Detecting Inefficient API Usage

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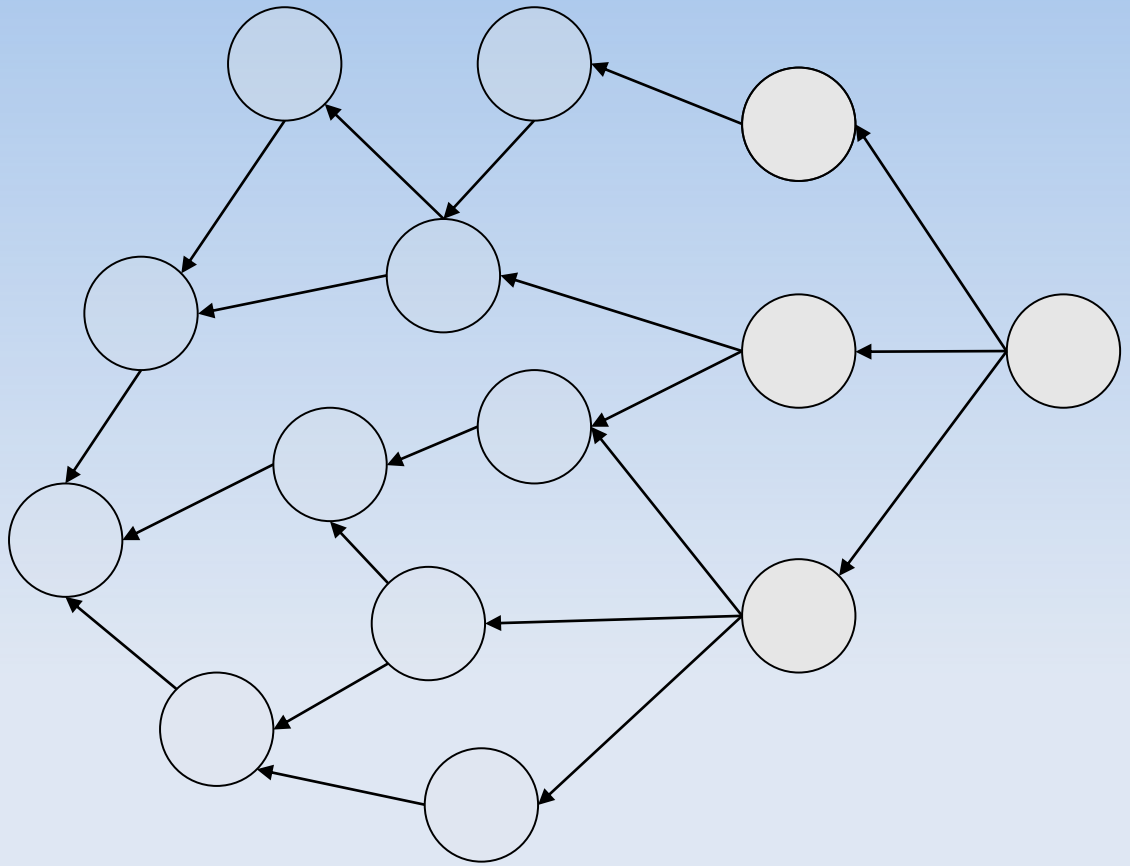
Application Programming Interfaces



Inefficient API Usage

```
gettingURLResponse(String url)
{
    WebResponse response = null;
    URL serverUrl = new URL(url);
    conversation = new WebConversation();
    request = new GetMethodWebRequest(serverUrl,"");
    response = conversation.getResponse(request);
    return response;
}
```

Inefficient API Usage

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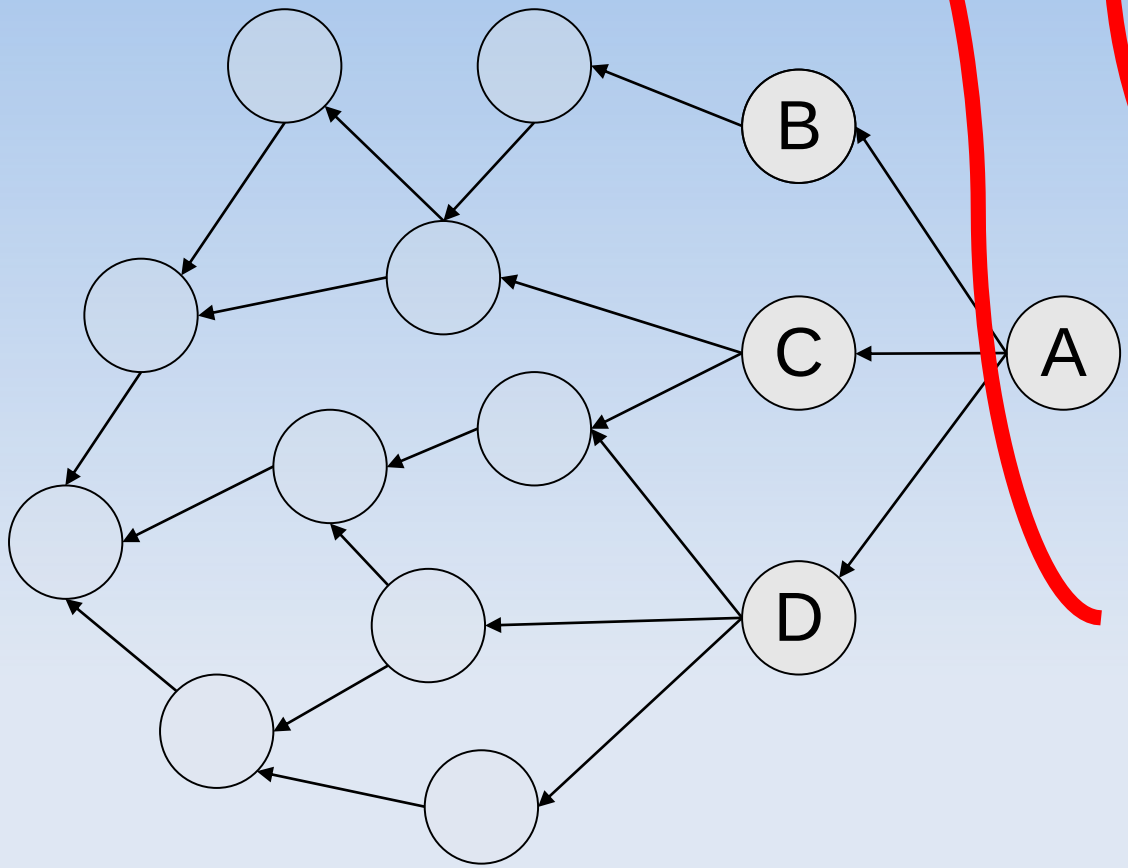
gettingURLResponse(String url)
{
    WebResponse response = null;
    URL serverUrl = new URL(url);
    conversation = new WebConversation();
    request = new GetMethodWebRequest(serverUrl,"");
    response = conversation.getResponse(request);
    return response;
}

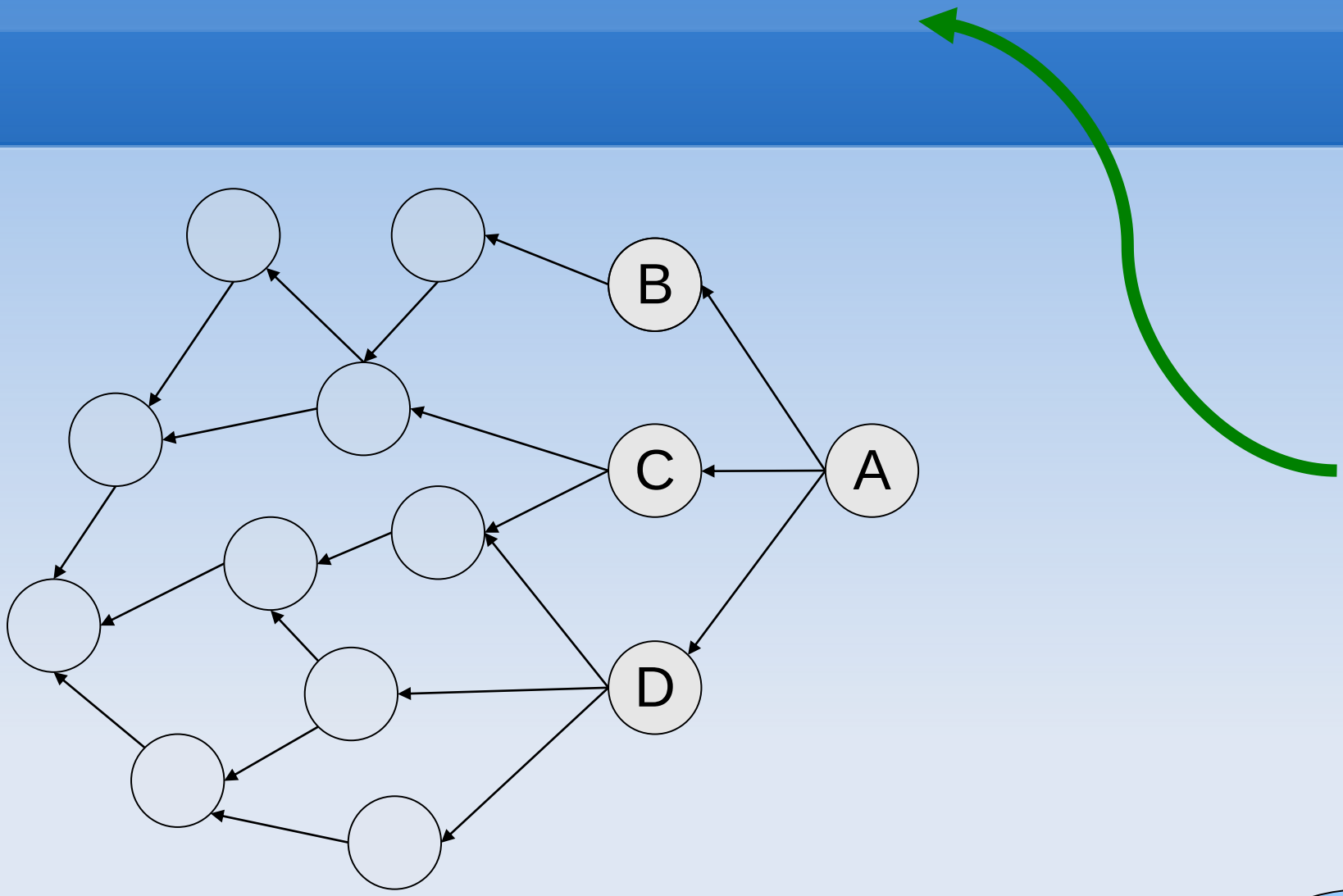
gettingURLResponse(String url)
{
    return new WebConversation().getResponse(url);
}
```

Inefficient API Usage



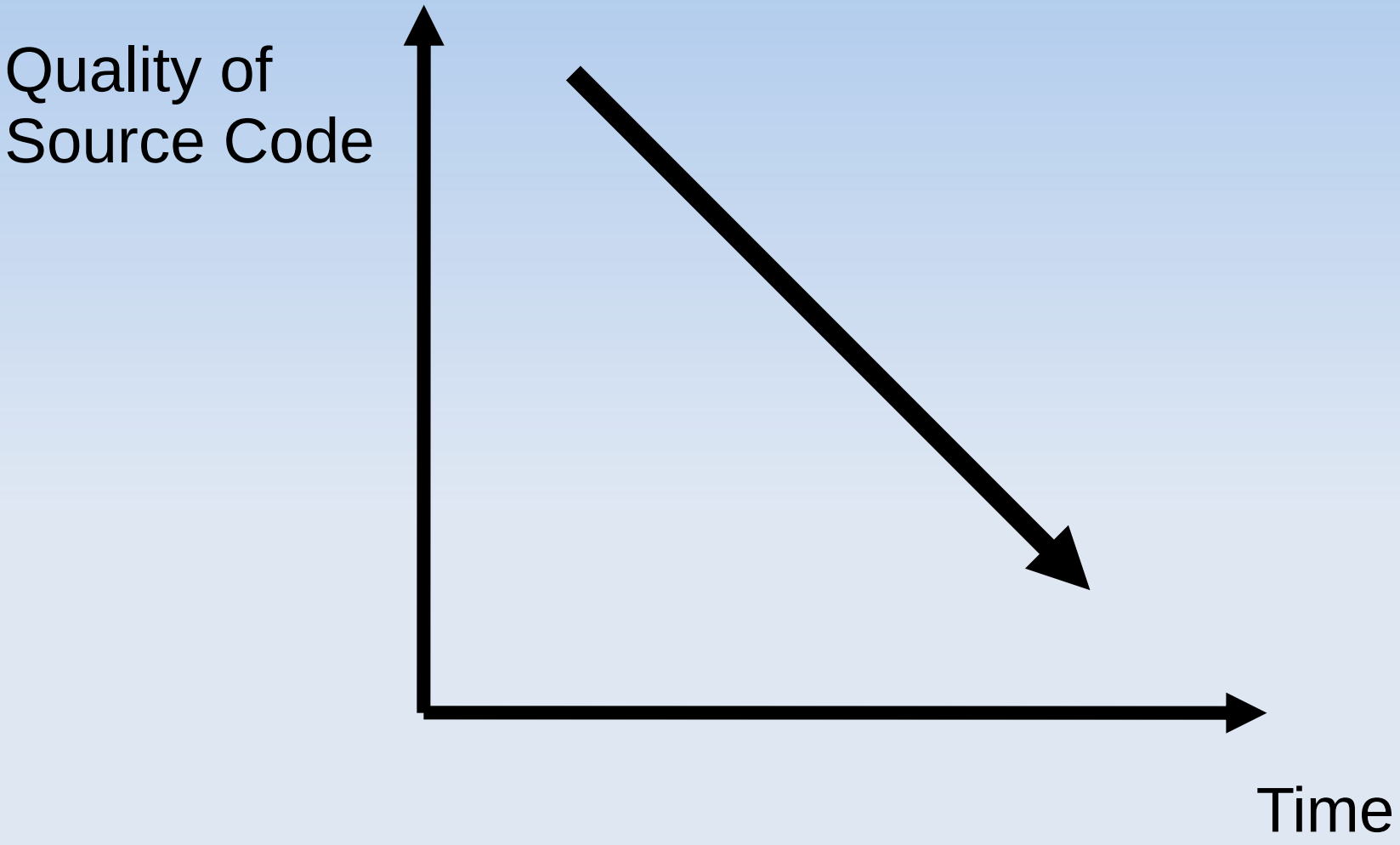
Client Method

Inefficient API Usage



Client Method

Motivation



Detection is not Easy

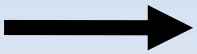
```
gettingURLResponse(String url)
{
    WebResponse response = null;
    URL serverUrl = new URL(url);
    conversation = new WebConversation();
    request = new GetMethodWebRequest(serverUrl,"");
    response = conversation.getResponse(request);
    return response;
}

getResponse(String url)
{
    return _mainWindow.getResponse(url);
}
```

Our Approach

Abstract Method Bodies

```
gettingURLResponse(String url)
{
    WebResponse response = null;
    URL serverUrl = new URL(url);
    con = new WebConversation();
    req = new GMWR(serverUrl,"");
    response =  con.getResponse(req);
    return response;
}
```



WebResponse

URL

URL(String)

WebConversation()

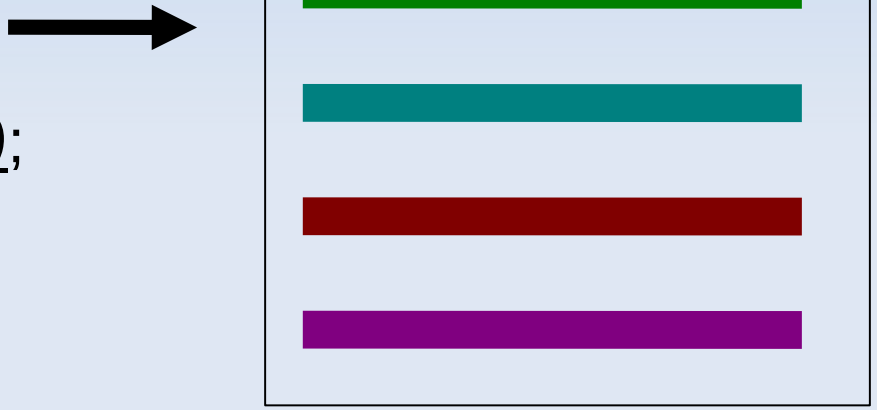
GMWR(URL,String)

getResponse(GMWR)

Our Approach

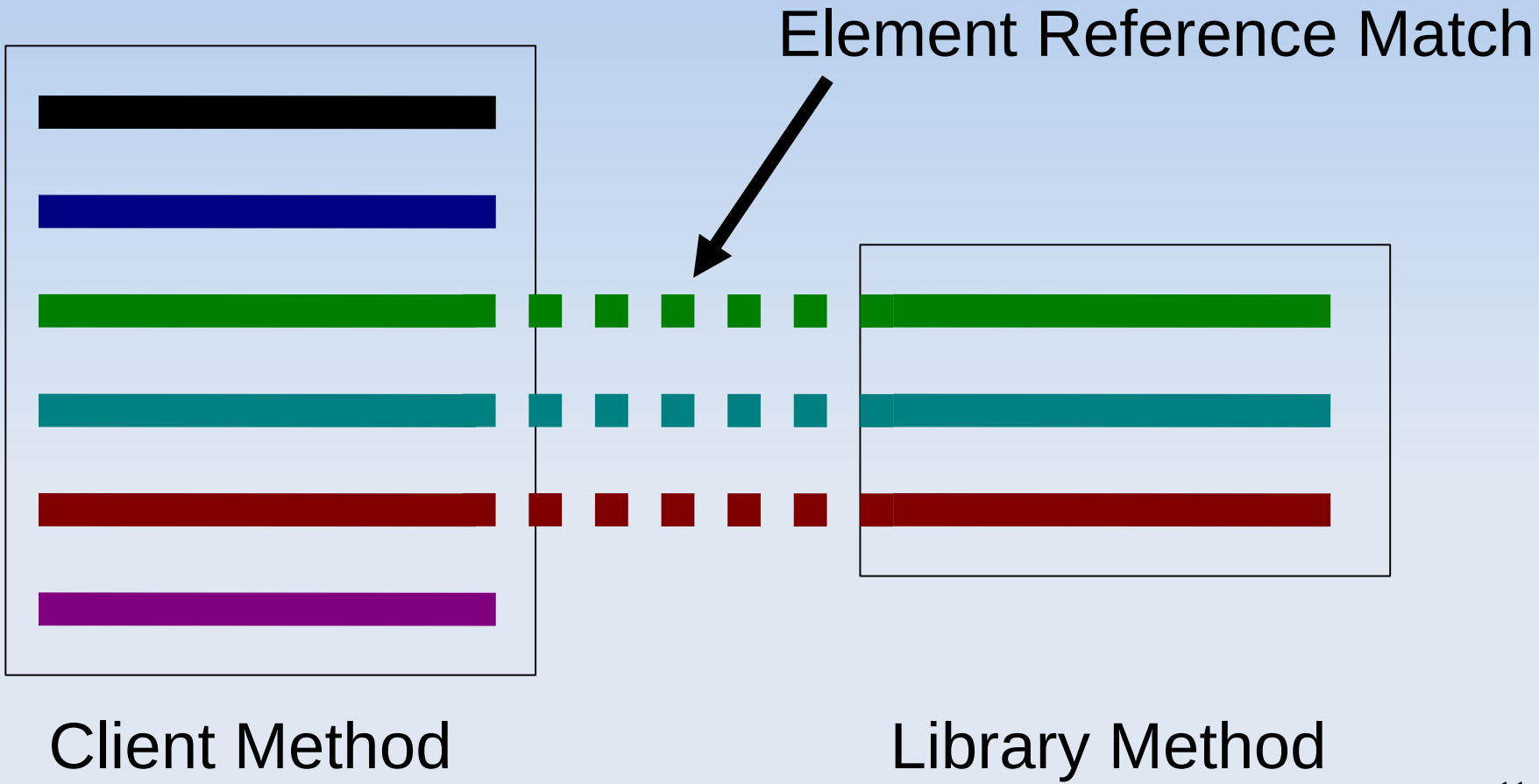
Abstract Method Bodies

```
gettingURLResponse(String url)
{
    WebResponse response = null;
    URL serverUrl = new URL(url);
    con = new WebConversation();
    req = new GMWR(serverUrl,"");
    response =  con.getResponse(req);
    return response;
}
```



Our Approach

Find Imitations

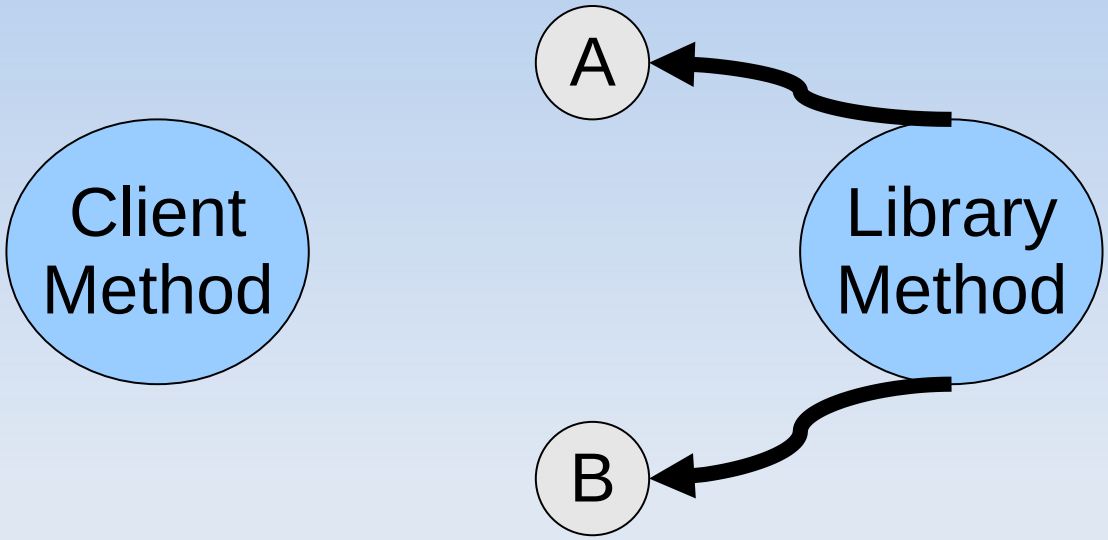


Three Kinds of Matches

Direct

Indirect

Nested

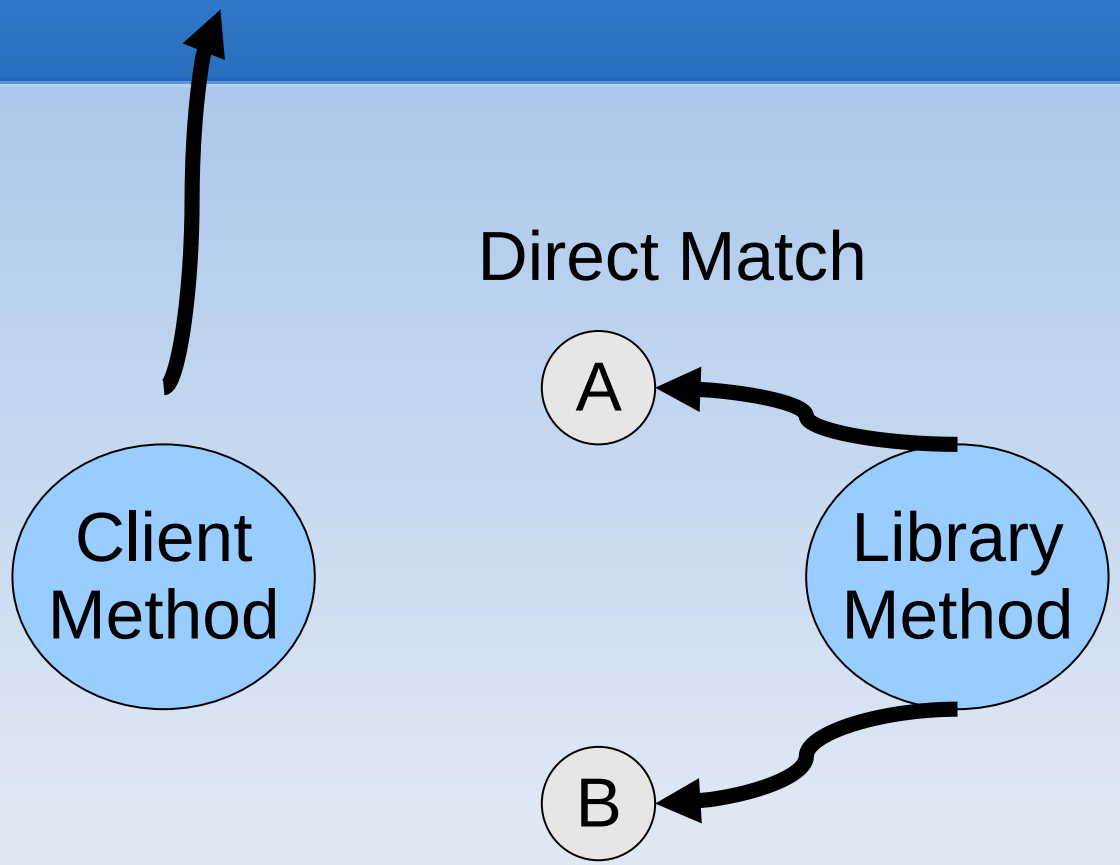


Three Kinds of Matches

Direct

Indirect

Nested



Three Kinds of Matches

Direct

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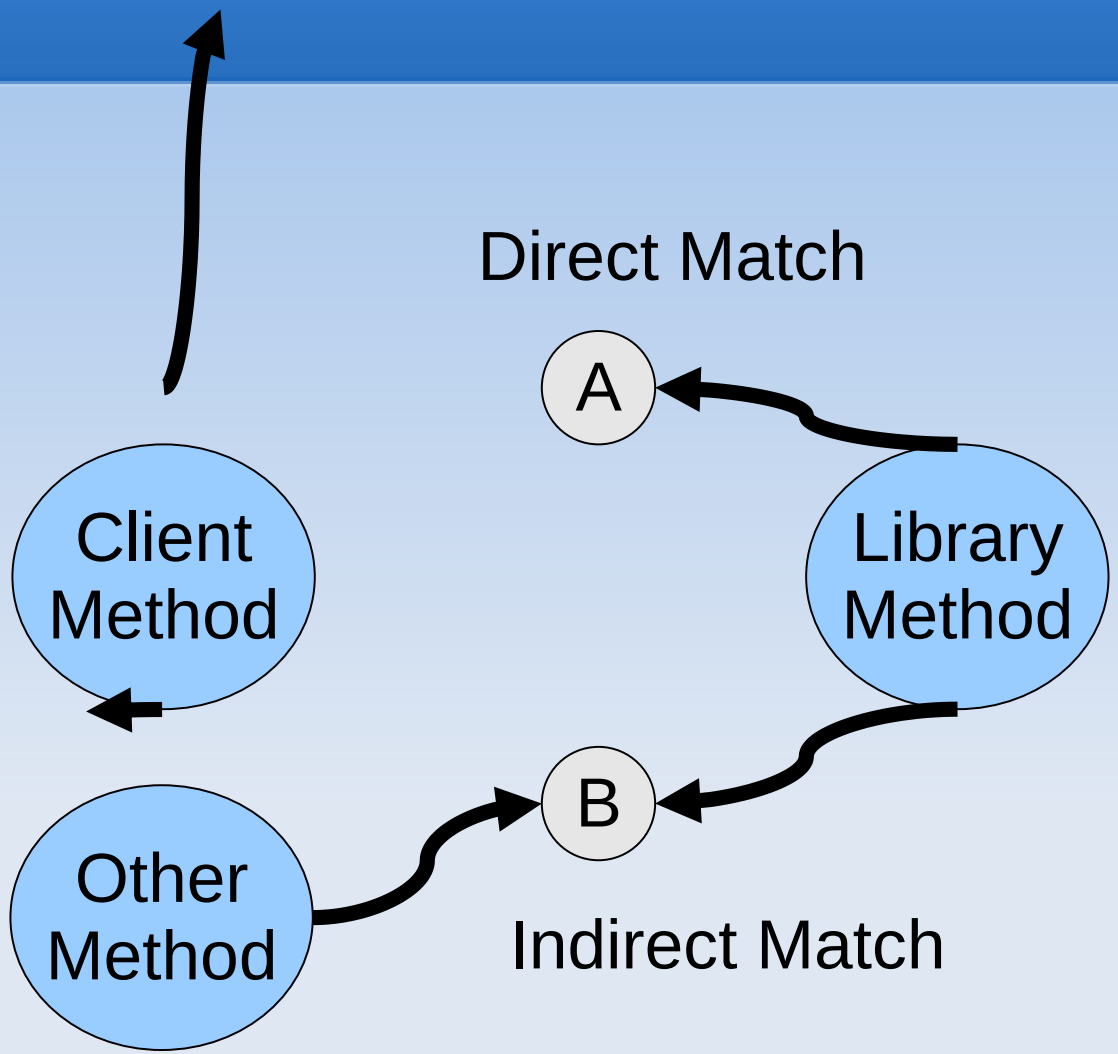
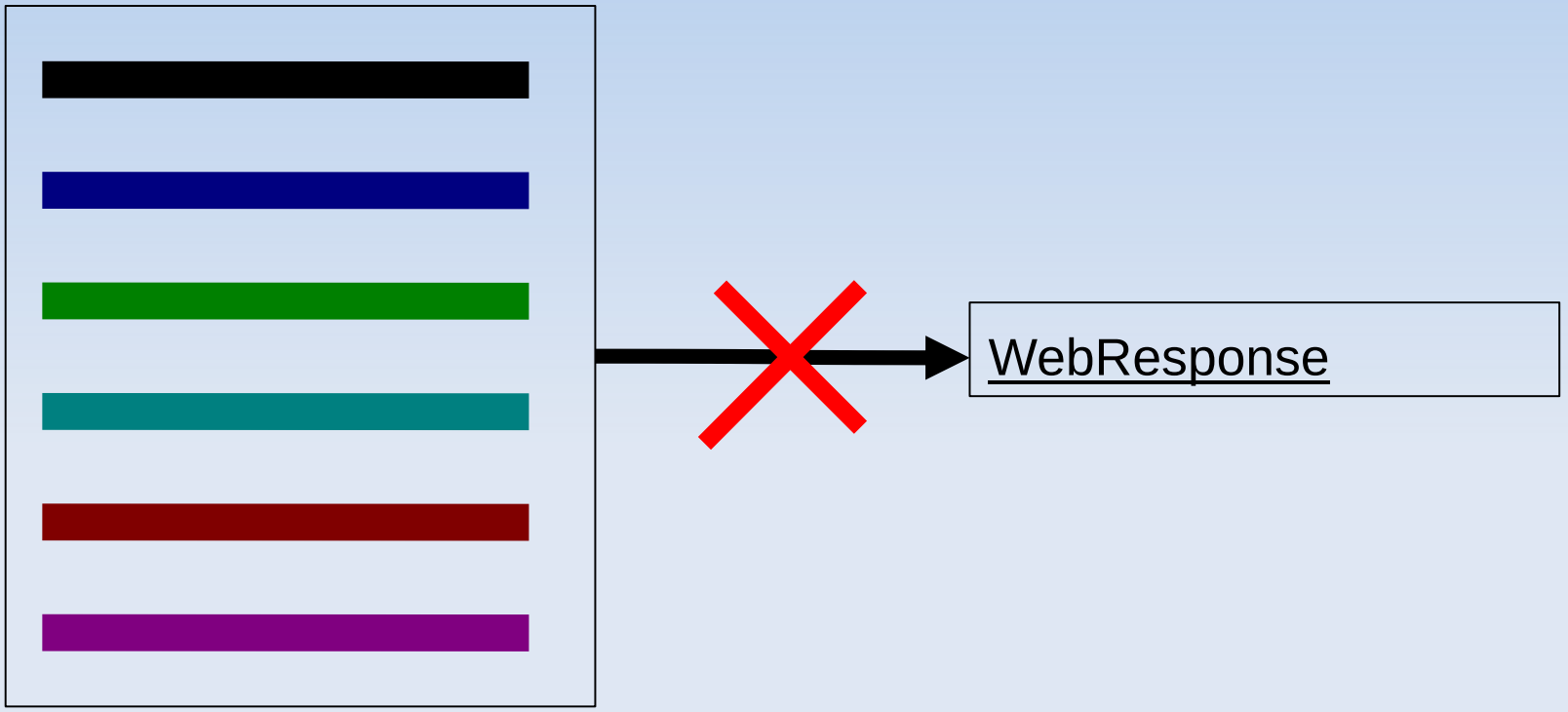


Our Approach

Filter the Imitations

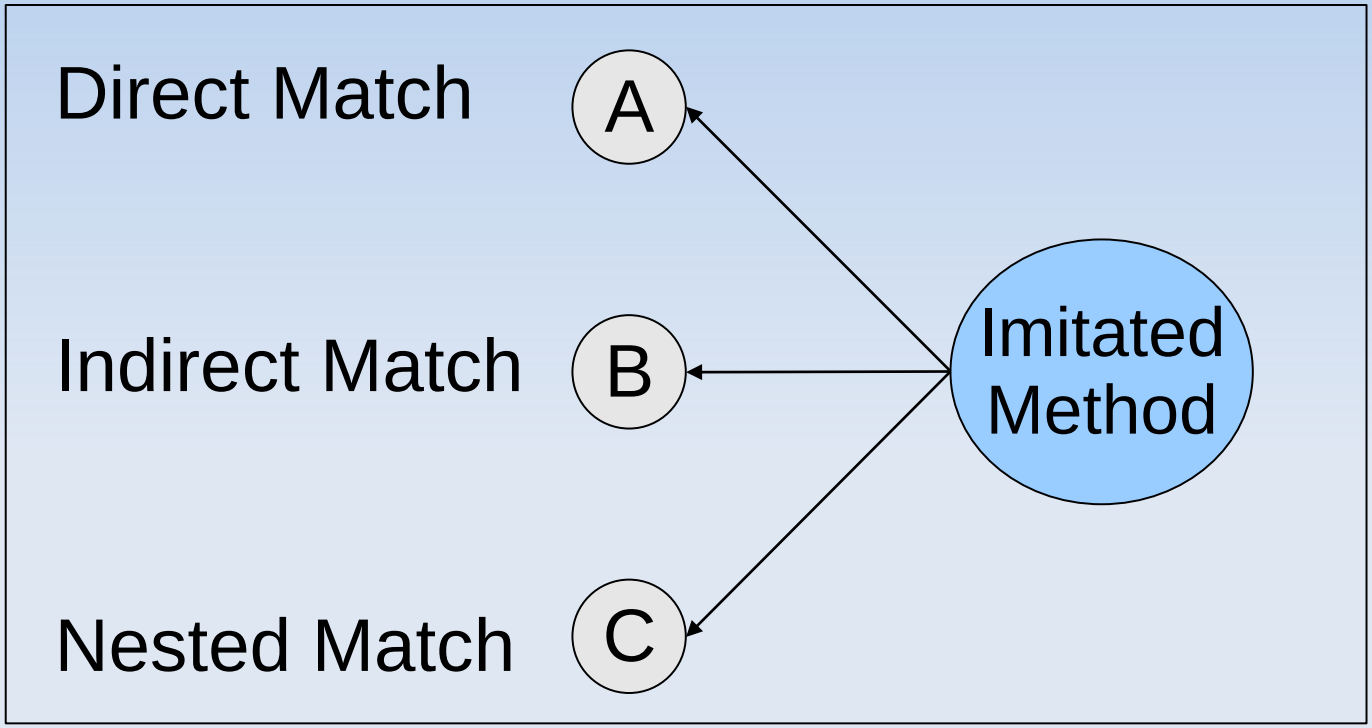


Client Method

Library Method

Our Approach

Abstract Imitations as Usage Patterns

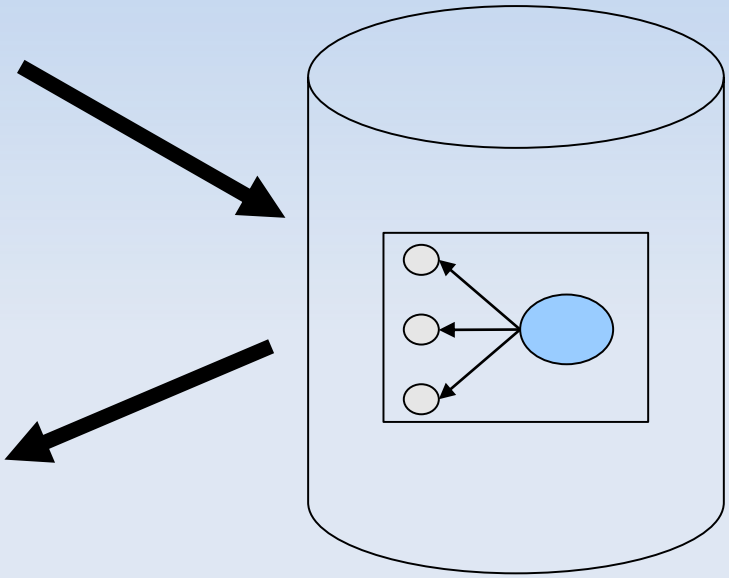


Our Approach

Store and Reuse (good) Patterns

```
gettingURLResponse(String url)
{
    WebResponse resp = null;
    ....
    return resp.getResponse(...);
}
```

```
gettingURLResponse(String url)
{
    WebResponse resp = null;
    ....
    return resp.getResponse(...);
}
```



Preliminary Results

Project	Valid Imitations	Reusable Patterns	"Edits"
JBoss	163	29	209
SpringFramework	1	1	1
JasperServer	13	9	42

Edits: Saving a function call, variable declaration, or String / integer literal.

Typical Case

```
UploadFileSpec[] files = new UploadFileSpec[]
            { new UploadFileSpec(file) };
foo.setParameter(“newData”,files);
```

Vs.

```
foo.setParameter(“newData”,file);
```

Thank You

Questions?