

Due: Friday 23rd February 2007, 12:00 AM

PROJECT 1: DESIGNING AND DEPLOYING A WEB SERVICE

Purpose:

1. To understand the components, core technologies, architecture and protocols that enable a Web Services-based distributed system.
2. To design and implement a Web Service.
3. To understand the elaborate and complex process of preparing and deploying a remote service.

Preparation before lab:

1. Read and study the Web Services architecture and associated protocols. Go through the Web Services tutorial offered by Sun Microsystems. Understand RMI. Web Resources:
 - a. <http://www.w3.org/2002/ws/>
 - b. <http://java.sun.com/webservices/tutorial.html>
 - c. <http://java.sun.com/j2se/1.5.0/docs/guide/rmi/index.html>
2. Learn how to use the XML-based build tool Ant.
 - a. <http://ant.apache.org/manual/index.html>
3. Understand the role of deployment descriptors. Deployment descriptors are XML files used to configure runtime properties of an application thus allowing the application to concentrate on dealing only with the programmatic details. A simple reading on deployment descriptors can be found at
 - a. <http://edocs.bea.com/wls/docs61/webapp/webappdeployment.html>
4. Learn to use the application interface to the Oracle database using embedded SQL and JDBC.
 - a. <http://java.sun.com/docs/books/tutorial/jdbc/basics/index.html>
 - b. <http://www.cse.buffalo.edu/local/Consulting/Software/Databases/Oracle/>
5. Finally, you must have a clear understanding of a client-server system operation.

Web Services Technology:

Web Services technology provides a standard means of building a distributed system over the Internet. In simple terms, it provides a means for a sophisticated remote procedure call. The sophistication arises out of the elegant mechanisms it supports for enabling:

1. Various transparencies (platform, language, and hardware),
2. Application to application data exchange and interoperability, and
3. Creation of complex web services from a set of simple web services.

The significant difference between regular HTTP-based technologies and Web Services is the standardization realized through the XML and SOAP (SOAP and XML over HTTP). Web Services Definition Language (WSDL) is an important standard that allows for consistent definition of services. All these advantages make Web Services technology ideally suited for large-scale enterprise level application integration.

Web Services specifications are defined by the World Wide Web Consortium (W3C). Many vendors including Sun Microsystems and Microsoft (.net) have frameworks for building and deploying Web Services.

Assignment:

Build a multi-tier distributed system comprising two major sub-systems

1. An **RMI** and **simple data acquisition system** and
2. A **Web Services** based **web application** that processes and serves the data collected.

The two sub-systems are loosely coupled via a database. The block diagram of the system you will implement is given in Figure 1. The RMI part of the project is adapted from the Weather service problem described in the Fourth Edition of ‘*Java: How to Program?*’ by *Deitel and Deitel*.

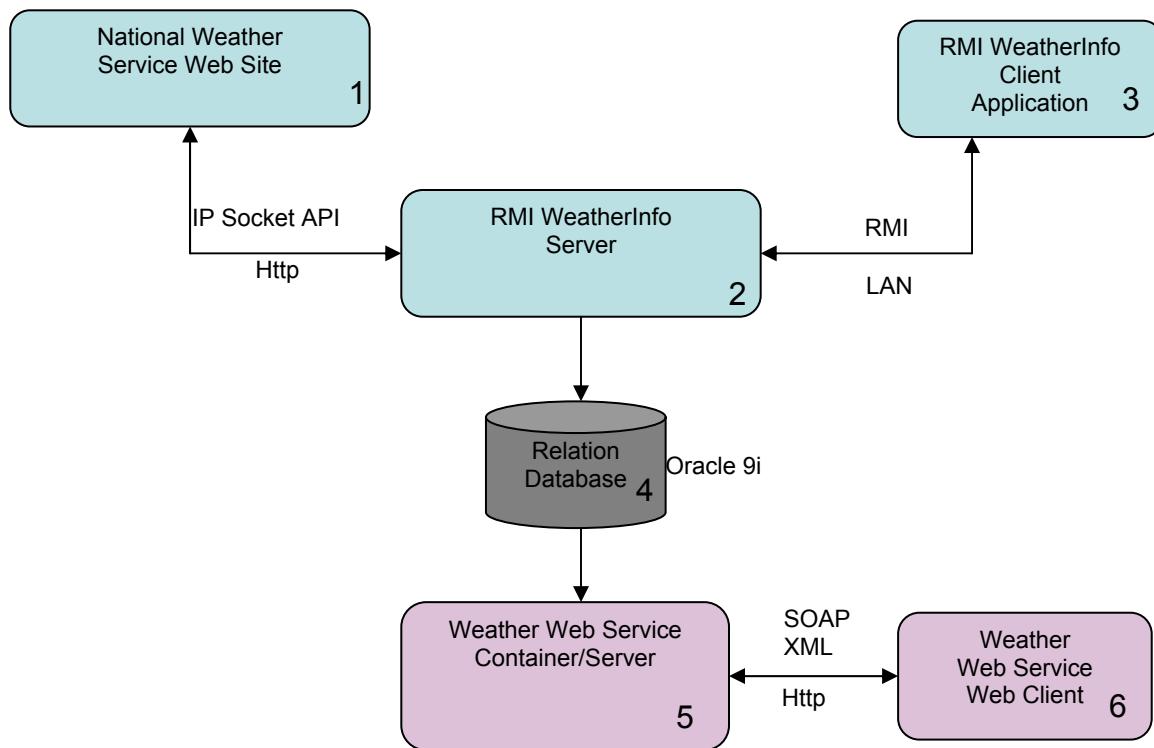


Figure 1: System Architecture of the Weather Service

The national weather bureau updates the weather conditions at various cities on its web site (*box 1 in Figure 1*) at:

- <http://iwin.nws.noaa.gov/iwin/us/traveler.html>

The RMI Server (*box 2*) streams in the page and parses it for the relevant data and stores it in a persistent storage. (The details of the RMI and existing code base and a simple frame work were discussed during the lecture and are available in the course web page. You will have to port that code to Java 5 version).

The persistent storage in the sample code is a simple file and the data stored is just the weather data for one day. You are required to update the code to accumulate the data for a period of over at least 1 week (or any 7 days).

The data collected should be stored in a **relational database** (*box 4*) on *Oracle 9i*. The daily data in the sample code is served to an RMI client (*box 3*) which simply renders the ASCII data provided by the weather bureau by transforming it using visually appealing graphics [The RMI client functionality is already provided with the sample code and was demonstrated in class].

In the **Web Services** part of the system, the data collected in the database will be processed by the server (*box 5*) for such information as average temperature for a given city, and the temperature on a particular day for a city. The Web Services client (*box 6*) will be able to query the server for various information related to the data collected. Your task is to design and implement the complete Web Services-based system indicated by *boxes 4, 5 and 6* of *Figure 1*, and study the operation of the integrated system depicted in Figure 1.

Project Implementation Details and Steps:

1. Get used to building *client-server* systems:

- When you implement a simple *client side* application program there are just two steps involved: compile and execute the code.
- In a *client-server* system, you will have to take care of the *server side* as well as the *client side*. On the *server side*, you will compile the code, generate stubs or proxies using special compilers, deploy the service, register and publicize the service for the clients to use. On the *client side* you will prepare the client code with appropriate stubs, and during execution lookup the service needed and use it.
- To understand the processes study the RMI-based system code and implementation. Deploy it and make sure it works and you understand the various operations. You will notice that besides simple compile and execute, configuration and deployment of a service are important issues to be reckoned with. Use the latest version of RMI.

2. Working with the *relational database* and embedded *SQL*:

- In this project you will store the data in a relational table and access it using SQL statements embedded in the Java programming language (using JDBC). Work on a simple java program to refresh your knowledge about accessing the Oracle database.

3. Building systems using build tools such as Ant:

- In order to tackle complexities in configuration and deploying server-side applications, you will need to use special build tools. Apache Ant is an XML-based build tool similar to “make” utility that most of you are familiar with. Work on simple files to familiarize yourself with the Ant build tool.

4. Study and understand the Web Services building and deployment details:

- For the Web Services part of this project, we will use the Sun Microsystems implementation of the Web Services specification.
- By this time, you should already have setup Tomcat and JWSDP in your project spaces, and successfully tried out the ‘HelloWorld’ Demo. This will provide you with an example to develop your Web Services client-server system on. It has a clear directory structure which you are expected to emulate.

5. Design, implement and test your weather Web Service:

- Using the example given in the Step 4 above design the Web Service for dispensing and answering user queries about the weather information of various cities. This is

expected to be the most time consuming part of the project due to the novelty of the topic. (Note: Explore using JUnit for testing the various modules).

6. Deploy the integrated system:

- The various components listed above should have been deployed and tested individually. In this step you will run the entire integrated system. The RMI part can be scheduled to acquire data once a day to update the database that will be used by the Web Service part.

7. It is suggested that you use either Netbeans or Eclipse IDE to develop and deploy your applications.

Project Deliverables:

1. A modified **RMI Server** that periodically schedules and updates a relational database with weather information for a set of cities.
2. An **RMI Client** (essentially the same client that was given to you) that can still connect to the RMI Server, obtain, and display latest weather information for a set of cities.
3. A **Web Service** that is able to query the relational database for different information. Requirements include (but need not be limited to):
 - a. Weather for a particular city on a particular day
 - b. Average weather for a particular city over a given period
 - c. Ability to convert between English and Metric Units
 - d. Ability to directly invoke the RMI Server from Web Service to get **current** weather (as opposed to weather stored in the database)
4. A **Web based client** created using JSP pages that allows a user to use the various services offered by your web service.

Submission Details:

Will be provided as the deadline nears...

There's a lot of new stuff you'll have to pick up. You'll definitely need the whole month, so

- Start Early,
- Read-up and make sure you understand what your code does, and
- Don't forget to have fun!