MEMORANDUM

To: William A Davidson

From: Matthew Martimo

Date: 10/14/2011

Subject: **Period Specific Line Keywords Delivery – Transit Model Update**

Cube Voyager's PT program uses a series of keywords embedded in the description of the public transport line data to save information. These keywords may be specific to the line as a whole (line keywords) or specific to a particular segment of the route (node keywords).

As a convenience the HEADWAY[p] (and HEADWAY_R[p]) line keywords are indexed by time period so that the users may code several values in one dataset that can be selected dynamically based on the HDWAYPERIOD parameter in the script.

In order to provide better ways to calibrate and adjust transit travel times, some of the node specific keywords (specifically DWELL and DELAY) have also been made available as a line level keyword (specifically DWELL_DEFAULT and DELAY_DEFAULT) which can provide a default value for the line which is then able to be overwritten with the node keywords.

This task has indexed these line keywords by period as well. In this way, several defaults may be stored and called dynamically. The following keywords have been updated to use the HDWAYPERIOD parameter to set the value dynamically:

- DWELL_DEFAULT
- DELAY_DEFAULT
- TIMEFAC

In all cases, an unspecified index will default to 1.

This update is provided in the Cube Voyager 6.x series of software. A prerelease version can be downloaded from: http://www.citilabs.com/beta/voyager600pre.zip

The documentation updates follow.

DWELL_DEFAULT |RV5| Optional. Dwell time, in minutes, the line spends at all stop nodes for the line until one specifies a DWELL_C or DWELL sub-keyword. DWELL_C and DWELL work as they normally do. When the DWELL terminates the DWELL_C, the value for DWELL_ALL is then used for all subsequent stop nodes down the line.

The program selects the line specific dwell to be consistent with the PARAMETERS HDWAYPERIOD. If coding only one line specific dwell value, you may enter either DWELL_DEFAULT=x or DWELL_DEFAULT[1]=x. If entering multiple line specific dwells, you must enter each index separately, such as DEWELL_DEFAULT[1]=1, DEWELL_DEFAULT [2]=2, DEWELL_DEFAULT [3]=3. You cannot enter DEWELL_DEFAULT =1,2,3.

Valid values range from 0 to 999. Default value is 0.

DELAY_DEFAULT |RV5| Optional. Additional time delay added to all link times for the line until one specifies a DELAY_C or DELAY sub-keyword. DELAY_C and DELAY work as they normally do. When the DELAY terminates the DELAY_C, the value for DELAY_ALL is then used for all subsequent links down the line.

The program selects the line specific delay to be consistent with the PARAMETERS HDWAYPERIOD. If coding only one line specific dwell value, you may enter either DELAY_DEFAULT=x or DELAY_DEFAULT [1]=x. If entering multiple line specific dwells, you must enter each index separately, such as DELAY_DEFAULT [1]=1, DELAY_DEFAULT [2]=2 DELAY_DEFAULT [3]=3. You cannot enter DEWELL_DEFAULT =1,2,3.

Valid values range from 0 to 999. Default value is 0.

TIMEFAC |RV5| Optional. Time factor applied to the travel time of all links the line traverses. The program applies this factor until encountering a NODES TF keyword or NODES SPEED keyword.

The program selects the line specific time factor to be consistent with the PARAMETERS HDWAYPERIOD. If coding only one line specific TIMEFAC value, you may enter either TIMEFAC=x or TIMEFAC [1]=x. If entering multiple line specific dwells, you must enter each index separately, such as TIMEFAC [1]=1, TIMEFAC [2]=2 TIMEFAC [3]=3. You cannot enter TIMEFAC =1,2,3.

Valid values are numbers greater than or equal to 1.

EXAMPLES

As shown in Appendix, new keywords (e.g. DWELL_DEFAULT, DELAY_DEFAULT, and TIMEFAC) that can be implemented using the latest PT version have been tested using the data provided from the NERPM (Northeast Regional Planning Model). Three examples for testing new keywords are referred as Test 1, Test 2, and Test 3, respectively. One transit line named 'B6 EB' has been selected to see the changes of transit run times between without-keyword (e.g. 'ORG') and with-keyword (e.g. 'TEST #') cases.

TEST 1 - Example of 'DWELL_DEFAULT' keyword

The 'DWELL_DEFAULT' keyword is applied to all the stops except the first stop station because the first stop station would be served on the scheduled operating time. If the nodes are indicated as the non-stop with a negative sign in node number (or STOPA=0), the dwell time would not be added into the nodes. As an example, the 'Comparison of run times in link level' shows the addition of 2 min for peak period only in each transit stop station (e.g. STOPA=1).

< Transit line coding: 2 min for peak and 1 min for off-peak >

```
LINE  NAME="B6 EB", LONGNAME="Stockton-Wilson EB", HEADWAY[1]=60,
      HEADWAY[2]=60, MODE=21, ONEWAY=T, OPERATOR=1, CIRCULAR=F,
      DWELL_DEFAULT[1]=2, DWELL_DEFAULT[2]=1,
      USERA3="Line 026", USERA2="B6", USERA1="LOCAL", N=11964,
      -11967, -11960, -11965, -11962, -11966, -11963, -11969,
      DELAY=5, N=11961, -11968, -11972, -11959, -11958, -11956,
```

< Comparison of run times in link level >

NAME	A	B	MODE	LINKSEQ	STOPA	DIST	TIME_ORG	TIME_TEST1	TIME_DIFF
B6 EB	11964	11967	21	1	1	0.08	0.21	0.21	0
B6 EB	11967	11960	21	2	0	0.07	0.2	0.2	0
B6 EB	11960	11965	21	3	0	0.04	0.11	0.11	0
B6 EB	11965	11962	21	4	0	0.09	0.23	0.23	0
B6 EB	11962	11966	21	5	0	0.09	0.24	0.24	0
B6 EB	11966	11963	21	6	0	0.03	0.08	0.08	0
B6 EB	11963	11969	21	7	0	0.06	0.16	0.16	0
B6 EB	11969	11961	21	8	0	0.1	5.27	5.27	0
B6 EB	11961	11968	21	9	1	0.07	0.18	2.18	2
B6 EB	11968	11972	21	10	0	0.14	0.37	0.37	0
B6 EB	11972	11959	21	11	0	0.08	0.21	0.21	0
B6 EB	11959	11958	21	12	0	0.17	0.47	0.47	0
B6 EB	11958	11956	21	13	0	0.33	0.9	0.9	0
B6 EB	11956	11952	21	14	0	0.07	0.19	0.19	0
B6 EB	11952	12111	21	15	1	0.19	0.44	2.44	2
B6 EB	12111	12135	21	16	0	0.02	0.05	0.05	0

< Comparison of run times for transit line ('B6 EB') >

PERIOD	DISTANCE (mile)	ORIGINAL (min)	TEST 1 (min)	DIFF (min)	DIFF (%)
PEAK	22.1	77.9	269.9	192.0	246.5
OFF-PEAK	22.1	72.7	168.7	96.0	132.1

TEST 2 - Example of 'DELAY_DEFAULT' keyword

The 'DELAY_DEFAULT' keyword is applied to all the links except the link specified with either DWELL or DWELL_C sub-keyword. It simply adds the delay time into each link. As an example, the 'Comparison of run times in link level' shows the addition of 1 min for peak period for every link except the link 11969-11961 with 'DELAY=5'.

< Transit line coding: 1 min for peak and 0.5 min for off-peak >

```
LINE  NAME="B6 EB", LONGNAME="Stockton-Wilson EB", HEADWAY[1]=60,
      HEADWAY[2]=60, MODE=21, ONEWAY=T, OPERATOR=1, CIRCULAR=F,
      DELAY_DEFAULT[1]=1, DELAY_DEFAULT[2]=0.5,
      USERA3="Line 026", USERA2="B6", USERA1="LOCAL", N=11964,
      -11967, -11960, -11965, -11962, -11966, -11963, -11969,
      DELAY=5, N=11961, -11968, -11972, -11959, -11958, -11956,
```

< Comparison of run times in link level >

NAME	A	B	MODE	LINKSEQ	STOPA	DIST	TIME_ORG	TIME_TEST1	TIME_DIFF
B6 EB	11964	11967	21	1	1	0.08	0.21	1.21	1
B6 EB	11967	11960	21	2	0	0.07	0.2	1.2	1
B6 EB	11960	11965	21	3	0	0.04	0.11	1.11	1
B6 EB	11965	11962	21	4	0	0.09	0.23	1.23	1
B6 EB	11962	11966	21	5	0	0.09	0.24	1.24	1
B6 EB	11966	11963	21	6	0	0.03	0.08	1.08	1
B6 EB	11963	11969	21	7	0	0.06	0.16	1.16	1
B6 EB	11969	11961	21	8	0	0.1	5.27	5.27	0
B6 EB	11961	11968	21	9	1	0.07	0.18	1.18	1
B6 EB	11968	11972	21	10	0	0.14	0.37	1.37	1
B6 EB	11972	11959	21	11	0	0.08	0.21	1.21	1
B6 EB	11959	11958	21	12	0	0.17	0.47	1.47	1
B6 EB	11958	11956	21	13	0	0.33	0.9	1.9	1
B6 EB	11956	11952	21	14	0	0.07	0.19	1.19	1
B6 EB	11952	12111	21	15	1	0.19	0.44	1.44	1
B6 EB	12111	12135	21	16	0	0.02	0.05	1.05	1

< Comparison of run times for transit line ('B6 EB') >

PERIOD	DISTANCE (mile)	ORIGINAL (min)	TEST 3 (min)	DIFF (min)	DIFF (%)
PEAK	22.1	77.9	187.2	109.3	140.4
OFF-PEAK	22.1	72.7	106.5	33.8	46.5

TEST 3 - Example of ''TIMEFAC'' keyword

The 'TIMEFAC' keyword is applied to all the links except the links specified with either NODES TF or NODES SPEED sub-keyword. It simply multiplies the runtime by the input factor value into in each link. As an example, the 'Comparison of run times in link level' shows the increase of link runtime by approximately twice for every link for peak period because 'TIMEFAC[1]' is 2.0. Note that the time proportions in the summary table are not exactly same as 2.0 for peak period due to the rounding issue in the dBase format.

< Transit line coding: 2.0 min for peak and 1.5 min for off-peak >

```
LINE  NAME="B6 EB", LONGNAME="Stockton-Wilson EB", HEADWAY[1]=60,
      HEADWAY[2]=60, MODE=21, ONEWAY=T, OPERATOR=1, CIRCULAR=F,
      TIMEFAC[1]=2.0, TIMEFAC[2]=1.5,
      USERA3="Line 026", USERA2="B6", USERA1="LOCAL", N=11964,
      -11967, -11960, -11965, -11962, -11966, -11963, -11969,
      DELAY=5, N=11961, -11968, -11972, -11959, -11958, -11956,
```

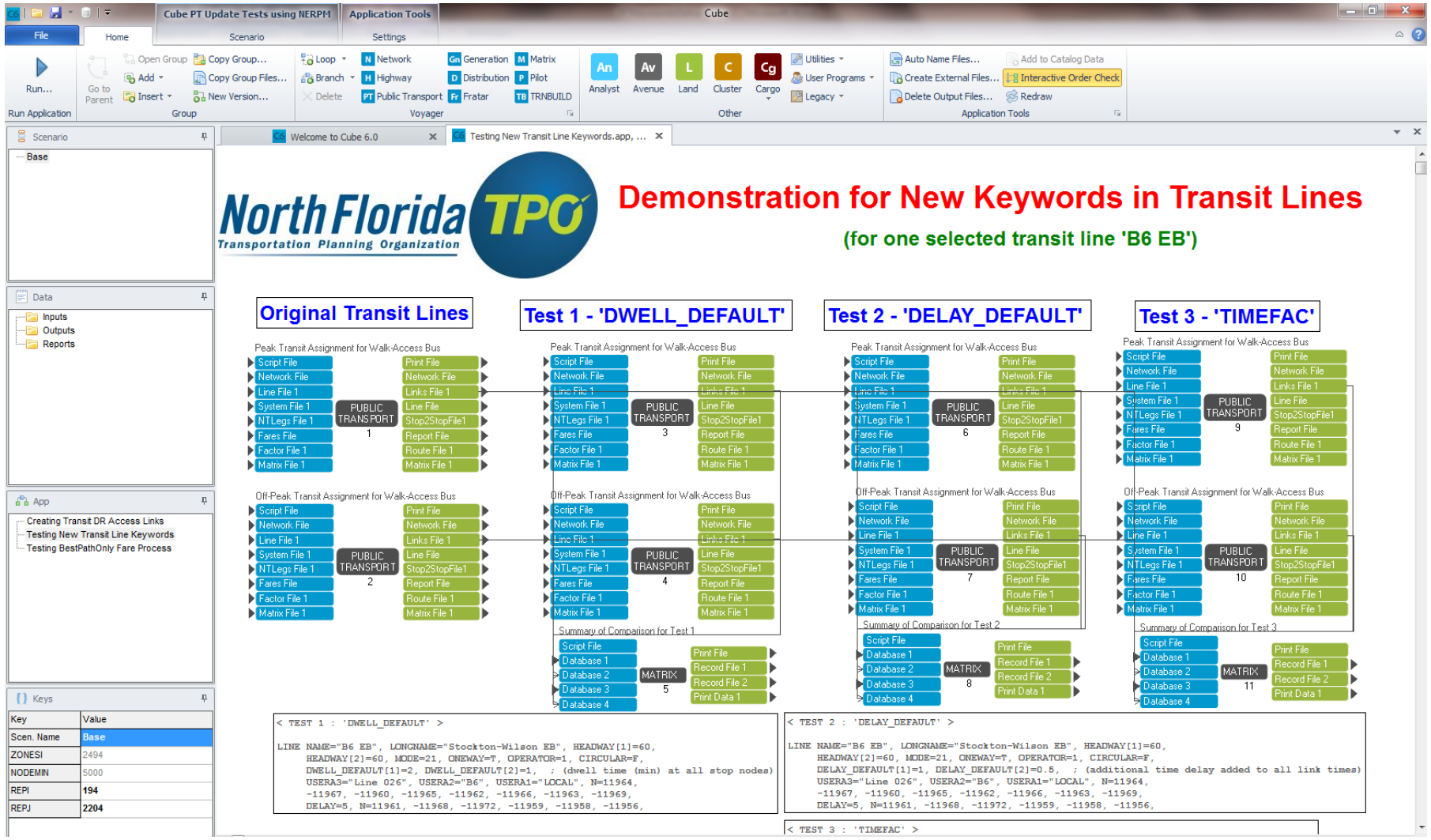
< Comparison of run times in link level >

NAME	A	B	MODE	LINKSEQ	STOPA	DIST	TIME_ORG	TIME_TEST1	TIME_DIFF	TIME_PROP
B6 EB	11964	11967	21	1	1	0.08	0.21	0.42	0.21	2
B6 EB	11967	11960	21	2	0	0.07	0.2	0.39	0.19	1.95
B6 EB	11960	11965	21	3	0	0.04	0.11	0.23	0.12	2.09
B6 EB	11965	11962	21	4	0	0.09	0.23	0.47	0.24	2.04
B6 EB	11962	11966	21	5	0	0.09	0.24	0.49	0.25	2.04
B6 EB	11966	11963	21	6	0	0.03	0.08	0.16	0.08	2
B6 EB	11963	11969	21	7	0	0.06	0.16	0.33	0.17	2.06
B6 EB	11969	11961	21	8	0	0.1	5.27	5.53	0.26	1.05
B6 EB	11961	11968	21	9	1	0.07	0.18	0.37	0.19	2.06
B6 EB	11968	11972	21	10	0	0.14	0.37	0.73	0.36	1.97
B6 EB	11972	11959	21	11	0	0.08	0.21	0.43	0.22	2.05
B6 EB	11959	11958	21	12	0	0.17	0.47	0.93	0.46	1.98
B6 EB	11958	11956	21	13	0	0.33	0.9	1.79	0.89	1.99
B6 EB	11956	11952	21	14	0	0.07	0.19	0.38	0.19	2
B6 EB	11952	12111	21	15	1	0.19	0.44	0.88	0.44	2
B6 EB	12111	12135	21	16	0	0.02	0.05	0.09	0.04	1.8

< Comparison of run times for transit line ('B6 EB') >

PERIOD	DISTANCE (mile)	ORIGINAL (min)	TEST 3 (min)	DIFF (min)	PROPORTION
PEAK	22.1	77.9	150.8	73.0	1.9
OFF-PEAK	22.1	72.7	106.5	33.8	1.5

APPENDIX


Cube PT Update Tests using NERPM
Application Tools
Cube
Scenario
Settings
Run...
Run Application
Group
Voyager
Analyst
Avenue
Land
Cluster
Cargo
Other
Application Tools
Scenario
Base
Data
Inputs
Outputs
Reports
App
Creating Transit DR Access Links
Testing New Transit Line Keywords
Testing BestPathOnly Fare Process
Keys
Key
Value
Scen. Name
Base
ZONESI
2494
NODEMIN
5000
REPI
194
REPJ
2204
Welcome to Cube 6.0
Testing New Transit Line Keywords.app, ...
North Florida TPO
Transportation Planning Organization
Demonstration for New Keywords in Transit Lines
(for one selected transit line 'B6 EB')
Original Transit Lines
Test 1 - 'DWELL_DEFAULT'
Test 2 - 'DELAY_DEFAULT'
Test 3 - 'TIMEFAC'
Peak Transit Assignment for Walk-Access Bus
Off-Peak Transit Assignment for Walk-Access Bus
Summary of Comparison for Test 1
Summary of Comparison for Test 2
Summary of Comparison for Test 3
PUBLIC TRANSPORT
MATRIX
< TEST 1 : 'DWELL_DEFAULT' >
LINE NAME="B6 EB", LONGNAME="Stockton-Wilson EB", HEADWAY[1]=60,
HEADWAY[2]=60, MODE=21, ONEWAY=T, OPERATOR=1, CIRCULAR=F,
DWELL_DEFAULT[1]=2, DWELL_DEFAULT[2]=1, ; (dwell time (min) at all stop nodes)
USERA3="Line 026", USERA2="B6", USERA1="LOCAL", N=11964,
-11967, -11960, -11965, -11962, -11966, -11963, -11969,
DELAY=5, N=11961, -11968, -11972, -11959, -11958, -11956,
< TEST 2 : 'DELAY_DEFAULT' >
LINE NAME="B6 EB", LONGNAME="Stockton-Wilson EB", HEADWAY[1]=60,
HEADWAY[2]=60, MODE=21, ONEWAY=T, OPERATOR=1, CIRCULAR=F,
DELAY_DEFAULT[1]=1, DELAY_DEFAULT[2]=0.5, ; (additional time delay added to all link times)
USERA3="Line 026", USERA2="B6", USERA1="LOCAL", N=11964,
-11967, -11960, -11965, -11962, -11966, -11963, -11969,
DELAY=5, N=11961, -11968, -11972, -11959, -11958, -11956,
< TEST 3 : 'TIMEFAC' >