2006 Paper 4 Question 8

Concurrent Systems and Applications

(a) To which components of a class definition is it legal to apply the `strictfp` modifier in Java and what effect does it have in each case?   [3 marks]

(b) When the `transient` modifier is applied to a field of type *object reference to an array of Objects* in a class definition, Java's default Serialization mechanism will omit the array itself and all of the elements in the array from a serialized representation. A useful and reusable class would offer a *partially transient array*: a class containing an ordered list of elements indexed by integers from zero upwards, which allows the programmer to toggle each item separately between being transient and non-transient. The class should provide methods to get and set the values in each position of the array and to indicate that an element should behave as though it is/is not transient.

   (i) Define a *generic* Java interface, `PartiallyTransientArray`, appropriate for this purpose.   [4 marks]

   (ii) Give the definition of a *generic* class providing the functionality of a partially transient array ensuring that, when serialized, the class and (only) the non-transient elements are included in the output. It is sufficient to state the size of the array at construction-time and for it to be unchangeable thereafter.   [6 marks]

(c) Explain, drawing examples from your partially transient array class, how formal type parameters can be restricted in the Java language using the `extends` and `super` keywords.   [4 marks]

(d) What are the drawbacks of the "Generics" features of the Java language for providing type-polymorphism?   [3 marks]