Web Service Facade for PHP5

Andreas Meyer, Sebastian Böttner, Stefan Marr

Agenda

- Objectives and Status
  - Architecture
  - Framework Features
- WSD Generator
  - PHP5 Reflection API
- Security Aspects
  - used approach
  - planned techniques
  - Web Services Security
    - Username Token Profile 1.0
    - Further used WSS features
- Coding Guidelines
  - PHPDoc Tags
  - Examples based on current TT-Implementation

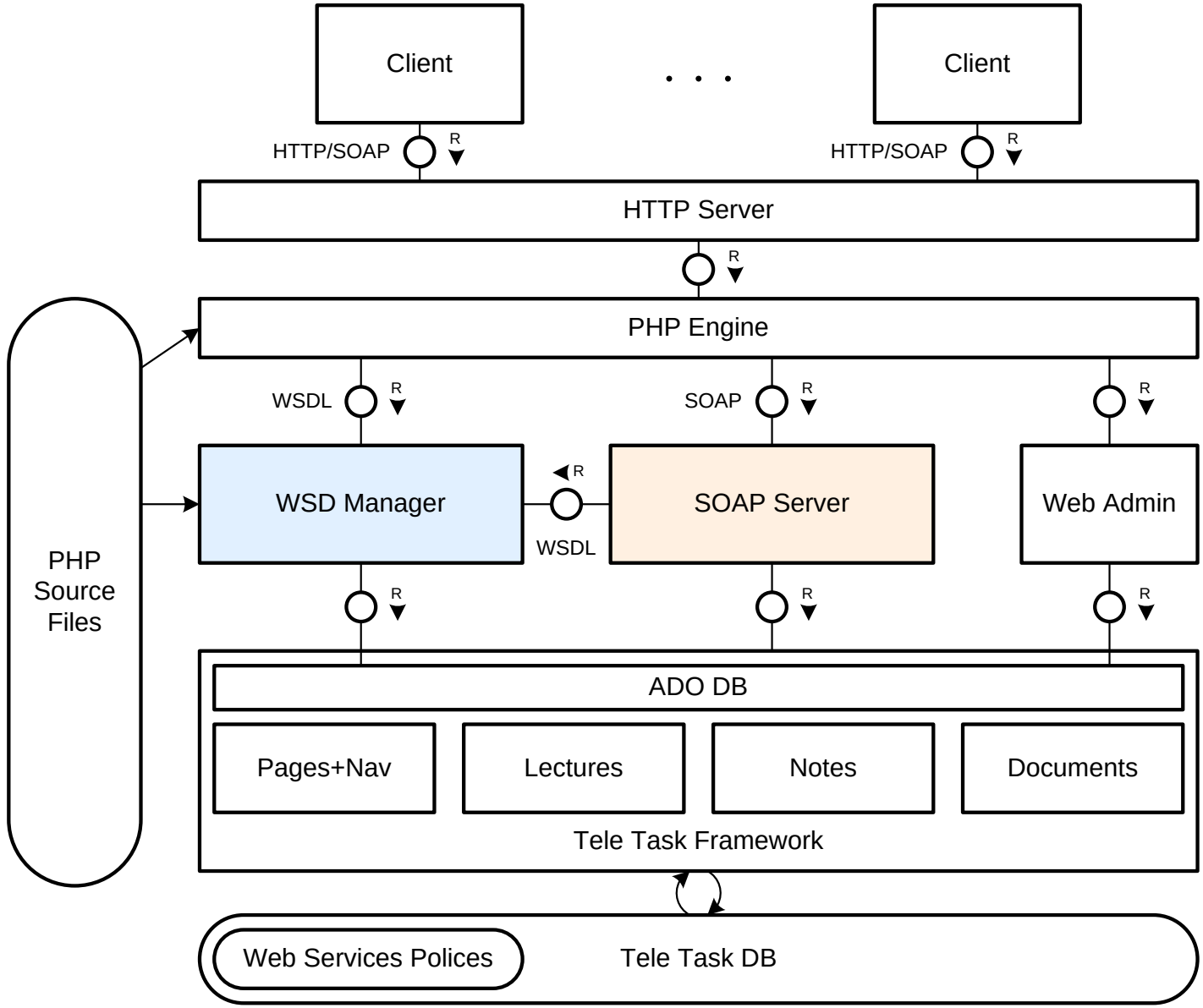
Objectives

- Tool for generating WSDL-files from PHP5 code
- Inspect code and generate XSD-files for used parameter types

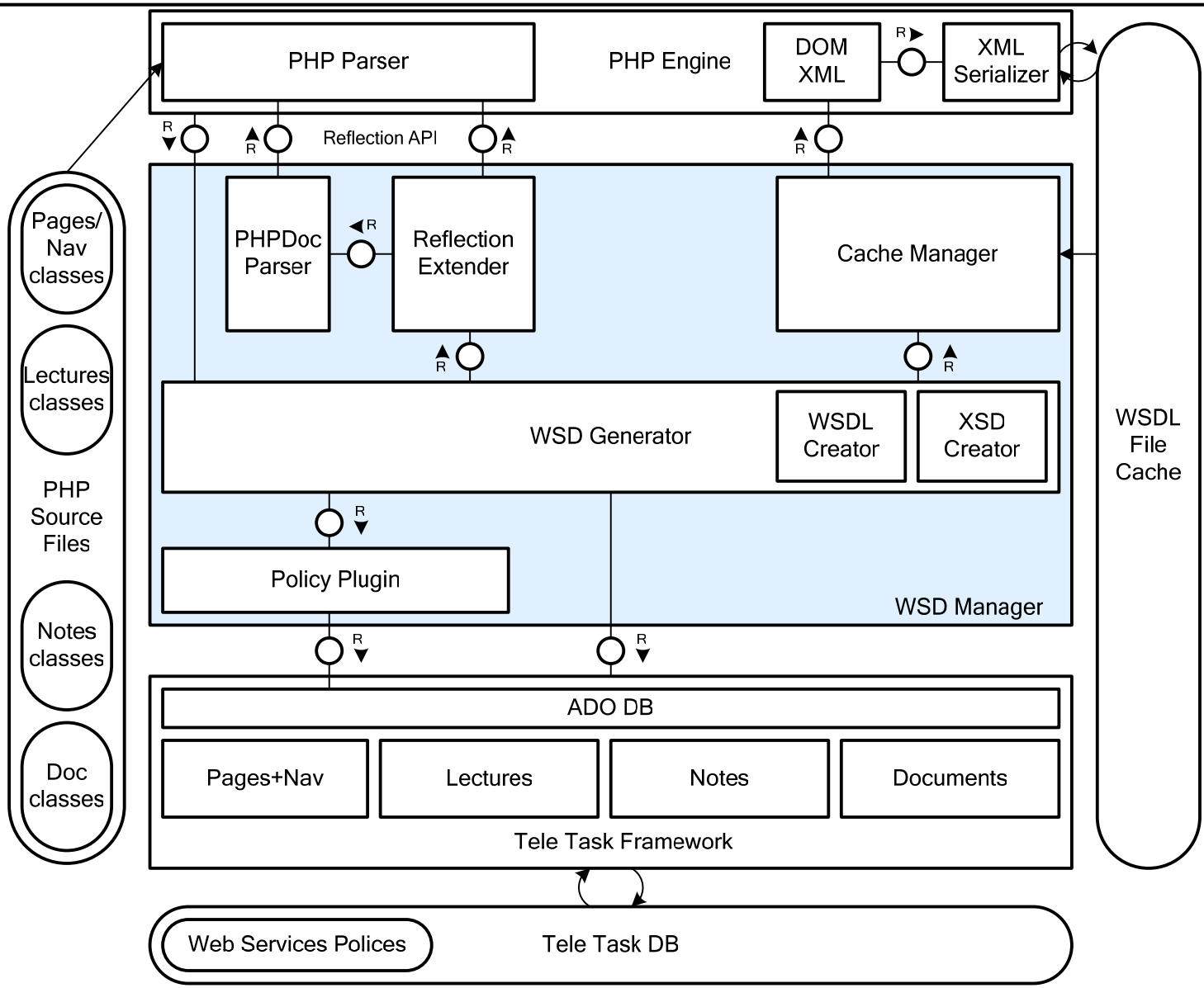
- Building a framework
  - Combine tools
  - Provide SOAP-Server for TT
  - Consider security aspects
    - Personalized services
    - Authentication

  - Web-Based SOAP-Server Configuration
  - Example implementation based on old TT database
    - Part of framework documentation
    - Including guidelines and hints for usage

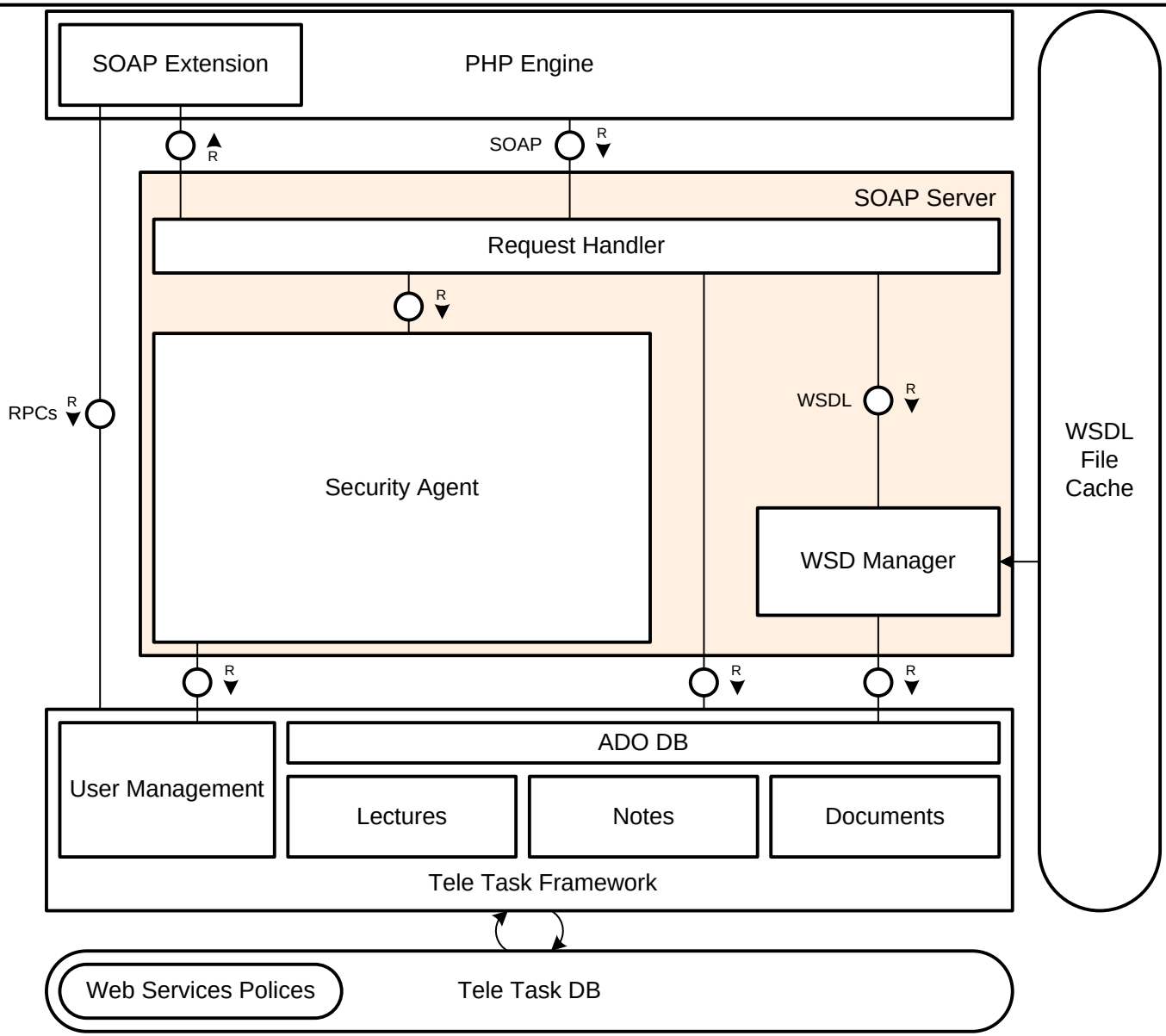
Architecture



WSD Manager

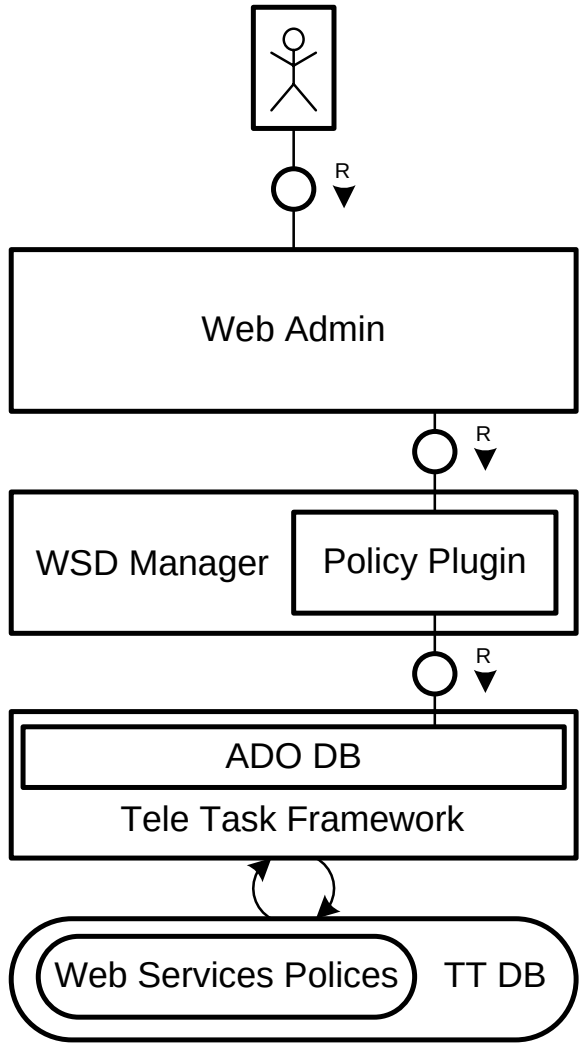

PHP Parser
PHP Engine
DOM XML
XML Serializer
R
Reflection API
PHPDoc Parser
Reflection Extender
Cache Manager
Pages/ Nav classes
Lectures classes
PHP Source Files
Notes classes
Doc classes
WSD Generator
WSDL Creator
XSD Creator
WSDL File Cache
Policy Plugin
WSD Manager
ADO DB
Pages+Nav
Lectures
Notes
Documents
Tele Task Framework
Web Services Polices
Tele Task DB

SOAP Server


SOAP Extension
PHP Engine
R
SOAP
R
SOAP Server
Request Handler
R
RPCs
R
Security Agent
WSDL
R
WSDL
File
Cache
WSD Manager
R
R
R
User Management
ADO DB
Lectures
Notes
Documents
Tele Task Framework
Web Services Polices
Tele Task DB

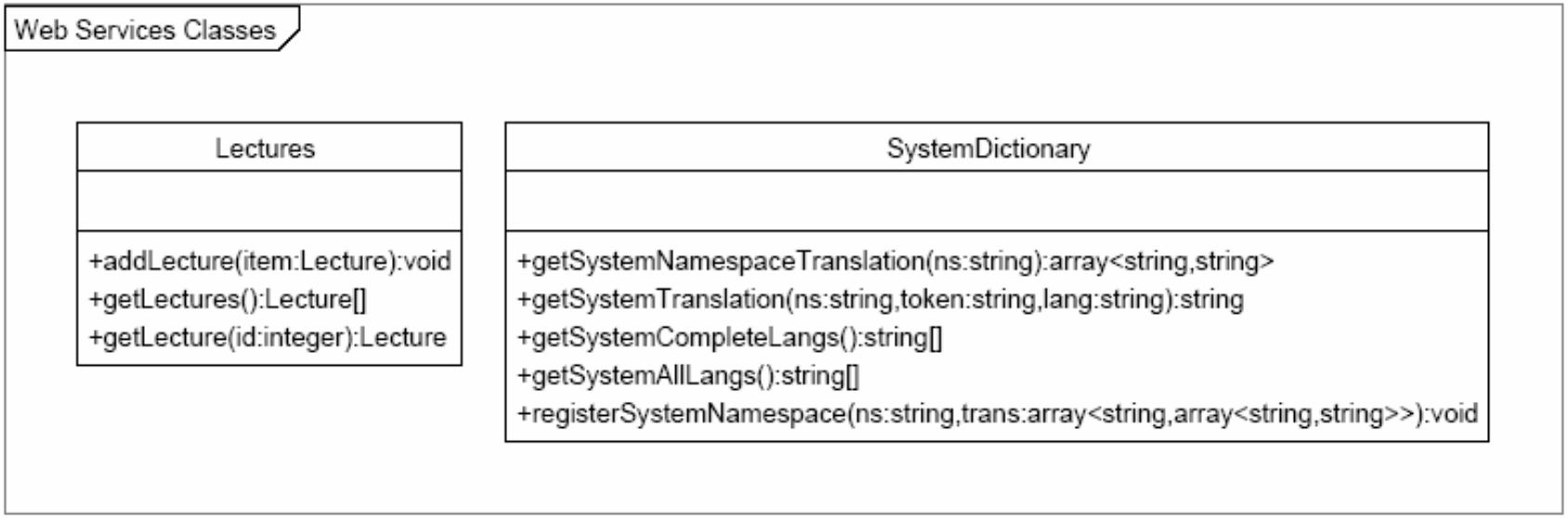
Web Admin Features

- Set polices for provided web services
  - Activate classes to provide Web Services
  - Choose published methods
    - Only `public` methods
- Adjust documentation published in WSDL



Constrains for this Approach

- **General expectations on classes intended to be used as Web Services**



- **Problem: inputs via SOAP are only plain objects with members, no methods**

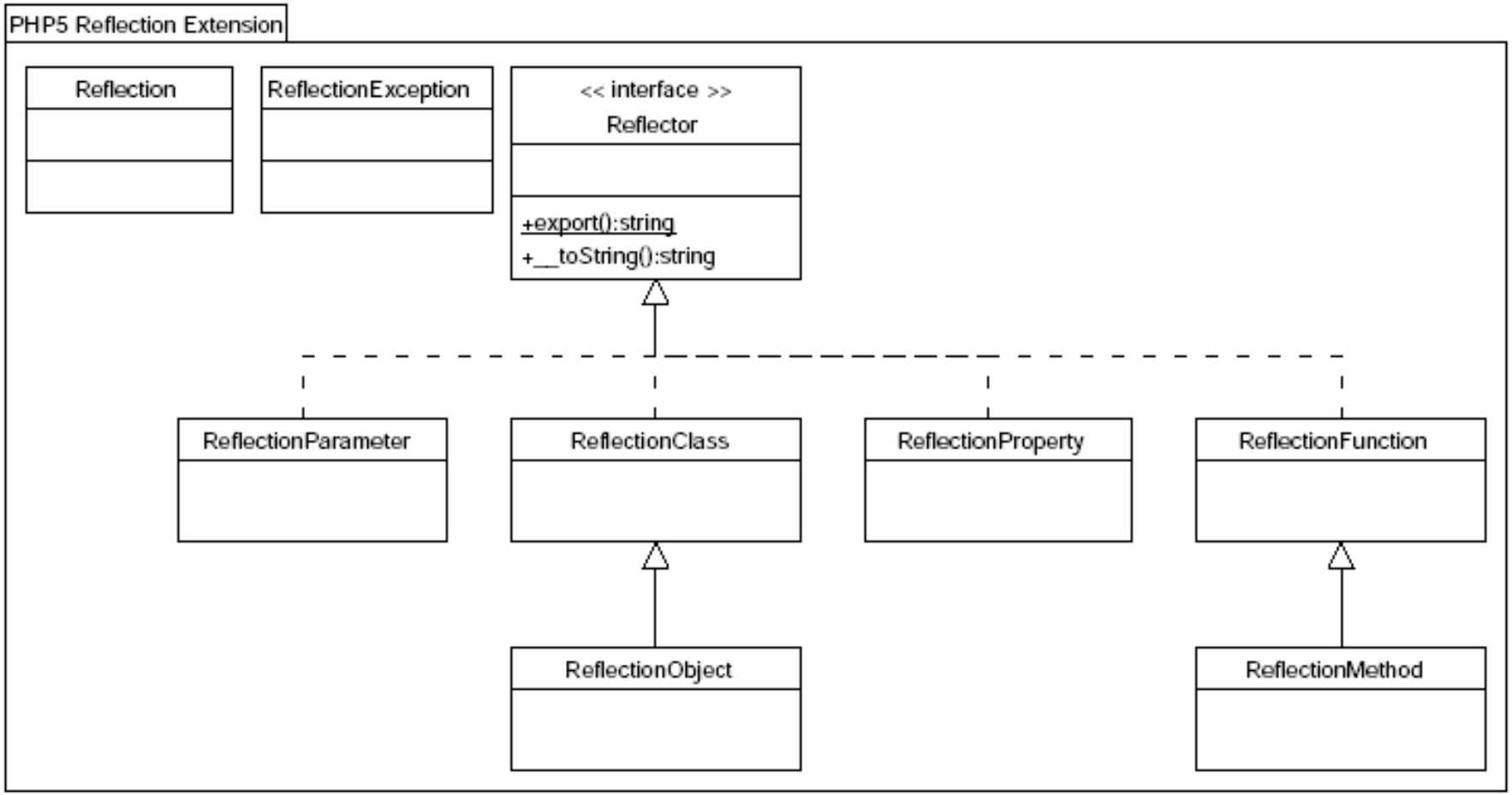
Status

- Conceptual Design
- Security Standards
  - WSS Approach
  - HTTP based
- Generation of WSDL- and XSD-Files
  - Extended Reflection API
- Example Implementation
- Documentation
  - Style Guide

WSD Generator - PHP5 Reflection API

- PHP5 provides complete reflection API
  - reverse-engineer
    - Classes
    - Interfaces
    - Functions
    - Methods
    - Extensions
  - retrieve doc comments
- object-oriented extension to Zend Engine
- used to gather information for generate WSDL- and XSD-files

PHP5 Reflection API



Security Aspects

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Security: Aims

- usage of security aspects independently from WSDL-files

AM11
- prevent stateful webservices

- general procedure
  - a proxy catches the messages
  - controls the security aspects
  - forward the messages to a worker

AM12
- implemented classes should be unattached by security aspects

- implementation of two different possibilities
  - Token Framework
  - Username Token Profile 1.0

AM11 Server muss keinen Status von Clients verwalten
Andreas Meyer; 29.11.2005

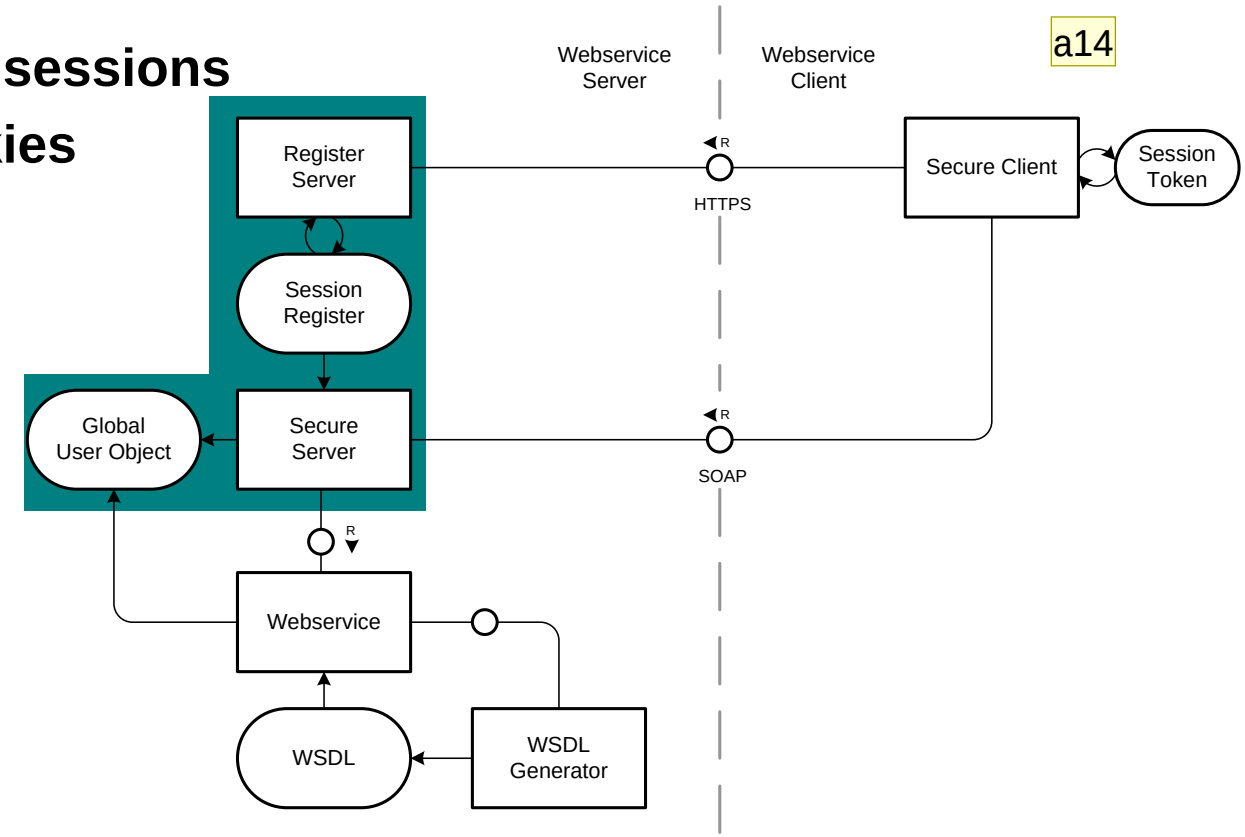
AM12 transparente Schnittstellen - Speicherung in einer globalen Variable anhand der die Zugriffsrechte ermittelt werden
Andreas Meyer; 29.11.2005

Security: Token Framework 1/2

- General Information
  - client connects to the register server and gets a token depending on username and password
  - by the use of this token the access to the user's functions is controlled
  - usage of PHP sessions
  - usage of cookies

AM13

a14



AM13

- Secure Client übermittelt Passwort und Username an Register Server
- Register Server registriert Session im Session Register und das Setzen der gobalen Variable für die Zugriffsrechte wird veranlasst
- Secure Client bekommt Token mit Session ID zurück
- Secure Client speichert Session ID im Cookie
- Secure Client geht mit Cookie zum Secure Server
- Secure Server überprüft Zugriffsrechte im Global User Object
- und darf dann mit den Webservices "spielen"

Andreas Meyer; 29.11.2005

a14

Secure Client ist abgeleitet vom Soap Client

User muss im Konstruktor nur Username und Passwort angeben..Rest macht Secure Client

Andreas Meyer; 29.11.2005

Security: Token Framework 2/2

- **Advantages**
  - **usage of existing standards**
  - **stateful Web Services possible**

- **Disadvantages**
  - **plaintext**
    - **counteractive measures**
      - SSL
      - HTTPS
  - **stateful Web Service**

Security: Username Token Profile 1.0 1/3

- **General Information**
  - **implementation of parts of the OASIS Web Services Security (WSS)**
  - **xml syntax:**

```
<wsse:Security>
    <wsse:UsernameToken wsu:Id="our-Example">
        <wsse:Username> Andreas </wsse:Username>
        <wsse:Password Type="...#PasswordDigest">
                weYI3nXd8LjMNVksCKFV8t3rgHh3Rw==
        </wsse:Password>
        <wsse:Nonce>
                WScqanjCEAC4mQoBE07sAQ==
        </wsse:Nonce>
        <wsu:Created> 2003-07-16T01:24:32Z </wsu:Created>
    </wsse:UsernameToken>
</wsse:Security>
```

  - **Password_Digest**
    = Base64 (SHA-1 (nonce + created + password))

Security: Username Token Profile 1.0 2/3

- security considerations
  - the secret is put at the end of the input an not the front
  - replay attacks: using message timestamps, nonces and caching
  - recommends against replay attacks:
    - reject any UsernameToken using not both nonces and timestamps
    - using timestamp freshness limitation and rejecting all UsernameToken with “stale” timestamps
    - caching nonces for a period of time and rejecting all UsernameToken with already used nonces

Security: Username Token Profile 1.0 3/3

- Advantages
  - open standard (supported by IBM, SUN (java), …)
  - independent of PHP, e.g. other clients with different programming languages can use it
  - there are only ‘self-writing-alternatives’
- Disadvantages
  - Password_Digest valid for a specified time-frame
    - counteractive measures: one-time nonce
  - Possibly plaintext passwords

Coding Guidelines

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Coding and Style Guidelines

- WSDL-files are necessary to define communication between Web Service Client and Server
  - Interface specification of Web Service needed
- Documentation is added to compensate the lack of datatype info
- phpDocumentor-Tags:
  - existing parsers can be used
  - common standard
- Enhanced readability and easier maintenance as a plus

WSDL Example

```
<wsdl:types>
  <schema xmlns="http://www.w3.org/2001/XMLSchema" targetNamespace="http://www.tele-task.de/webservices/LectureWebService.wsdl">
    <xsd:import namespace="http://schemas.xmlsoap.org/soap/encoding/"/>
    <xsd:import namespace="http://schemas.xmlsoap.org/wsdl/"/>
    <complexType name="LectureListType">
      <complexContent>
        <restriction base="SOAP-ENC:Array">
          <attribute ref="SOAP-ENC:arrayType" wsdl:arrayType="string[]"/>
        </restriction>
      </complexContent>
    </complexType>
  </schema>
</wsdl:types>
<message name="getLectures"/>
<message name="getLecturesResponse">
  <part name="return" type="tns:LectureListType"/>
</message>
<portType name="getLecturesPortType">
  <operation name="getLectures">
    <input message="tns:getLectures"/>
    <output message="tns:getLecturesResponse"/>
  </operation>
</portType>
```

General Guidelines

- One header block comment per file
- One comment per class, method or function
- Short documentation for every variable
- DocComments start with /** and end with */, beginning with a description followed by the DocTags
- Maximum of 77 chars per line
- CamelCase, avoid underscores

Datatype Declaration

- Tags needed for WSDL Parser:
  - @return datatype description
    - States the datatype of the return value and additional information
  - @var datatype description
    - States the datatype and additional information for variables
  - @param datatype $paramname description
    - States the datatype and information for function arguments
  - datatype may be
    - `Integer`
    - `String`
    - `Double`
    - `Boolean`
    - `AnyClass`
    - array of a datatype (`string[]`, `integer[]`, `MyClass[]`, ...)
    - Associative arrays as: `array<datatype,datatype>`
  - No mixed

Header Block Comments

```
<?php
//*************************************************************************
//*************************************************************************
//**                                                                     **
//* class.dbNews.php - used for instancing of dbNewsObjects              **
//*                                                                      **
//* Projekt: Teletask, Konzepte und Methodern der Web-Programmierung     **
//*                                                                      **
//* @package dbTables                                                    **
//* @author Stefan Marr <stefan.marr@hpi.uni-potsdam.de>                 **
//* @author Sebastian Böttner <sebastian.boettner@hpi.uni-potsdam.de>    **
//* @copyright 2005 by Andreas Meyer, Sebastian Böttner, Stefan Marr     **
//* @license http://example.org/examplelicense.php Example License       **
//* @lastchange: 2005-11-30 altered News, phpDocumentor-Tags added       **
//*                                                                      **
//*************************************************************************
//*************************************************************************
```

- Short description
- Optional long description
- Project name
- At least:
  - @package @author @copyright @license @lastchange
- Optional:
  - @deprecated @internal @see @since @uses @version

Classes and Attributes

```
//***** dbNews ************************************************************
/**
* dbNews - represents and sets elements of the table news
*
* Projekt: Teletask, Konzepte und Methodern der Web-Programmierung
*
* @package dbTables
* @author Stefan Marr  <stefan.marr@hpi.uni-potsdam.de>
* @author Sebastian Böttner <sebastian.boettner@hpi.uni-potsdam.de>
* @copyright 2005 by Andreas Meyer, Sebastian Böttner, Stefan Marr
* @license http://example.org/examplelicense.php Example License
*/
```

- Similar to Header Block Comments (same Tags)
  - Optical differences for distinguishing

```
/**
* @var string
*/
private $zeugs = 'something important';
```

- There must be one comment for each variable
  - At least datatype must be present
  - Description optional

Methods and Functions

```
//=======================================================================
/**
* constructor-method of class dbNews
*
* This is the constructor used to instanciate dbNews objects in
* dbMoreThanOneNews. Will be filled with a Data Record from Teletask_news
*
* @param integer $id
* @param array<string,string> $data
*/
public function __construct($id = -1, $data = null) {
  $this->_tableName = news;
  $this->_primaryKey = 'id';
  parent::__construct($id, $data);
}
```

- **Short description**
- **Optional long description**
- **At least @param and @return must be present if existent**
- ***//end of functionName if method spans more than 15 lines***

Control Structures

```
//============================================================================
/**
* shows how to use brackets, whitespaces and indentations
*/
public function styleExample() {
  if ($a == $b || !($c > $d + $e)) {
    //do something
  } //end if
  elseif ($f) {
    //do something
  } //end elseif
  else {
    //do something
  } //end else

  for|foreach|while (...) {
    //do
  } //end for|foreach|while

  do {

  } while ($g);

  switch ($h) {
    case ...:
      ...;
      break;
    default:
      ...;
  } //end switch
} //end of styleExample
```

- **//end of structure comment if structure spans more than 15 lines**

References

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  http://www.php.net/manual/en/language.oop5.reflection.php
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- **[JAVADOC] How to Write Doc Comments for the Javadoc Tool**
  http://java.sun.com/j2se/javadoc/writingdoccomments/
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Q & A

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