



Distributed Systems 2016 – Assignment 2

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Web Services



Overview

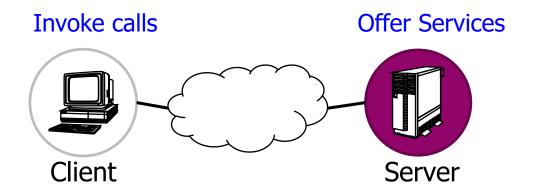
- Quick walkthrough of Web application architectures
 - WS-* Web Services
 - Representational State Transfer (REST)
- Exercise 2
 - Overview
 - Tasks
 - Hints & Anchors



Web Services

Definition:

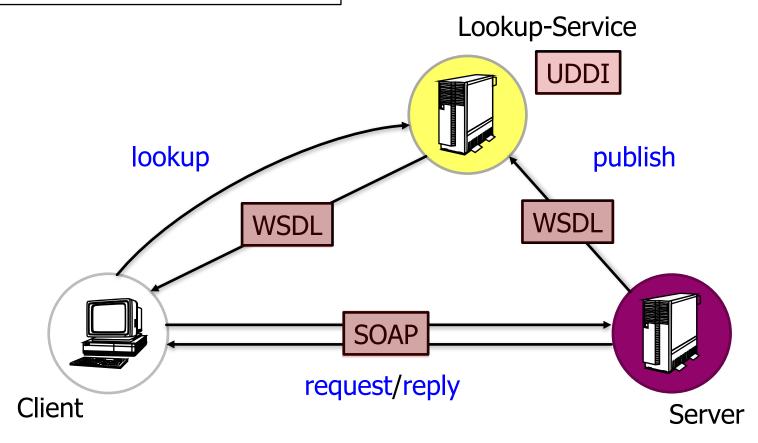
"A Web service is an application component accessible over open protocols"





Web Services in a Nutshell

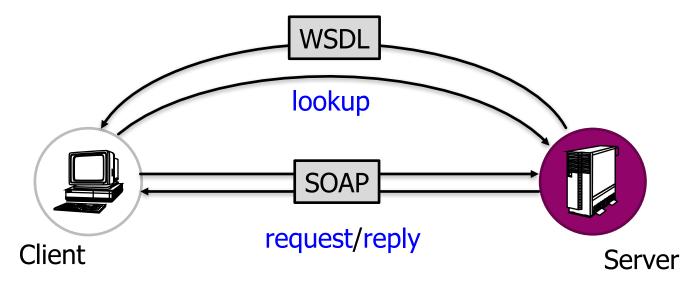
Service-Oriented Architecture (SOA)





Web Services in a Nutshell

For the exercise, we let the service publish its WSDL without going through a UDDI...



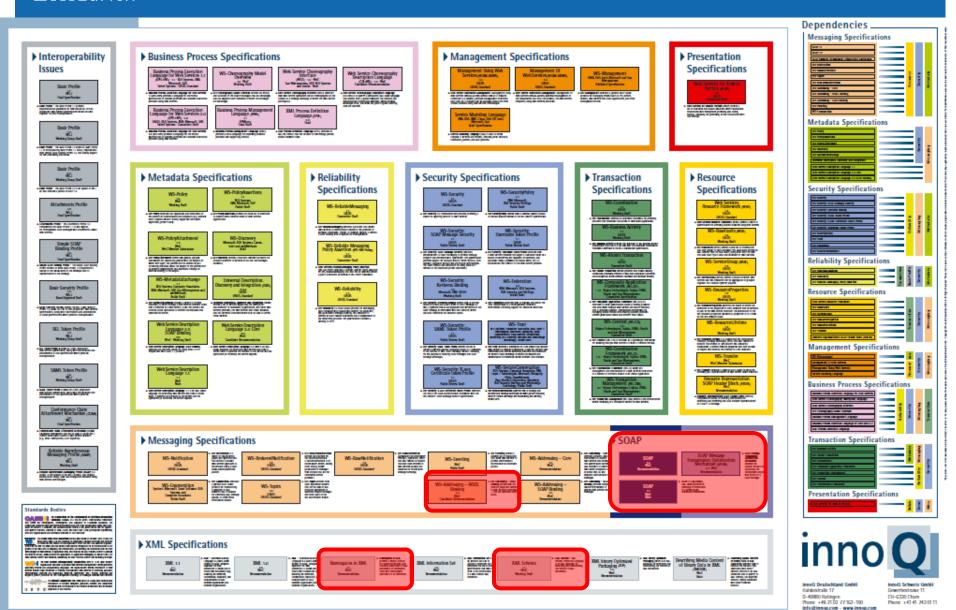


Web Services - WSDL Overview

- WSDL: **W**eb **S**ervices **D**escription **L**anguage describes:
 - What a Web service can do
 - Where it resides
 - How to invoke it
- **Explore WSDL**
 - **Example:** http://vslab.inf.ethz.ch:8080/SunSPOTWebServices/SayHello?Tester

Types, Messages, PortType, Binding, Service, Port, Definition

ETH zürich





Programming WS-* Clients

- Most IDEs provide code generators
- Server-side
 - Java annotations
 - Automatic generation of WSDL file



- Parsing of WSDL file
- Automatic generation of client stubs





REST: Representational State Transfer

- REST is a lightweight architectural style for designing networked applications
 - HTTP 1.1 implements the REST architectural style
 - It uses HTTP methods for CRUD (Create/Read/Update/Delete) operations
- Platform independent
- Language independent
- Open standard-based



REST Architecture





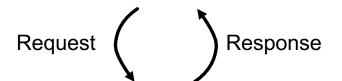


e.g., a sensor node: http://vslab.inf.ethz.ch:8081/sunspots/Spot1

- A web of resources: Resources are linked
 - Similar to the interconnection of Web pages in the WWW
 - When relevant, resources should link to additional information.
- **Stateless** communication protocol:
 - Each new request must carry all the information required to complete it



RESTful Server Structure



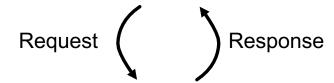
Resource-Oriented Architecture (ROA)

HTTP Server

/sensors/Spot1 → ResourceHandlerSpot1 /db/credits/Account1 → ResourceHandlerAccount1

. . .

URI → ResourceHandler



ResourceHandler

Sensor

ResourceHandler

Database

Resource Handler

Assignment 2 – Overview

Objectives:

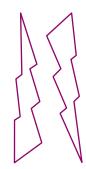
- Learn to develop distributed Web applications
- Use the two different paradigms seen in the lecture:
 - Representational State Transfer (REST)
 - Web Services (WS-*)

Dates:

- Exercise begins: Today (October 14, 2016)
- Exercise due: 11:59 p.m., October 24, 2016



[http://code.google.com/p/h



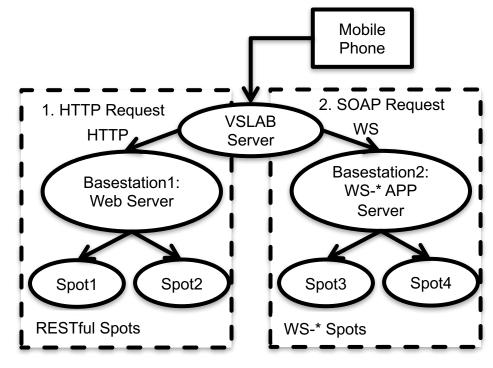




Assignment 2 – System Setup

- Access Sun SPOTs through WS-* and REST
- Sun SPOTs: Wireless sensor nodes (temp, acc, light,...)







Assignment 2 – Task 1

Experimenting with RESTful Web Services (2P)

- Create an HTTP request
 - a) "manually" (i.e., without the use of an HTTP library)
 - b) Using java.net.HttpURLConnection
- Use HTTP content negotiation to get machine-readable data
- Connect to a Sun SPOT and retrieve the temperature value
- Hint: Use the HTTP header "Connection: close" to avoid blocking

Distributed Sysyems – Introduction Assignment 2



Assignment 2 – Task 2

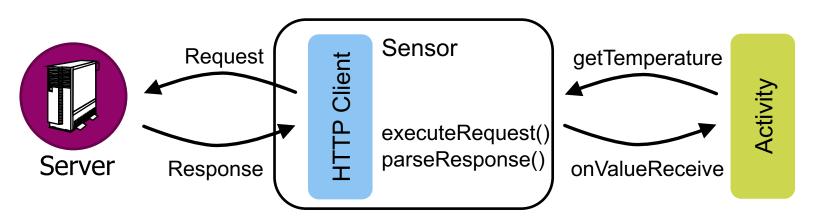
Experimenting with WS-* Web Services (2P)

- Explore WSDL, create SOAP requests
- Connect to a Sun SPOT and retrieve the temperature value.
- Hints:
 - Use the Android version of the kSOAP2 library
 - http://simpligility.github.io/ksoap2-android/
 - Important classes are: SoapObject, SoapSerializationEnvelope
 - You do not have to implement the decoding of the WSDL file



Code Skeleton

- Interfaces for Sensors
 - Separate UI from logic
 - Increase of code reuse
 - Each subtask is a new class that implements the Sensor interface



informs all registered SensosListeners

implements SensosListener



Assignment 2 – Task 3

Your Phone as a Server (4P)

Implement a Web server on your phone that allows to access the sensors and actuators of the phone

Hints:

- Use a Service to implement the server
- Use Intents and BroadcastReceiver, or Bound Services, to communicate between Service and Activity
- When you are using an existing WiFi network, make sure the ports you are using are not blocked!





Deliverables

- See exercise sheet for details
 - code.zip
 - answers.pdf
- Filesize limit
 - Delete the build folder from your application oject>/app/build



Assignment 2 Hints - Relevant Terminology

- Internet Media Types
 - text/html, text/xml
 - application/xml, application/json
- ROA Resource-Oriented Architecture
- REST Representational State Transfer
- SOA Service-Oriented Architecture
- SOAP Simple Object Access Protocol
- WSDL Web Services Description Language



REST Hints

- http://www.infoq.com/articles/rest-introduction
- RESTful Web Services (Leonard Richardson und Sam Ruby)
 - Available at D-INFK library





Noteworthy Tools

- Firefox extensions
 - HttpRequester
 - Poster
 - RESTClient
 - SOA Client
- Chrome extensions
 - Simple REST client
- Wireshark



Android SDK Tools

- Android Debug Bridge (adb tool)
 - You can find the adb tool in <sdk>/platform-tools/
 - http://developer.android.com/tools/help/adb.html
- Android Emulator
 - http://developer.android.com/tools/devices/emulator.html
- Setting up a port forwarding
 - adb forward tcp:port1 tcp:port2
 - forwards the local port port1 on the machine to port2 on the emulator.
 - Example: adb forward tcp:12345 tcp:8088