香港公開大學 科技學院
THE OPEN UNIVERSITY OF HONG KONG
SCHOOL OF SCIENCE AND TECHNOLOGY

COMP S811

Java Programming for Web Applications, Enterprise Computing and Mobile Devices

Spring 2020 Presentation

Tutor Marked Assignment 3 (TMA03)

Please submit your work by 28th October 2020

via the OLE's electronic assignment submission system

Preamble

Dear COMP S811 Students,

This is the third TMA for the course COMP S811. The objectives of this TMA are to apply the knowledge that you learned in Units 6, 7 and 8, and to practice programming XML and Android applications.

There are 4 questions in this TMA. Again, the questions are of different degree of difficulty. Question 1 requires you to answer some short questions, and Questions 2, 3 and 4 involve practical Java programming of XML and Android.

Remember to use the OLE online submission when you submit your TMA03. Please follow the following convention and practice:

- Please submit a document file that contains your written answers towards the TMA, including program listings as indicated in the questions. The preferred document formats are DOC, DOCX, RTF, ODT.
- Also submit all Java source files of your programs (e.g., the whole directories of Eclipse projects).
- Zip all files (the document file and the Java source files) into a single file. Name your zip file like TMA3_sxxxxxxxx.zip, where xxxxxxxx is your 8-digit student ID number.

To check the status of your submission, you may use the TMA submission and recording system in the OLE.

Oliver Au (COMP S811 CC)

Question 1 Concepts [40 marks]

(a) Describe and contrast between a well-formed XML document and a valid XML document. **[2 marks]**

(b) SAX (Simple API for XML) and DOM (Document Object Model) are two major standard APIs for processing XML documents with Java. Compare SAX with DOM by describing their key features, and pros and cons. **[6 marks]**

(c) Briefly describe what "data binding" refers to in the aspect of XML processing with Java. **[2 marks]**

(d) In addition to SAX, StAX, DOM, JAXP and JAXB, there are other APIs for XML processing with Java. Research from the web to find any two of them and briefly describe their features. **[4 marks]**

(e) There are different types of components in Android. **[6 marks]**

- (i) State the four types of application components in Android.
- (ii) Which type of component is most suitable for implementing a login form in an application? Justify your answer.
- (iii) Which type of component is most suitable for implementing download operations in the background? Justify your answer.

(f) Permissions are required for an Android application to perform certain privilege operations. **[6 marks]**

- (i) In which file of an Android project are permissions specified?
- (ii) When does the user confirm or grant the permissions of an application?
- (iii) Write the XML tag for the permission required for making a phone call.
- (iv) Write the XML tag for the permission required for writing to a SD card of the device.

(g) Android applications use resources. **[6 marks]**

- (i) What is the use of the auto-generated R class in an Android project?
- (ii) A color resource is called "text_color" and is blue (#00F) by default and greenish-blue (#07F) for the locale of Hong Kong.
  1. Define the default color resource in XML, and state the file (the full path within the Android project) in which it is defined.
  2. Define the color resource for the locale of Hong Kong in XML, and state the file (the full path within the Android project) in which it is defined.

(h) Android's UI system uses a single thread model. **[6 marks]**

- (i) State two rules that an Android application should obey regarding the single thread model.
- (ii) For each of the rules, describe the problem if the rule is violated.

(i) The Android platform is evolving. What is the latest version and API level of the Android platform? Describe a new feature or significant improvement of the new version. **[2 marks]**

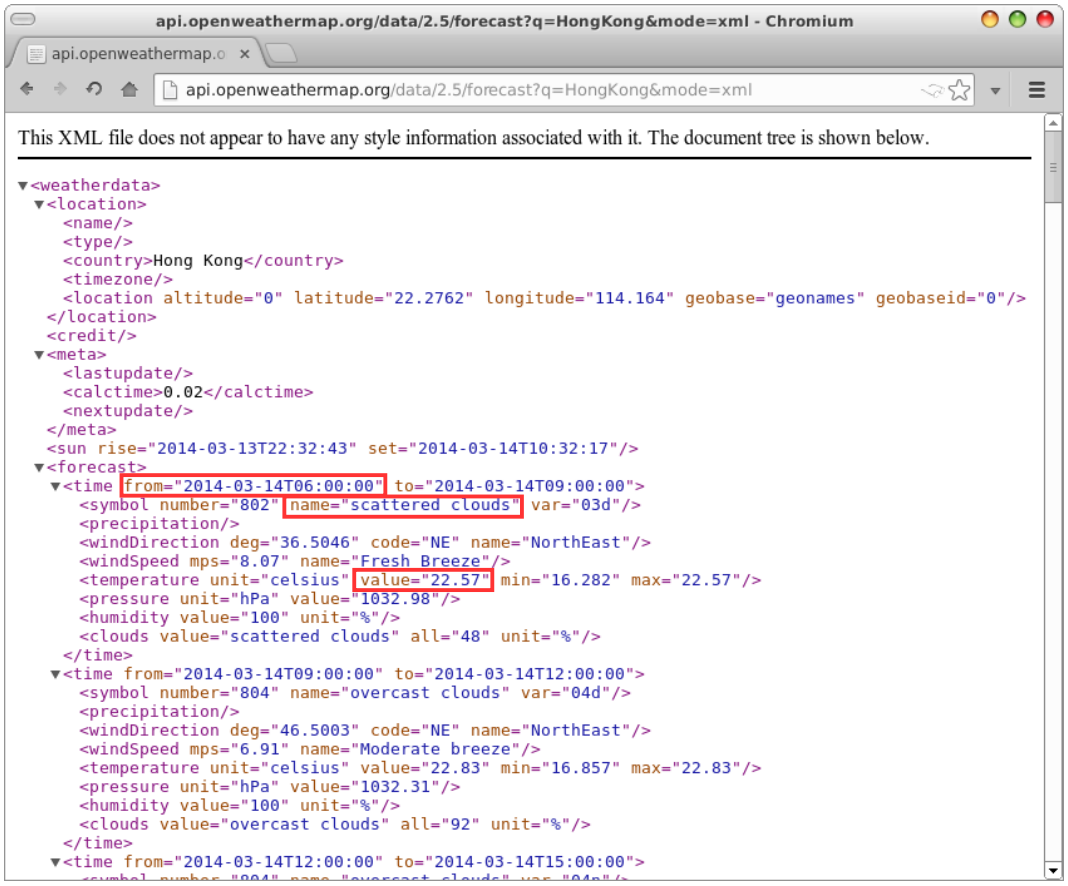
Question 2 XML parsing [15 marks]

The Open Weather Map API (http://openweathermap.org/API) supplies weather data in XML and other formats. Sign up an account to obtain an API key. In this question, you will develop a program that shows weather forecast information.

Weather forecast of Hong Kong in XML can be retrieved at the URL, where XXYYZZ is your API key:

http://api.openweathermap.org/data/2.5/forecast?q=HongKong&mode=xml&APPID=XXYYZZ

The figure below shows a sample of the forecast data. The "forecast" element contains a number of "time" elements, and each "time" element represents the forecast data for a period of time.



Develop a program (class `weather.WeatherForecast`) that retrieves the XML, parses it and displays the following three pieces of data for each "time" element:

- the "from" attribute of the "time" element,
- the "name" attribute of the "symbol" element, and
- the "value" attribute of the "temperature" element.

In the above figure, these data of the first "time" element are indicated in boxes.

A sample output of running the program is shown below:

```
2014-03-14T06:00:00: scattered clouds, 22.57℃
2014-03-14T09:00:00: overcast clouds, 22.83℃
```

```
2014-03-14T12:00:00: overcast clouds, 22.31℃
2014-03-14T15:00:00: overcast clouds, 21.93℃
2014-03-14T18:00:00: broken clouds, 21.72℃
...
```

Hints:

- You may use SAX, StAX, DOM or JAXB to implement the program.
- You may use the `URL` class and the XML parsing methods that accept an `InputStream` object, e.g., the `parse(InputStream)` method of the `DocumentBuilder` class.
- The symbol ℃ has unicode 2103 and can be displayed like `System.out.println("\u2103")`.

Question 3 Android calculator [25 marks]

In this question, you build an Android application of a basic calculator. Sample screenshots of the application are shown below.

Figure 3a

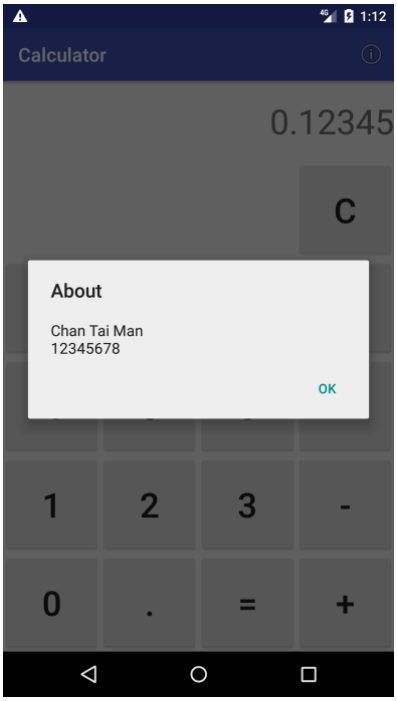


Figure 3b

(a) Create an Android application called `Calculator` with package name `comps811.calculator`. Construct the main layout as shown in Figure 3a. There are a right-aligned display number for output and 17 buttons for input, all in text size of 36sp. **[7 marks]**

(b) Implement the operations of the calculator. You may refer to the Swing calculator example of Unit 3 for the logic of handling the button clicks and processing the data. **[6 marks]**

(c) Create an "About" options menu item and show it as an action item. You may use a built-in Android drawable resource as its icon. When the item is activated, an "About" dialog box appears to show *your name* and *your student ID*, as depicted in Figure 3b. **[6 marks]**

(d) Persist the display number across the application's executions. That is, the application stores the display number on exit, and loads the last display number when it starts the next time. **[6 marks]**

Submit the whole Android project that contains all your work.

Question 4 Android networking [20 marks]

In this question, you create an Android application that retrieves the time of a server using the Daytime protocol. The default port of the protocol is 13, and a Daytime server in Hong Kong is stdtime.gov.hk. Sample screenshots of the application are shown below.

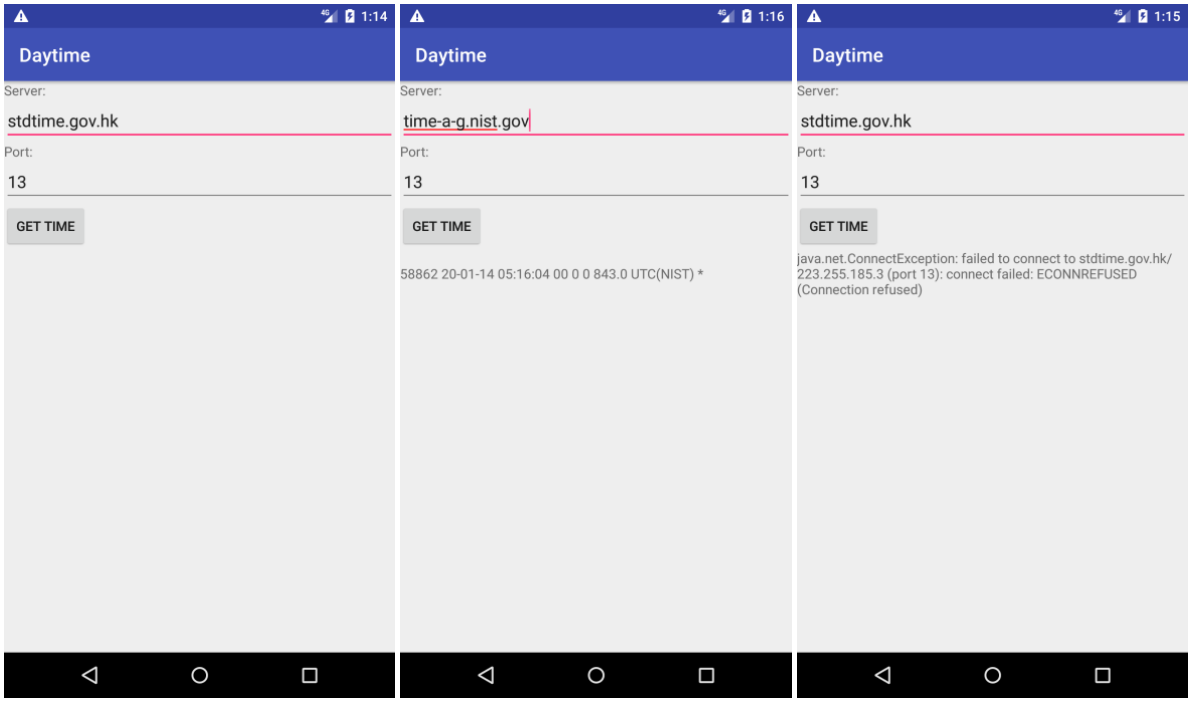


Figure 4a Figure 4b Figure 4c

The layout of the application contains

- two input text fields (and their labels), one for the server address with default of stdtime.gov.hk and the other for the port with default of 13,
- a button with label “Get time” to start the networking operation, and
- an output text field, initially empty, for displaying the result or an error message.

When the button is clicked, the program creates a TCP socket to the server and receives the daytime text data; this should be done in a worker thread. The received text is then displayed in the output text field, as in Figure 4b. If there is any error, an error message is displayed in the output text field, as in Figure 4c.

Submit the whole Android project that contains all your work.