COP3530 – Assignment 4

Objective

Students will be able to develop code involving fundamental data structures, by implementing a solution to a problem that requires the use of hash tables and collision resolution using chaining.

Assignment Problem

A *symbol table* is a data structure used by compilers to store information about identifiers in a program such as variables, methods, and classes. In this exercise you are asked to implement a symbol table that will store the identifiers of a Java program and their associated access modifiers (public, private, protected, default/package-private). The following aspects are to be observed:

- Element information is a pair *(identifier, access)*, where *identifier* is the identifier name and *access* is the corresponding access modifier. Both *identifier* and *access* are strings of characters.
- Elements will be read into your program from a text file with one pair (identifier, access) in each line. For example,

  x private
  y public
  p1 protected
  firstName default
  lastName default
  taxValue public

- *SymbolTable*, your main data structure, will be implemented with a hash table that will store the symbol table elements, i.e. pairs (identifier, access). Hash table size will be 13. The **key** of an element is the **identifier** component.
- Collisions will be resolved using the **chaining** approach: elements with the same hash value are stored in a linked list.
- Hash function to be used is the one implemented in class on exercise *Prog23_01*.
- To implement the linked list, use solution in *Prog13_01* (Canvas/Modules) modified to meet the UML diagram given below.
- Several files accompany this project description:
  - *assignment 4 input.txt*: a test file
  - *Main.java*: a complete implementation of the `Main` class (tests your code using file *assignment 4 input.txt*),
  - *ElementType.java*: the implementation of the `ElementType` class
  - other class files: please read the comments written on the files
  - *output.pdf*: a file with the output generated by the `Main` class provided.
- The output of your program is expected to be the same as the output example provided.

Guidelines

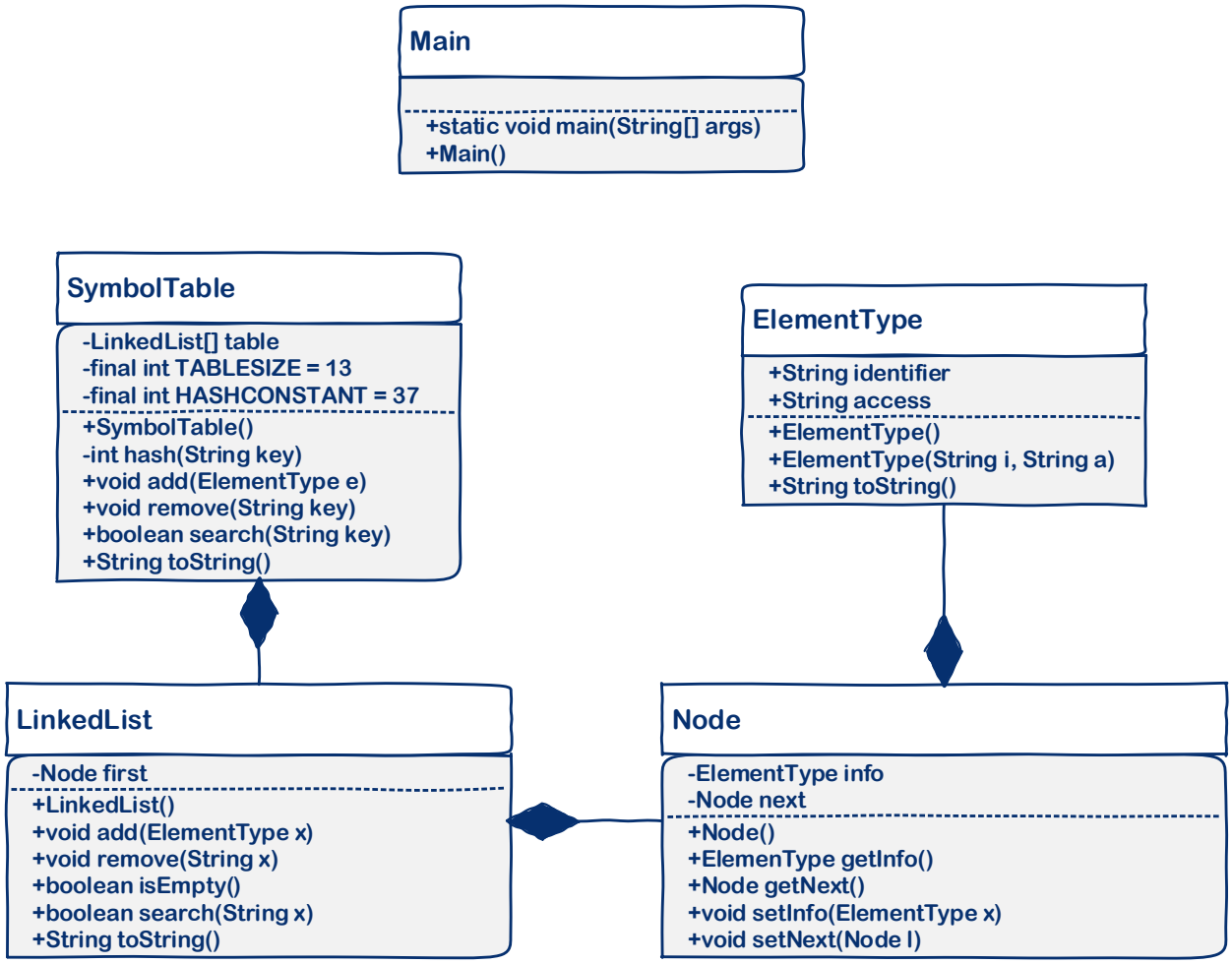
- The assignment is to be completed individually or in teams of two students. The given problem is based on the content studied on hashing and collision resolution.

- You are allowed to use all of the code given in the lectures. In those cases, make sure you properly credit its source.

- Classes from the Java Collection Framework are not allowed for use in your implementation.

- Students are required to structure the code as indicated in the UML class diagram.

UML class diagram:



Deliverables:

- A compressed folder, *PID Assignment 4* (e.g. *1234567 Assignment 4*), containing

  - files *Node.java*, *LinkedList.java*, and *SymbolTable.java*
  - A screenshot of the running program. Note: a screenshot is an image that shows 1) the IDE environment with code and 2) the output window. A partial view of the IDE with code is fine, the output window is to be displayed in its entirety. More than one image file might be required to capture everything.

- Include **only** the .java files mentioned above; do not include other files or folders generated by the IDE.

- Make sure you write your full name(s), Panther ID(s), and class section(s) in the @author field of each Java class.

Grading Rubric

The assignment is worth 145 points (out of 1000 total course points). Grade components:

<table>
<tr><th>Component</th><th>Points</th><th>Description</th></tr>
<tr><td>Submission</td><td>5</td><td>The student has submitted the project solution using the requirements for deliverables specified in the Deliverables section.</td></tr>
<tr><td>Organization</td><td>5</td><td>Code is expected to be neat, organized, and readable.</td></tr>
<tr><td>Content</td><td>135</td><td>
<table>
<tr><th>Deliverable</th><th>Points</th></tr>
<tr><td>SymbolTable class</td><td>50 pts</td></tr>
<tr><td>LinkedList class</td><td>50 pts</td></tr>
<tr><td>Node class</td><td>26 pts</td></tr>
<tr><td>Screenshot</td><td>9 pts</td></tr>
</table>
</td></tr>
</table>