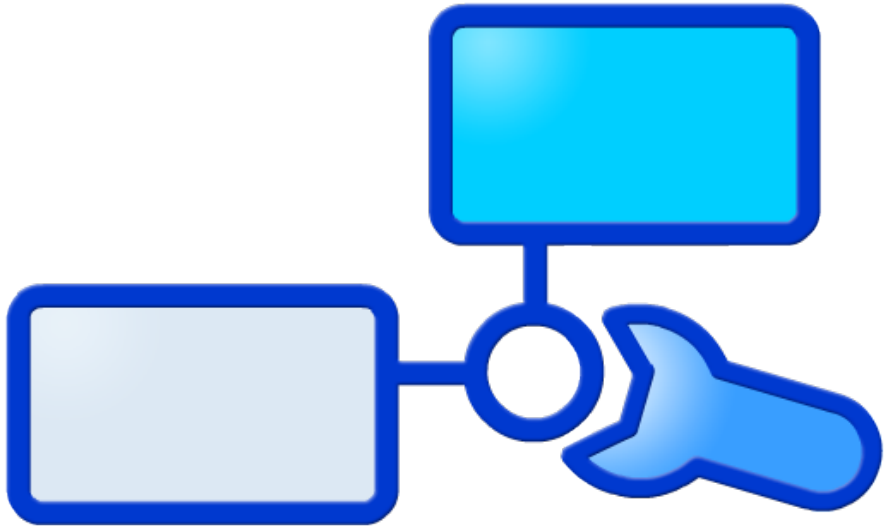
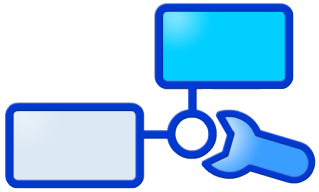


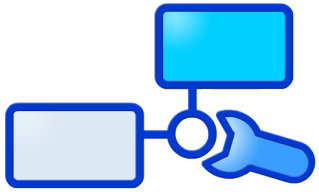
InstantSVC

The PHP Web Services Builder

| 4 September 2007 | Falko Menge

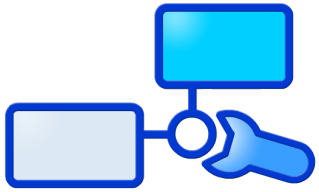


Web Services?



Agenda

- Motivation
- Brief Introduction to Web Service Technologies
- Web Services with PHP5
- Core Components of InstantSVC
  - Extended Reflection API and Annotations for PHP
  - WSDL Generator and Adapter Generator
  - SOAP Handler Chains and WS-Security for PHP5
  - RESTful Web Services
- Administration Front-End
- Live Demo



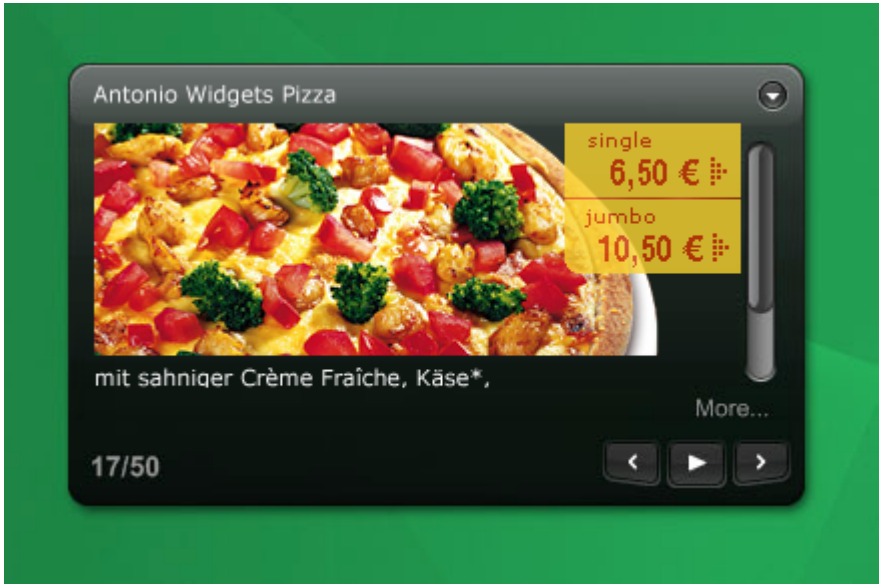
Services?

- Blog with Web 2.0 stuff
  - Feeds, Publishing API, User Contribution, Single-Sign On,…
- Shops
  - Catalog of Goods, Buying API, Availability Checks
  - Intention: Close the Media Gap
- Enterprise Applications
  - Finance, Warehouse Management, Human Resources,…
- Services provided by specialists
  - Used to build applications upon

Services: For Whom?

Enterprise People

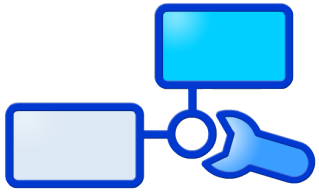
- Portals and Mesh-Ups
  - Personalization



Innovators

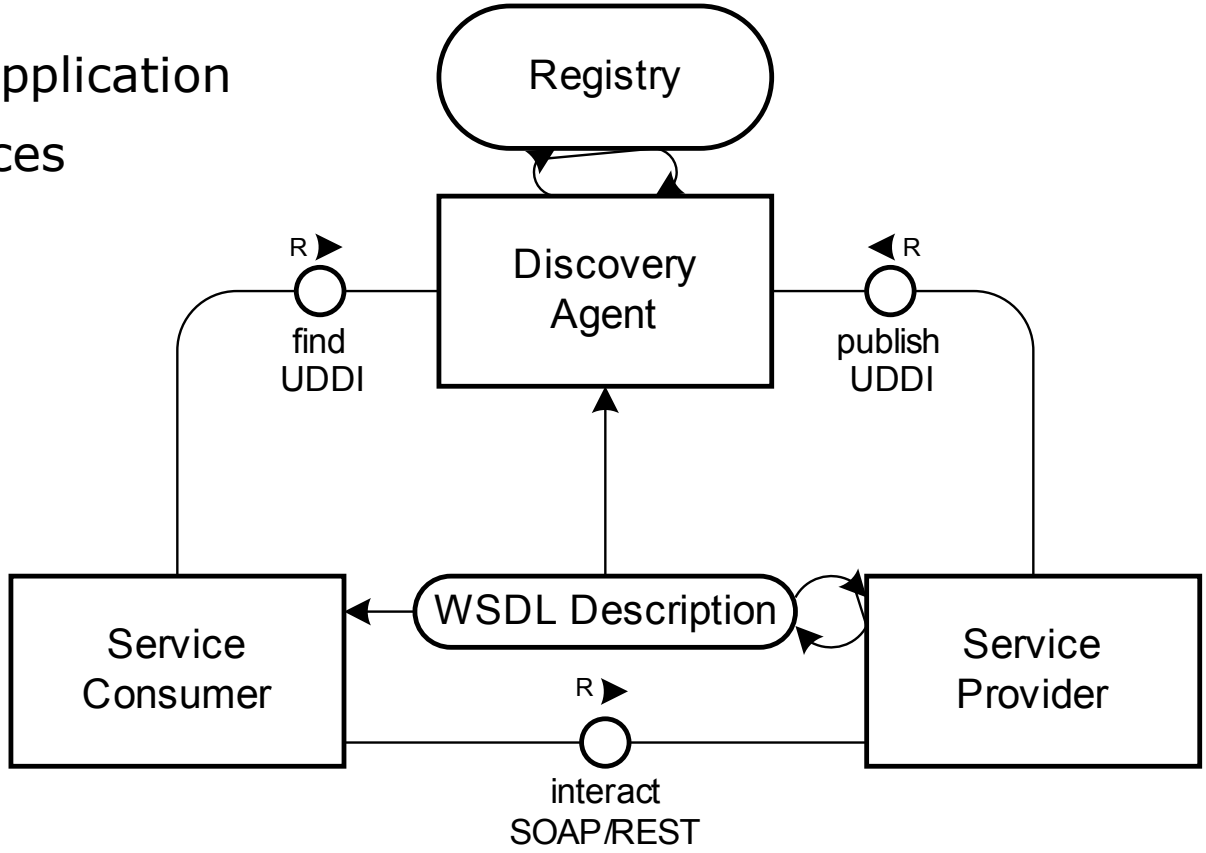
- It is cool
- Everybody wanne have it
- Is it Flickr, del.icio.us, Digg, Google Maps, Ebay?

- Likely, it’s not!
- You did not imagine what's possible with your services
- They do!

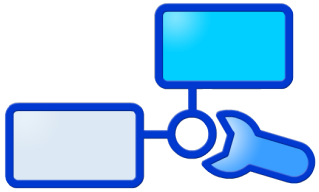


Web Services

- Functions of an application exposed as services
- Technologies:
  - HTTP
  - SOAP
  - WSDL
  - UDDI
- Alternative:
  - REST

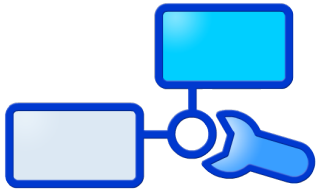


- Powerful concept for cross-platform integration

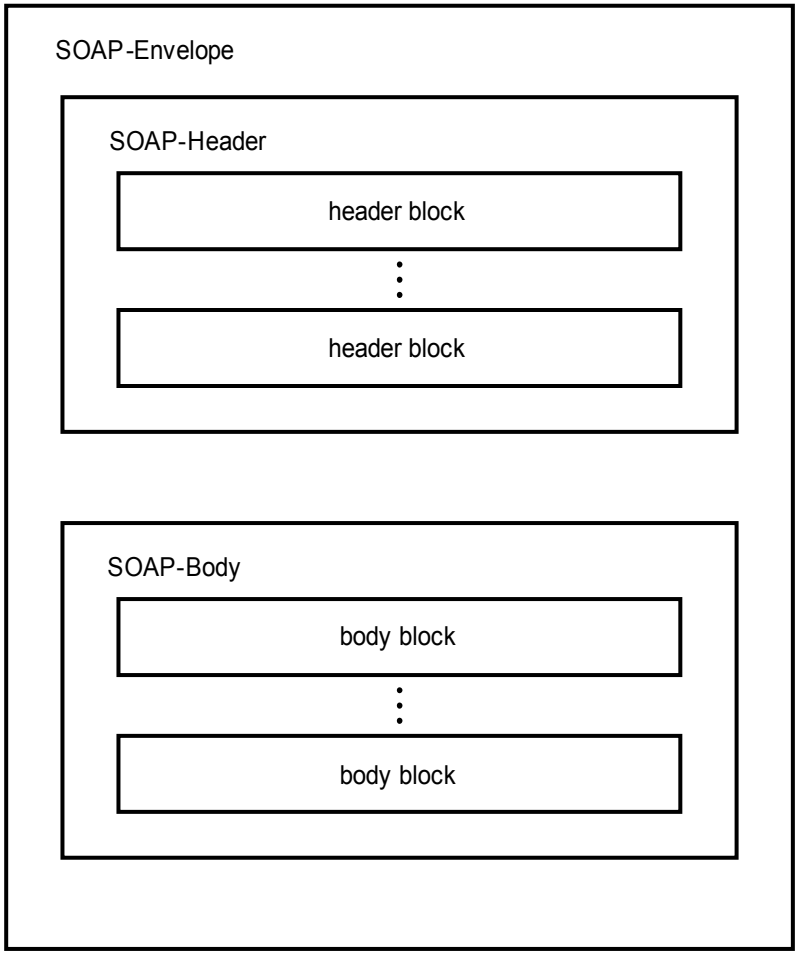


The Core Web Services Protocol Stack

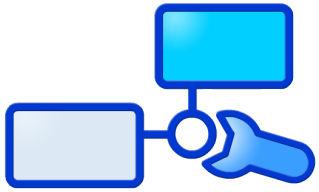
Discovery	UDDI (Itself a Web Service)
Description	WSDL, WSFL/XLANG, others to come
Access	SOAP, SOAP with Attachments, XML-RPC, REST
Transfer	HTTP, SMTP, FTP, others
Transport	TCP/IP, UDP, others



SOAP – The Messaging Protocol




```
<?xml version="1.0" ?>
<Envelope>
        <Header>
                ...
        </Header>
        <Body>
                ...
        </Body>
</Envelope>
```



Web Services Description Language (WSDL)

```
<definitions>
    <types />
    <message />
    <portType>
        <operation />
    </portType>
    <binding />
    <service>
        <port />
    </service>
</definitions>
```

→ Container for data type definitions using some type system (such as XML Schema)

→ Abstract, typed definition of the data being communicated

→ Abstract set of operations

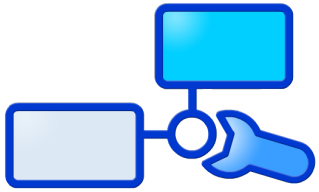
→ Abstract description of an action supported by the service

→ Concrete protocol and data format specification for a particular port type

→ Collection of related endpoints

→ Single endpoint defined as a combination of a binding and a network address

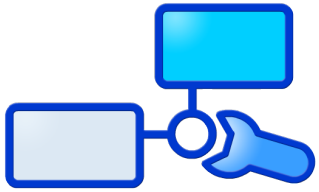
source: W3C



Web Services with PHP5

Steps for creating Web Services using the SOAP extension of PHP5:

- Create XMLSchema for data types
- Write WSDL service description
- Own wrapping for Document/Literal
- Include documentation
- Build SOAP server script
- No support for additional WS-* standards (e.g. WS-Security)

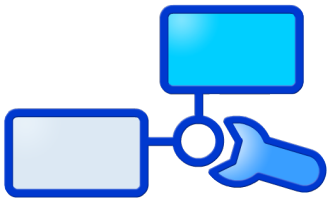


The Vision

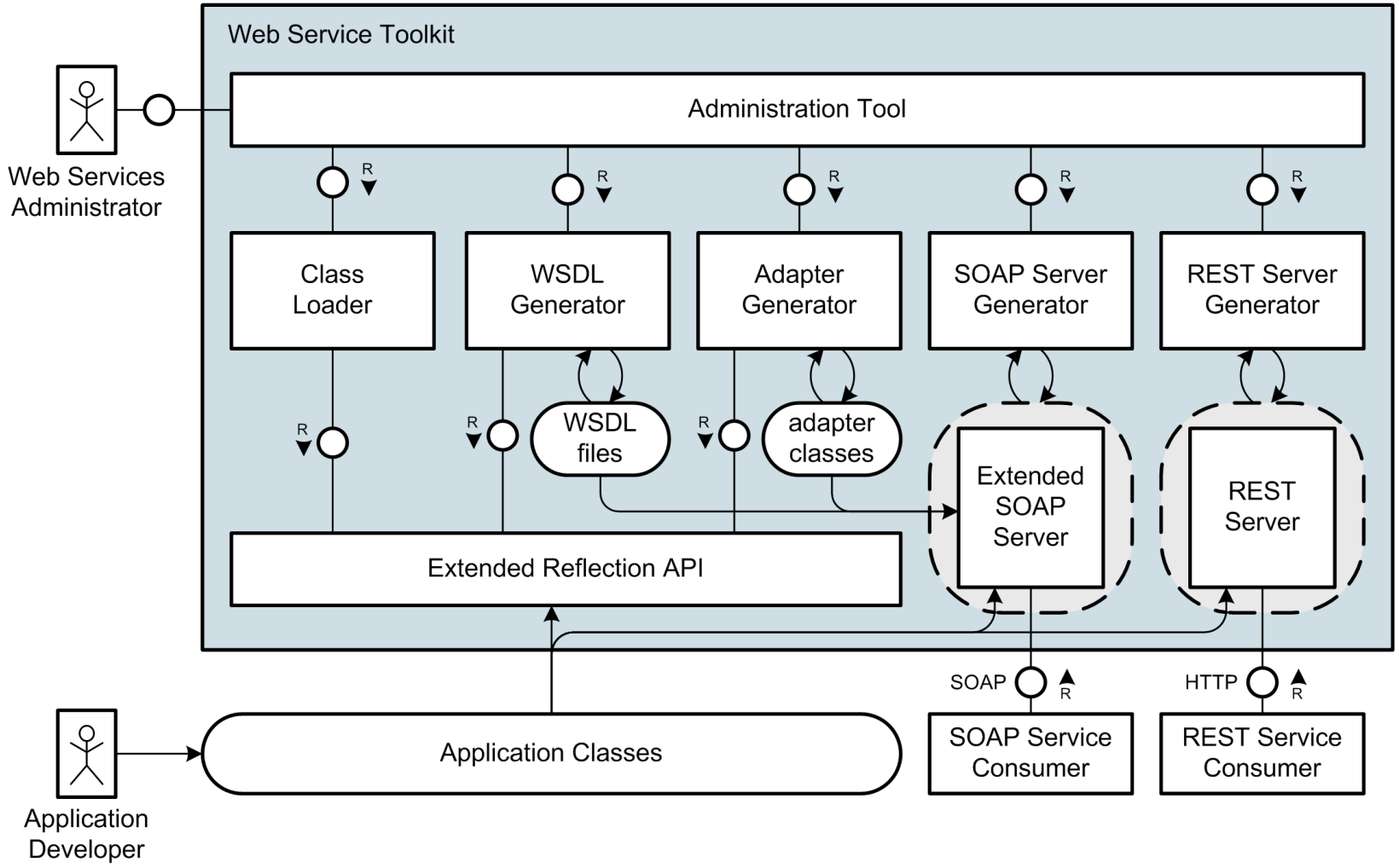
- Consuming Web Services already supported by tools
- Providing Web Services is still to much work

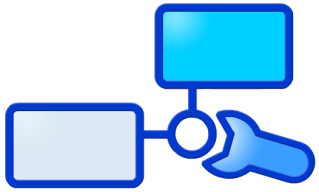
- On other platforms like Java EE or .NET:
  - Extensive tool support
  - Annotations
  - Deployment to Application Servers

- Vision:
  - Generation of Web Services for existing applications
  - Configuration instead of programming
  - Complete automation of the process



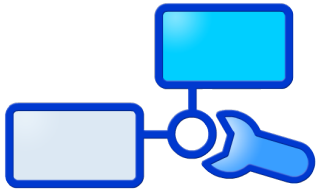
InstantSVC
The PHP Web Services Builder





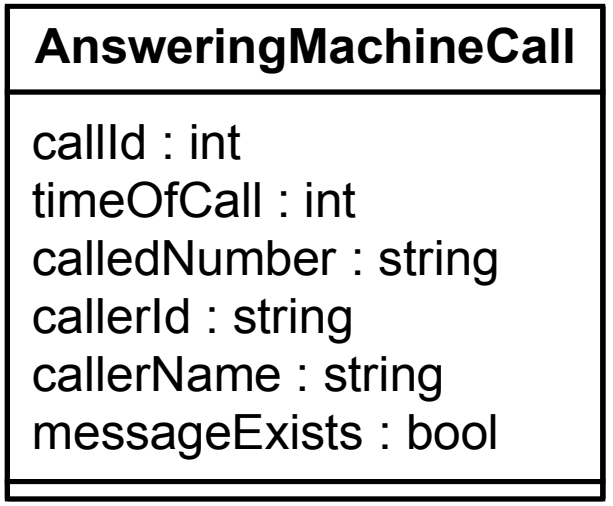
About the Project

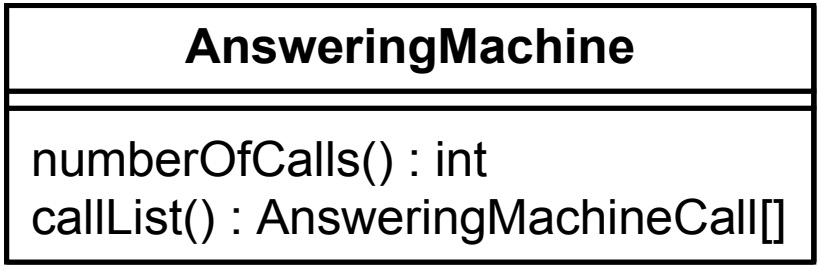
- Base project developed by 6 HPI students since october 2005
  - G. Gabrysiak, Ch. Hartmann, M. Perscheid, M. Sprengel
  - Today here: Stefan Marr and Falko Menge
- Project presented at the FrOSCon 2006
- Open steps: contribute base to eZ Components
- Additional work
  - Access Control in Service Oriented Architectures
  - Implementation of Task-Role Base Access Control based on ServiceMix/Java and InstantSVC

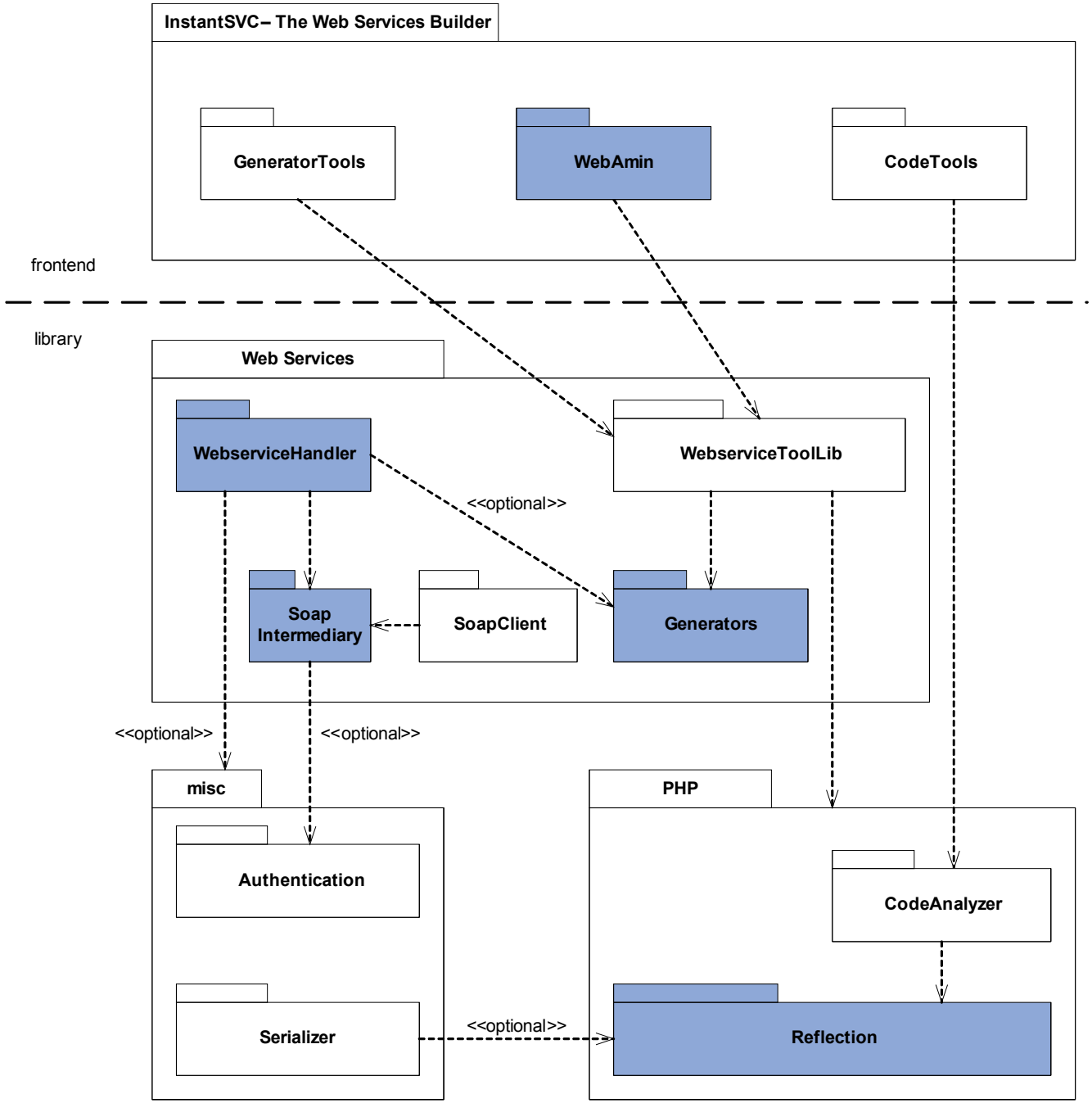


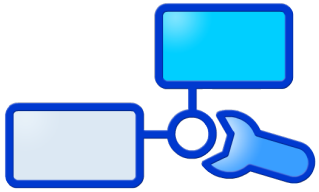
Running Example

- Application: Answering Machine
  - Number of Calls
  - List of Calls
- Example Web Service
  - using SOAP Protocol



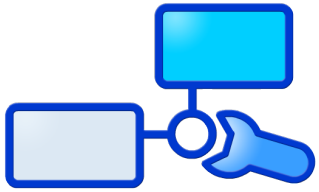



InstantSVC– The Web Services Builder
GeneratorTools
WebAmin
CodeTools
frontend
library
Web Services
WebserviceHandler
WebserviceToolLib
<<optional>>
Soap Intermediary
SoapClient
Generators
<<optional>>
<<optional>>
misc
PHP
Authentication
CodeAnalyzer
Serializer
<<optional>>
Reflection



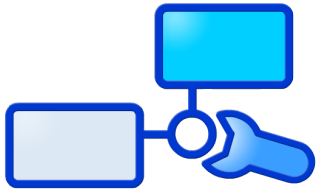
Reflection API

- PHP 5.1 Extension
- Usage of PHP build-in Parser
- Structural Information at Runtime
  - Classes
  - Methods
  - PHP Extensions
- But only very little Information about Types
  - PHP is a dynamically typed Language



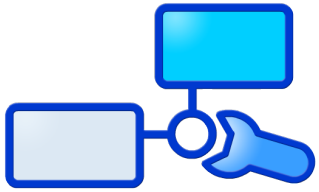
Annotations

- Additional Information in the Source Code
- Developed from Source Code Comments like:
  - Pre and Post Conditions given in Comments
  - Conceptual Properties
- Support in .NET and Java 5 already available
  - But not in PHP
- Possible Usage Scenarios
  - Marking or Configuring of Classes/Methods…
  - Aspect-Oriented Programming



Extended Reflection API

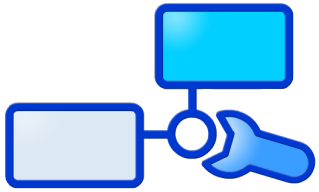
- Extends the Reflection API of PHP 5.1
  - Implemented in PHP
- Adding Annotation Mechanism
- Typing
  - Parameters
  - Return Values
  - Attributes
- Types represented as Objects for easy Usage
  - XMLSchema for Types



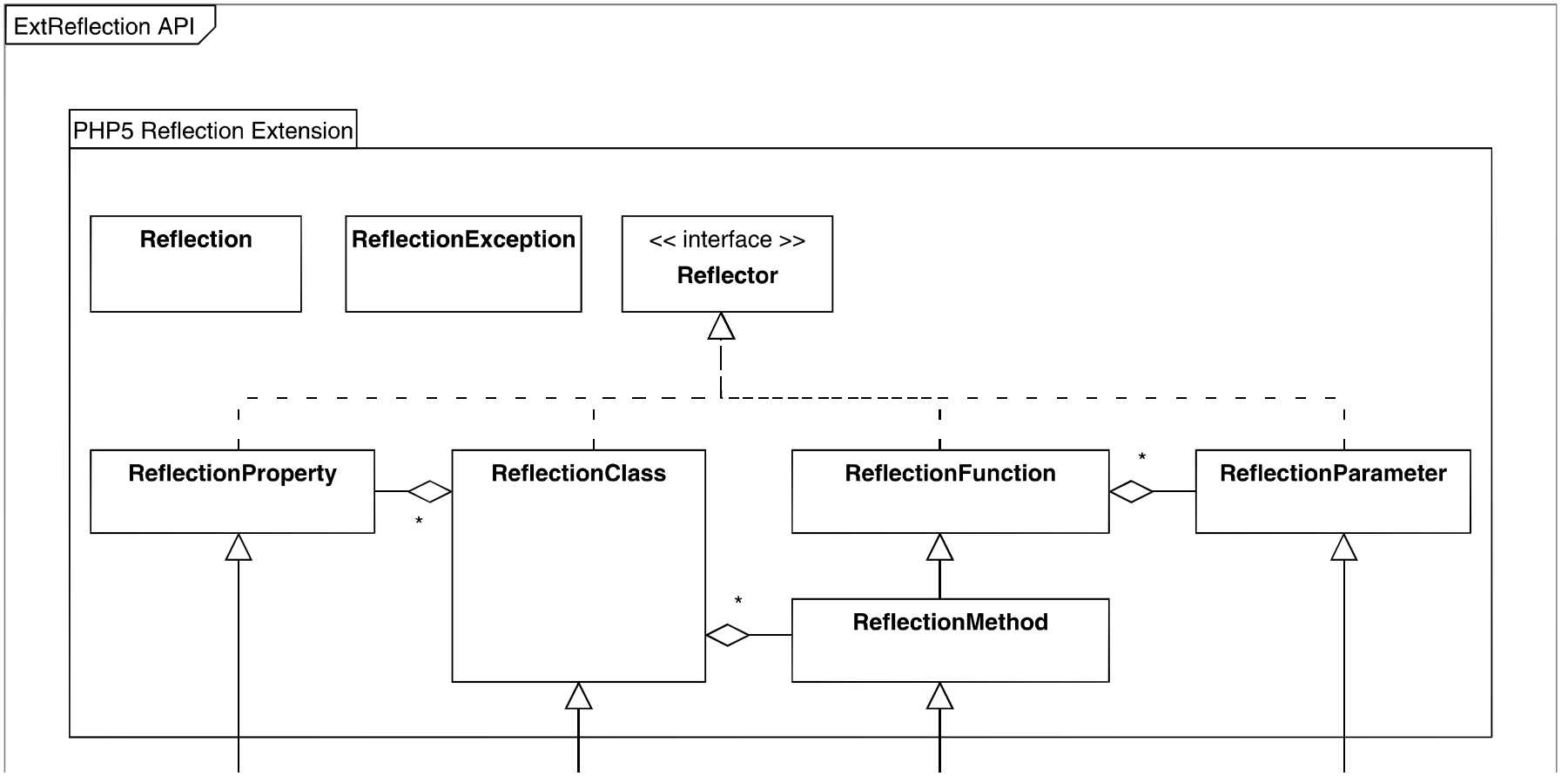
Annotations based on PHPDoc

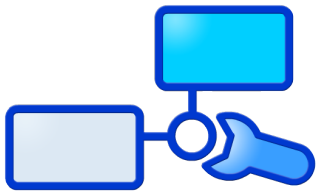
- PHPDoc widely used in many Projects for Documentation
- Good Starting Point for Annotations
- Comparable Development in Java with XDoclet

```
/**
* @myAnnotation paramA paramB
*/
class AnsweringMachineCall {
   /**
    * @return int
    */
   public function getCallId() {  return intval($this->callId);  }
   /**
    * @param string $value
    */
   public function setCallerName($value) {  $this->callerName = $value;  }
}
```

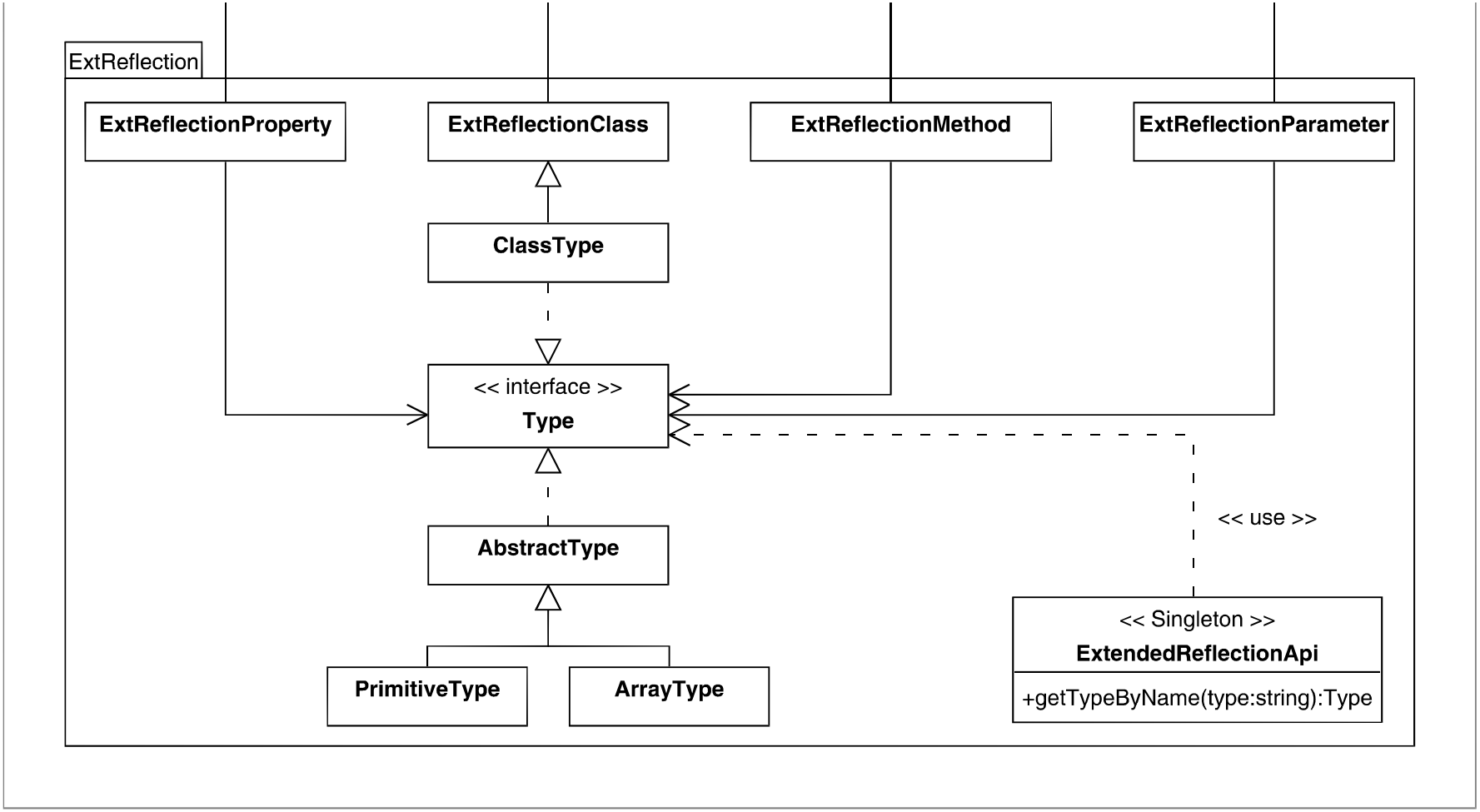


The PHP Extension

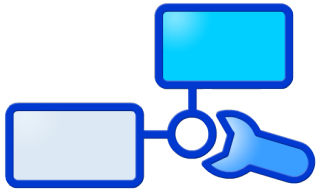




Extended Reflection API

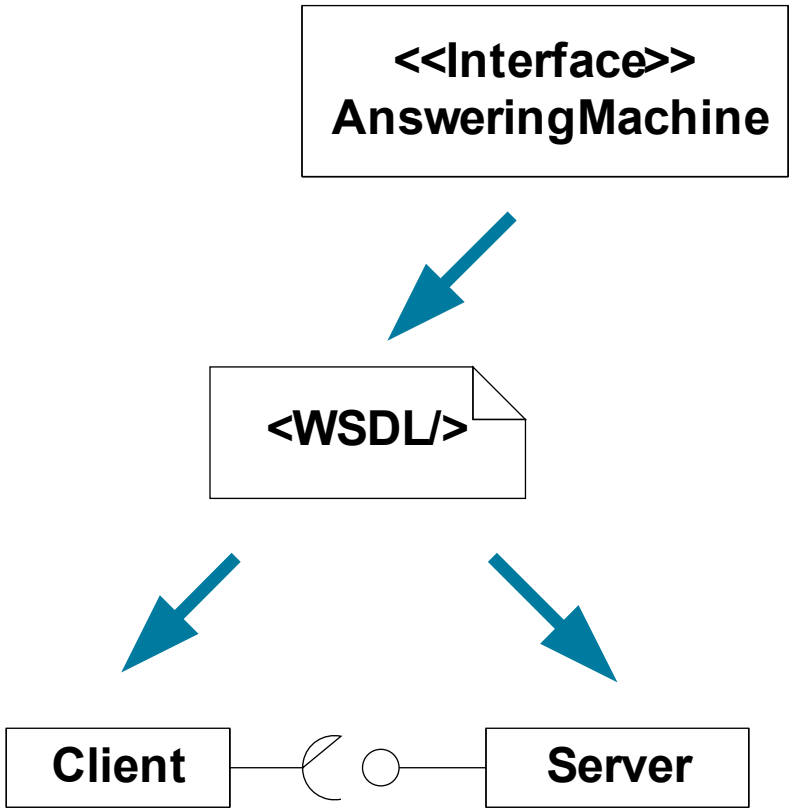


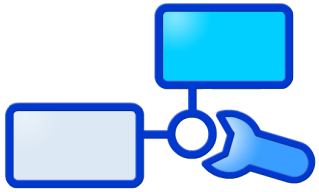
- Extended with Annotations and a type system



Web Services Description Language (WSDL)

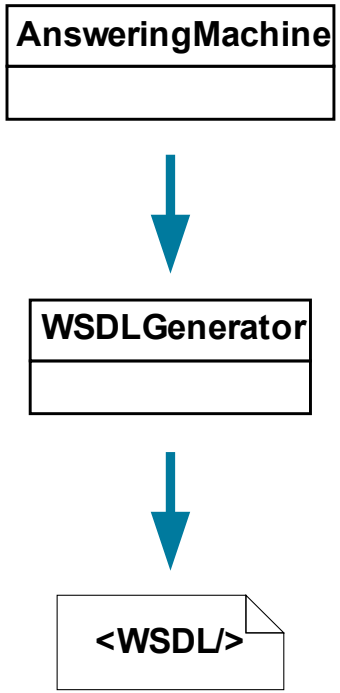
- Platform independent language for describing interfaces
- Description contains
  - Interface
  - Method signatures
  - Data types

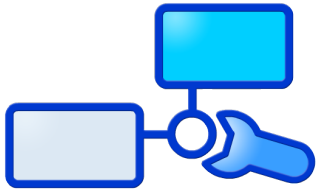




WSDL Generator

- Generates WSDL from PHP Classes or Collections of Functions
- WSDL 1.1
  - Supports RPC Encoded / Literal and Document Literal / Wrapped
  - Conforms to the WS-I Basic Profile by 95%
- Uses DOM-API
- Tested with phpt Test Cases
  - Reused from SOAP Extension
- Adapter Generator
  - For document-wrapped Binding
  - Classes for Un/wrapping of Arguments and Return Values

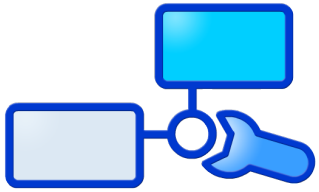




Document/Literal Adapter Generator

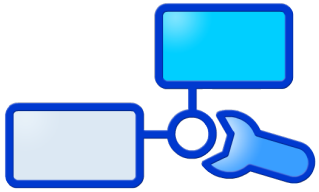
```
/**
 * @param int $id
 * @return Lecture
 */
public function getLecture($id) {…}
```

```
public function getLecture($param) {
    return array("Lecture"
        => $this->target->getLecture($param->id));
}
```



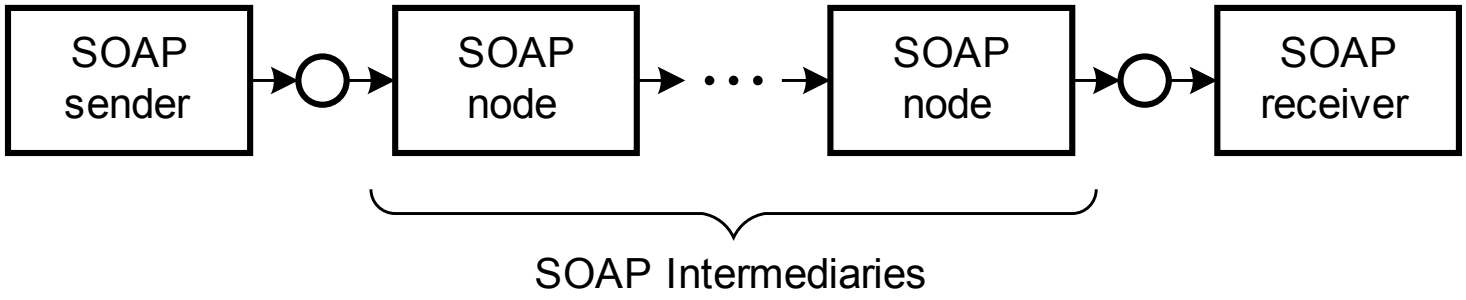
Other Web Service Standards

- Basics are already implemented for PHP
  - SOAP: PHP5 Extension, PEAR SOAP, NuSOAP
  - UDDI: PEAR Package
  - WSDL: Generator
- Over 20 additional WS-* Standards for
  - Security
  - Synchronisation
  - Sessioning
- Standards add new Elements to SOAP Header

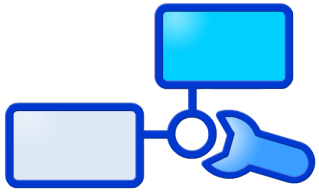


SOAP Intermediaries

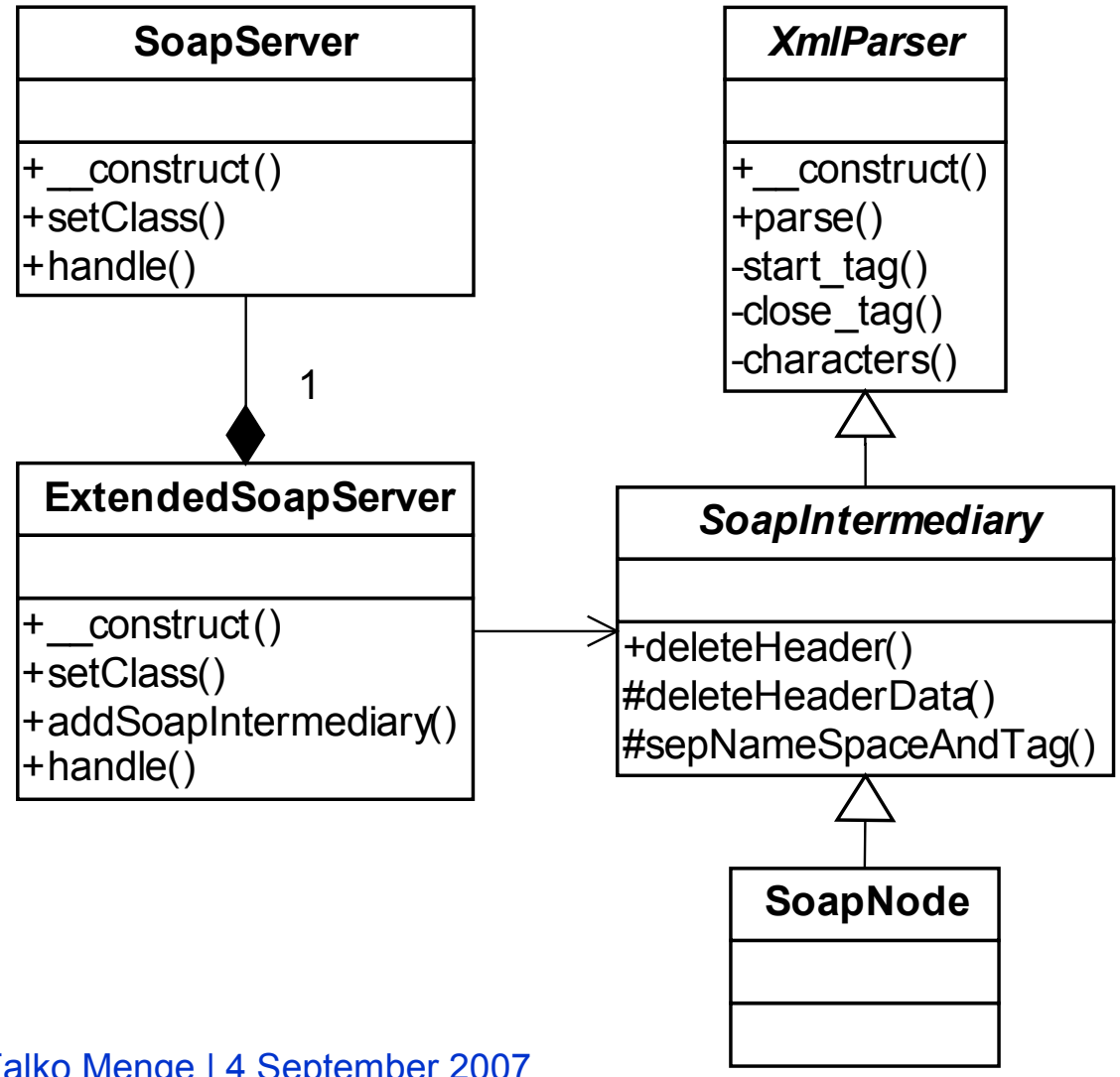
- SOAP Standard describes Intermediaries

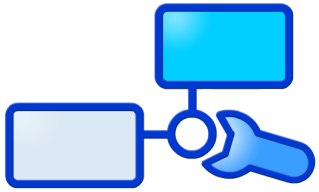


- Intermediaries are working on SOAP Message before reaching Ultimate Receiver
- Additional Features independent of final Web Service
- Implementation Pattern: Handler Chain



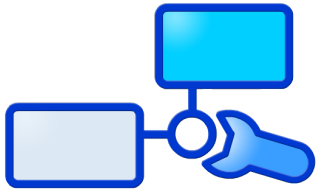
Handler Chain Mechanism





WS-Security for PHP5

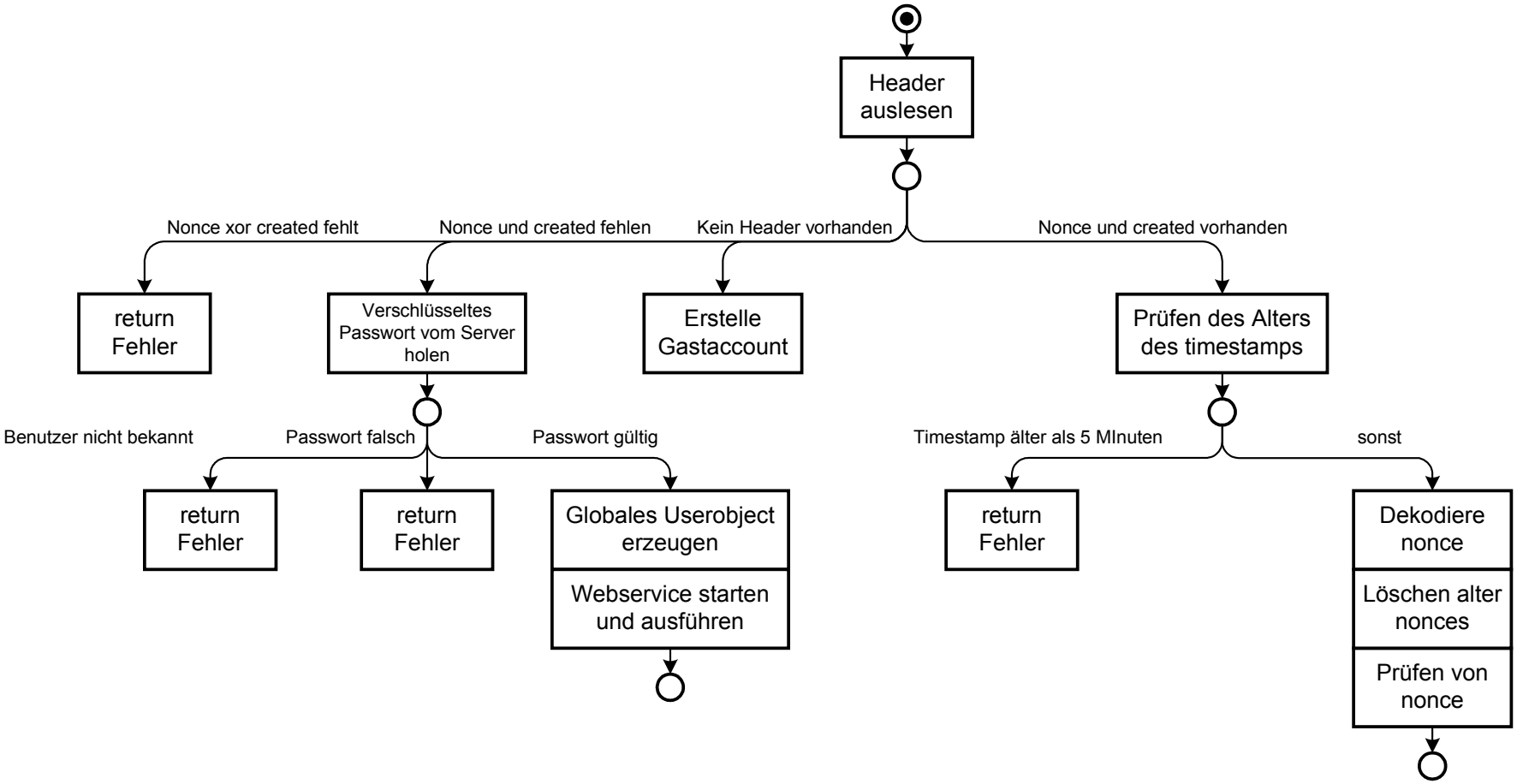
- Security Concepts for Web Services:
  - Confidentiality => SSL (SOAP via HTTPS)
  - Authentication => **WS-Security + Token Profiles**
  - Authorisation => Application
- WS-Security defines SOAP Header Element for security-related Data
- Different Profiles specify several Authentication Mechanisms
- First Profile implemented:
  - Username Token Profile 1.0



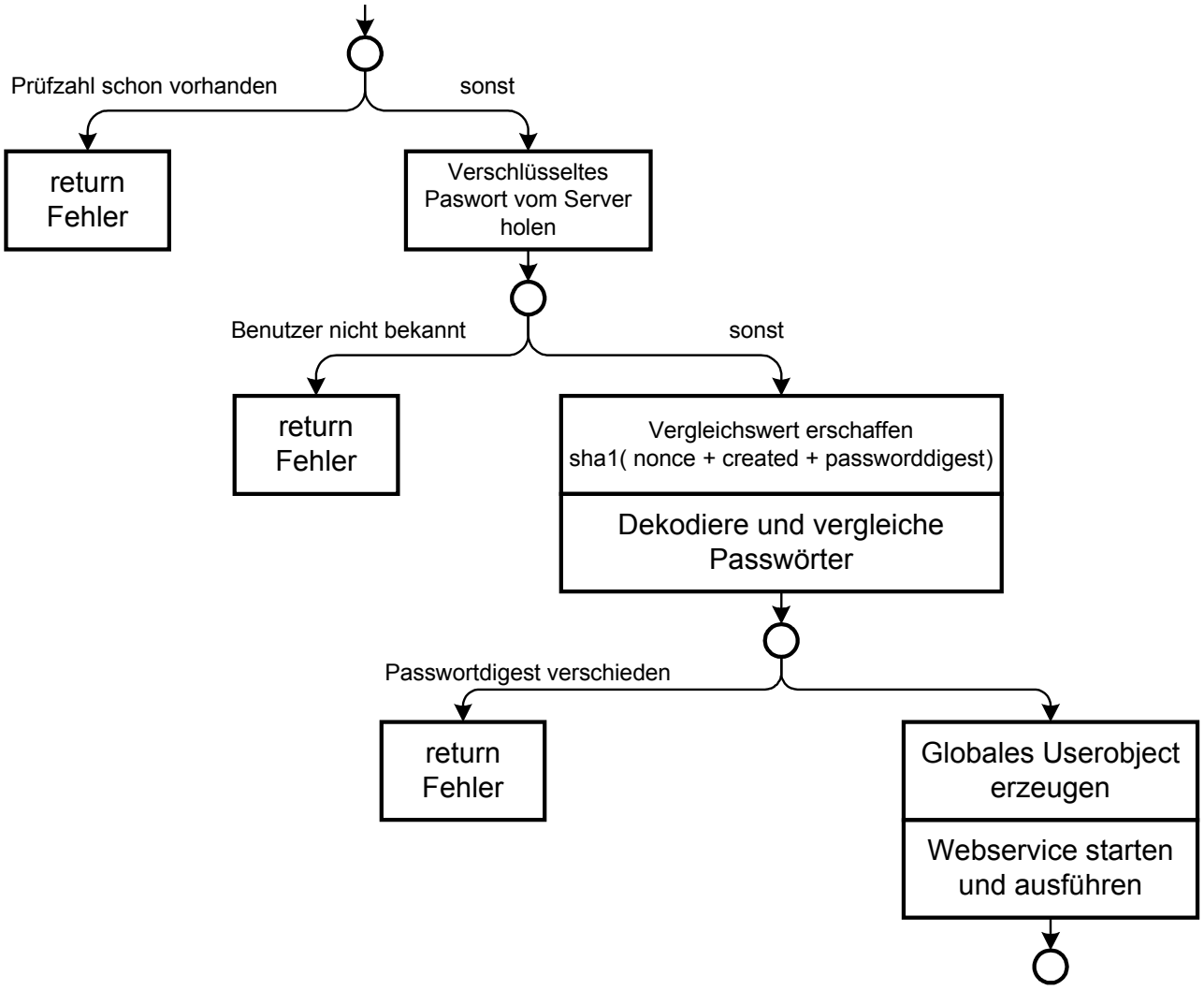
WS-Security
Username Token Profile 1.0

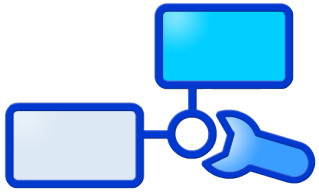
```
<wsse:Security>
    <wsse:UsernameToken>
        <wsse:Username>Stefan</wsse:Username>
        <wsse:Password Type="...#PasswordDigest">
            weYI3nXd8LjMNVksCKFV8t3rgHh3Rw==
        </wsse:Password>
        <wsse:Nonce>WScqanjCEAC4mQoBE07sAQ==</wsse:Nonce>
        <wsu:Created>2006-06-24T11:00:00Z</wsu:Created>
    </wsse:UsernameToken>
</wsse:Security>
```

Username Token Profile (1/2)

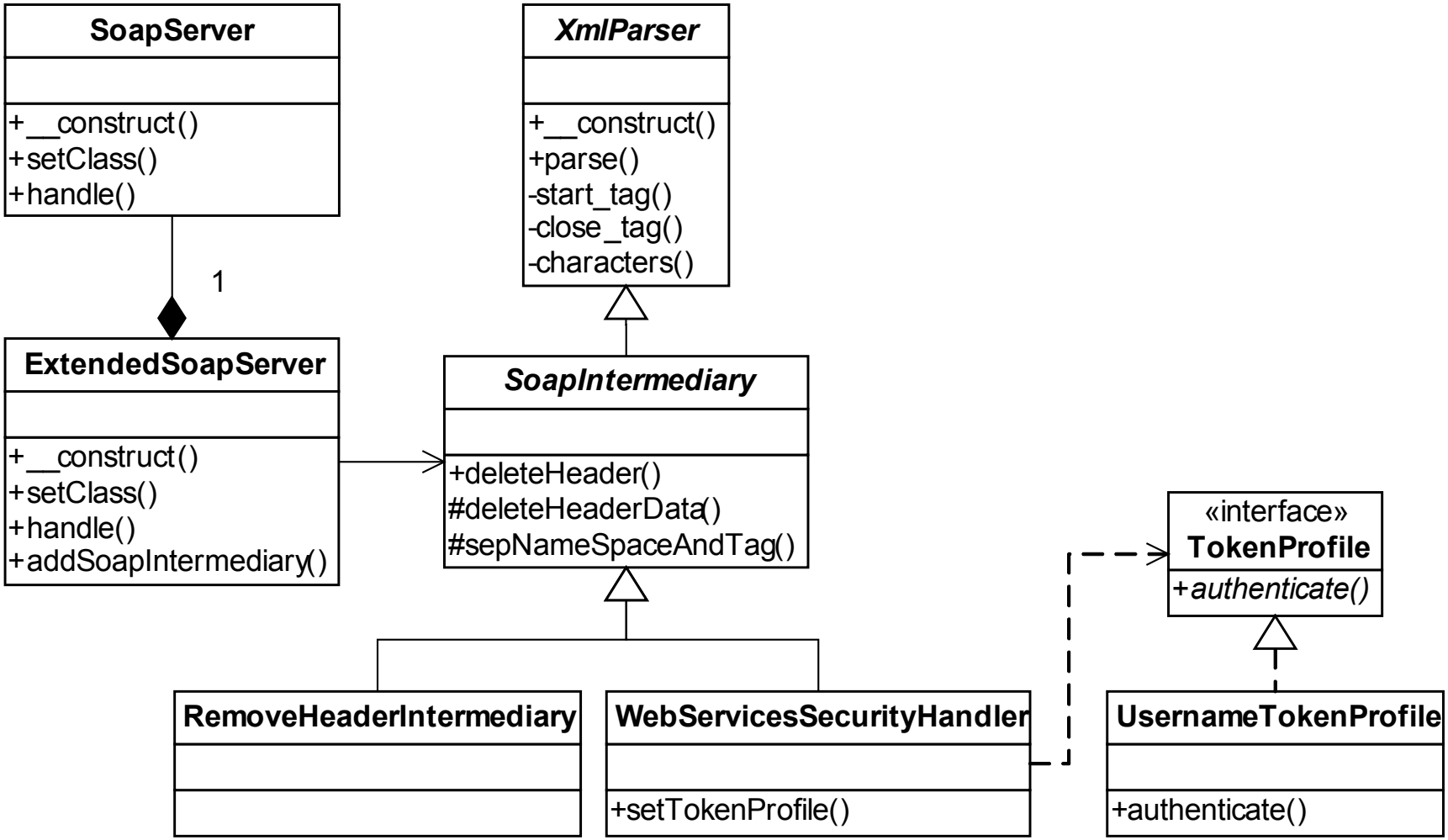


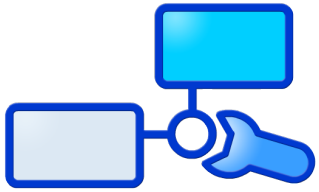
Username Token Profile (2/2)



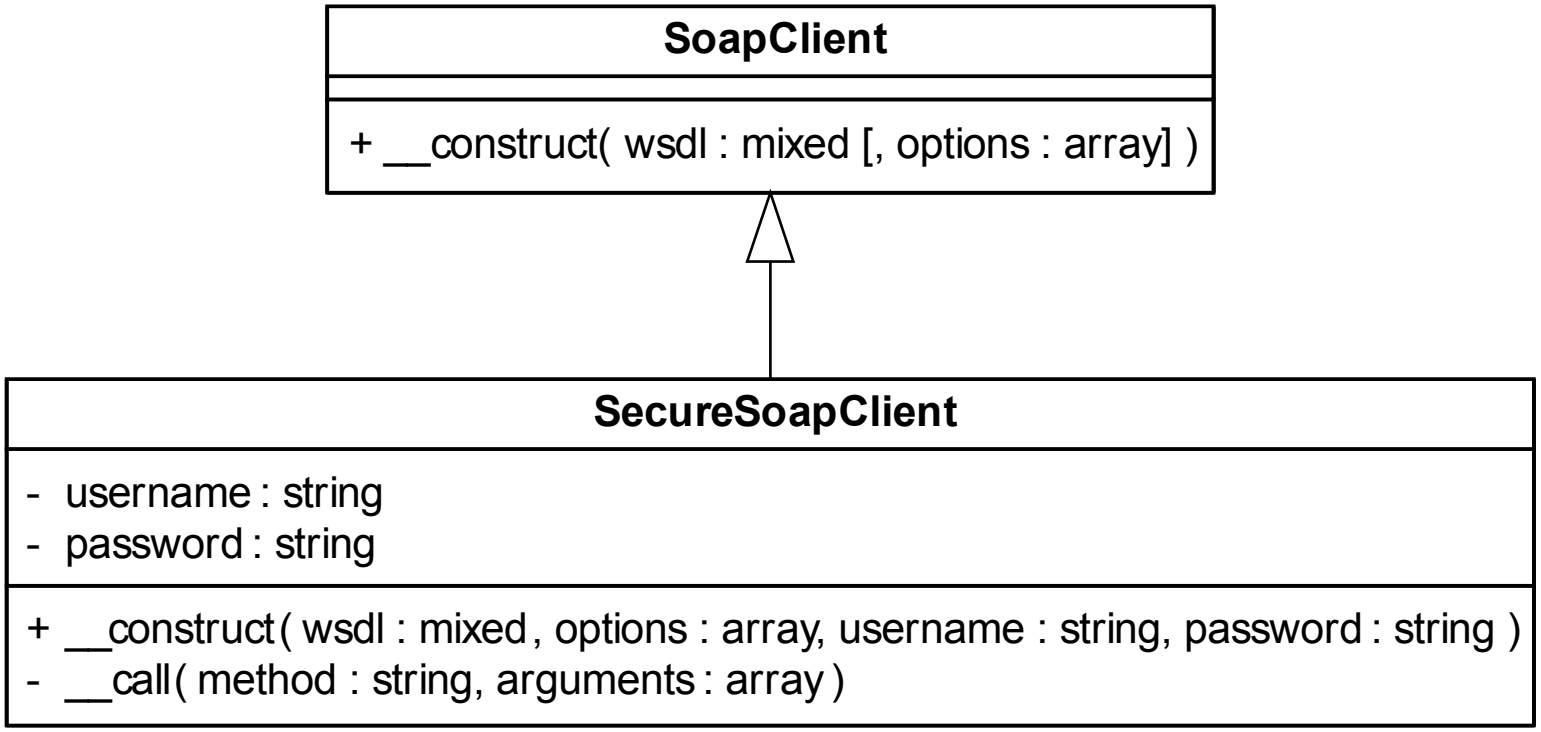


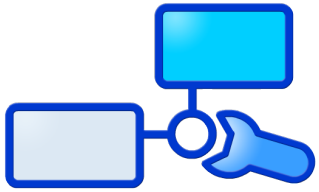
Username Token Profile 1.0 (Server)





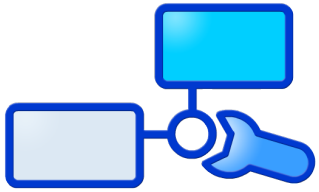
Username Token Profile 1.0 (Client)





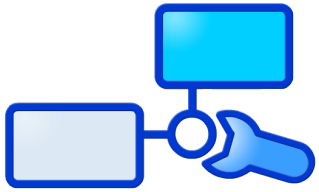
Representational State Transfer (REST)

- Alternative to SOAP Web Services
- Resource-oriented Approach
- HTTP-REST
  - Just uses HTTP Methods
    - GET, POST, PUT, DELETE
  - Messages with Payload Semantic instead of RPC Semantic
- Implemented using a Remote Facade
  - Mapping from URIs to PHP methods
  - Custom De/Serialiser for PHP Objects
  - REST Server Configuration generated from Code Annotations
- Security by TLS or DigestAuth (RFC2617)



Administration Front-End

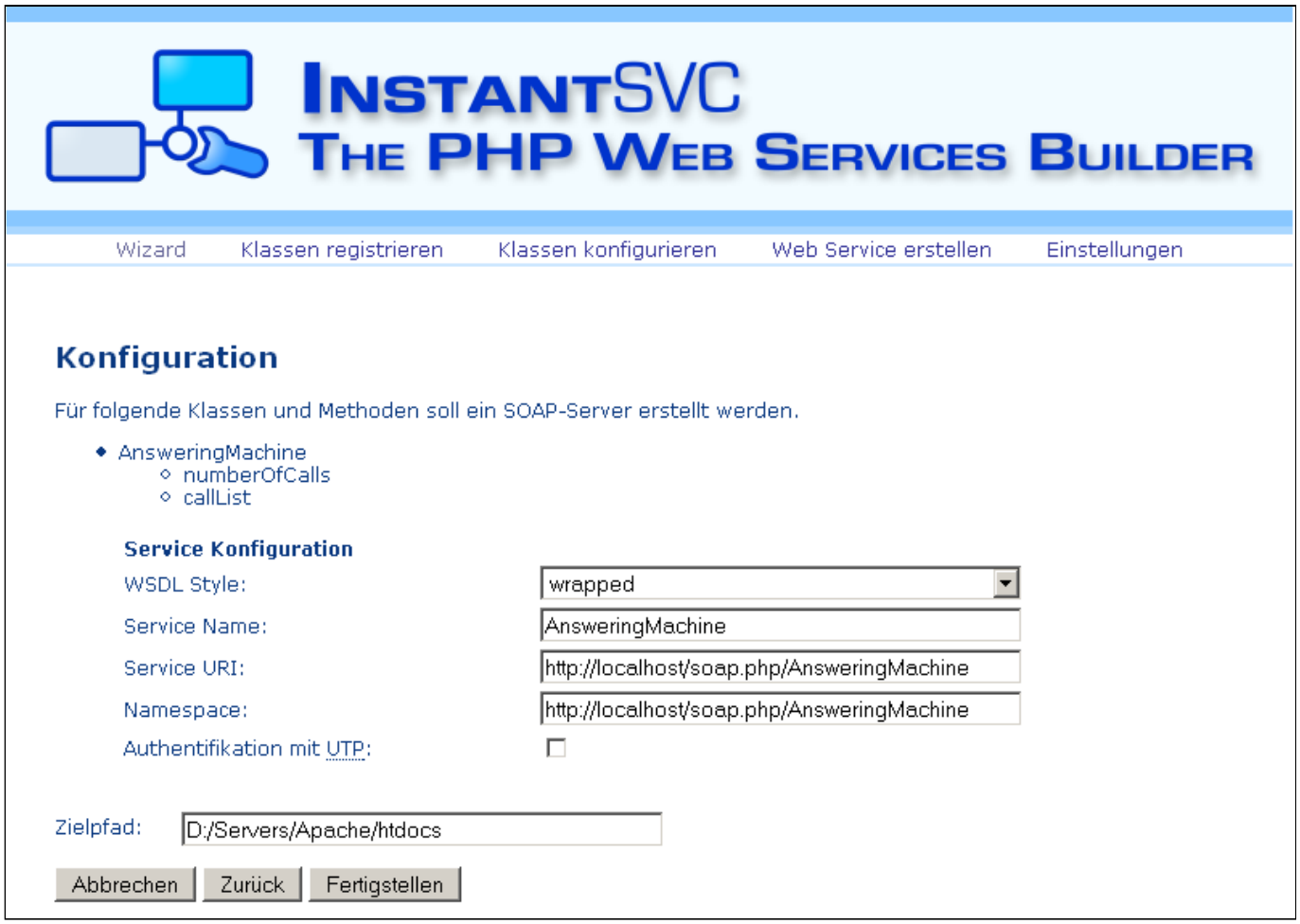
- Administration Front-End
  - Automated Creation of Web Services from existing Applications
  - Annotations identify Classes to be used
  - Administration via Web Browser
    - Classes and Methods selected by User
    - Generates SOAP and REST Server Scripts
    - Generates WSDL File and Adapter Classes
    - SOAP Server with WS-Security



Administration Tool & Policy Plug-In

- Administration Tool
  - Automated Creation of Web Services from existing Applications
  - Annotations identify Classes to be used
  - Administration via Web Frontend
    - Classes and Methods selected by User
    - Generates SOAP and REST Server Scripts
    - Generates WSDL File and Adapter Classes
    - SOAP Server with WS-Security
- Policy Plug-In for WSDL-Generator
  - Filters Methods to be hidden from Web Services
  - Adds Comments to WSDL Ports from Source Code Documentation
  - Enables Administrator to edit published Comments

Administration Front-End



InstantSVC
The PHP Web Services Builder

Wizard | Klassen registrieren | Klassen konfigurieren | Web Service erstellen | Einstellungen

Konfiguration

Für folgende Klassen und Methoden soll ein SOAP-Server erstellt werden.

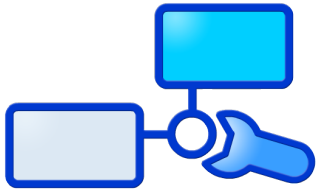
- AnsweringMachine
  - numberOfCalls
  - callList

Service Konfiguration

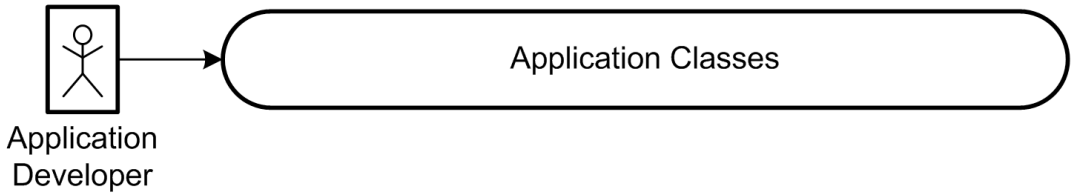
WSDL Style:	wrapped
Service Name:	AnsweringMachine
Service URI:	http://localhost/soap.php/AnsweringMachine
Namespace:	http://localhost/soap.php/AnsweringMachine
Authentifikation mit UTP:	☐

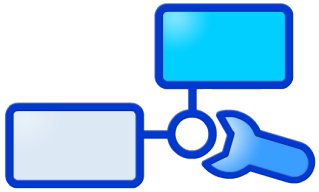
Zielpfad: D:/Servers/Apache/htdocs

Abbrechen | Zurück | Fertigstellen



Interaction Overview





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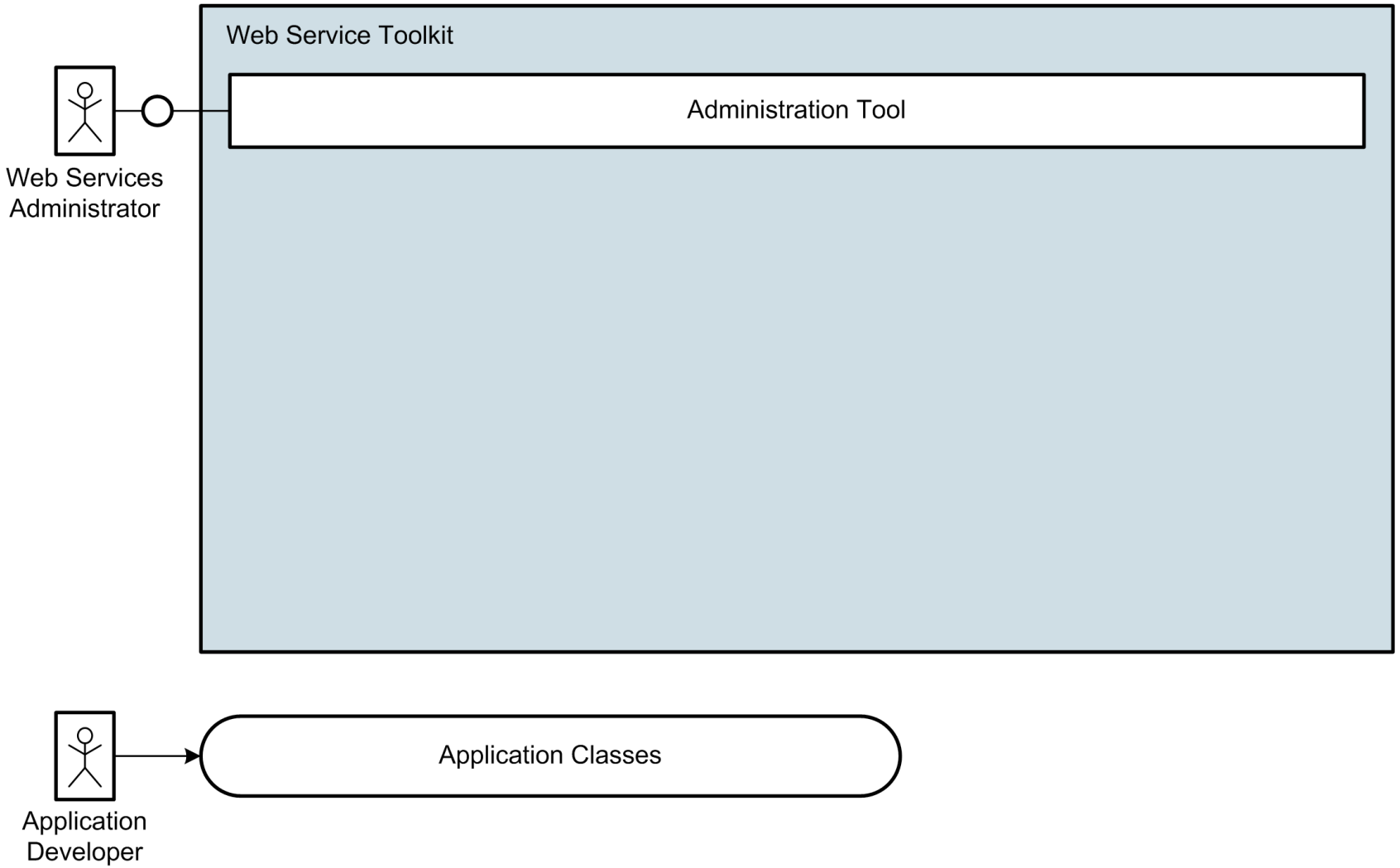

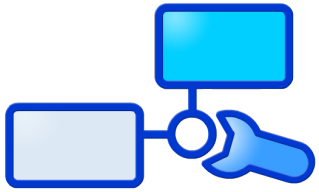

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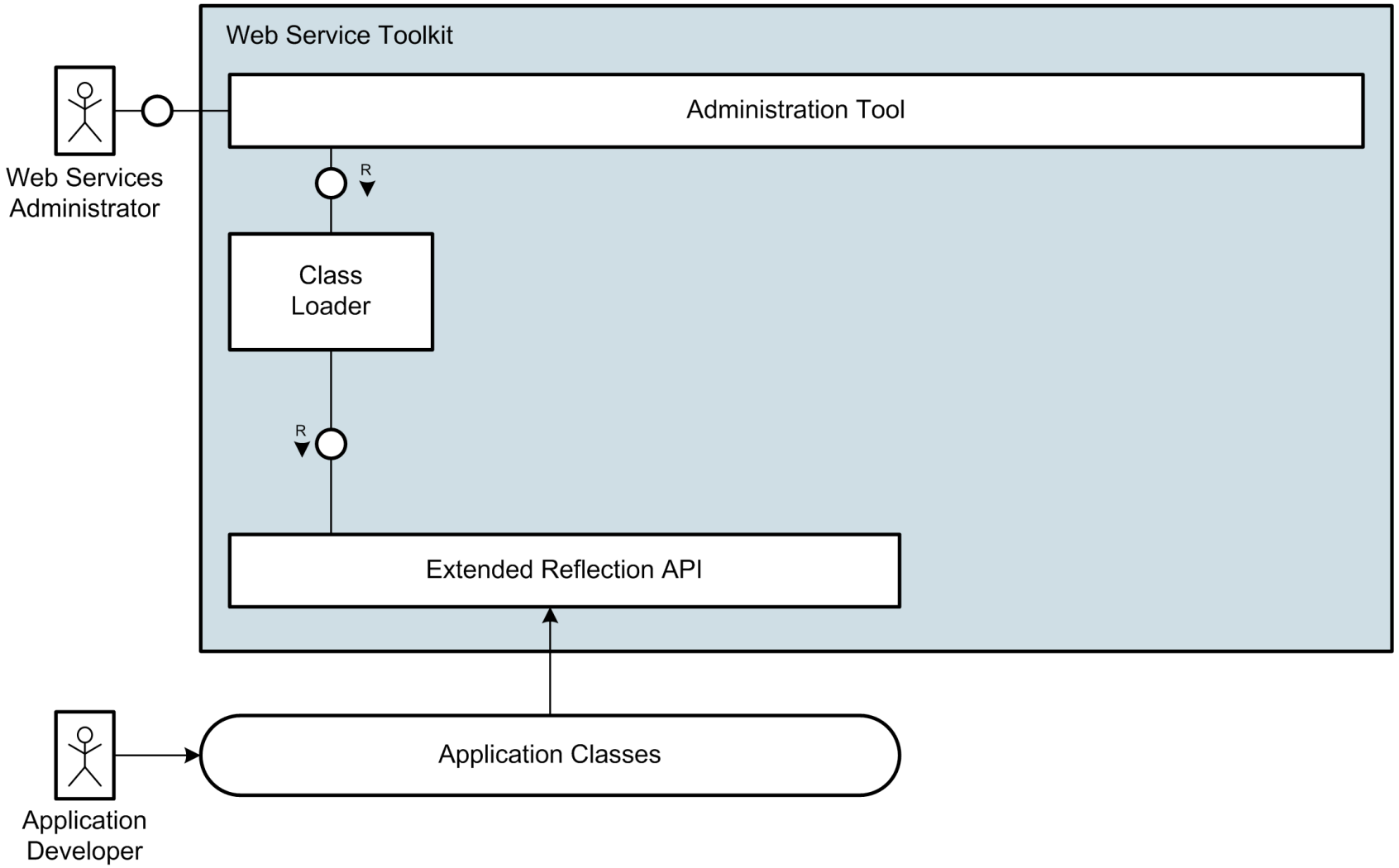

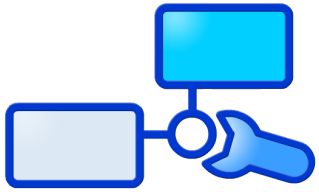

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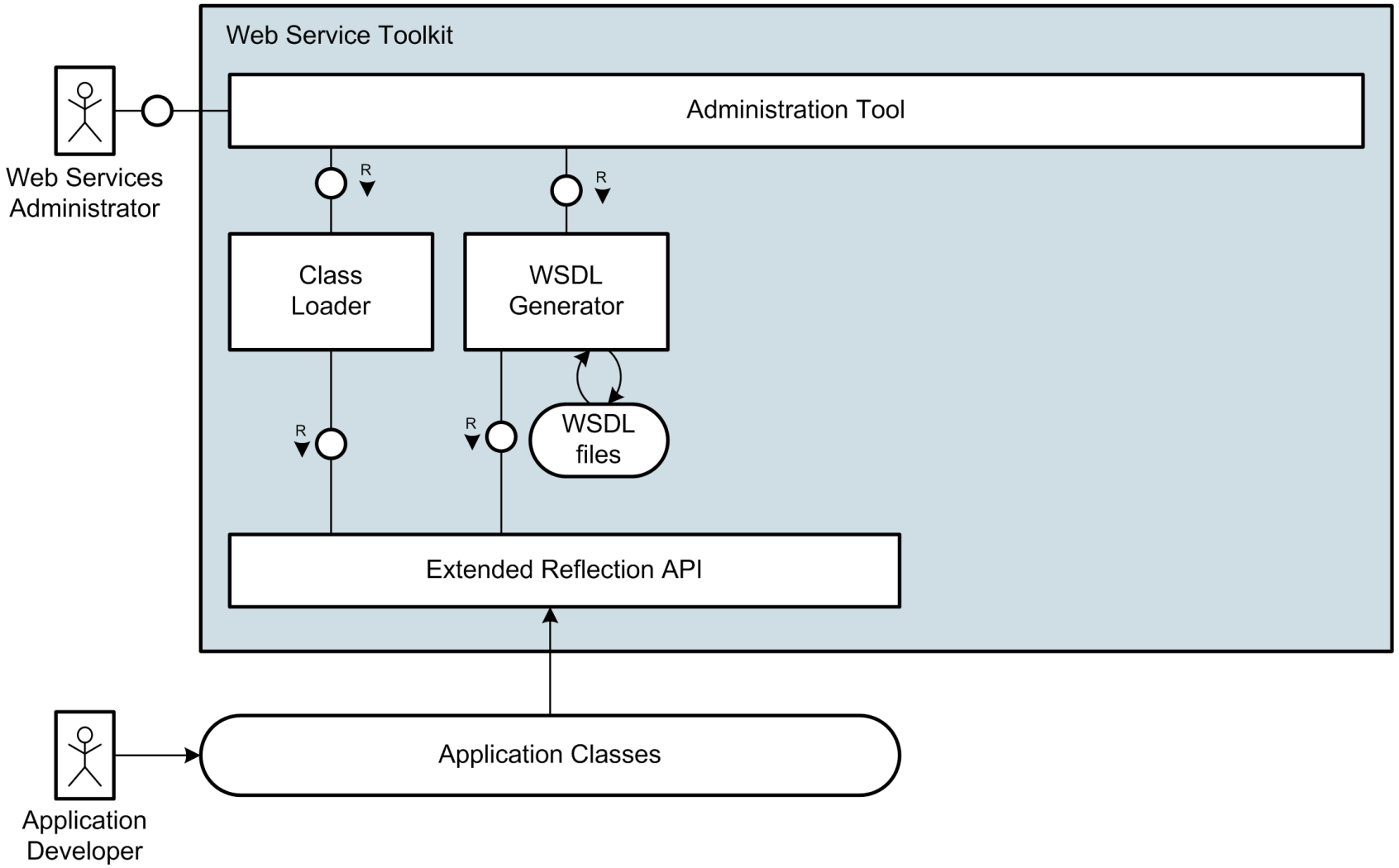

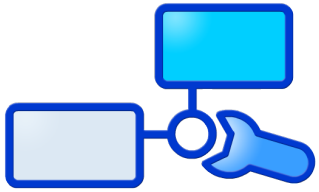

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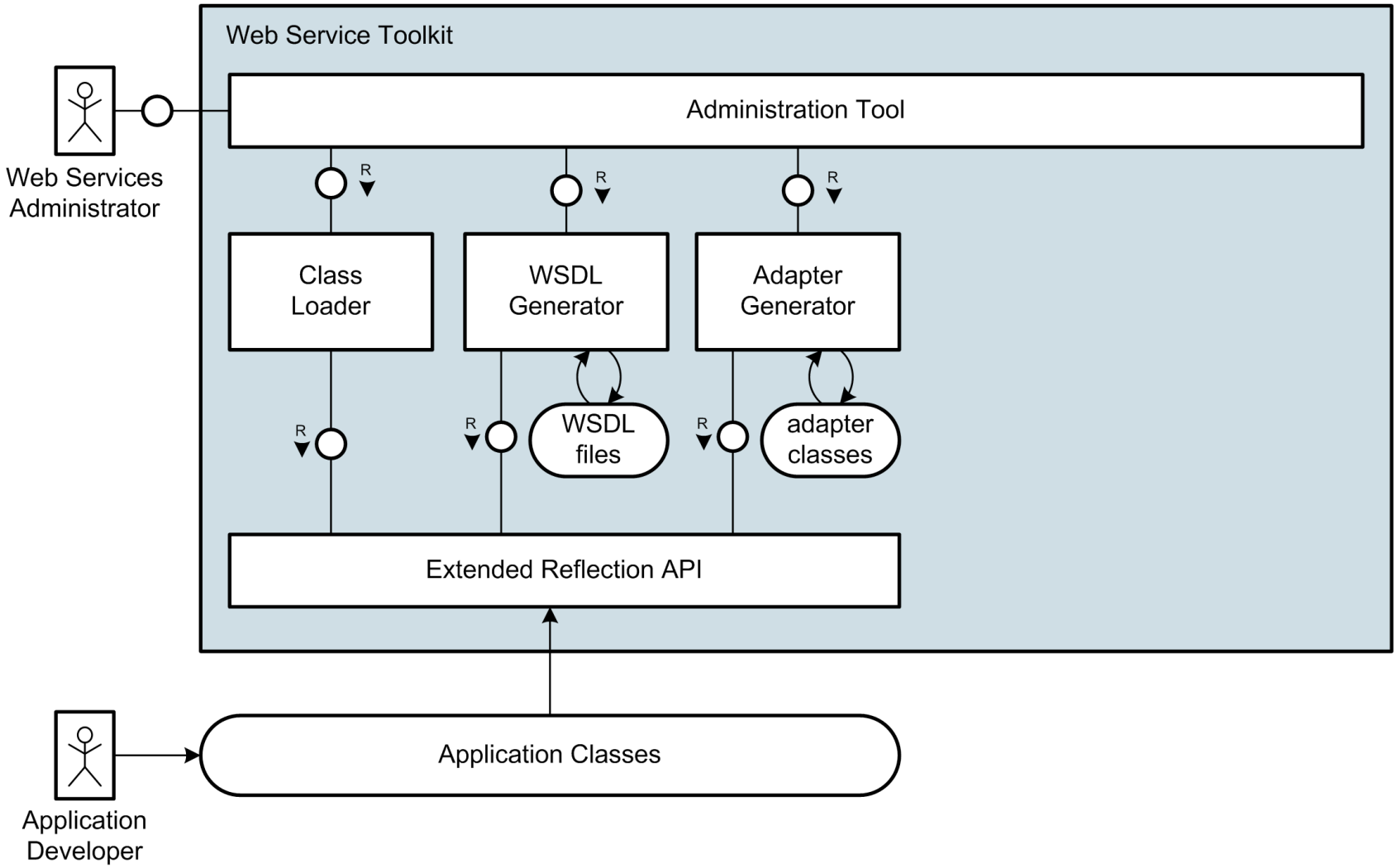

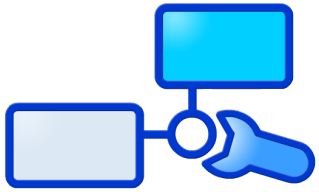

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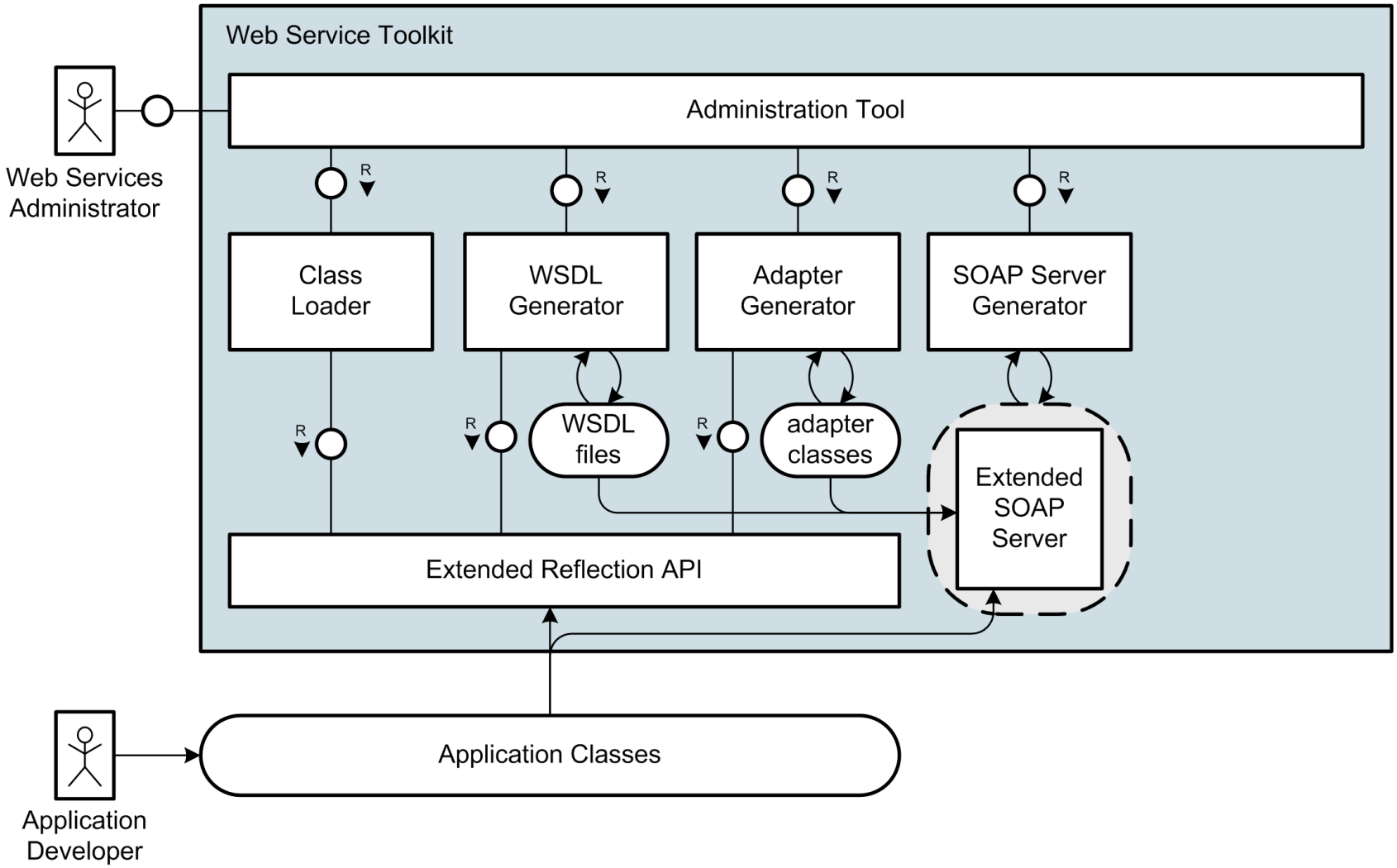

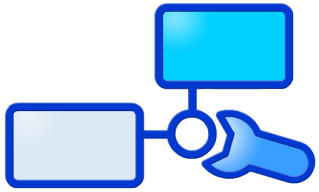

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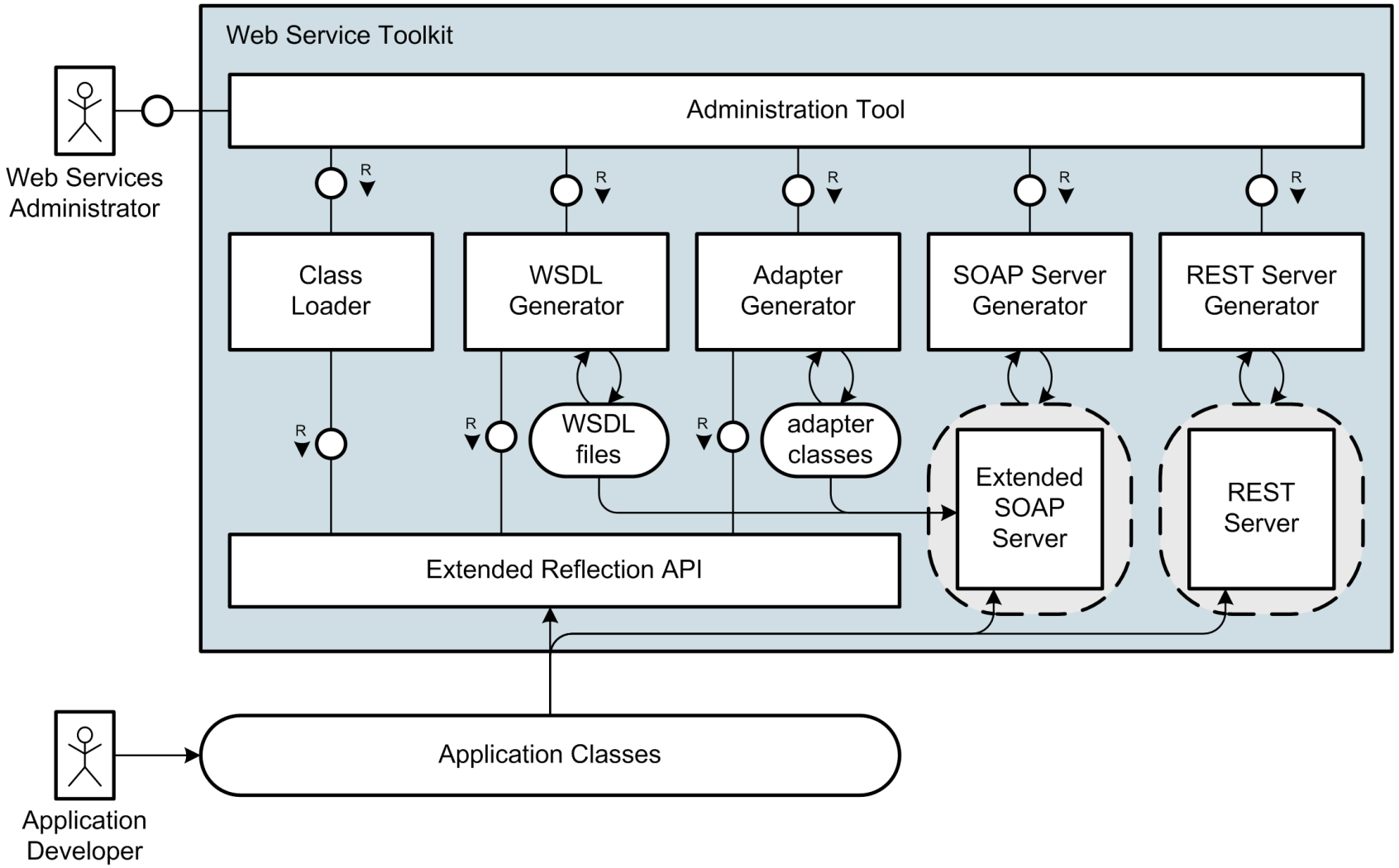

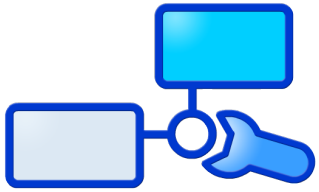

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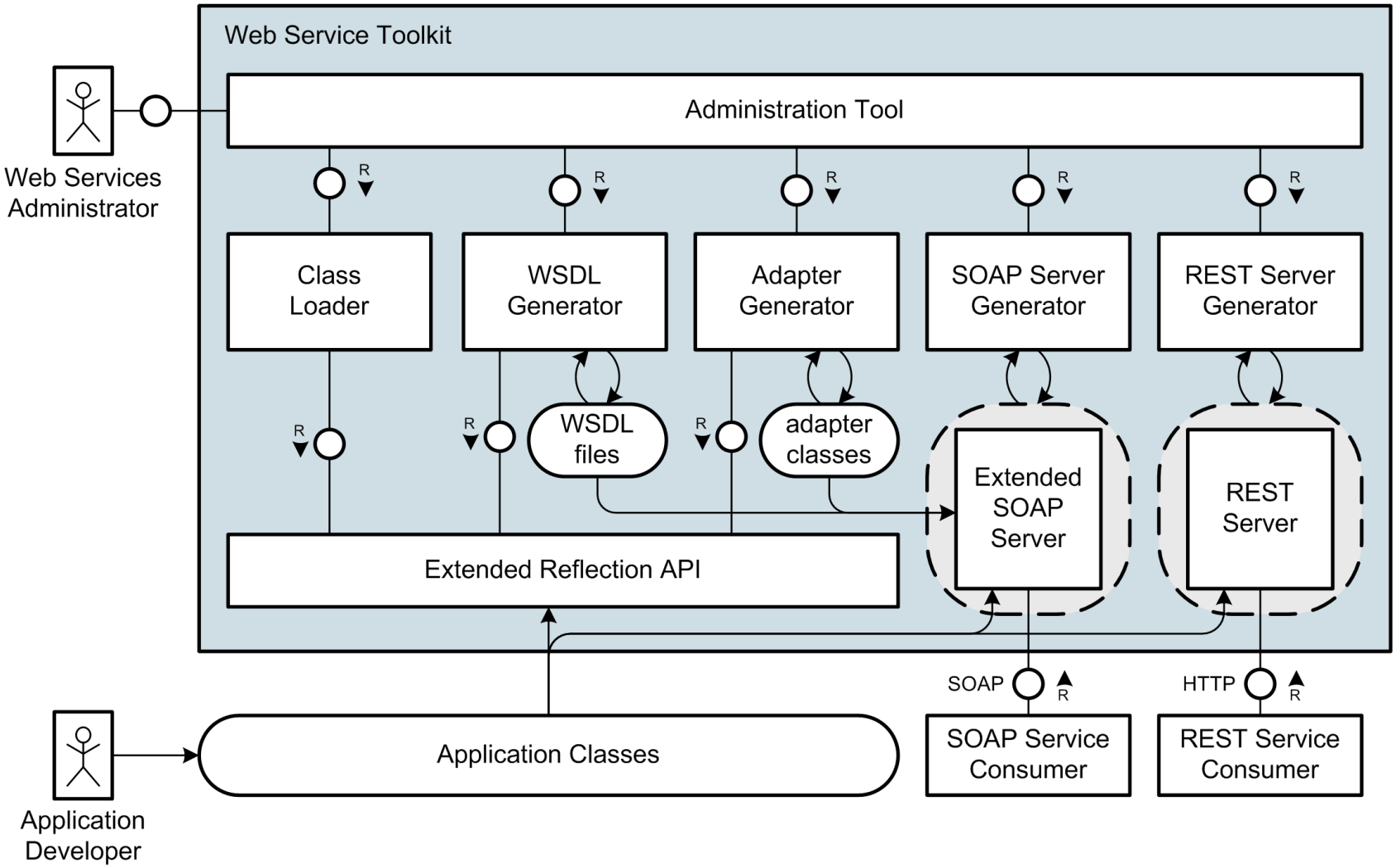
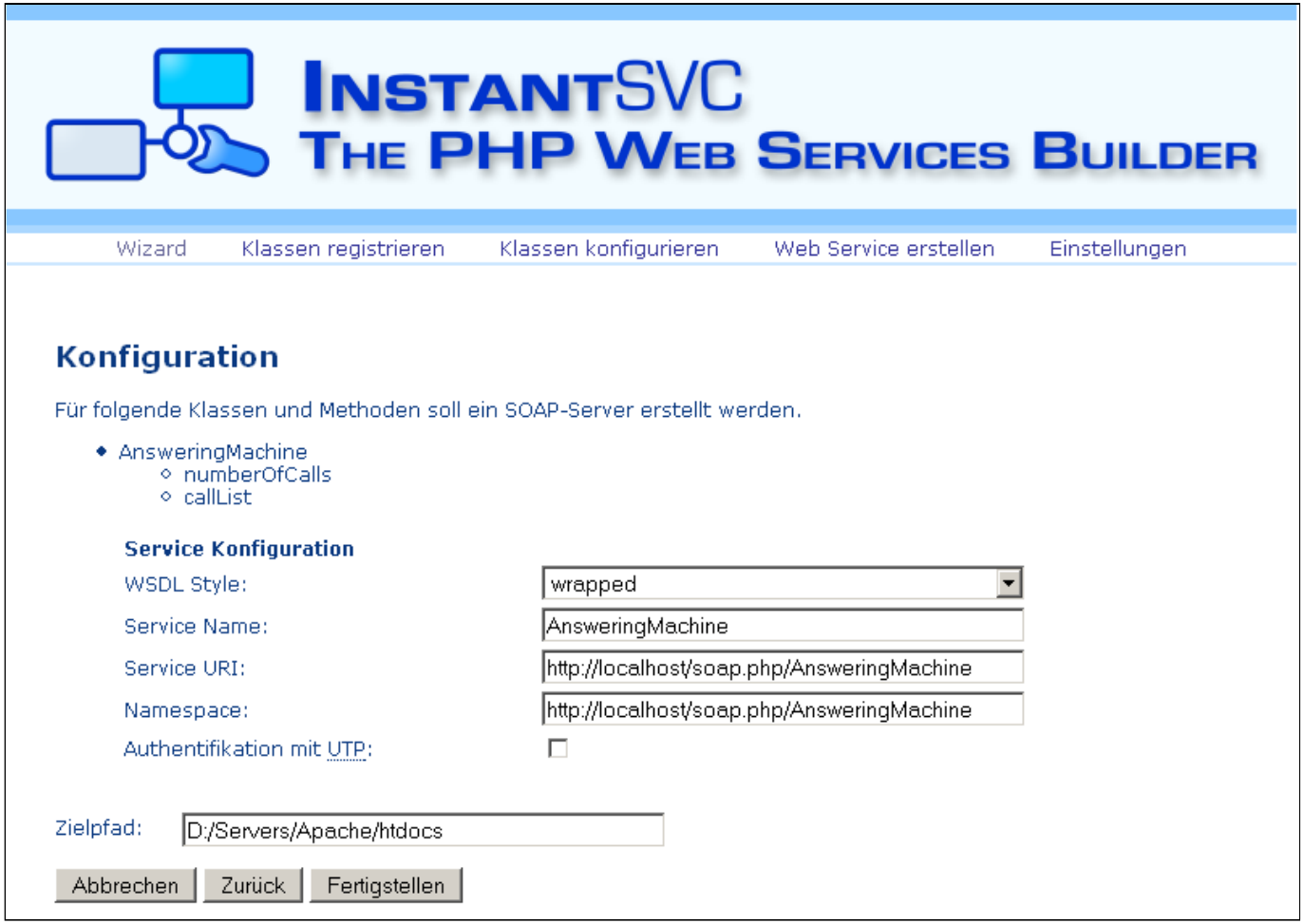


Live Demo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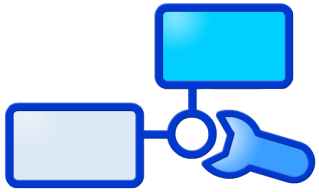
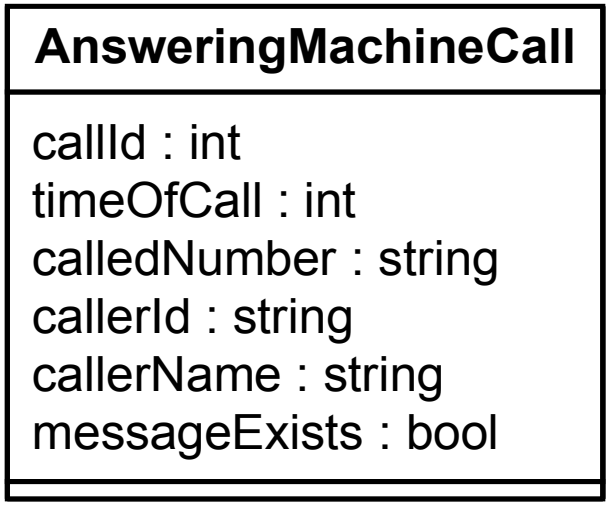
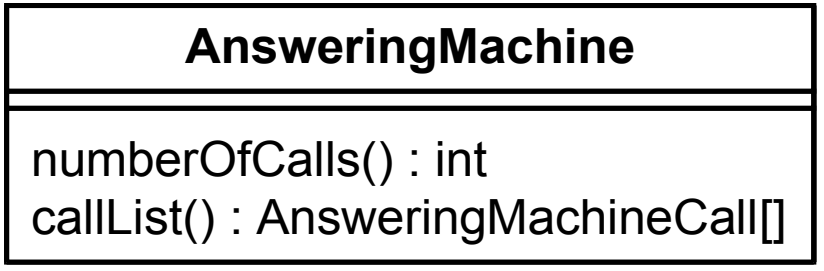
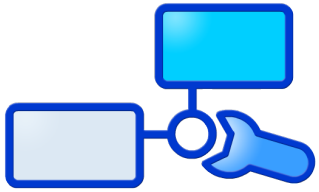


Example Application

- Application: Answering Machine
  - Number of Calls
  - List of Calls
- Example Web Service
  - using SOAP Protocol







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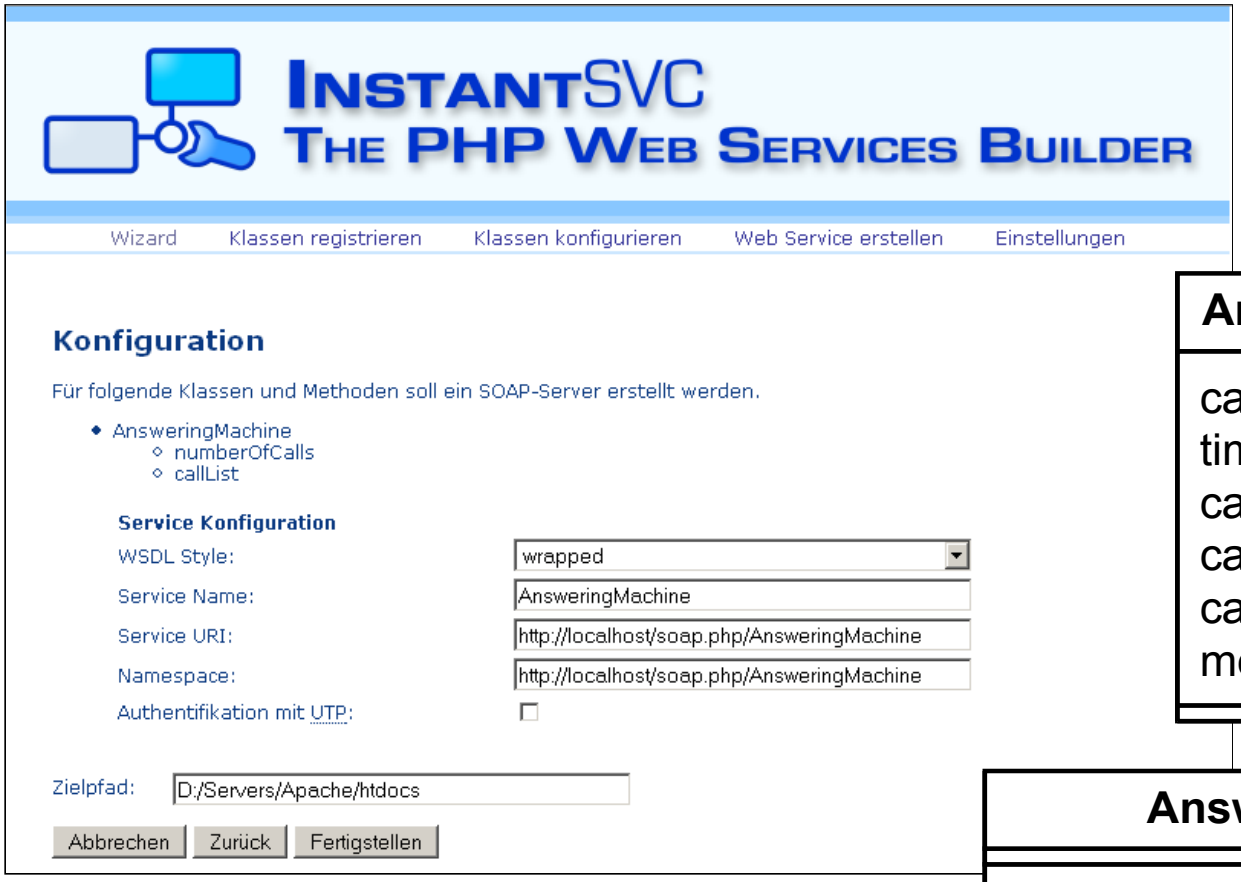
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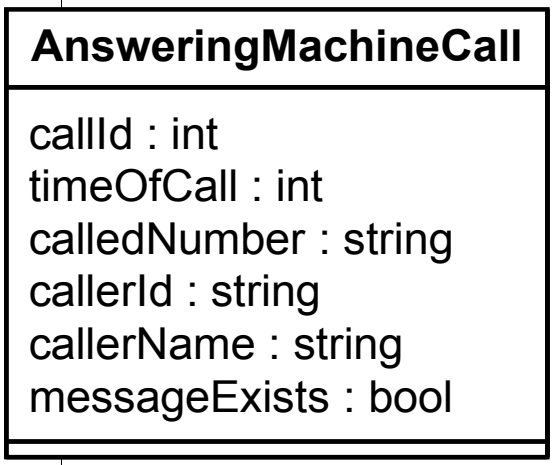
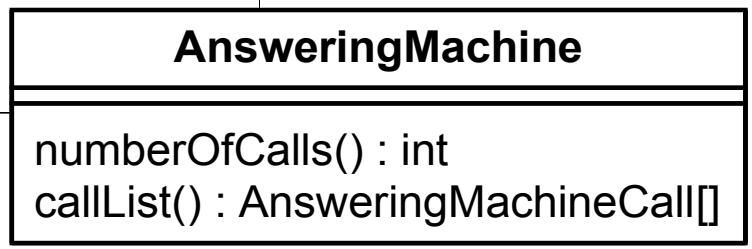
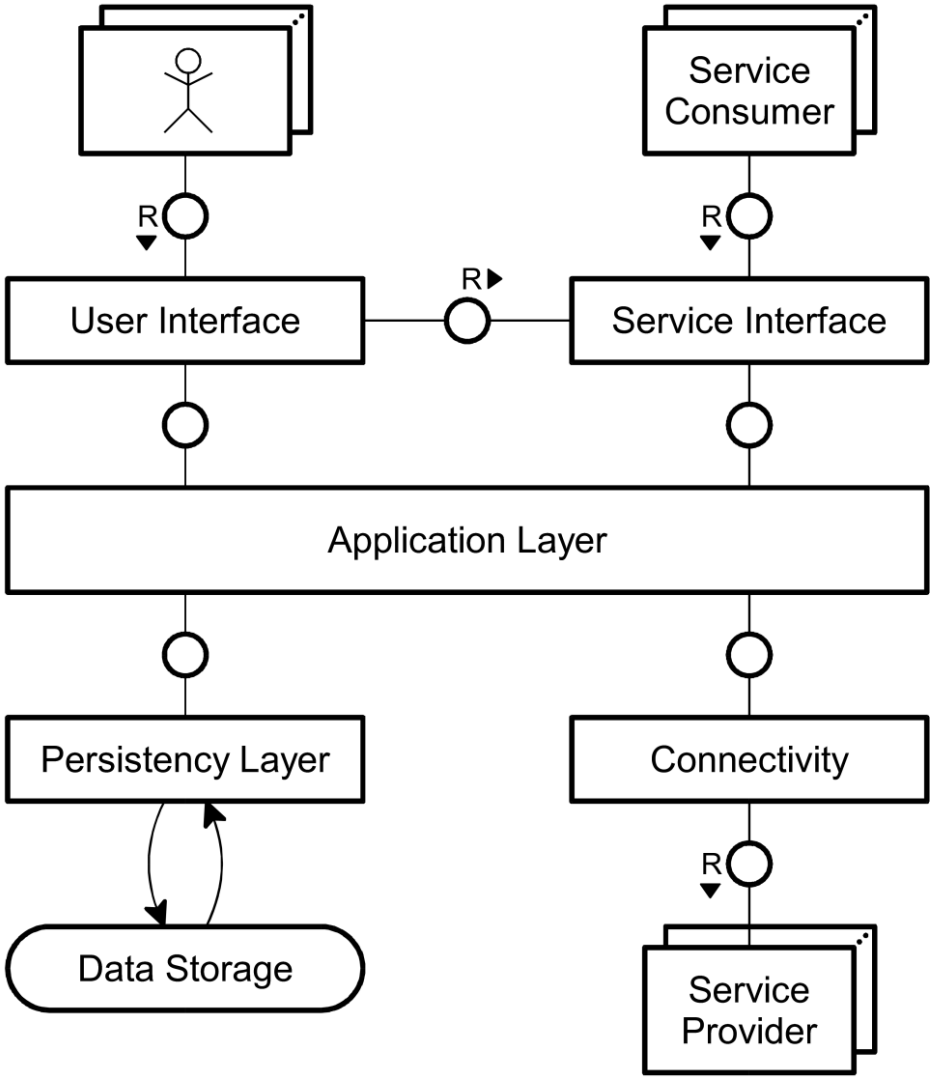
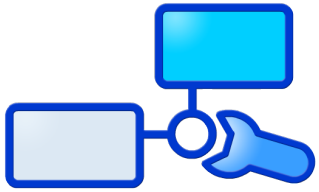

AnsweringMachineCall
callId : int
timeOfCall : int
calledNumber : string
callerId : string
callerName : string
messageExists : bool


AnsweringMachine
numberOfCalls() : int
callList() : AnsweringMachineCall[]

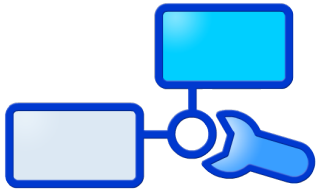
Proposed Application Architecture





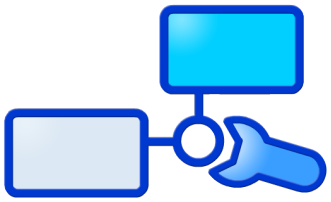
Summary

- Extended Reflection API with Information about Types
- Annotations for PHP
- WSDL Generator conform to WS-I Basic Profile
- Document/Literal Adapter Generator
- Handler Chain Mechanism for SOAP Processing
- Implementation of WS-Security and Username Token Profile
- RESTful Web Services
- Administration Tool for convenient Creation und Management of SOAP and REST Services



Future of the Project

- Developed by 6 HPI Students since October 2005
  - Stefan Marr
  - Christoph Hartmann
  - Michael Perscheid
  - Martin Sprengel
  - Gregor Gabrysiak
  - Falko Menge
- Project presented at the FrOSCon 2006 (Free and Open Source Software Conference)
- Next Step: Contribution to eZComponents



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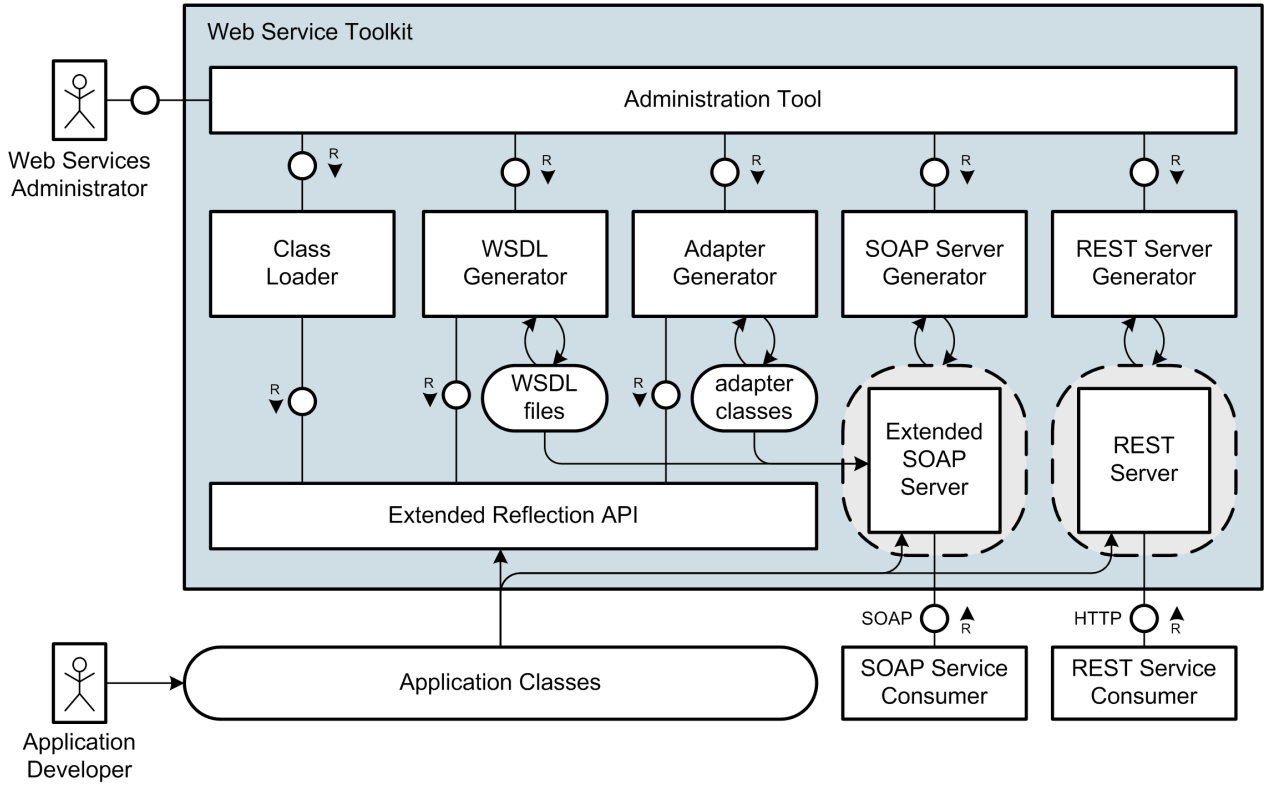

Further Information and Download at:

http://instantsvc.sourceforge.net