
Data Structures and Algorithms

COMP 103

2019-20

Semester 2

Lecture 06c

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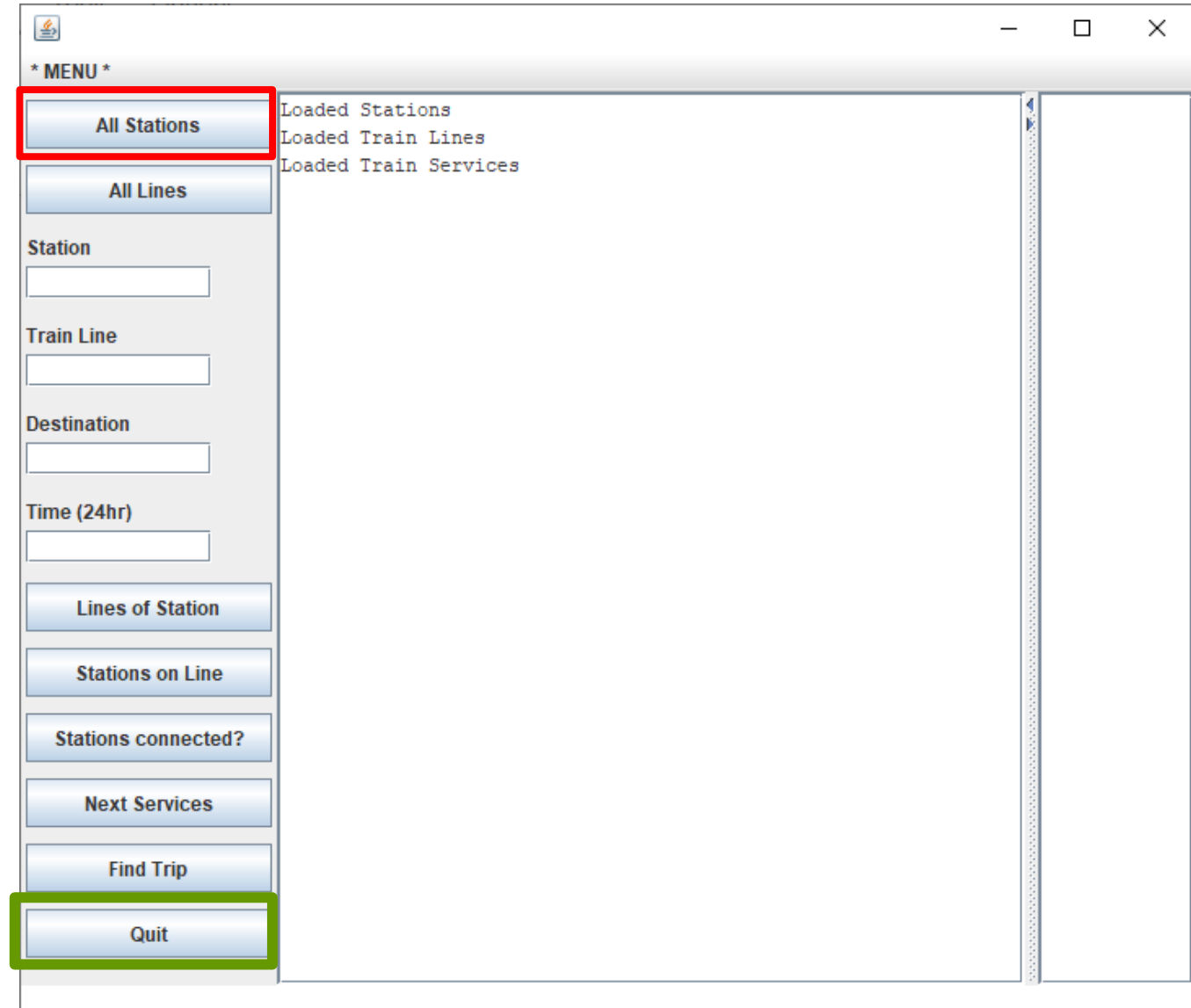
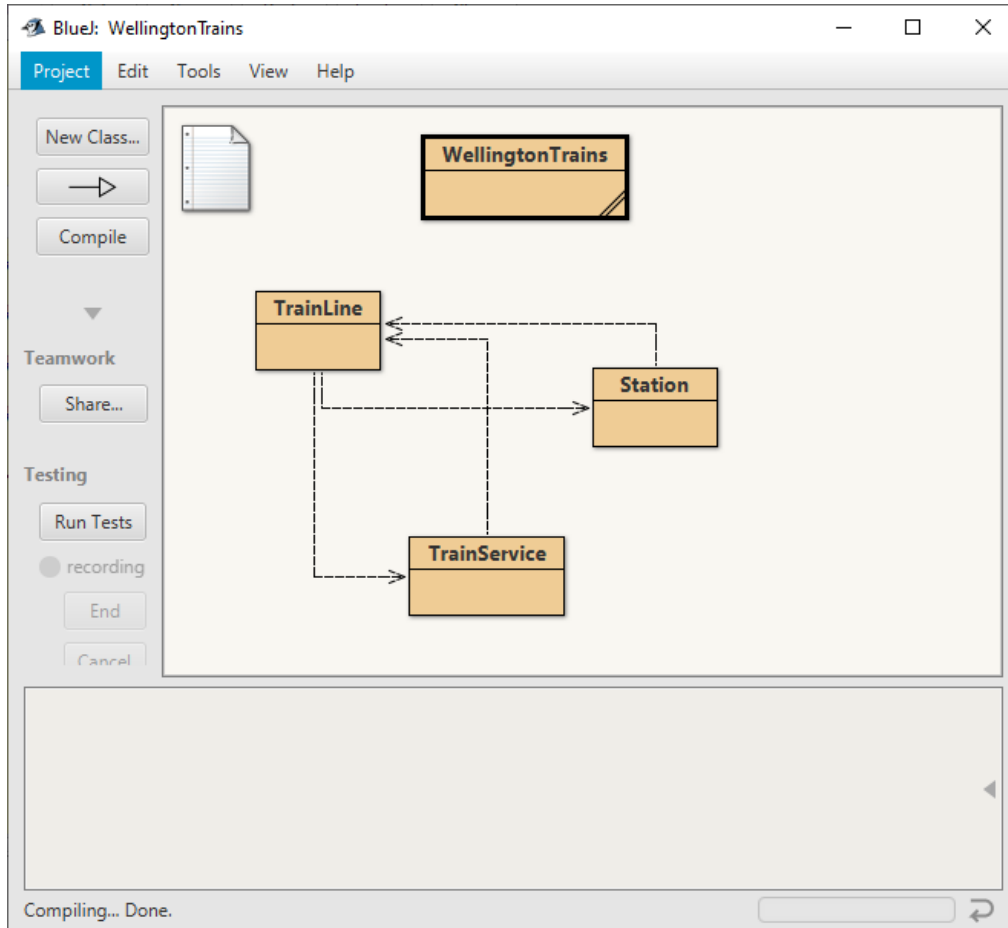
Victoria University of Wellington

https://ecs.wgtn.ac.nz/Courses/XMUT103_2020T1/Assignment2PartA

Name	Date modified	Type	Size
data	15/04/2020 3:51 PM	File folder	
package.bluej	15/04/2020 3:51 PM	BlueJ Project File	
Station.java	15/04/2020 3:51 PM	JAVA File	
TrainLine.java	15/04/2020 3:51 PM	JAVA File	
TrainService.java	15/04/2020 3:51 PM	JAVA File	
WellingtonTrains.java	15/04/2020 3:51 PM	JAVA File	

The screenshot shows the BlueJ IDE interface for a project named 'WellingtonTrains'. The main workspace displays four class icons: WellingtonTrains (top right, cross-hatched), TrainLine (middle left, diagonal lines), Station (middle right, diagonal lines), and TrainService (bottom center, diagonal lines). A red arrow points from the 'WellingtonTrains.java' file in the file explorer on the left to the WellingtonTrains class icon in the workspace. The interface includes a menu bar (Project, Edit, Tools, View, Help), a toolbar with buttons for 'New Class...', 'Compile', 'Teamwork', and 'Testing', and a status bar at the bottom that reads 'Initialising virtual machine... Done.'.

Compile & run the WellingtonTrains program



Files from the zip file:

Name	Date modified	Type	Size
data	15/04/2020 3:51 PM	File folder	
package.bluej	15/04/2020 3:51 PM	BlueJ Project File	2 KB
Station.java	15/04/2020 3:51 PM	JAVA File	2 KB
TrainLine.java	15/04/2020 3:51 PM	JAVA File	3 KB
TrainService.java	15/04/2020 3:51 PM	JAVA File	3 KB
WellingtonTrains.java	15/04/2020 3:51 PM	JAVA File	4 KB

25 files in the data folder:

Name	Date modified	Type	Size
1 fares.data	15/04/2020 3:51 PM	DATA File	1 KB
geographic-map.png	15/04/2020 3:51 PM	PNG File	91 KB
2 Johnsonville_Wellington-services.data	15/04/2020 3:51 PM	DATA File	2 KB
3 Johnsonville_Wellington-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Masterton_Wellington-services.data	15/04/2020 3:51 PM	DATA File	1 KB
Masterton_Wellington-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Melling_Wellington-services.data	15/04/2020 3:51 PM	DATA File	1 KB
Melling_Wellington-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
4 stations.data	15/04/2020 3:51 PM	DATA File	1 KB
system-map.png	15/04/2020 3:51 PM	PNG File	70 KB
5 train-lines.data	15/04/2020 3:51 PM	DATA File	1 KB
Upper-Hutt_Wellington-services.data	15/04/2020 3:51 PM	DATA File	5 KB
Upper-Hutt_Wellington-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Waikanae_Wellington-services.data	15/04/2020 3:51 PM	DATA File	4 KB
Waikanae_Wellington-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Wellington_Johnsonville-services.data	15/04/2020 3:51 PM	DATA File	2 KB
Wellington_Johnsonville-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Wellington_Masterton-services.data	15/04/2020 3:51 PM	DATA File	1 KB
Wellington_Masterton-stations.data	15/04/2020 3:51 PM	DATA File	1 KB
Wellington_Melling-services.data	15/04/2020 3:51 PM	DATA File	1 KB
Wellington_Melling-stations.data	15/04/2020 3:51 PM	DATA File	1 KB

Data files: 1) fares.data

2) Johnsonville_Wellington-services.data

3) Johnsonville_Wellington-stations.data

```
fares.data - Notepad
File Edit Format View Help
Zones fare
1 2.50
2 4.00
3 5.00
4 5.50
5 6.50
6 8.50
7 9.50
8 10.50
9 12.00
10 13.00
11 15.00
12 16.00
13 17.50
14 19.00
```

```
Johnsonville_Wellington-services.data - Notepad
File Edit Format View Help
600 602 605 607 608 610 612 614 623
630 632 635 637 638 640 642 644 653
645 647 650 652 653 655 657 659 708
700 702 705 707 708 710 712 714 723
715 717 720 722 723 725 727 729 738
730 732 735 737 738 740 742 744 753
745 747 750 752 753 755 757 759 808
800 802 805 807 808 810 812 814 823
815 817 820 822 823 825 827 829 838
830 832 835 837 838 840 842 844 853
845 847 850 852 853 855 857 859 908
900 902 905 907 908 910 912 914 923
930 932 935 937 938 940 942 944 953
1000 1002 1005 1007 1008 1010 1012 1014 1023
1030 1032 1035 1037 1038 1040 1042 1044 1053
1100 1102 1105 1107 1108 1110 1112 1114 1123
1130 1132 1135 1137 1138 1140 1142 1144 1153
1200 1202 1205 1207 1208 1210 1212 1214 1223
1230 1232 1235 1237 1238 1240 1242 1244 1253
1300 1302 1305 1307 1308 1310 1312 1314 1323
1330 1332 1335 1337 1338 1340 1342 1344 1353
1400 1402 1405 1407 1408 1410 1412 1414 1423
1430 1432 1435 1437 1438 1440 1442 1444 1453
1500 1502 1505 1507 1508 1510 1512 1514 1523
1530 1532 1535 1537 1538 1540 1542 1544 1558
1600 1602 1605 1607 1608 1610 1612 1614 1628
1615 1617 1620 1622 1623 1625 1627 1629 1643
1630 1632 1635 1637 1638 1640 1642 1644 1658
1645 1647 1650 1652 1653 1655 1657 1659 1713
1700 1702 1705 1707 1708 1710 1712 1714 1728
1715 1717 1720 1722 1723 1725 1727 1729 1743
1730 1732 1735 1737 1738 1740 1742 1744 1758
1745 1747 1750 1752 1753 1755 1757 1759 1813
1800 1802 1805 1807 1808 1810 1812 1814 1828
1815 1817 1820 1822 1823 1825 1827 1829 1843
```

```
Johnsonville_Wellington-stations.data - Notepad
File Edit Format View Help
Johnsonville
Raroa
Khandallah
Box-Hill
Simla-Crescent
Awarua-Street
Ngaio
Crofton-Downs
Wellington
```

Data files: 4) stations.data

5) train-lines.data

stations.data - Notepad

File Edit Format View Help

```
Wellington 1 0
Ngauranga 3 4.8
Crofton-Downs 3 4.9
Ngaio 3 5.2
Awarua-Street 3 6
Simla-Crescent 3 6.9
Box-Hill 3 7.2
Khandallah 3 8
Raroa 3 9.2
Johnsonville 3 10.5
Petone 4 10.5
Takapu-Road 4 11.9
Western-Hutt 4 11.9
Ava 4 12.5
Redwood 4 13.1
Melling 4 13.5
Tawa 4 13.8
Woburn 4 14.4
Linden 4 14.9
Waterloo 4 15.5
Kenepuru 5 16.2
Epuni 5 16.5
Porirua 5 17.7
Naenae 5 18.3
Wingate 5 19.5
Taita 5 20.6
Paremata 6 21.9
Pomare 5 22
Mana 6 23.2
Manor-Park 6 23.7
Plimmerton 6 24.5
Silverstream 6 26.8
Heretaunga 6 28.2
Trentham 6 29.4
Pukerua-Bay 7 30.4
```

1st row2nd row3rd row4th row

train-lines.data - Notepad

File Edit Format View Help

```
Johnsonville_Wellington
Wellington_Johnsonville
Melling_Wellington
Wellington_Melling
Waikanae_Wellington
Wellington_Waikanae
Masterton_Wellington
Wellington_Masterton
Upper-Hutt_Wellington
Wellington_Upper-Hutt
|
```

Adding more Java code into the `loadStationData` method

```

46 public void loadData(){
47     1 loadStationData();
48     UI.println("Loaded Stations");
49     loadTrainLineData();
50     UI.println("Loaded Train Lines");
51     3 // The following is only needed for the Completion
52     loadTrainServicesData();
53     UI.println("Loaded Train Services");
54 }
55
56 public void loadStationData() {
57 }
58
59 public void loadTrainLineData() {
60 }
61
62 public void loadTrainServicesData() {
63 }

```

stations.data - Notepad

File Edit Format View Help

Wellington 1 0
 Ngauranga 3 4.8
 Crofton-Downs 3 4.9
 Ngaio 3 5.2
 Awarua-Street 3 6
 Simla-Crescent 3 6.9
 Box-Hill 3 7.2
 Khandallah 3 8
 Raroa 3 9.2
 Johnsonville 3 10.5
 Petone 4 10.5
 Takapu-Road 4 11.9
 Western-Hutt 4 11.9
 Ava 4 12.5
 Redwood 4 13.1
 Melling 4 13.5
 Tawa 4 13.8
 Woburn 4 14.4
 Linden 4 14.9
 Waterloo 4 15.5
 Kenepuru 5 16.2
 Epuni 5 16.5
 Porirua 5 17.7
 Naenae 5 18.3
 Wingate 5 19.5
 Taita 5 20.6
 Paremata 6 21.9
 Pomare 5 22
 Mana 6 23.2
 Manor-Park 6 23.7
 Plimmerton 6 24.5
 Silverstream 6 26.8
 Heretaunga 6 28.2
 Trentham 6 29.4
 Pukerua-Bay 7 30.4

WellingtonTrains.java file opened in BlueJ

```
77 // Methods for loading data and answering queries
78
79 /*# YOUR CODE HERE */
80
81 // Utility method to help with reading data files
82 /** Read all lines in a file into a list of Strings */
83 public ArrayList<String> readAllLines(String filename){
84     try{
85         ArrayList<String> ans = new ArrayList<String>();
86         Scanner sc = new Scanner(new File(filename));
87         while (sc.hasNext()){
88             ans.add(sc.nextLine());
89         }
90         sc.close();
91         return ans;
92     }
93     catch(IOException e){UI.println("Fail: " + e); return null;}
94 }
95
96 }
```


Adding more Java code into the `loadStationData` method

Screenshot of instructions from the Assignment 2 Part B web page

Suggested Algorithms for loading the data

To Create the Map of Stations:

- Read the data from `"data/stations.data"`
- For each line of the data,
 - construct a `Station` object using the data on the line
 - put the `Station` into the Map of Stations (the `Station` objects won't have any `TrainLine` information at this point)

Type these 8 Java code lines (from code line 58 to 65)

```

57 public void loadStationData() {
58     for (String stationLine : readAllLines("data/stations.data")){
59         Scanner sc = new Scanner(stationLine);
60         String stName = sc.next();
61         int zone = sc.nextInt();
62         double dist = sc.nextDouble();
63         Station station = new Station(stName, zone, dist);
64         allStations.put(stName, station);
65     }
66 }

```

stations.data - Notepad

File Edit Format View Help

```

Wellington 1 0
Ngauranga 3 4.8
Crofton-Downs 3 4.9
Ngaio 3 5.2
Awarua-Street 3 6
Simla-Crescent 3 6.9
Box-Hill 3 7.2
Khandallah 3 8
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Taita 5 20.6
Paremata 6 21.9
Pomare 5 22
Mana 6 23.2
Manor-Park 6 23.7
Plimmerton 6 24.5
Silverstream 6 26.8
Heretaunga 6 28.2
Trentham 6 29.4
Pukerua-Bay 7 30.4

```

Adding more Java code into the `listAllStations` method

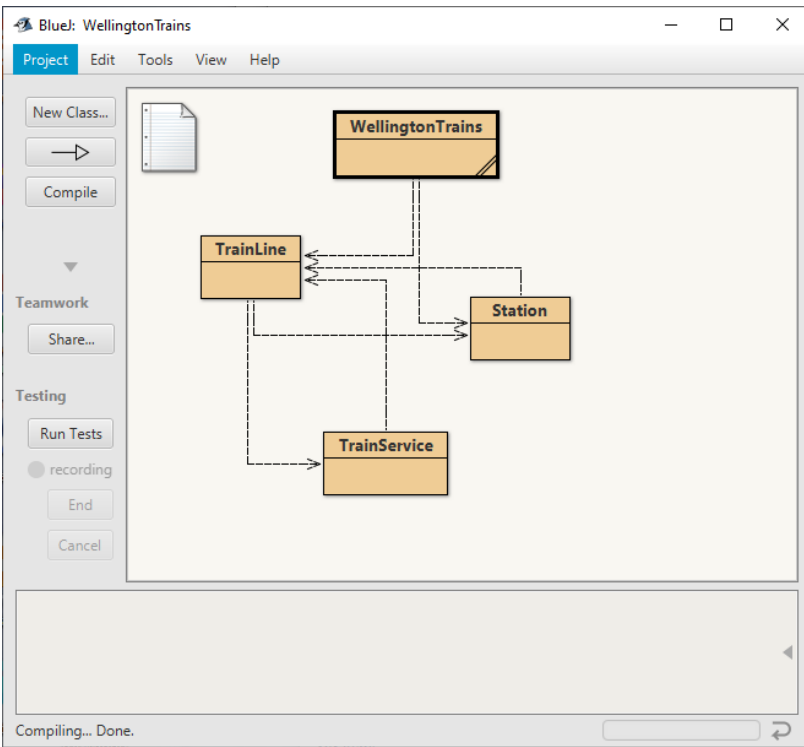
```
69 public void setupGUI(){
70     UI.addButton("All Stations", this::listAllStations); 1
71     UI.addButton("All Lines", this::listAllTrainLines);
72     UI.addTextField("Station", (String name) -> {this.stationName=name;});
73     UI.addTextField("Train Line", (String name) -> {this.lineName=name;});
74     UI.addTextField("Destination", (String name) -> {this.destinationName=name;});
75     UI.addTextField("Time (24hr)", (String time) ->
76         {try{this.startTime=Integer.parseInt(time);}catch(Exception e){UI.println("Enter four digits");}});
77     UI.addButton("Lines of Station", () -> {listLinesOfStation(this.stationName);});
78     UI.addButton("Stations on Line", () -> {listStationsOnLine(this.lineName);});
79     UI.addButton("Stations connected?", () -> {checkConnected(this.stationName, this.destinationName);});
80     UI.addButton("Next Services", () -> {findNextServices(this.stationName, this.startTime);});
81     UI.addButton("Find Trip", () -> {findTrip(this.stationName, this.destinationName, this.startTime);});
82     UI.addButton("Quit", UI::quit);
83     UI.setDivider(1.0);
84 }
85 // Methods for loading data and answering queries
86 /*# YOUR CODE HERE */
87 public void listAllStations() {
88 }
89 public void listAllTrainLines() {
90 }
91 // Utility method to help with reading data files
92 /** Read all lines in a file into a list of Strings */
93 public ArrayList<String> readAllLines(String filename){
```

Adding more Java code into the **listAllStations** method

```
94 // Methods for loading data and answering queries
95 /*# YOUR CODE HERE */
96 public void listAllStations() {
97     UI.clearText();
98     UI.println("All Stations in region:\n-----");
99     for (Station station : allStations.values()){
100         UI.println(station);
101     }
102 }
```

← Type these
5 Java code lines

Compiling & running the WellingtonTrains program



Click on the **All Stations** Button to produce the output as shown

