How to build a SOAP service in Java by “code-first” approach and deploy it on Apache Tomcat server with Apache CFX support from with eclipse IDE

Prerequisities

Java

This tutorial was prepared for jdk 11. You can download it from Oracle or you can use OpenJDK.

IDE

Thera are some options available on the market. This tutorial works for: **Eclipse** or **Spring Tools 4** ready-to-use distribution package. The scenario described can be repeated with the use of **IntelliJ**, however in a quite different way.

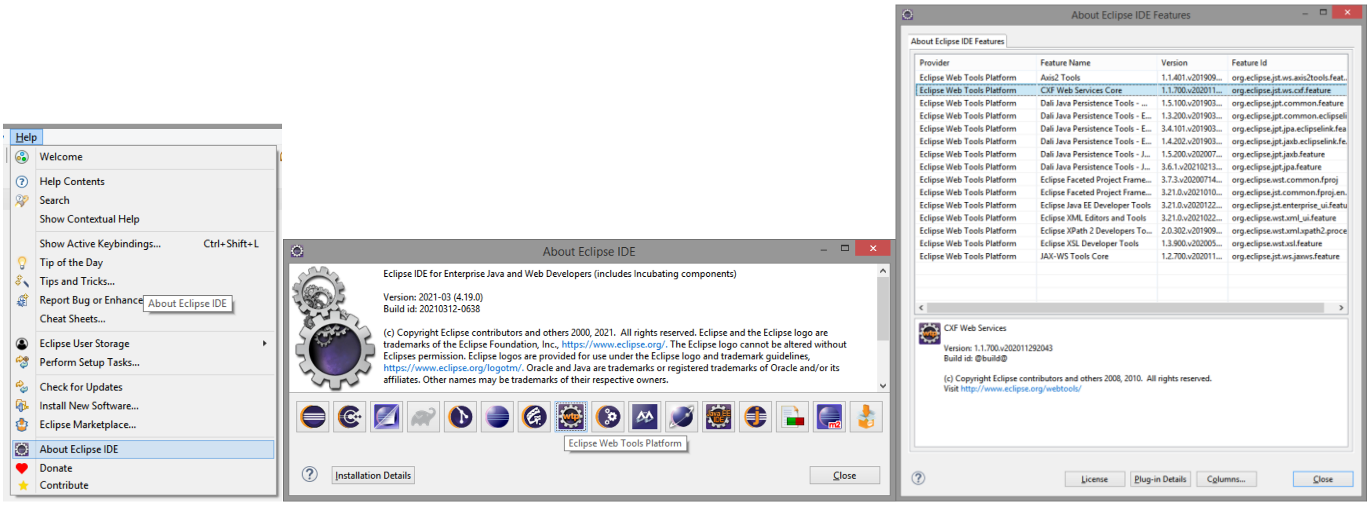
Eclipse

Download Eclipse from https://www.eclipse.org/downloads/packages/ and unzip it in a working folder. In particular you can download: **Eclipse IDE 2021-03 R Packages / Eclipse IDE for Enterprise Java Developers** from https://www.eclipse.org/downloads/packages/release/2021-03/r/eclipse-ide-enterprise-java-and-web-developers

This package includes **Eclipse Web Tools Platform 3.21** (WTP) – set of tools used to build web services.

WTP requires 64-bit **Java 11** or a newer "LTS" release to be run properly (there are none so far). **WTP 3.21** is the current supported release (at this tutorial writing).

You can check, what is really installed selecting Help/About Eclipse IDE and then clicking on WTP icon in the popup window.



Eclipse IDE for Enterprise Java and Web Developers (includes Incubating components)

Version: 2021-03 (4.19.0)
Build id: 20210312-0638

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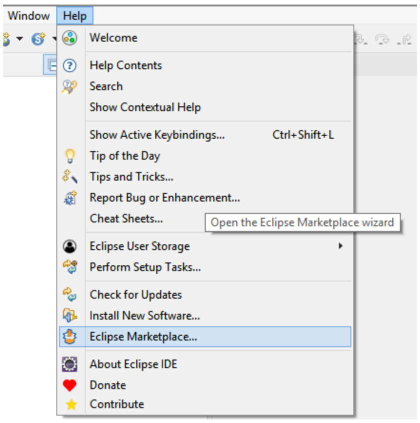
Provider	Feature Name	Version	Feature Id
Eclipse Web Tools Platform	Axis2 Tools	1.1.401.v201909...	org.eclipse.jst.ws.axis2tools.feat..
Eclipse Web Tools Platform	CXF Web Services Core	1.1.700.v202011...	org.eclipse.jst.ws.cxf.feature
Eclipse Web Tools Platform	Dali Java Persistence Tools - ...	1.5.100.v201903...	org.eclipse.jpt.common.feature
Eclipse Web Tools Platform	Dali Java Persistence Tools - E...	1.3.200.v201903...	org.eclipse.jpt.common.eclipseli
Eclipse Web Tools Platform	Dali Java Persistence Tools - E...	3.4.101.v201903...	org.eclipse.jpt.jpa.eclipselink.fea
Eclipse Web Tools Platform	Dali Java Persistence Tools - E...	1.4.202.v201903...	org.eclipse.jpt.jaxb.eclipselink.fe.
Eclipse Web Tools Platform	Dali Java Persistence Tools - J...	1.5.200.v202007...	org.eclipse.jpt.jaxb.feature
Eclipse Web Tools Platform	Dali Java Persistence Tools - J...	3.6.1.v20210213...	org.eclipse.jpt.jpa.feature
Eclipse Web Tools Platform	Eclipse Faceted Project Frame...	3.7.3.v20200714...	org.eclipse.wst.common.fproj
Eclipse Web Tools Platform	Eclipse Faceted Project Frame...	3.21.0.v2021010...	org.eclipse.jst.common.fproj.en.
Eclipse Web Tools Platform	Eclipse Java EE Developer Tools	3.21.0.v2020122...	org.eclipse.jst.enterprise_ui.featu
Eclipse Web Tools Platform	Eclipse XML Editors and Tools	3.21.0.v2021022...	org.eclipse.wst.xml_ui.feature
Eclipse Web Tools Platform	Eclipse XPath 2 Developers To...	2.0.302.v201909...	org.eclipse.wst.xml.xpath2.proce
Eclipse Web Tools Platform	Eclipse XSL Developer Tools	1.3.900.v202005...	org.eclipse.wst.xsl.feature
Eclipse Web Tools Platform	JAX-WS Tools Core	1.2.700.v202011...	org.eclipse.jst.ws.jaxws.feature

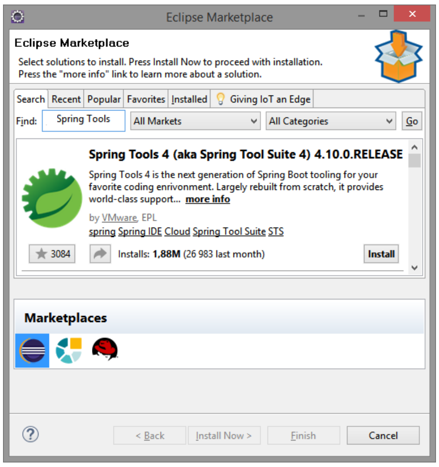
CXF Web Services

Version: 1.1.700.v202011292043
Build id: @build@

(c) Copyright Eclipse contributors and others 2008, 2010. All rights reserved.
Visit http://www.eclipse.org/webtools/

Eclipse IDE 2021-03 R Packages / Eclipse IDE for Enterprise Java Developers lacks of **Spring Tools 4 for Eclipse** that support development of application based of Spring/SpringBoot framework. They are not necessary to go on with this tutorial. However you can install and update these tools from Eclipse Marketplace (search for Spring Tools 4).





Eclipse Marketplace

Select solutions to install. Press Install Now to proceed with installation.
Press the "more info" link to learn more about a solution.

Find: Spring Tools

Spring Tools 4 (aka Spring Tool Suite 4) 4.10.0.RELEASE

Spring Tools 4 is the next generation of Spring Boot tooling for your favorite coding environment. Largely rebuilt from scratch, it provides world-class support... **more info**

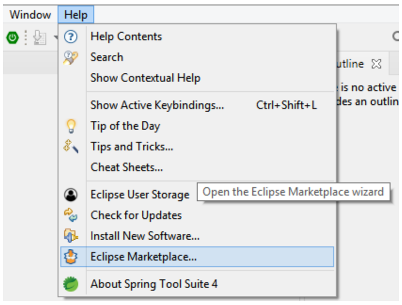
by VMware, EPL
spring Spring IDE Cloud Spring Tool Suite STS

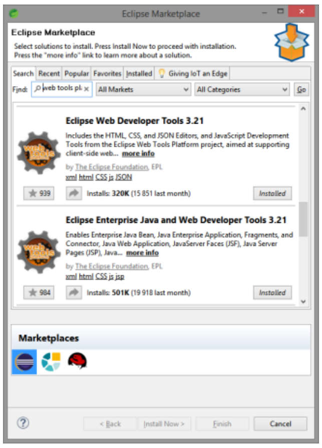
3084 Installs: **1,88M** (26 983 last month)

Spring Tools 4 ready-to-use distribution package

Download Spring Tools 4 as ready-to-use distribution package from https://spring.io/tools (for Windows, the download is a self-extracting JAR archive - double click and it will expand itself on disc).

This distribution package lacks of Web Tools Platform (WTP). Installation and updates of WTP can be performed from Eclipse Marketplace (search for Web Developer Tools)





Eclipse Marketplace

Select solutions to install. Press Install Now to proceed with installation.
Press the "more info" link to learn more about a solution.

Find: web tools pl

Eclipse Web Developer Tools 3.21

Includes the HTML, CSS, and JSON Editors, and JavaScript Development Tools from the Eclipse Web Tools Platform project, aimed at supporting client-side web... **more info**

by The Eclipse Foundation, EPL
xml html CSS js JSON

939 Installs: **320K** (15 851 last month)

Eclipse Enterprise Java and Web Developer Tools 3.21

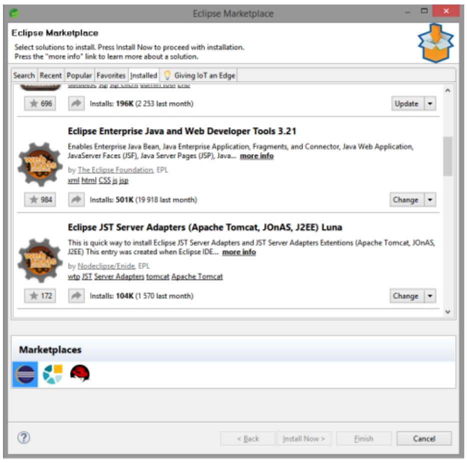
Enables Enterprise Java Bean, Java Enterprise Application, Fragments, and Connector, Java Web Application, JavaServer Faces (JSF), Java Server Pages (JSP), Java... **more info**

by The Eclipse Foundation, EPL
xml html CSS js jsp

984 Installs: **501K** (19 918 last month)

But please take care to install all the necessary parts. The installations details must much those listed in the About Eclipse IDE Features window.

After installation you can adjust the set of installed artefacts selecting “Change”



Eclipse Marketplace

Select solutions to install. Press Install Now to proceed with installation.
Press the "more info" link to learn more about a solution.

696 Installs: **196K** (2 253 last month)

Eclipse Enterprise Java and Web Developer Tools 3.21

Enables Enterprise Java Bean, Java Enterprise Application, Fragments, and Connector, Java Web Application, JavaServer Faces (JSF), Java Server Pages (JSP), Java... **more info**

by The Eclipse Foundation, EPL
xml html CSS js jsp

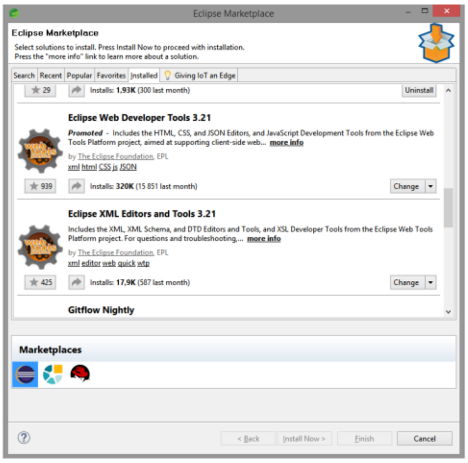
984 Installs: **501K** (19 918 last month)

Eclipse JST Server Adapters (Apache Tomcat, JOnAS, J2EE) Luna

This is quick way to install Eclipse JST Server Adapters and JST Server Adapters Extentions (Apache Tomcat, JOnAS, J2EE) This entry was created when Eclipse IDE... **more info**

by Nodeclipse/Enide, EPL
wtp JST Server Adapters tomcat Apache Tomcat

172 Installs: **104K** (1 570 last month)



Eclipse Marketplace

Select solutions to install. Press Install Now to proceed with installation.
Press the "more info" link to learn more about a solution.

29 Installs: **1,93K** (300 last month)

Eclipse Web Developer Tools 3.21

Promoted - Includes the HTML, CSS, and JSON Editors, and JavaScript Development Tools from the Eclipse Web Tools Platform project, aimed at supporting client-side web... **more info**

by The Eclipse Foundation, EPL
xml html CSS js JSON

939 Installs: **320K** (15 851 last month)

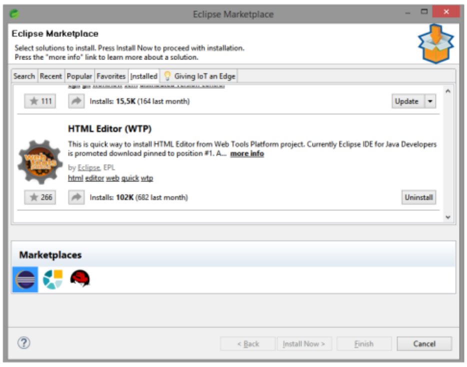
Eclipse XML Editors and Tools 3.21

Includes the XML, XML Schema, and DTD Editors and Tools, and XSL Developer Tools from the Eclipse Web Tools Platform project. For questions and troubleshooting,... **more info**

by The Eclipse Foundation, EPL
xml editor web quick wtp

425 Installs: **17,9K** (587 last month)

Gitflow Nightly



Eclipse Marketplace

Select solutions to install. Press Install Now to proceed with installation.
Press the "more info" link to learn more about a solution.

111 Installs: **15,5K** (164 last month)

HTML Editor (WTP)

This is quick way to install HTML Editor from Web Tools Platform project. Currently Eclipse IDE for Java Developers is promoted download pinned to position #1. A... **more info**

by Eclipse, EPL
html editor web quick wtp

266 Installs: **102K** (682 last month)

Apache CXF

To get use of the latest improvements of Apache CXF framework you should download it from https://cxf.apache.org/download.html web site.

Select binary distribution and unzip it in a working folder. In particular you can download apache-cxf-3.4.3.tar.gz (it was the latest one):

Apache CXF https://www.apache.org/dyn/closer.lua/cxf/3.4.3/apache-cxf-3.4.3.zip

Apache Tomcat

Download Apache Tomcat from http://tomcat.apache.org/ and unzip it in a working folder. In particular you can download:

9.0.35 https://tomcat.apache.org/download-90.cgi https://apache.mirrors.tworzy.net/tomcat/tomcat-9/v9.0.35/bin/apache-tomcat-9.0.35-windows-x64.zip

Implementation

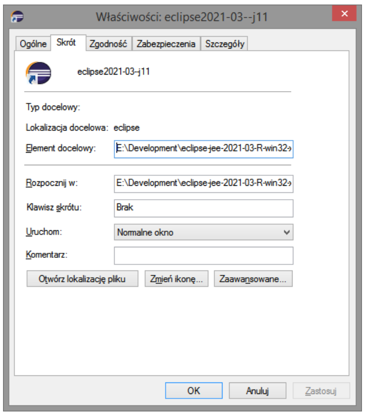
eclipse

Run eclipse with JDK 11. If you have various JDK present in your system please make sure, that you are using the correct one.

Under windows you can prepare shortcut with the following parameters:

> Target element: `drive_letter:eclipse_installation_directory\eclipse.exe -vm "drive_letter:java_installation_directory/bin/javaw.exe"`
>
> Start in: `drive_letter:eclipse_installation_directory`

The important setting is to pass –vm option to eclipse with a full path to javaw.exe (otherwise eclipse will use default path to java).



eclipse2021-03-j11

Typ docelowy:

Lokalizacja docelowa: eclipse

Element docelowy: E:\Development\eclipse-jee-2021-03-R-win32›

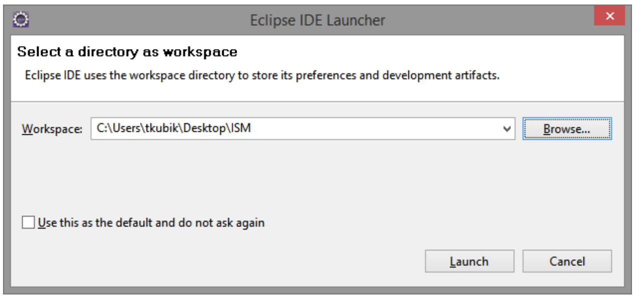
Rozpocznij w: E:\Development\eclipse-jee-2021-03-R-win32›

Klawisz skrótu: Brak

Uruchom: Normalne okno

Komentarz:

After launching eclipse you will be prompted for a workspace:



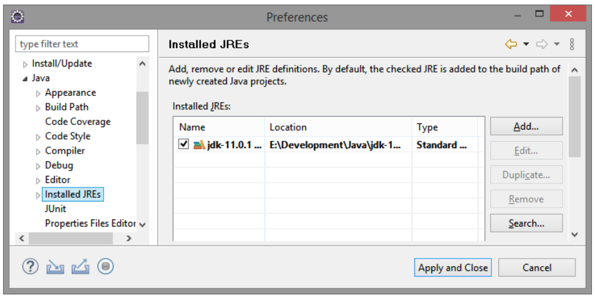
Select a directory as workspace

Eclipse IDE uses the workspace directory to store its preferences and development artifacts.

Workspace: C:\Users\tkubik\Desktop\ISM

□ Use this as the default and do not ask again

Next, when the eclipse will be already running, you have to configure java runtime in: “Windows/Preferences”. Most probably you will see something like this:



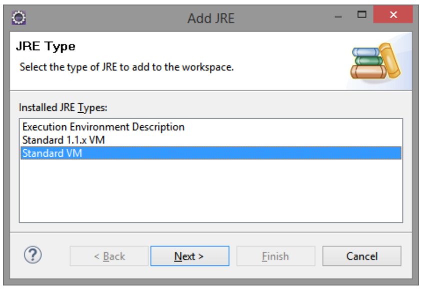
Installed JREs

Add, remove or edit JRE definitions. By default, the checked JRE is added to the build path of newly created Java projects.

Installed JREs:

Name	Location	Type
☑ jdk-11.0.1 ...	E:\Development\Java\jdk-1...	Standard ...

However, you can always add a new runtime by pressing on Add... button and then following wizard steps:

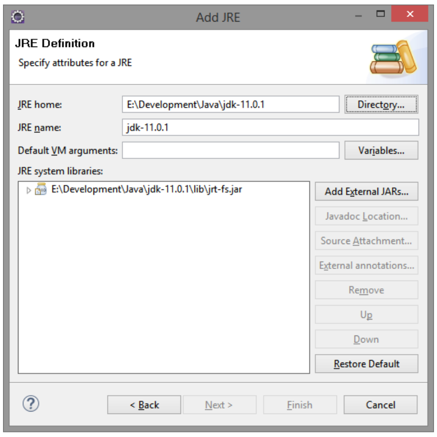

Add JRE

JRE Type

Select the type of JRE to add to the workspace.

Installed JRE Types:

Execution Environment Description
Standard 1.1.x VM
Standard VM


Add JRE

JRE Definition

Specify attributes for a JRE

JRE home: E:\Development\Java\jdk-11.0.1

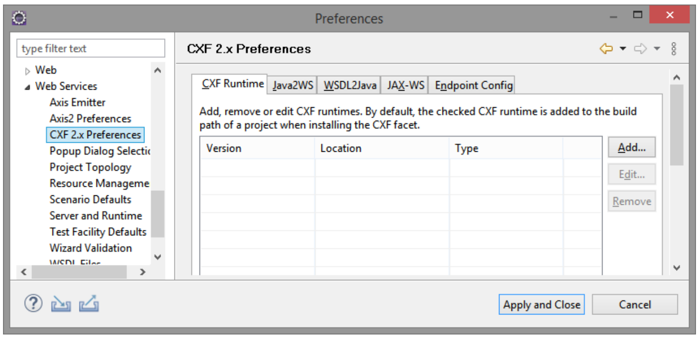
JRE name: jdk-11.0.1

Default VM arguments:

JRE system libraries:

E:\Development\Java\jdk-11.0.1\lib\jrt-fs.jar

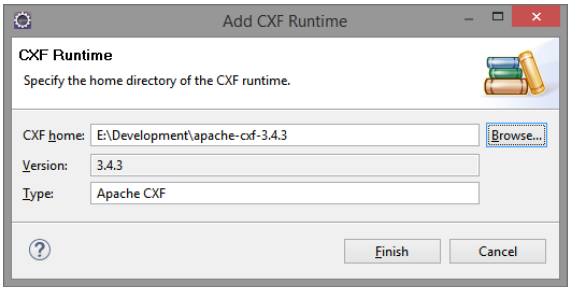
Set up Apache CXF in “Window/Preferences”


Preferences

CXF 2.x Preferences

Add, remove or edit CXF runtimes. By default, the checked CXF runtime is added to the build path of a project when installing the CXF facet.

Version	Location	Type


Add CXF Runtime

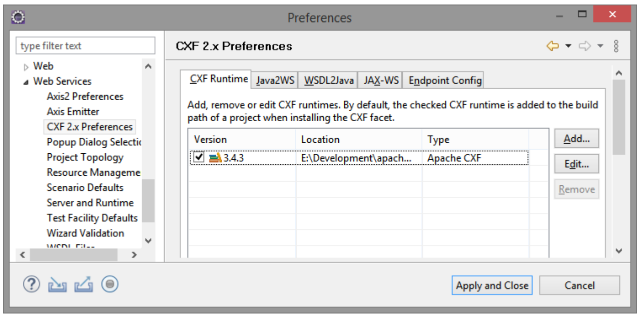
CXF Runtime

Specify the home directory of the CXF runtime.

CXF home: E:\Development\apache-cxf-3.4.3

Version: 3.4.3

Type: Apache CXF

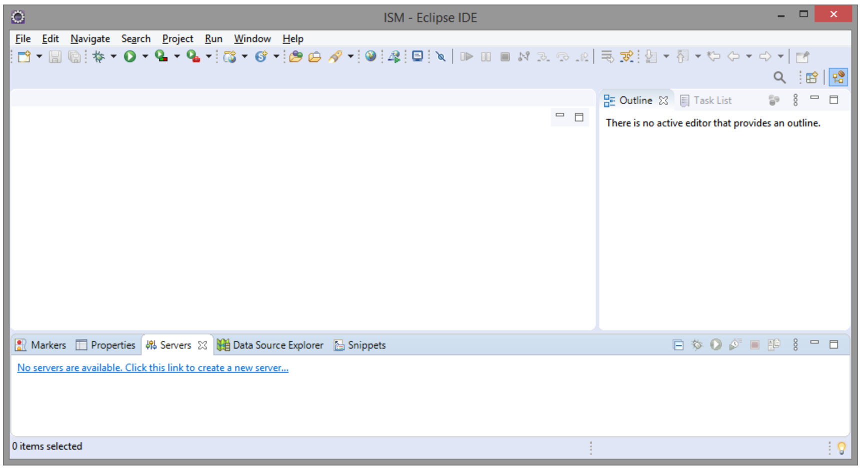

Preferences

CXF 2.x Preferences

Add, remove or edit CXF runtimes. By default, the checked CXF runtime is added to the build path of a project when installing the CXF facet.

Version	Location	Type
☑ 3.4.3	E:\Development\apach...	Apache CXF

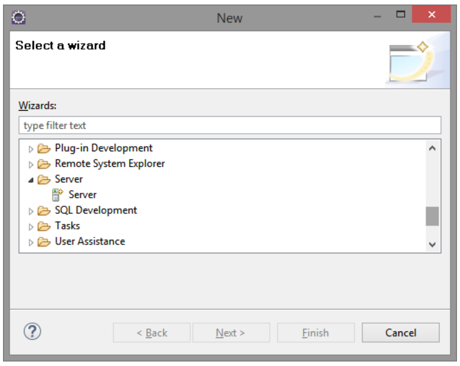
Add Apache Tomcat server. This can be done through click on link under Server tab in the eclipse workspace (if there are no servers yet) or at any time by a wizard “New/Other/Server”


ISM - Eclipse IDE

There is no active editor that provides an outline.

No servers are available. Click this link to create a new server...

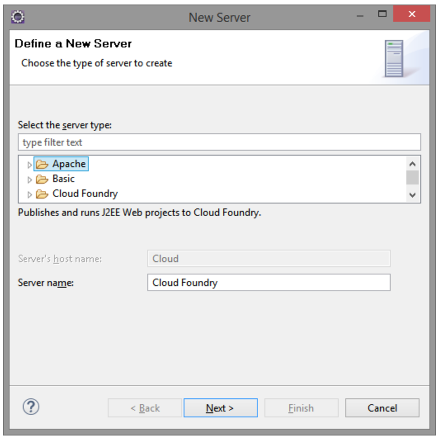
0 items selected


New

Select a wizard

Wizards:

Continue by setting up Apache Tomcat 9.0 (find it under Apache tree)

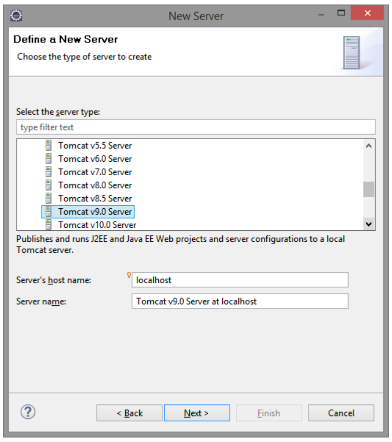

New Server

Define a New Server
Choose the type of server to create

Select the server type: type filter text
- Apache
- Basic
- Cloud Foundry

Publishes and runs J2EE Web projects to Cloud Foundry.

Server's host name: Cloud
Server name: Cloud Foundry

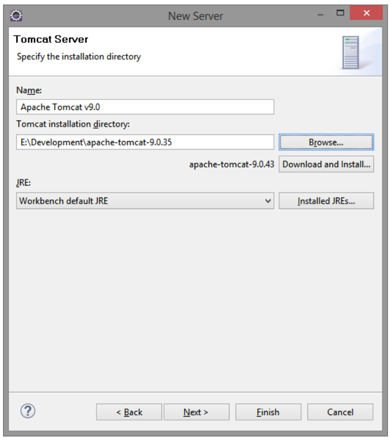

New Server

Define a New Server
Choose the type of server to create

Select the server type: type filter text
- Tomcat v5.5 Server
- Tomcat v6.0 Server
- Tomcat v7.0 Server
- Tomcat v8.0 Server
- Tomcat v8.5 Server
- Tomcat v9.0 Server
- Tomcat v10.0 Server

Publishes and runs J2EE and Java EE Web projects and server configurations to a local Tomcat server.

Server's host name: localhost
Server name: Tomcat v9.0 Server at localhost

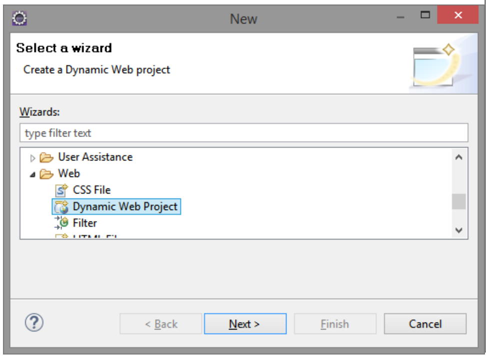

New Server

Tomcat Server
Specify the installation directory

Name: Apache Tomcat v9.0
Tomcat installation directory: E:\Development\apache-tomcat-9.0.35
apache-tomcat-9.0.43
JRE: Workbench default JRE

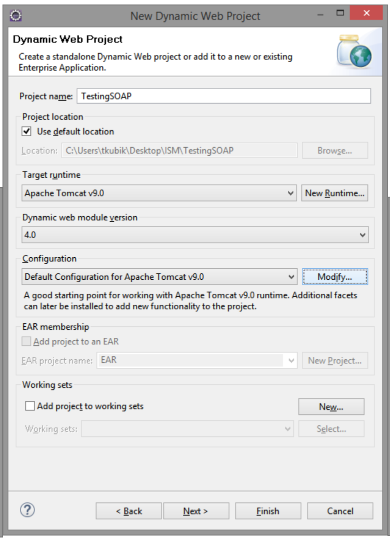
Project

Create new Dynamic Web Project. Name it, modify default configuration for Apache Tomcat (in order to make Apache CXF dependency)


New

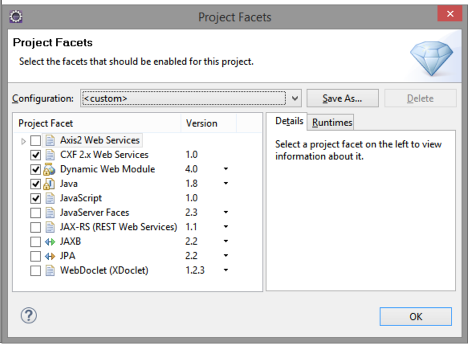
Select a wizard
Create a Dynamic Web project

Wizards: type filter text
- User Assistance
- Web
  - CSS File
  - Dynamic Web Project
  - Filter


New Dynamic Web Project

Dynamic Web Project
Create a standalone Dynamic Web project or add it to a new or existing Enterprise Application.

Project name: TestingSOAP
Project location
☑ Use default location
Location: C:\Users\tkubik\Desktop\ISM\TestingSOAP
Target runtime: Apache Tomcat v9.0
Dynamic web module version: 4.0
Configuration: Default Configuration for Apache Tomcat v9.0
A good starting point for working with Apache Tomcat v9.0 runtime. Additional facets can later be installed to add new functionality to the project.
EAR membership
□ Add project to an EAR
EAR project name: EAR
Working sets
□ Add project to working sets
Working sets:


Project Facets

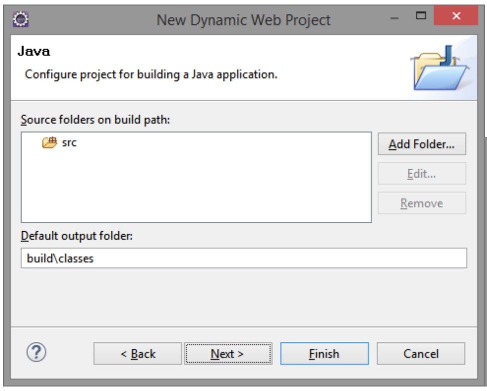
Project Facets
Select the facets that should be enabled for this project.

Configuration: <custom>

Project Facet	Version
□ Axis2 Web Services	
☑ CXF 2.x Web Services	1.0
☑ Dynamic Web Module	4.0
☑ Java	1.8
☑ JavaScript	1.0
□ JavaServer Faces	2.3
□ JAX-RS (REST Web Services)	1.1
□ JAXB	2.2
□ JPA	2.2
□ WebDoclet (XDoclet)	1.2.3

Details | Runtimes
Select a project facet on the left to view information about it.

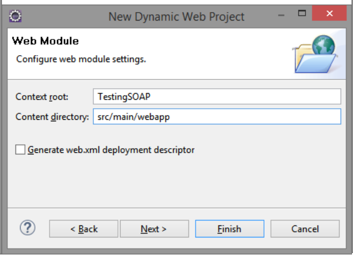
Please note, that in the wizard window checked box has label CXF 2.x Web Service. But in reality the CXF 3.4.3 will be used (acording to adjustment to eclipse configuration we have already done). You will notice this in the next third window:


New Dynamic Web Project

Java
Configure project for building a Java application.

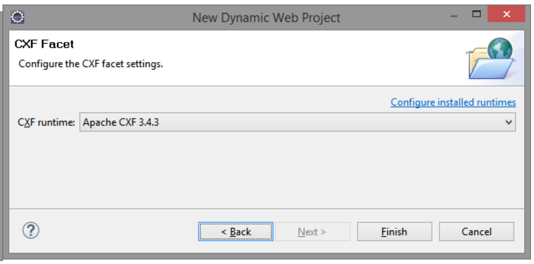
Source folders on build path:
- src

Default output folder: build\classes


New Dynamic Web Project

Web Module
Configure web module settings.

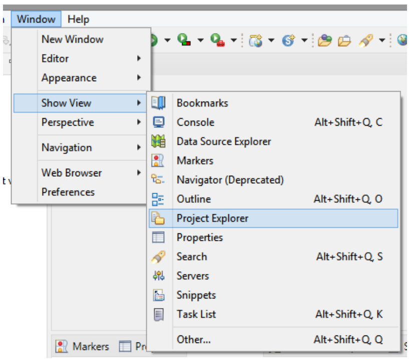
Context root: TestingSOAP
Content directory: src/main/webapp
□ Generate web.xml deployment descriptor

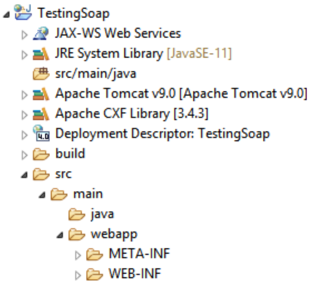

New Dynamic Web Project

CXF Facet
Configure the CXF facet settings.

Configure installed runtimes
CXF runtime: Apache CXF 3.4.3

Configure workspace (if you wish to see the project structure):

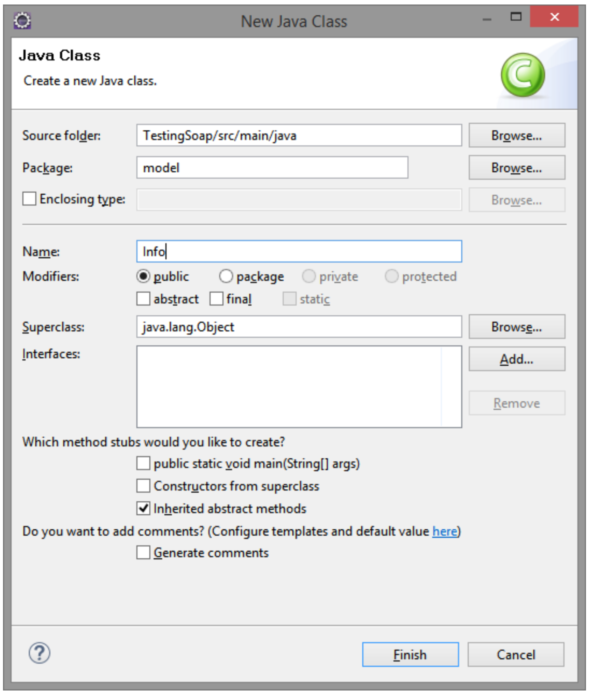




```
TestingSoap
  JAX-WS Web Services
  JRE System Library [JavaSE-11]
  src/main/java
  Apache Tomcat v9.0 [Apache Tomcat v9.0]
  Apache CXF Library [3.4.3]
  Deployment Descriptor: TestingSoap
  build
  src
    main
      java
      webapp
        META-INF
        WEB-INF
```

Create new classes:

1. Define Info class in model package



Java Class

Create a new Java class.

Source folder: TestingSoap/src/main/java

Package: model

☐ Enclosing type:

Name: Info

Modifiers: ● public ○ package ○ private ○ protected

☐ abstract ☐ final ☐ static

Superclass: java.lang.Object

Interfaces:

Which method stubs would you like to create?

☐ public static void main(String[] args)

☐ Constructors from superclass

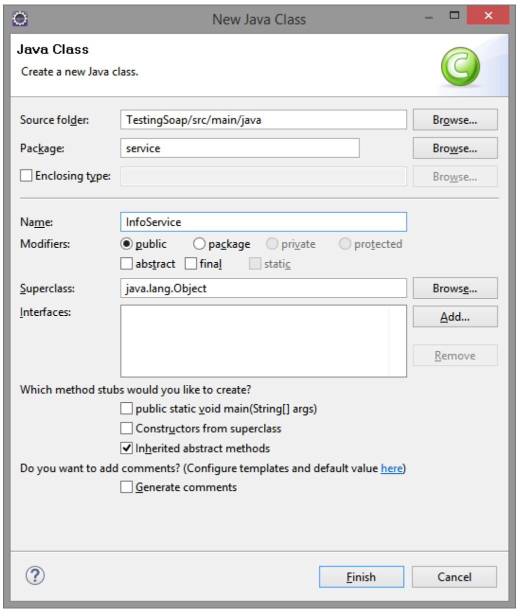
☑ Inherited abstract methods

Do you want to add comments? (Configure templates and default value here)

☐ Generate comments

```
package model;

public class Info {
   private String message;
   private String value;

   public String getMessage() {
         return message;
   }

   public void setMessage(String message)
{
         this.message = message;
   }

   public String getValue() {
         return value;
   }

   public void setValue(String value) {
         this.value = value;
   }
}
```

2. Define InfoService class in service package



Java Class

Create a new Java class.

Source folder: TestingSoap/src/main/java

Package: service

☐ Enclosing type:

Name: InfoService

Modifiers: ● public ○ package ○ private ○ protected

☐ abstract ☐ final ☐ static

Superclass: java.lang.Object

Interfaces:

Which method stubs would you like to create?

☐ public static void main(String[] args)

☐ Constructors from superclass

☑ Inherited abstract methods

Do you want to add comments? (Configure templates and default value here)

☐ Generate comments

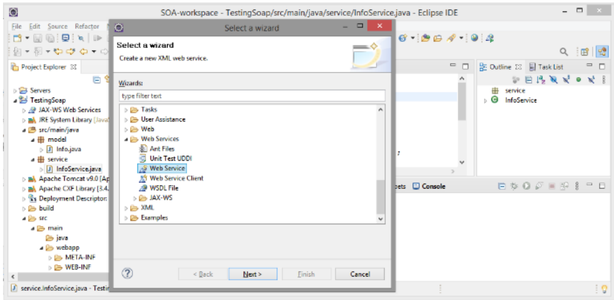
```
package service;

import java.util.ArrayList;
import java.util.List;

import model.Info;

public class InfoService {
   private List<Info> il = new
ArrayList<Info>();

   public List<Info> getAllInfo() {
         return il;
   }

   public void addInfo(Info info) {
         il.add(info);
   }

}
```

If needed, refresh project tree by pressing F5 (for some reasons sometimes packages are displayed not in correct place, but after refreshing problem disappear).

Now you can create and deploy a new web service (depoyable on Tomcat v9.0, with Apache CXF support, SOAP 1.2, wsdl without separate xsd). Please remember, that in “code first” approach the implementation of the class working as a service must be finished (at least the signatures of the methods must be in a final form). Otherwise you will need to regenerate service description every time the code of the class is changed. This may cause some troubles (!).

In order to generate and deploy a new service please select InfoService class (this makes things easier). After that start a wizard: New/Other/Web Services/Web Service.

On the way please remember to set “Web service runtime” in configuration section to **Apache CXF** (by default it is set to Apache Axis)



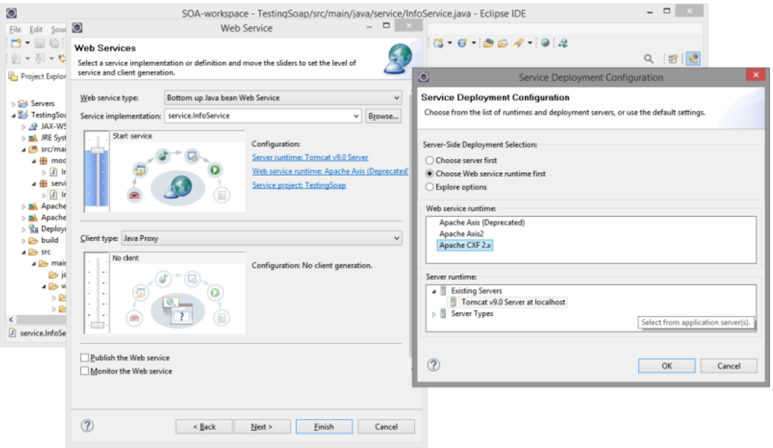
SOA-workspace - TestingSoap/src/main/java/service/InfoService.java - Eclipse IDE

Select a wizard

Create a new XML web service.

Wizards: type filter text

- Tasks
- User Assistance
- Web
- Web Services
  - Ant Files
  - Unit Test UDDI
  - Web Service
  - Web Service Client
  - WSDL File
  - JAX-WS
- XML
- Examples



Web Service

Web Services

Select a service implementation or definition and move the sliders to set the level of service and client generation.

Web service type: Bottom up Java bean Web Service

Service implementation: service.InfoService

Start service

Configuration:
Server runtime: Tomcat v9.0 Server
Web service runtime: Apache Axis (Deprecated)
Service project: TestingSoap

Client type: Java Proxy

No client

Configuration: No client generation.

□ Publish the Web service
□ Monitor the Web service

Service Deployment Configuration

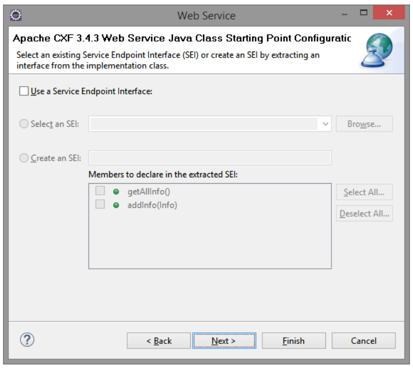
Choose from the list of runtimes and deployment servers, or use the default settings.

Server-Side Deployment Selection:
○ Choose server first
● Choose Web service runtime first
○ Explore options

Web service runtime:
Apache Axis (Deprecated)
Apache Axis2
Apache CXF 2.x

Server runtime:
Existing Servers
Tomcat v9.0 Server at localhost
Server Types

Wizard will ask for the methods in InfoService class which are going to be used as service’s methods. Select them accordingly (wizard will insert proper annotations inside class’ source code).



Web Service

Apache CXF 3.4.3 Web Service Java Class Starting Point Configuratic

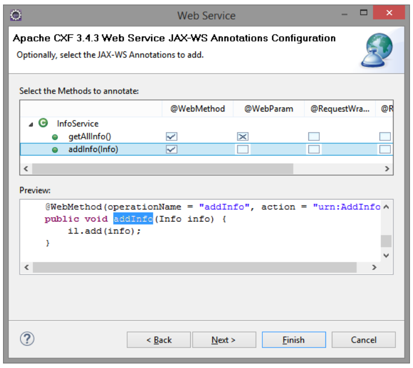
Select an existing Service Endpoint Interface (SEI) or create an SEI by extracting an interface from the implementation class.

□ Use a Service Endpoint Interface:

○ Select an SEI:

○ Create an SEI:

Members to declare in the extracted SEI:
□ getAllInfo()
□ addInfo(Info)



Web Service

Apache CXF 3.4.3 Web Service JAX-WS Annotations Configuration

Optionally, select the JAX-WS Annotations to add.

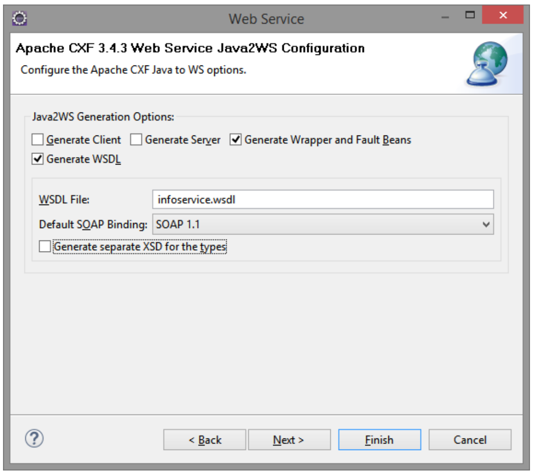
Select the Methods to annotate:

	@WebMethod	@WebParam	@RequestWra...	@R
InfoService				
getAllInfo()	☑	☒	□	□
addInfo(Info)	☑	□	□	□

Preview:

```
@WebMethod(operationName = "addInfo", action = "urn:AddInfo
public void addInfo(Info info) {
    il.add(info);
}
```

Next you will be asked about details of WSDL generation and SOAP binding. After that you can start server.



Web Service

Apache CXF 3.4.3 Web Service Java2WS Configuration

Configure the Apache CXF Java to WS options.

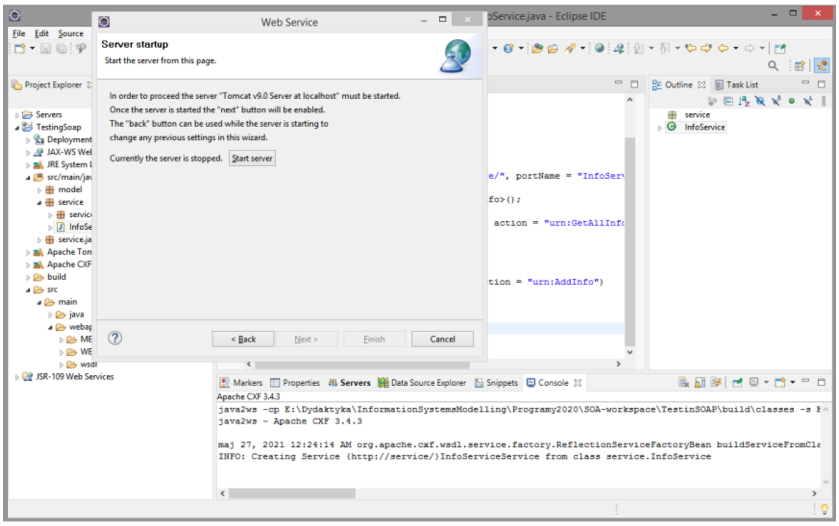
Java2WS Generation Options:

□ Generate Client □ Generate Server ☑ Generate Wrapper and Fault Beans
☑ Generate WSDL

WSDL File: infoservice.wsdl

Default SOAP Binding: SOAP 1.1

□ Generate separate XSD for the types



Web Service

Server startup

Start the server from this page.

In order to proceed the server "Tomcat v9.0 Server at localhost" must be started. Once the server is started the "next" button will be enabled. The "back" button can be used while the server is starting to change any previous settings in this wizard.

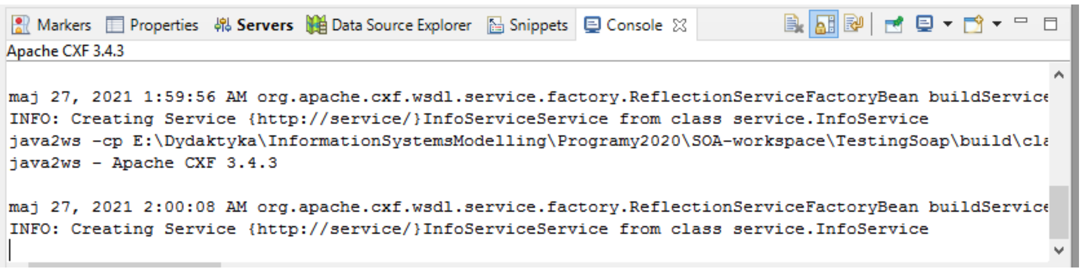
Currently the server is stopped. Start server

```
e/", portName = "InfoServ
fo>();
 action = "urn:GetAllInfc
tion = "urn:AddInfo")
```

Apache CXF 3.4.3

```
java2ws -cp E:\Dydaktyka\InformationSystemsModelling\Programy2020\SOA-workspace\TestinSOAP\build\classes -s E
java2ws - Apache CXF 3.4.3

maj 27, 2021 12:24:14 AM org.apache.cxf.wsdl.service.factory.ReflectionServiceFactoryBean buildServiceFromCla
INFO: Creating Service {http://service/}InfoServiceService from class service.InfoService
```

Please observe what is written in Console. If everything is all right, tou will see “java2ws …”.

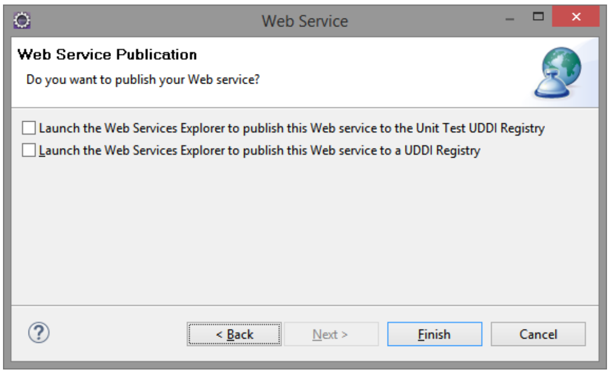


Apache CXF 3.4.3

```
maj 27, 2021 1:59:56 AM org.apache.cxf.wsdl.service.factory.ReflectionServiceFactoryBean buildService
INFO: Creating Service {http://service/}InfoServiceService from class service.InfoService
java2ws -cp E:\Dydaktyka\InformationSystemsModelling\Programy2020\SOA-workspace\TestingSoap\build\cla
java2ws - Apache CXF 3.4.3

maj 27, 2021 2:00:08 AM org.apache.cxf.wsdl.service.factory.ReflectionServiceFactoryBean buildService
INFO: Creating Service {http://service/}InfoServiceService from class service.InfoService
```

After pressing Start the server will be started. This will open new sockets and thus the Firewall might pop up an alert window.

If you continue you will see the window by which you can register the service in UDDI registry. But this registry is not running thus leave the available options unchecked.

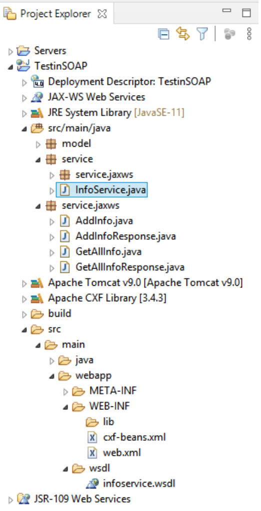


Web Service Publication

Do you want to publish your Web service?

□ Launch the Web Services Explorer to publish this Web service to the Unit Test UDDI Registry
□ Launch the Web Services Explorer to publish this Web service to a UDDI Registry

Look at “Apache CXF console”. If everything was all right you see the following output. This means that java2ws worked correctly and all supporting classes were generated. These classes will be placed in service.javaws package, the generated wsdl will be in /wsdl folder.



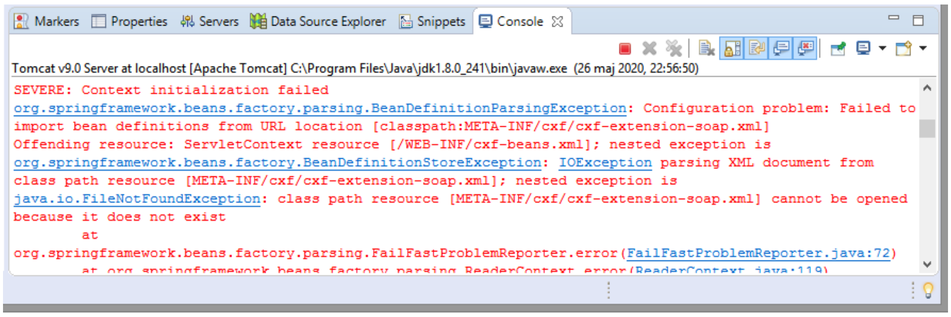
```
▷ Servers
◢ TestinSOAP
   ▷ Deployment Descriptor: TestinSOAP
   ▷ JAX-WS Web Services
   ▷ JRE System Library [JavaSE-11]
   ◢ src/main/java
      ▷ model
      ◢ service
         ▷ service.jaxws
         ▷ InfoService.java
      ◢ service.jaxws
         ▷ AddInfo.java
         ▷ AddInfoResponse.java
         ▷ GetAllInfo.java
         ▷ GetAllInfoResponse.java
   ▷ Apache Tomcat v9.0 [Apache Tomcat v9.0]
   ▷ Apache CXF Library [3.4.3]
   ▷ build
   ◢ src
      ◢ main
         ▷ java
         ◢ webapp
            ▷ META-INF
            ◢ WEB-INF
                  lib
                  cxf-beans.xml
                  web.xml
            ◢ wsdl
                  infoservice.wsdl
▷ JSR-109 Web Services
```

Additionally web.xml and cxf-beans.xml will be generated (described hereafter).

Please note – the content of WebContent folder will be deployed on Apache Tomcat (If you wish you can export your project as a war file and deploy this war file by hand).

Please note as well that there is no class in the project with main method. And this is correct. Indeed there is no application to run as stand alone app. The service will be deployed on Apache Tomcat container.

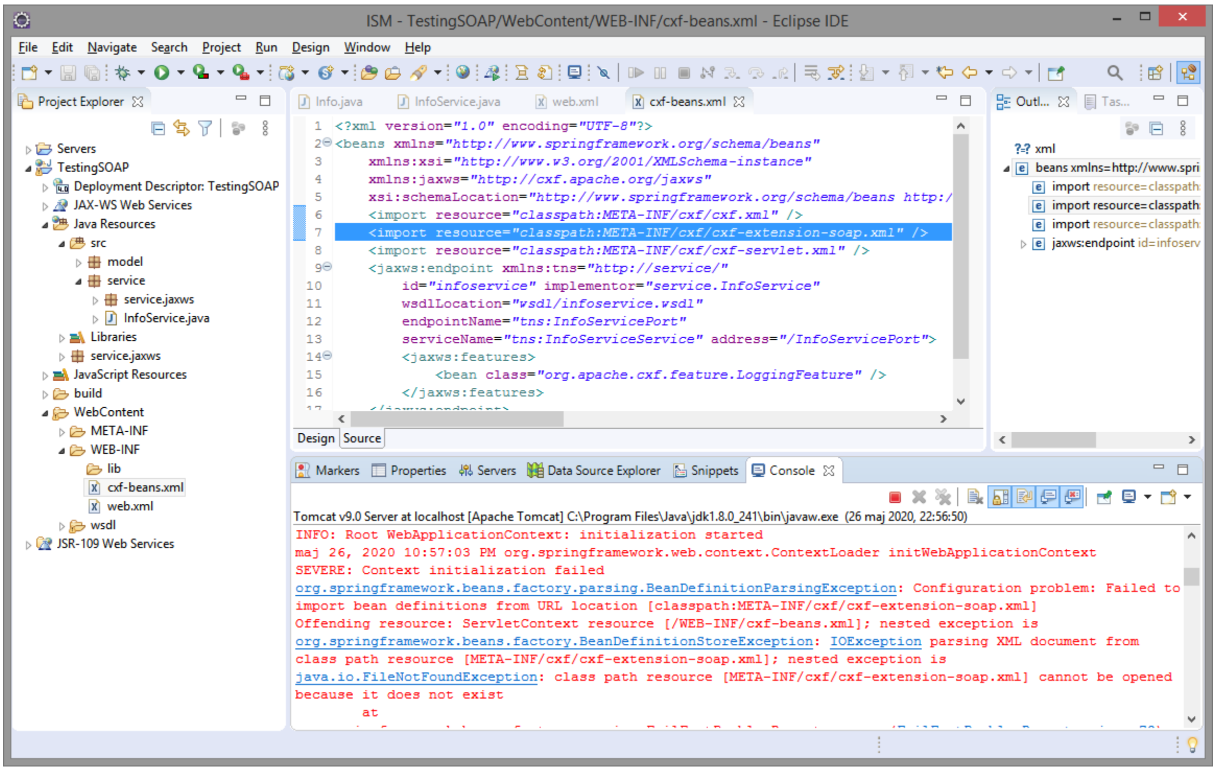
Most probably you will see the error in “Tomcat v9.0 server at local host” console:



Tomcat v9.0 Server at localhost [Apache Tomcat] C:\Program Files\Java\jdk1.8.0_241\bin\javaw.exe (26 maj 2020, 22:56:50)

```
SEVERE: Context initialization failed
org.springframework.beans.factory.parsing.BeanDefinitionParsingException: Configuration problem: Failed to
import bean definitions from URL location [classpath:META-INF/cxf/cxf-extension-soap.xml]
Offending resource: ServletContext resource [/WEB-INF/cxf-beans.xml]; nested exception is
org.springframework.beans.factory.BeanDefinitionStoreException: IOException parsing XML document from
class path resource [META-INF/cxf/cxf-extension-soap.xml]; nested exception is
java.io.FileNotFoundException: class path resource [META-INF/cxf/cxf-extension-soap.xml] cannot be opened
because it does not exist
        at
org.springframework.beans.factory.parsing.FailFastProblemReporter.error(FailFastProblemReporter.java:72)
        at org.springframework.beans.factory.parsing.ReaderContext.error(ReaderContext.java:119)
```

The reason is that the content of WebContent/WEB-INF/bean-cxf.xml (which was generated automatically) has been designed for an older version of Apache CXF. In a newer versions of this library all the /META-INF/cxf/cxf-extension-XYZ.xml files were removed (see: https://cxf.apache.org/docs/30-migration-guide.html). Therefore the /WEB-INF/cxf-beans.xml file must be updated by removing one highlighted line:



```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:jaxws="http://cxf.apache.org/jaxws"
    xsi:schemaLocation="http://www.springframework.org/schema/beans http:/
    <import resource="classpath:META-INF/cxf/cxf.xml" />
    <import resource="classpath:META-INF/cxf/cxf-extension-soap.xml" />
    <import resource="classpath:META-INF/cxf/cxf-servlet.xml" />
    <jaxws:endpoint xmlns:tns="http://service/"
        id="infoservice" implementor="service.InfoService"
        wsdlLocation="wsdl/infoservice.wsdl"
        endpointName="tns:InfoServicePort"
        serviceName="tns:InfoServiceService" address="/InfoServicePort">
        <jaxws:features>
            <bean class="org.apache.cxf.feature.LoggingFeature" />
        </jaxws:features>
```

```
Tomcat v9.0 Server at localhost [Apache Tomcat] C:\Program Files\Java\jdk1.8.0_241\bin\javaw.exe  (26 maj 2020, 22:56:50)
INFO: Root WebApplicationContext: initialization started
maj 26, 2020 10:57:03 PM org.springframework.web.context.ContextLoader initWebApplicationContext
SEVERE: Context initialization failed
org.springframework.beans.factory.parsing.BeanDefinitionParsingException: Configuration problem: Failed to
import bean definitions from URL location [classpath:META-INF/cxf/cxf-extension-soap.xml]
Offending resource: ServletContext resource [/WEB-INF/cxf-beans.xml]; nested exception is
org.springframework.beans.factory.BeanDefinitionStoreException: IOException parsing XML document from
class path resource [META-INF/cxf/cxf-extension-soap.xml]; nested exception is
java.io.FileNotFoundException: class path resource [META-INF/cxf/cxf-extension-soap.xml] cannot be opened
because it does not exist
	at
```

Sometimes eclipse xsd validator shows errors in the web.xml line:

```
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://xmlns.jcp.org/xml/ns/javaee"
xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd" version="4.0">
```

but indeed it is correct line.

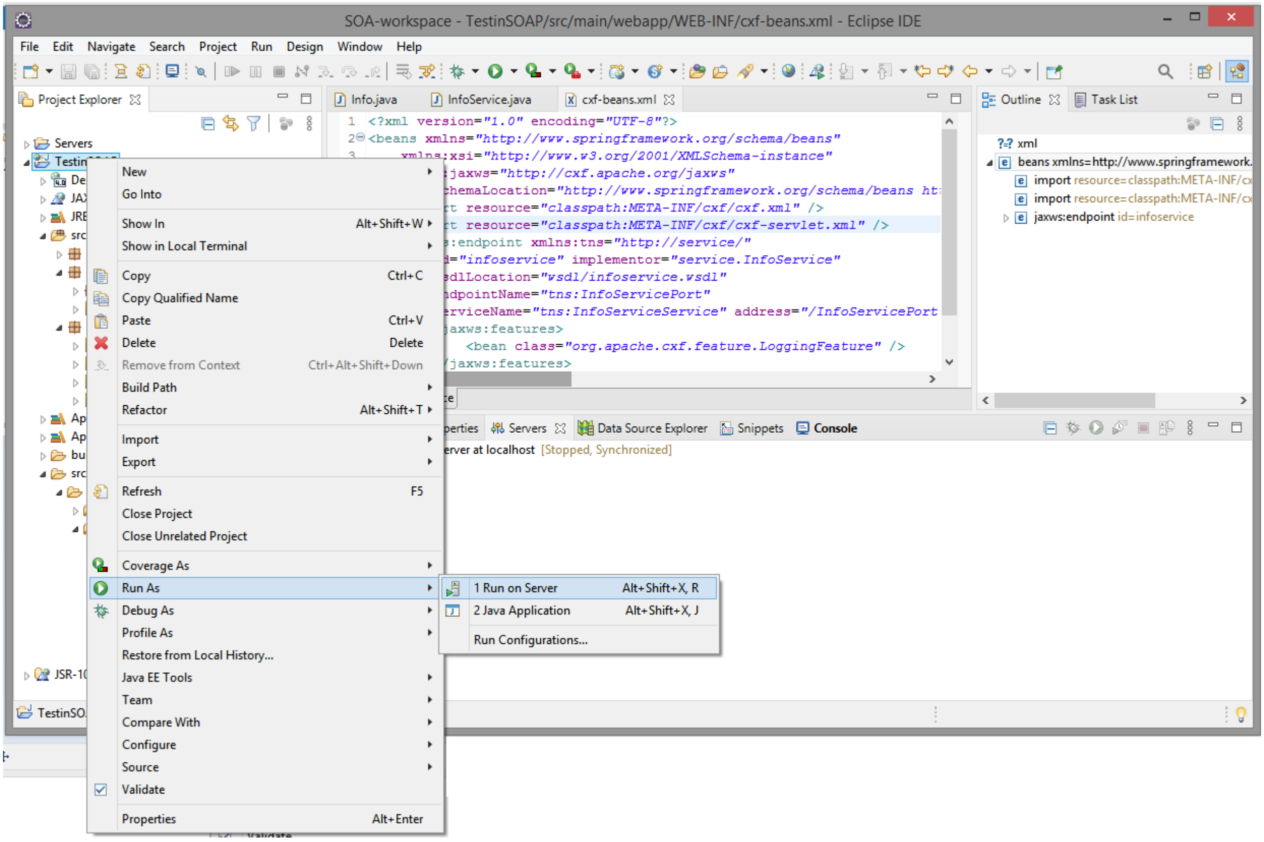
You can play a little saving cxf-beans.xml and web.xml – at certain moment eclipse will accept that line.

In troubles you could try to change it into:

```
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://xmlns.jcp.org/xml/ns/javaee"
xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
http://xmlns.jcp.org/xml/ns/javaee/web-app_3_1.xsd" version="3.1">
```

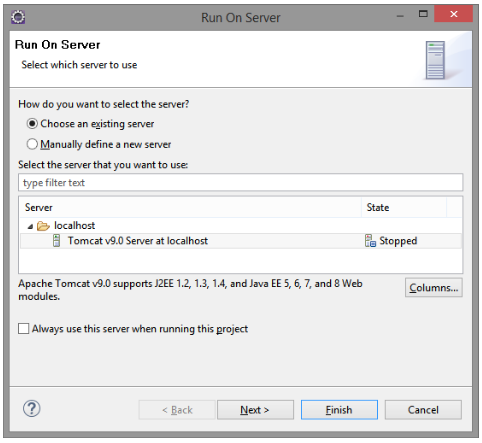
end revert changes.

Now restart your application and server:



SOA-workspace - TestinSOAP/src/main/webapp/WEB-INF/cxf-beans.xml - Eclipse IDE

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
:jaxws="http://cxf.apache.org/jaxws"
chemaLocation="http://www.springframework.org/schema/beans ht
t resource="classpath:META-INF/cxf/cxf.xml" />
t resource="classpath:META-INF/cxf/cxf-servlet.xml" />
:endpoint xmlns:tns="http://service/"
d="infoservice" implementor="service.InfoService"
sdlLocation="wsdl/infoservice.wsdl"
ndpointName="tns:InfoServicePort"
erviceName="tns:InfoServiceService" address="/InfoServicePort
jaxws:features>
  <bean class="org.apache.cxf.feature.LoggingFeature" />
/jaxws:features>
```



Run On Server

Select which server to use

How do you want to select the server?

● Choose an existing server

○ Manually define a new server

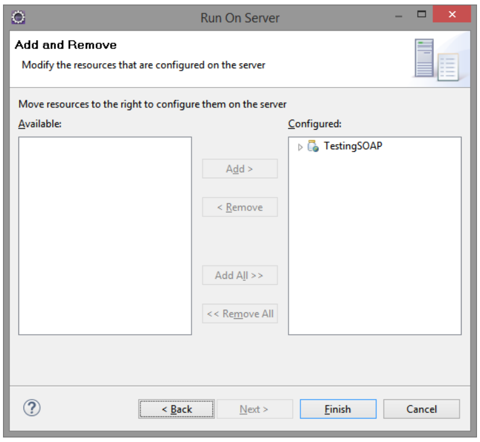
Select the server that you want to use:

type filter text

Server	State
localhost	
Tomcat v9.0 Server at localhost	Stopped

Apache Tomcat v9.0 supports J2EE 1.2, 1.3, 1.4, and Java EE 5, 6, 7, and 8 Web modules.

□ Always use this server when running this project



Add and Remove

Modify the resources that are configured on the server

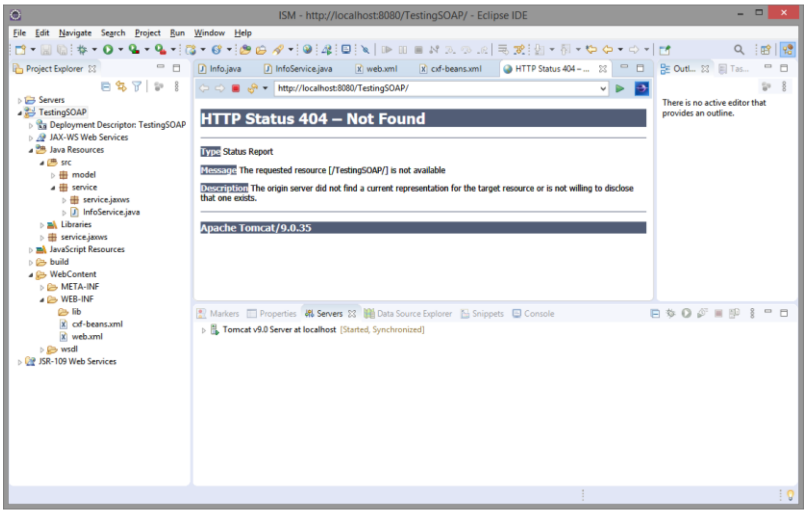
Move resources to the right to configure them on the server

Available:

Configured:

TestingSOAP

If you see opened browser with 404 - dont worry. Actually this is not an error. Just the environment tries to show in a browser home page of your Dynamic Web Application. But this is a service, not a web app. You should access its functions from the endpoints.



ISM - http://localhost:8080/TestingSOAP/ - Eclipse IDE

http://localhost:8080/TestingSOAP/

HTTP Status 404 – Not Found

Type Status Report

Message The requested resource [/TestingSOAP/] is not available

Description The origin server did not find a current representation for the target resource or is not willing to disclose that one exists.

Apache Tomcat/9.0.35

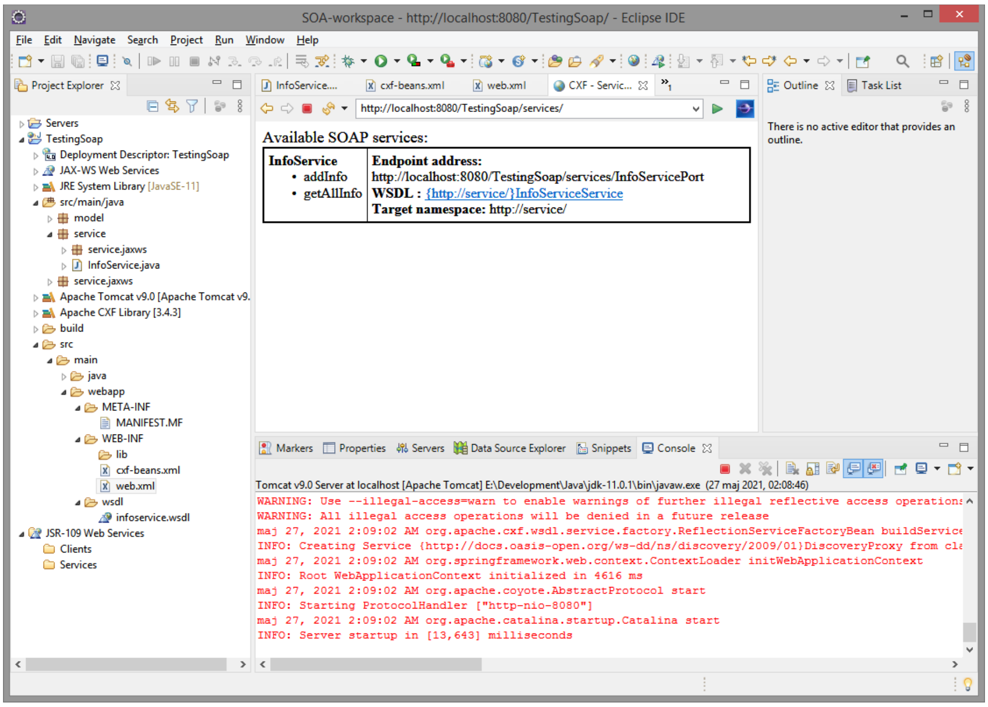
There is no active editor that provides an outline.

Tomcat v9.0 Server at localhost [Started, Synchronized]

Information about all exposed endpoints can be found under: http://localhost:8080/TestingSOAP/services/

If you move a mouse over WSDL link, you will see, in the footnote, the address where wsdl file is served: http://localhost:8080/TestingSOAP/services/InfoServicePort?wsdl

All the paths of the service are configured in the deployment descriptor /WEB-INF/web.xml and in the file /WEB-INF/cxf-beans.xml



Available SOAP services:

InfoService • addInfo • getAllInfo	**Endpoint address:** http://localhost:8080/TestingSoap/services/InfoServicePort **WSDL :** {http://service/}InfoServiceService **Target namespace:** http://service/

```
Tomcat v9.0 Server at localhost [Apache Tomcat] E:\Development\Java\jdk-11.0.1\bin\javaw.exe  (27 maj 2021, 02:08:46)
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
maj 27, 2021 2:09:02 AM org.apache.cxf.wsdl.service.factory.ReflectionServiceFactoryBean buildService
INFO: Creating Service {http://docs.oasis-open.org/ws-dd/ns/discovery/2009/01}DiscoveryProxy from cla
maj 27, 2021 2:09:02 AM org.springframework.web.context.ContextLoader initWebApplicationContext
INFO: Root WebApplicationContext initialized in 4616 ms
maj 27, 2021 2:09:02 AM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["http-nio-8080"]
maj 27, 2021 2:09:02 AM org.apache.catalina.startup.Catalina start
INFO: Server startup in [13,643] milliseconds
```

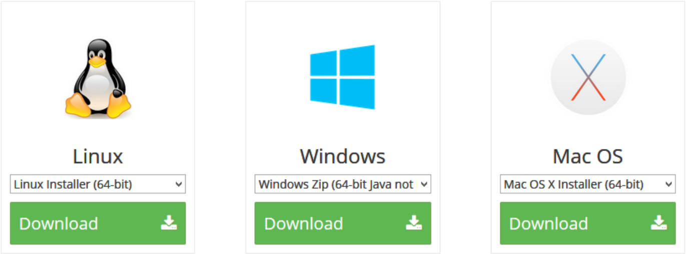
SoupUI

If you want to test your service you can run some tools offered by eclipse (like Web Service Explorer) or you can build client application by yourself. Bu there is another option. You can run SoapUI tool.

SoapUI Open Source Version 5.5.0 can be downloaded from https://www.soapui.org/

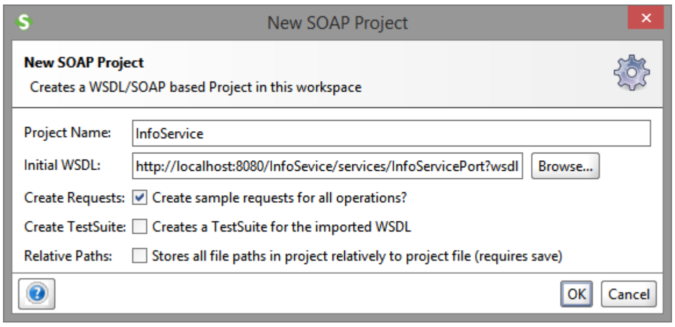
https://www.soapui.org/downloads/latest-release/

Latest **SoapUI Open Source** Downloads (Version 5.5.0)



Good option is to download zip version (it can run from a local folder).

Now you can create SoupUI project and sent the requests from it to the service



New SOAP Project

New SOAP Project

Creates a WSDL/SOAP based Project in this workspace

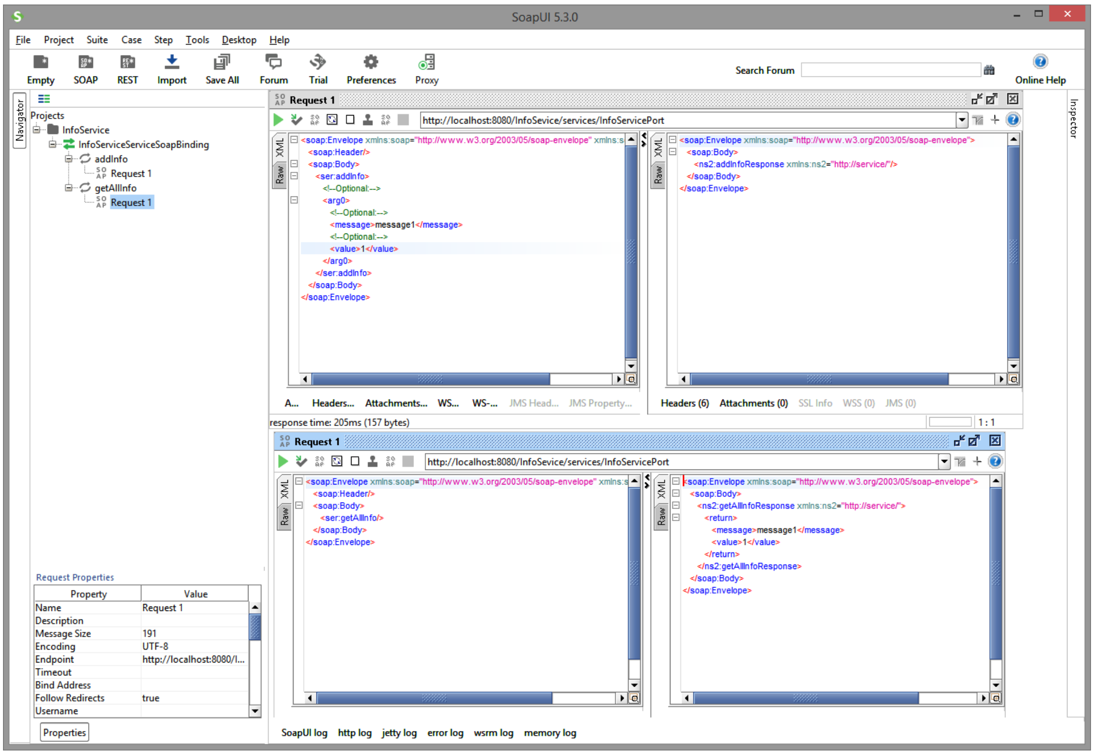
Project Name: InfoService

Initial WSDL: http://localhost:8080/InfoSevice/services/InfoServicePort?wsdl

Create Requests: ☑ Create sample requests for all operations?

Create TestSuite: □ Creates a TestSuite for the imported WSDL

Relative Paths: □ Stores all file paths in project relatively to project file (requires save)



```
Projects
  InfoService
    InfoServiceServiceSoapBinding
      addInfo
        Request 1
      getAllInfo
        Request 1
```

Request 1

http://localhost:8080/InfoSevice/services/InfoServicePort

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:s
   <soap:Header/>
   <soap:Body>
      <ser:addInfo>
         <!--Optional:-->
         <arg0>
            <!--Optional:-->
            <message>message1</message>
            <!--Optional:-->
            <value>1</value>
         </arg0>
      </ser:addInfo>
   </soap:Body>
</soap:Envelope>
```

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope">
   <soap:Body>
      <ns2:addInfoResponse xmlns:ns2="http://service/"/>
   </soap:Body>
</soap:Envelope>
```

response time: 205ms (157 bytes)

1 : 1

Request 1

http://localhost:8080/InfoSevice/services/InfoServicePort

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:s
   <soap:Header/>
   <soap:Body>
      <ser:getAllInfo/>
   </soap:Body>
</soap:Envelope>
```

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope">
   <soap:Body>
      <ns2:getAllInfoResponse xmlns:ns2="http://service/">
         <return>
            <message>message1</message>
            <value>1</value>
         </return>
      </ns2:getAllInfoResponse>
   </soap:Body>
</soap:Envelope>
```

Request Properties

Property	Value
Name	Request 1
Description	
Message Size	191
Encoding	UTF-8
Endpoint	http://localhost:8080/I...
Timeout	
Bind Address	
Follow Redirects	true
Username	

Remarks

Sometimes the eclipse wizards are not working. The source of troubles can be java2wsdl run by Apache CXF. Sometimes Apache Tomcat can not start, most often because of wrong configuration. For example – your eclipse may run different jre than declared runtime in your project (this happens often if in one system there are several jdk installed). Or your project has not correct path for Apache CXF library (by the way – eclipse for Java EE has all plugins needed to build Dynamic Web Projects, if you run STS based on eclipse – some plugins may not be installed). Thus please check all the requirements and dependencies.

Sometimes Apache Tomcat cannot start. The reasons might be: system firewall (especially on Windows 10), occupied port (by some other services) etc. Try to trace the problems according to these hints.