Distributed Systems – Labs

Week 4

Data encoding techniques development

Learning Outcomes:

1. Be able to write Java classes whose objects may be serialised.
2. Be able to serialise Java objects.
3. Gain understanding of JSON and protocol buffers data encoding techniques.

Tasks

Object Serialisation

1. Extract T1\\`Serialise.java`. Note how the class Personnel in this file implements the java.io.Serializable interface. Any objects that can be serialised by Java MUST implement this interface.

Note also how the use of `ObjectInputStream` and `ObjectOutputStream` can allow instances of the Personnel class to be serialised to a file.

2. Serialisable objects can be written to files as we have seen in Step 1. However, they can also be written to any location for which we have an `OutputStream`, and read from anywhere we have an `InputStream`, such as our TCP sockets.

With this in mind, modify the `TCPEchoClient` and `TCPEchoServer` (from Week 2) so that rather than writing text, they pass instances of Person objects, where Person objects contain name, age and address attributes.
These objects should be created on the client side by the user entering required data, and should then be serialised and sent to the server which will print out the contents of the object.

ArrayLists

3. Extract T3\\`ArrayListSerialise.java`

Note how this program creates three objects of class Personnel and then uses the add method of class ArrayList to place the objects into an ArrayList.

4. Read Section 8 of Secure Coding Guidelines for Java SE

https://www.oracle.com/java/technologies/javase/seccodeguide.html#8

Protocol Buffers

5. Read a basic Java programmer's introduction to working with protocol buffers.

   https://developers.google.com/protocol-buffers

   https://developers.google.com/protocol-buffers/docs/javatutorial

JSON

6. Take a look at JSON at:

https://www.json.org/json-en.html

https://www.oracle.com/technical-resources/articles/java/json.html

References

Chapter 4 of Introduction to Network Programming in Java by Graba.

https://docs.oracle.com/en/java/javase/18/core/serialization-filtering1.html#GUID-3ECB288D-E5BD-4412-892F-E9BB11D4C98A