

Slide 1: Algorithm and Languages

Algorithm I chose was: Merge Sort

Language I chose was: Java

This language is:

- Java is both compiled and interpreted; Java source code is first compiled into byte-code, then the byte-code runs on a Java Virtual Machine
- Java is statically-typed, as it expects its variable to be declared before they can be assigned values.
- Compiled Java code can run on any machine as long as it can run a JVM.
- Some machines offer direct hardware support for Java using micro controllers that can run Java bytecode in hardware.

Slide 2: Implementation in Language X

```
8 void merge(int[] list, int l, int m, int r) {
9     int num1 = m - l + 1;
10    int num2 = r - m;
11
12    int left[] = new int[num1];
13    int right[] = new int[num2];
14    for (int i = 0; i < num1; ++i) {
15        left[i] = list[l + i];
16    }
17    for (int j = 0; j < num2; ++j) {
18        right[j] = list[m + 1 + j];
19    }
20    int i = 0;
21    int j = 0;
22
23    int k = l;
24    while (i < num1 && j < num2) {
25        if (left[i] <= right[j]) {
26            list[k] = left[i];
27            i++;
28        }
29        else {
30            list[k] = right[j];
31            j++;
32        }
33        k++;
34    }
35    while (i < num1) {
36        list[k] = left[i];
37        i++;
38        k++;
39    }
40    while (j < num2) {
41        list[k] = right[j];
42        j++;
43        k++;
44    }
45 }
```

```
47 void sort(int[] list, int l, int r) {
48     if (l < r) {
49         int m = l + (r - l) / 2;
50
51         sort(list, l, m);
52         sort(list, m + 1, r);
53
54         merge(list, l, m, r);
55     }
56 }
```

Java Run

```
before merge, list1[:10] = 800000 1 799999 2 799998 3 799997 4 799996 5
after merge, list1[:10] = 1 2 3 4 5 6 7 8 9 10
Algorithm runtime (in milliseconds): 57
```

Python Run

```
before merge, list1[:10] = [800000, 1, 799999, 2, 799998, 3, 799997, 4, 799996, 5]
after merge, list1[:10] = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Python merge time: 2.5314 sec
```

Slide 3: Results and Conclusion

- Python runtime: 2530
- Java runtime: 57
- Java ran 44 times faster than Python

In the future, my preferred language to use would be Python. Although Java ran faster than Python, my understanding and experience with Python makes it an easier language to work with for educational purposes. In real world cases, I would use Java rather than Python due to the efficiency and compatibility benefits.