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CMPSCI 4250

Homework 3

1. A descriptor is the collection of the attributes of a variable. In an implementation, a descriptor is an area of memory that stores the attributes of a variable. If the attributes are all static, descriptors are required only at compile time. These descriptors are built by the compiler, usually as a part of the symbol table, and are used during compilation. For dynamic attributes, however, part or all of the descriptor must be maintained during execution. In this case, the descriptor is used by the run-time system. In all cases, descriptors are used for type checking and building the code for the allocation and deallocation operations.

2. Table summarizing advantages and disadvantages of different types of array.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Static Array | Fixed stack-dynamic array | Fixed heap-dynamic array | Heap-dynamic array |
| Advantages | .Efficiency  .No dynamic allocation or deallocation is required. | .Space efficiency  .A large array in one subprogram can use the same space as a large in a different subprogram, as long as both subprograms are not active at the same time. | .Flexibility, the array’s size always fits the problem. | .Flexibility, array can grow and shrink during program execution as the need for space changes. |
| Disadvantages | .The storage for the array is fixed for the entire execution time of the program. | .Required allocation and deallocation time. | .Allocation time from the heap, which is longer than allocation time from the stack | .Allocation and deallocation take longer and may happen many times during execution of the program. |

3. Identify operations on array that common for Python and Ruby.

. Python’s array are called lists. Python provides array assignment, although it is only a reference change. Python also has operations for array catenation (+) and element membership (**in**) and slices. Python includes two different comparison operators: one that determines whether the two variables reference the same object (**is**) and one that compares all corresponding objects in the referenced objects, regardless of how deeply they are nested, for equality (==).

. Ruby’s array elements are references to objects. Like Python, when a == operator is used between two arrays, the result is true only if the two arrays have the same length and the corresponding elements are equal. Ruby’s arrays can be catenated with an Array method.

4. Describe difference between unions, free unions and discriminated unions.

. Union is a type whose variable may store different type values at different time during program execution.

. Free unions is provided by C and C++ with union constructs in which there is no language support for type checking. The union constructs is used to specify union structures. The unions in these language are called Free Union.

. Discriminated Unions, type checking of unions requires that each union construct include a type indicator. Such an indicator is called discriminant, and a union with a discriminant is called a discriminated union.

5. Explain the reason why we conclude that the following language are or are not strongly typed: C, C++, Java, C#.

. C and C++ are not strongly typed because parameter type checking can be avoided and they both include union types which are not type checked.

. Java and C# are almost strongly typed because of explicit type casting.