**PlanIt Test Cases**

1. *Input File Formats*

The BasicCsv tests use the BasicCsvScan input builder. This requires four input CSV files, one for each of:

* the network;
* zones;
* demands;
* route types.

*Network File Columns*

* Start Node – this is an external identifier number, corresponding to the Anode and Bnode number in the MetroScan input files
* End Node
* Direction – uses the MetroScan convention of 1 for A to B, 2 for B to A and 3 for two-way
* Length
* NoLanes
* Type – defined in the route types file

BasicCsv goes through this file creating a new node whenever it is first defined. There is no node definition file.

*Zones File Columns*

* Zones – identifier number for each zone
* Node – identifier for the node used by this zone, defined in the network file

*Demand File Columns*

* Origin – identifier for origin zone, defined in zones file
* Destination – identifier for destination zone, defined in zones file
* Demand

*Route Types File Columns*

* Type – identifier
* Name
* Speed
* Capacity – per lane
* alpha – used by BPR function
* beta – used by BPR function

1. *Results File Format*

The results file has the following columns

* Run Id
* Time Period Id
* Mode Id
* Start Node Id
* End Node Id
* Link Flow – the total flow off all vehicles, covering all routes
* Capacity
* Length
* Speed
* Link Cost – derived from the BPR function given the Link Flow
* Cost to End Node – the running total of link flow multiplied by link cost to reach the end of the current node
* alpha
* beta

The results file contains all the links in the solution, but the order they are listed may not match the order vehicles go through them. For example, the link from 1 to 6 appears in the third line of the results file for Test 1, although this is obviously the first link vehicles would travel through. It would be too much work to order the output lines automatically in the code.

For a test case which involve multiple origin-destination pairs, the ordering of the results file is irrelevant anyway since there is no “first” link, the link flows contain contributions from vehicles travelling on different routes.

The “Cost to End Node” value of the last link listed will be the total travel time of all vehicles in the network.

1. *Basic Test Cases*

The CSV files for test cases 1, 2 and 3 are saved in the BasicCsv/test/resources/basic directory.

Test cases 1, 2 and 3 all use the network used by Michiel in course ITLS6102 (taken from page 120 of the “Introduction, data, key concepts” course notes). This is defined as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| StartNode | EndNode | Direction | Length | NoLanes | Type |
| 1 | 2 | 3 | 33 | 1 | 1 |
| 2 | 3 | 3 | 23 | 1 | 1 |
| 3 | 4 | 3 | 10 | 1 | 1 |
| 4 | 5 | 3 | 10 | 1 | 1 |
| 1 | 6 | 3 | 10 | 1 | 1 |
| 2 | 7 | 3 | 7 | 1 | 1 |
| 3 | 8 | 3 | 8 | 1 | 1 |
| 4 | 9 | 3 | 4 | 1 | 1 |
| 5 | 10 | 3 | 10 | 1 | 1 |
| 6 | 7 | 3 | 31 | 1 | 1 |
| 7 | 8 | 3 | 12 | 1 | 1 |
| 8 | 9 | 3 | 20 | 1 | 1 |
| 9 | 10 | 3 | 20 | 1 | 1 |
| 6 | 11 | 3 | 12 | 1 | 1 |
| 7 | 12 | 3 | 5 | 1 | 1 |
| 8 | 13 | 3 | 40 | 1 | 1 |
| 9 | 14 | 3 | 10 | 1 | 1 |
| 10 | 15 | 3 | 3 | 1 | 1 |
| 11 | 12 | 3 | 8 | 1 | 1 |
| 12 | 13 | 3 | 47 | 1 | 1 |
| 13 | 14 | 3 | 5 | 1 | 1 |
| 14 | 15 | 3 | 10 | 1 | 1 |
| 11 | 16 | 3 | 40 | 1 | 1 |
| 12 | 17 | 3 | 10 | 1 | 1 |
| 13 | 18 | 3 | 15 | 1 | 1 |
| 14 | 19 | 3 | 40 | 1 | 1 |
| 15 | 20 | 3 | 21 | 1 | 1 |
| 16 | 17 | 3 | 12 | 1 | 1 |
| 17 | 18 | 3 | 32 | 1 | 1 |
| 18 | 19 | 3 | 30 | 1 | 1 |
| 19 | 20 | 3 | 9 | 1 | 1 |
| 16 | 21 | 3 | 10 | 1 | 1 |
| 17 | 22 | 3 | 30 | 1 | 1 |
| 18 | 23 | 3 | 20 | 1 | 1 |
| 19 | 24 | 3 | 6 | 1 | 1 |
| 20 | 25 | 3 | 43 | 1 | 1 |
| 21 | 22 | 3 | 5 | 1 | 1 |
| 22 | 23 | 3 | 20 | 1 | 1 |
| 23 | 24 | 3 | 20 | 1 | 1 |
| 24 | 25 | 3 | 40 | 1 | 1 |

Each test case has its own zone definition:

zones1.csv:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 1 |
| 2 | 10 |
|  |  |

zones2.csv:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 1 |
| 2 | 13 |
|  |  |

zones3.csv:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 1 |
| 2 | 20 |

The definitions of route type and demand are the same for all three test cases and are trivial:

route\_types.csv:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Name | Speed | Capacity | Alpha | Beta |
| 1 | Standard | 1 | 2000 | 0 | 0 |

demandZones.csv:

|  |  |  |
| --- | --- | --- |
| Origin | Destination | Demand |
| 1 | 2 | 1 |

All the test cases were run with the following parameters for the Stop Criterion:

Epsilon = 0.001

Max Iterations = 5000

For the three basic test cases, the Run Id, Time Period Id, Mode Id, alpha and beta are all zero. The other results are:

results1zones.csv:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node |
| 3 | 4 | 1 | 2000 | 10 | 1 | 10 | 10 |
| 4 | 5 | 1 | 2000 | 10 | 1 | 10 | 20 |
| 1 | 6 | 1 | 2000 | 10 | 1 | 10 | 30 |
| 8 | 3 | 1 | 2000 | 8 | 1 | 8 | 38 |
| 5 | 10 | 1 | 2000 | 10 | 1 | 10 | 48 |
| 7 | 8 | 1 | 2000 | 12 | 1 | 12 | 60 |
| 6 | 11 | 1 | 2000 | 12 | 1 | 12 | 72 |
| 12 | 7 | 1 | 2000 | 5 | 1 | 5 | 77 |
| 11 | 12 | 1 | 2000 | 8 | 1 | 8 | 85 |

results2zones.csv:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node |
| 1 | 6 | 1 | 2000 | 10 | 1 | 10 | 10 |
| 6 | 11 | 1 | 2000 | 12 | 1 | 12 | 22 |
| 11 | 12 | 1 | 2000 | 8 | 1 | 8 | 30 |
| 12 | 13 | 1 | 2000 | 47 | 1 | 47 | 77 |

results3zones.csv:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node |
| 1 | 6 | 1 | 2000 | 10 | 1 | 10 | 10 |
| 7 | 8 | 1 | 2000 | 12 | 1 | 12 | 22 |
| 8 | 9 | 1 | 2000 | 20 | 1 | 20 | 42 |
| 6 | 11 | 1 | 2000 | 12 | 1 | 12 | 54 |
| 12 | 7 | 1 | 2000 | 5 | 1 | 5 | 59 |
| 9 | 14 | 1 | 2000 | 10 | 1 | 10 | 69 |
| 11 | 12 | 1 | 2000 | 8 | 1 | 8 | 77 |
| 14 | 15 | 1 | 2000 | 10 | 1 | 10 | 87 |
| 15 | 20 | 1 | 2000 | 21 | 1 | 21 | 108 |

All these results can be verified by inspection of the original question.

1. *Route Choice Test Cases*

The CSV files for the more advanced test cases based on the OmniTRANS examples are saved in the BasicCsv/test/resources/route\_choice directory.

All of these test cases have zero values for Run Id, Mode Id and Time Period Id. They were run with 500 iterations to convergence and a zero epsilon value.

Test Case 1 Network:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| StartNode | EndNode | Direction | Length | NoLanes | Type |
| 2 | 1 | 1 | 1 | 1 | 1 |
| 1 | 3 | 1 | 1 | 1 | 2 |
| 3 | 2 | 1 | 1 | 1 | 1 |
| 13 | 4 | 1 | 1 | 10 | 1 |
| 4 | 2 | 1 | 1 | 1 | 1 |
| 6 | 3 | 1 | 1 | 1 | 1 |
| 12 | 6 | 1 | 1 | 10 | 1 |
| 15 | 5 | 1 | 1 | 10 | 1 |
| 5 | 1 | 1 | 1 | 1 | 1 |
| 2 | 11 | 1 | 1 | 1 | 1 |
| 3 | 14 | 1 | 1 | 1 | 1 |
| 1 | 16 | 1 | 1 | 1 | 1 |

Test Case 1 Route Types:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Name | Speed | Capacity | Alpha | Beta |
| 1 | Standard | 100 | 2000 | 0.5 | 4 |
| 2 | Link 2 | 100 | 1000 | 0.5 | 4 |

Test Case 1 Zones:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 11 |
| 2 | 12 |
| 3 | 13 |
| 4 | 14 |
| 5 | 15 |
| 6 | 16 |

Test Case 1 Demands:

|  |  |  |
| --- | --- | --- |
| Origin | Destination | Demand |
| 3 | 4 | 1000 |
| 5 | 1 | 1000 |
| 2 | 6 | 1000 |

The results for this Test Case 1 were:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node | alpha | beta |
| 2 | 1 | 2000 | 2000 | 1 | 100 | 0.015 | 30 | 0.5 | 4 |
| 1 | 3 | 2000 | 1000 | 1 | 100 | 0.09 | 210 | 0.5 | 4 |
| 3 | 2 | 2000 | 2000 | 1 | 100 | 0.015 | 240 | 0.5 | 4 |
| 13 | 4 | 1000 | 20000 | 1 | 100 | 0.01 | 250 | 0.5 | 4 |
| 4 | 2 | 1000 | 2000 | 1 | 100 | 0.010313 | 260.3125 | 0.5 | 4 |
| 6 | 3 | 1000 | 2000 | 1 | 100 | 0.010313 | 270.625 | 0.5 | 4 |
| 12 | 6 | 1000 | 20000 | 1 | 100 | 0.01 | 280.6251 | 0.5 | 4 |
| 15 | 5 | 1000 | 20000 | 1 | 100 | 0.01 | 290.6251 | 0.5 | 4 |
| 5 | 1 | 1000 | 2000 | 1 | 100 | 0.010313 | 300.9376 | 0.5 | 4 |
| 2 | 11 | 1000 | 2000 | 1 | 100 | 0.010313 | 311.2501 | 0.5 | 4 |
| 3 | 14 | 1000 | 2000 | 1 | 100 | 0.010313 | 321.5626 | 0.5 | 4 |
| 1 | 16 | 1000 | 2000 | 1 | 100 | 0.010313 | 331.8751 | 0.5 | 4 |

Test Case 2 Network:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| StartNode | EndNode | Direction | Length | NoLanes | Type |
| 11 | 1 | 1 | 1 | 3 | 1 |
| 1 | 4 | 1 | 1 | 1 | 1 |
| 4 | 12 | 1 | 1 | 3 | 1 |
| 1 | 2 | 1 | 2 | 1 | 1 |
| 2 | 4 | 1 | 2 | 1 | 1 |
| 1 | 3 | 1 | 1 | 1 | 1 |
| 3 | 4 | 1 | 1 | 1 | 1 |

Test Case 2 Route Types:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Name | Speed | Capacity | Alpha | Beta |
| 1 | Standard | 60 | 1200 | 0.5 | 4 |

Test Case 2 Zones:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 11 |
| 2 | 12 |

Test Case 2 Demands:

|  |  |  |
| --- | --- | --- |
| Origin | Destination | Demand |
| 1 | 2 | 3600 |

Test Case 2 results:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node | alpha | beta |
| 11 | 1 | 3600 | 3600 | 1 | 60 | 0.025 | 90 | 0.5 | 4 |
| 1 | 4 | 1879.2 | 1200 | 1 | 60 | 0.066784 | 215.5 | 0.5 | 4 |
| 4 | 12 | 3600 | 3600 | 1 | 60 | 0.025 | 305.5 | 0.5 | 4 |
| 1 | 2 | 295.2 | 1200 | 2 | 60 | 0.033394 | 315.358 | 0.5 | 4 |
| 2 | 4 | 295.2 | 1200 | 2 | 60 | 0.033394 | 325.2161 | 0.5 | 4 |
| 1 | 3 | 1425.6 | 1200 | 1 | 60 | 0.033266 | 372.6397 | 0.5 | 4 |
| 3 | 4 | 1425.6 | 1200 | 1 | 60 | 0.033266 | 420.0634 | 0.5 | 4 |

Test Case 3 Network:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| StartNode | EndNode | Direction | Length | NoLanes | Type |
| 11 | 1 | 1 | 2 | 4 | 2 |
| 1 | 3 | 1 | 2 | 2 | 1 |
| 1 | 2 | 1 | 2 | 2 | 3 |
| 2 | 3 | 1 | 2 | 2 | 2 |
| 3 | 5 | 1 | 2 | 1 | 2 |
| 3 | 4 | 1 | 2 | 2 | 1 |
| 4 | 5 | 1 | 2 | 1 | 2 |
| 5 | 12 | 1 | 2 | 1 | 2 |

Test Case 3 Route Types:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Name | Speed | Capacity | Alpha | Beta |
| 1 | Capacity1500 | 100 | 1500 | 0.5 | 4 |
| 2 | Capacity2000 | 100 | 2000 | 0.5 | 4 |
| 3 | Capacity2500 | 100 | 2500 | 0.5 | 4 |

Test Case 3 Zones:

|  |  |
| --- | --- |
| Zone | Node |
| 1 | 11 |
| 2 | 12 |

Test Case 3 Demands:

|  |  |  |
| --- | --- | --- |
| Origin | Destination | Demand |
| 1 | 2 | 8000 |

Test Case 3 results:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start Node Id | End Node Id | Link Flow | Capacity | Length | Speed | Link Cost | Cost to End Node | alpha | beta |
| 11 | 1 | 8000 | 8000 | 2 | 100 | 0.03 | 240 | 0.5 | 4 |
| 1 | 3 | 4048 | 3000 | 2 | 100 | 0.05315 | 455.1492 | 0.5 | 4 |
| 1 | 2 | 3952 | 5000 | 2 | 100 | 0.023903 | 549.6135 | 0.5 | 4 |
| 2 | 3 | 3952 | 4000 | 2 | 100 | 0.029529 | 666.3104 | 0.5 | 4 |
| 3 | 5 | 4144 | 2000 | 2 | 100 | 0.204314 | 1512.989 | 0.5 | 4 |
| 3 | 4 | 3856 | 3000 | 2 | 100 | 0.047294 | 1695.353 | 0.5 | 4 |
| 4 | 5 | 3856 | 2000 | 2 | 100 | 0.158175 | 2305.275 | 0.5 | 4 |
| 5 | 12 | 8000 | 2000 | 2 | 100 | 2.58 | 22945.27 | 0.5 | 4 |