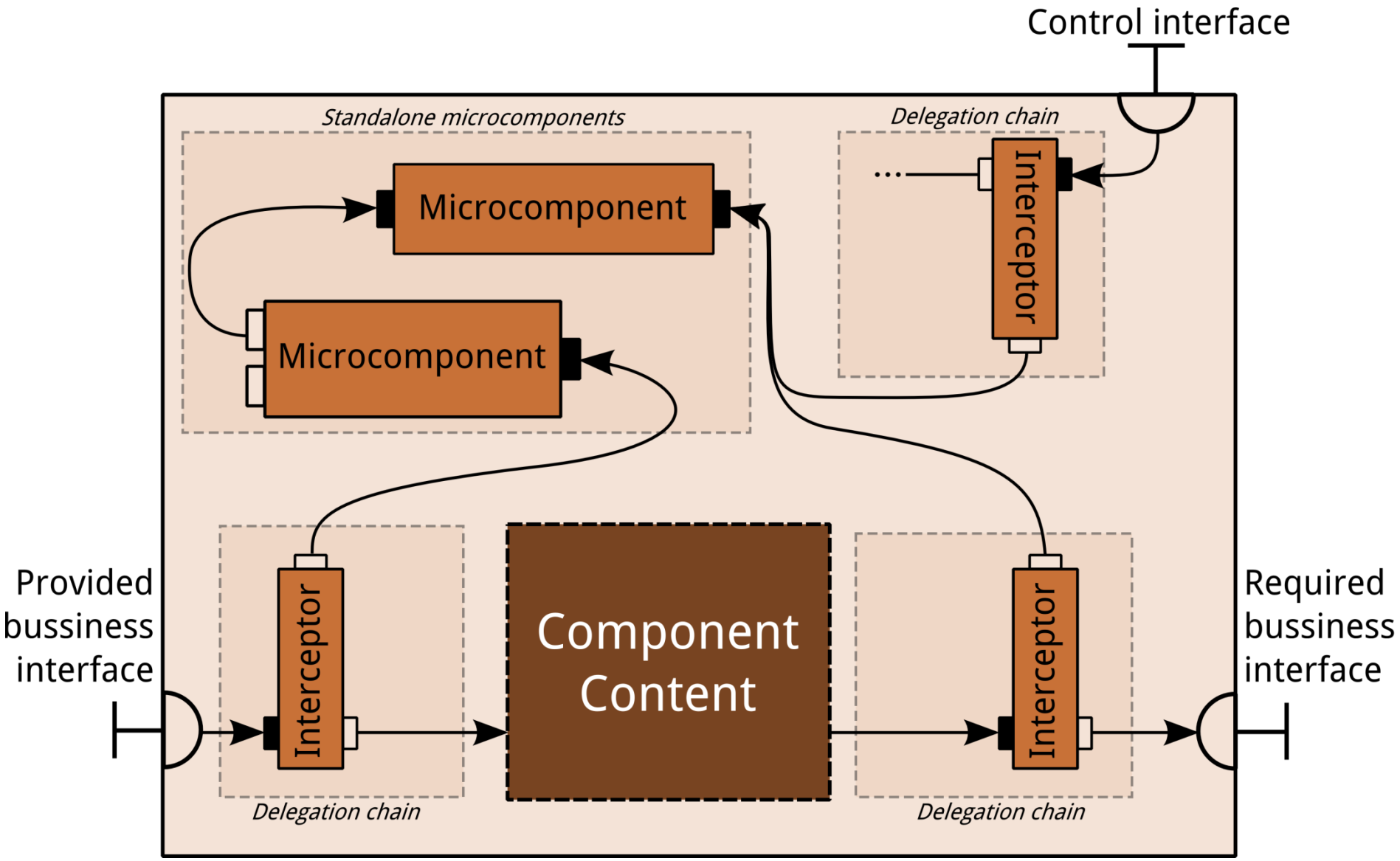
Aspects implemented using micro-architecture elements

- Simple flat non-distributed component model

Several important concepts

- Control interfaces
- Delegation chains
- Interceptors

Micro-architecture example



3. Dynamic language support implementation

Overall architecture

The component content represents the script code

- Created automatically
- Generic component content

The script code is executed in a designated aspect

- Script Aspect

The code updates are implemented in a separate aspect

- Update Script Aspect
- Optional

Script Aspect

Executes the component's script code

- Java Scripting Framework
- JavaScript (Rhino), Python (Jython)

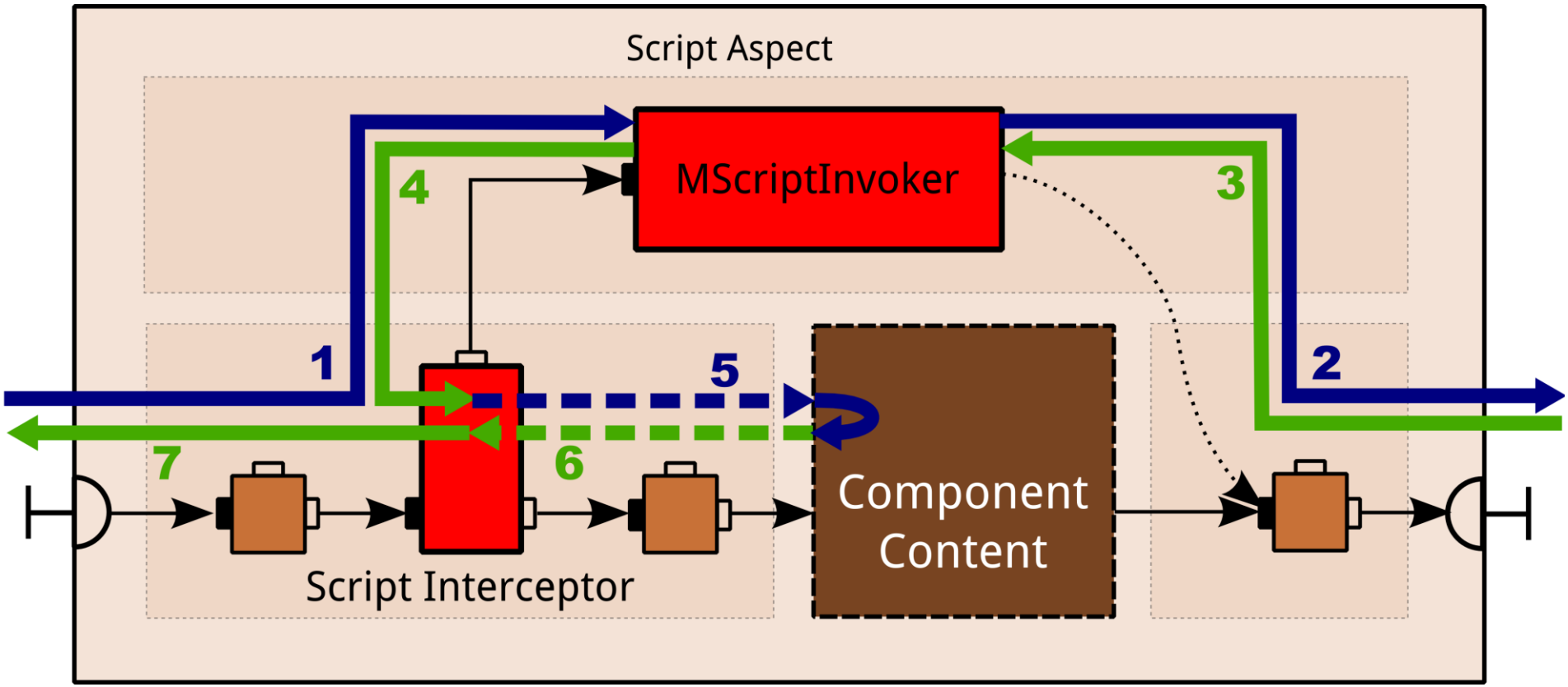
Provided interface calls are redirected using an interceptor

- Script Interceptor

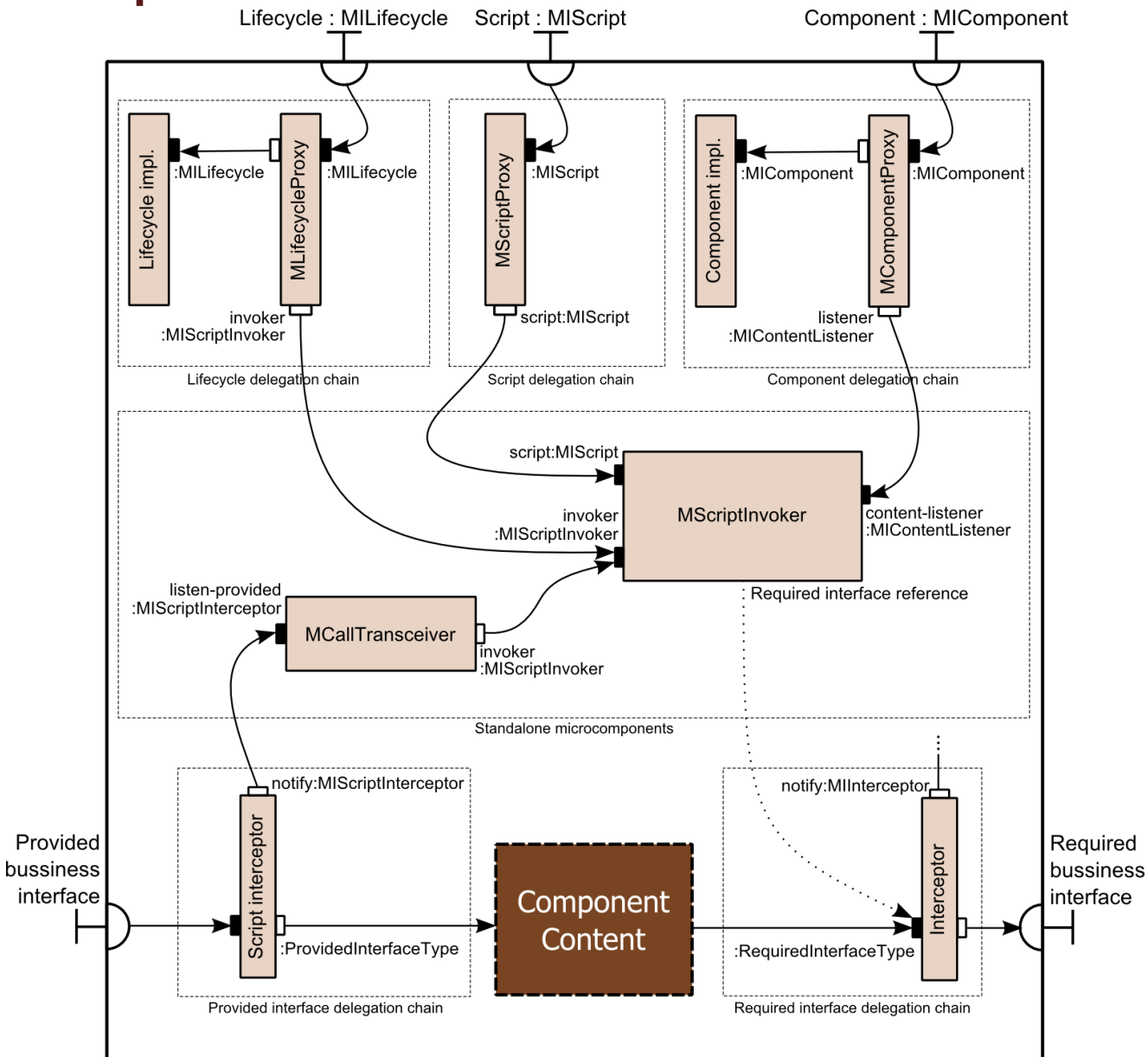
Integrated with the Lifecycle and Component aspects

Script control interface

Execution of the script code in an aspect



Script Aspect architecture



Update Script Aspect

Ensures the remote changes of the component's code

Extends the Script Aspect

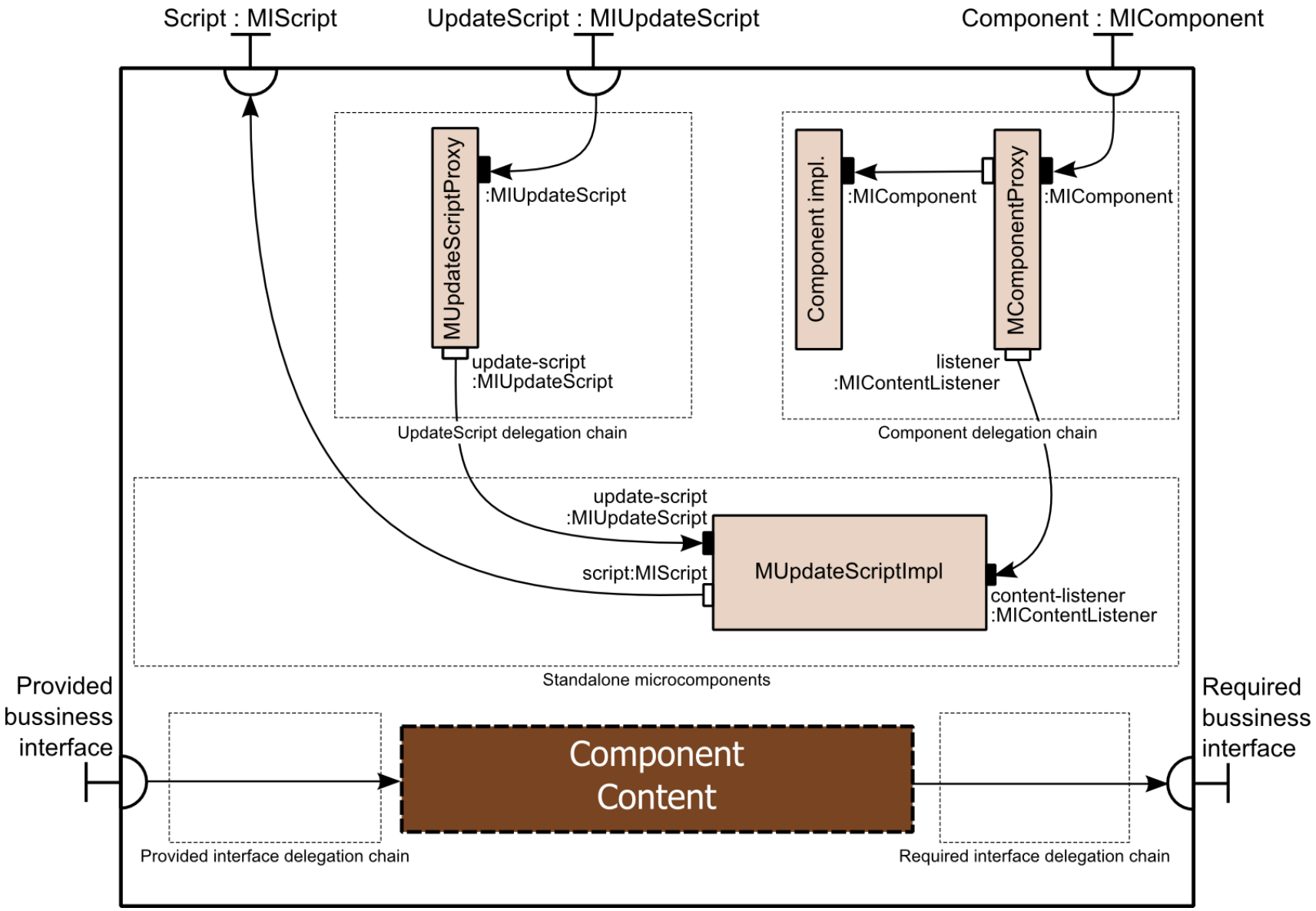
Stores changes back in the repository

Integrated with the Component aspect

UpdateScript control interface

- Accessed remotely from a console application

Update Script Aspect architecture



Features

- Similar specification/implementation to Java components
- Implicit access to Java classes from dependent c. bundles
- Support for script module importing
- Code updates can be stored into repository
- Replacing Java component by scripted one at runtime
- Fully optional, non-intrusive implementation
- General support for similar extensions (C# components)

Limitations

Implementation is dependent on the used scripting engine

- Class loading, module importing

Doesn’t support checked exceptions

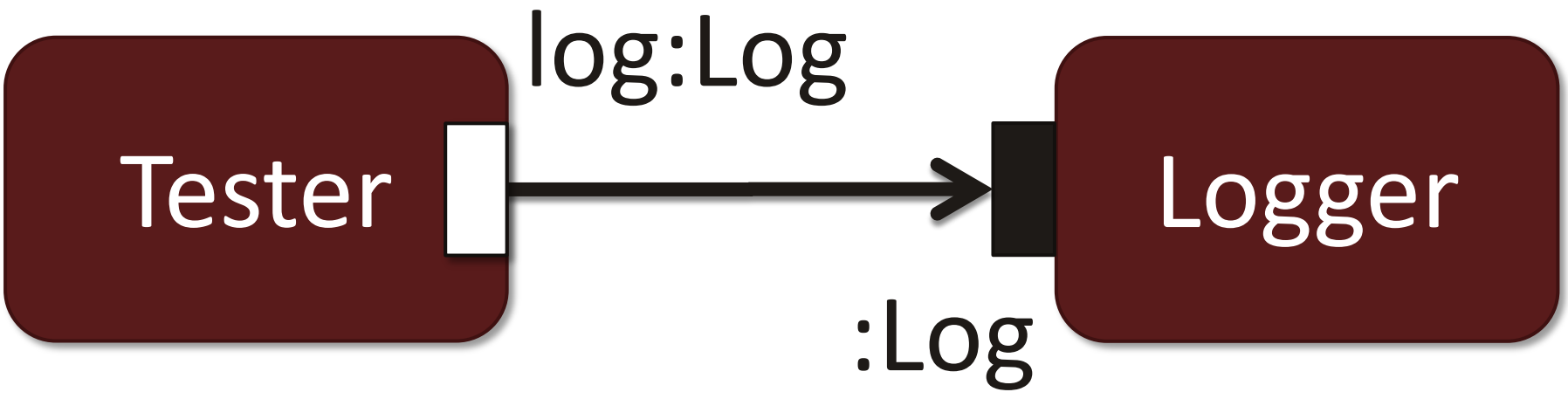
- Not supported by adaptation layer of the used scripting engines

Doesn’t allow to change the component type

- Not supported for the Java components either

4. Example

Example architecture



Interface (Java)

```
package org...examples.script.logdemo.iface;

public interface Log {
     void log(String message);
}
```

Tester architecture definition

```
<?xml version="1.0"?>

<architecture

    name="org...script.logdemo.arch.Tester"

    frame="sofatype://org...script.logdemo.frame.Tester"

    impl="org...script.logdemo.arch.Tester.js"

    lang="JavaScript"
>

    ...

</architecture>
```

Tester implementation (JavaScript)

```
function main() {
    var ret = 0;
    try {
        ret = log.log("Hello world from script.");
        …
        java.lang.Thread.sleep(5000);
    } catch (e) { … }
}

function start() {
    v = new java.lang.Runnable() {
        run: function() {
            while(!end) {
                main();
            }
        }
    }
    try {
        t = new java.lang.Thread(v);
        t.start();
    } catch (e) { … }
}

function stop() { end = true; }
```

Logger implementation (Python)

SOFAPythonImporter.loadCurrentCodeBundle()

```
from org...logdemo.arch.Printer
  import LogPrinter

printer = LogPrinter()

def log(message):
    printer.printLog(message)

…

class LogPrinter:
    def printLog(self, message):
        print "LOG: " + message
```

5. Evaluation

What was hard/interesting?

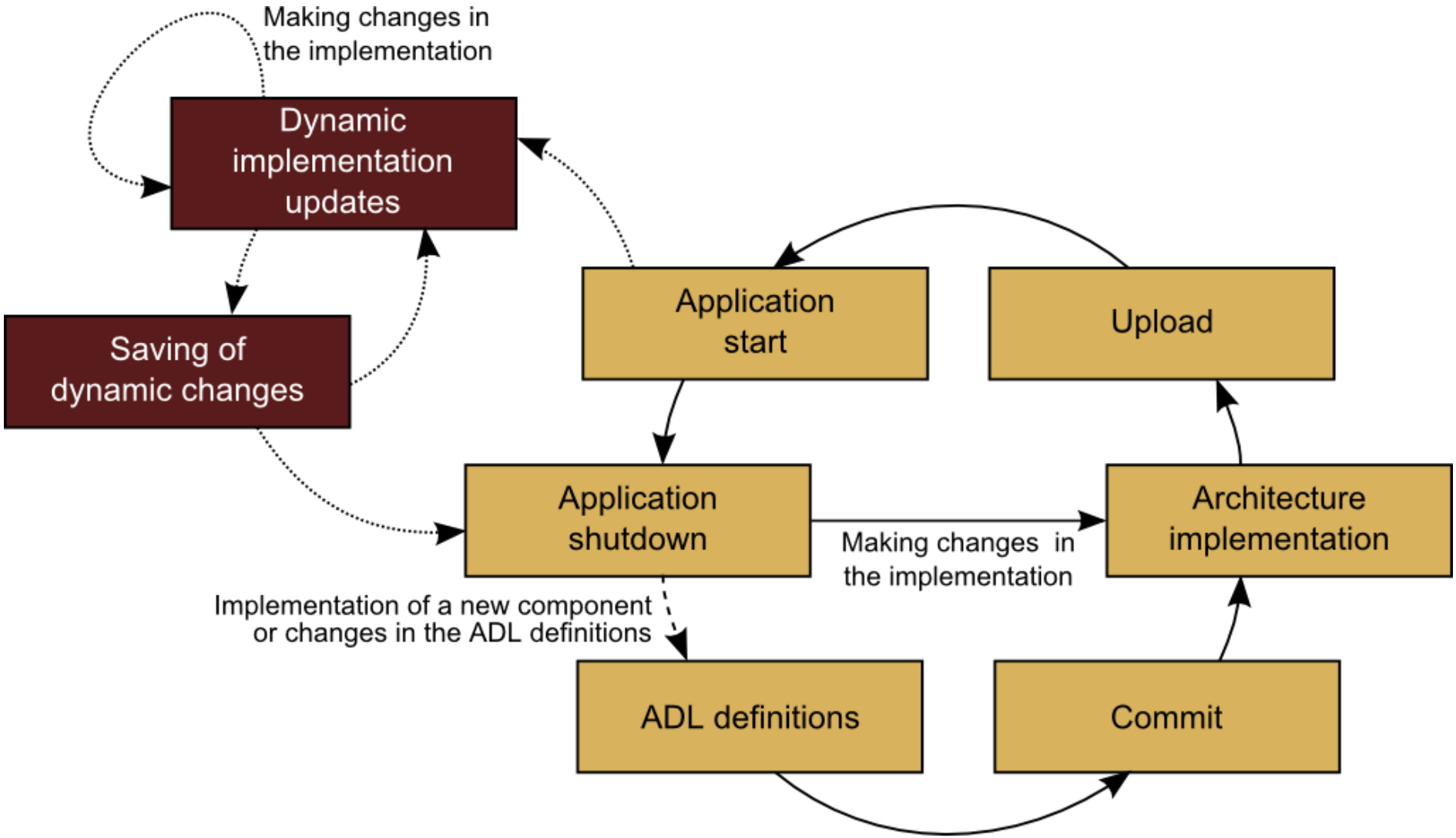
Execution of the component's code in an aspect

- Interceptor ordering
- Transparency with respect to other controllers
- Detection of non-scripted components

Integration of SOFA 2 environment and scripting engines

- Class loading of renamed classes
- Script module importing

Improved development cycle



6. Future tasks

Scripting support future tasks

Integration of the code updates into the SOFA IDE

Support for additional scripting languages

Versioning of the dynamic code updates

SOFA micro-architecture future tasks

Interceptor ordering specification

- Aspect ordering is not enough

Component aspect extension mechanism

- Extension points, …

Fully configurable component instantiation

- User-supplied component factories

Summary

1. Motivation & Goals
2. SOFA 2 component aspects overview
3. Dynamic language support architecture
4. Example
5. Evaluation
6. Future tasks

Conclusion

Easy implementation of scripted components

Good integration with the original runtime

- Both Java and scripted components in one application

A general approach to integration of new implementation technologies

Questions?