



## D.19 Changes in SATURN 11.1

### DATE OF LAST UPDATE: 15<sup>th</sup> MARCH 2012

**SATURN** 11.1 was first released in pre-Beta version in June 2011 as 11.1.1, as 11.1.2 in August 2011 etc. etc. up until its first full release as 11.1.8. in January 2012.

The most prominent new advance in 11.1 as compared to previous releases is the full introduction of “Network Aggregation” or “SPIDER” techniques which have been available on Beta-release in 10.9. Basically SPIDER allows the assignment sub-module within **SATURN** to be run up to 10 times faster than traditional methods. In addition the same ideas may be applied to a wide range of post-assignment analyses such as Select Link Analysis although some of these applications are still effectively on Beta release and more will be added in later releases.

For a more complete description of SPIDER methods see Section 15.56.

As always, in terms of backwards/forwards compatibility, the 11.1 network .dat files contain several new features (e.g., parameter names) which will **not** be recognised by pre 11.1 versions of **SATNET** but will not cause the program to crash; however pre 11.1 .dat files will be read perfectly happily by 11.1. Similarly 11.1 network .ufs files contain new arrays which older version exe’s will be able to read but not recognise whereas 11.1 exe’s will be able to read pre 11.1 ufs files. Matrix .ufm files have not fundamentally changed and should be both forward and backward compatible.

In terms of results there have been a large number of both relatively major and minor changes to the simulation so that one might expect 11.1 to give different – possibly significantly different – results to pre 11.1. For this reason the opportunity has been taken to change the default values of a number of parameters, typically options that were introduced in recent releases but “turned off” by default are now “turned on” having been verified in practice. E.g., see notes under **SATNET**.

Our advice therefore would be to re-run old networks “from scratch” and certainly not to do comparisons between 11.1 outputs and pre 11.1 outputs.

The following sections describe the changes made in **SATURN** 11.1, some of which were also included in latest released versions of 10.9, i.e., 10.9.25 (and may also be in the very latest versions of 10.9 which are not on general release). Each note should give the precise release number in which the change was introduced (e.g., 11.1.3), the date and references to relevant sections in the Manual.

### D.19.1 SATNET

- 1) APRESV has been made a link-dependent variable which may be set on the second link record as currently done for TAX, FLAREX and FLAREF. See 6.4.14 and 8.8.3.1. 10/06/11

- 2) New parameter KARL (default = 50) to control when repeated error messages in certain circumstances (e.g., coded distances different from cow-fly distances) are suppressed. See 6.3.2. 23/06/11.
- 3) NO333C = T (which allows zone numbers to be input without a C) has been correctly installed and also applies to data input under KNOB files. See 15.14.5.1. 11.1. 02/08/11.
- 4) The minimum value of NITA\_S has been upgraded to 99 from 25. See 6.3.2. 11.1. 05/08/11.
- 5) The rules for identifying a large input capacity such as 9999 as a “dummy” which is effectively treated as an infinite capacity but very often printed as zero or blank have been changed. 9999 is still a dummy but any values up to 18,888 are treated as “real” on the basis that a 5-lane motorway may genuinely have a 5-digit capacity, 11.1. 23/09/11.
- 6) Banned and/or penalised turns at buffer nodes may now be modelled **provided** that SPIDER = T and the node in question has been aggregated (i.e., removed) by the network aggregation procedure. Thus the 44444 data may now include banned turn data. See 6.9 and 15.56.7. 11.1.1. 15/08/11.
- 7) The rules under which bus routes are allowed to use bus lanes have been improved to consider where the bus route goes next. Thus, for example, a bus route which turns **right** from the most offside lane on a link would not be allowed to use a **nearside** bus lane on that link but would have to join the “normal” traffic as a fixed flow on the central lanes. See 15.39.1. 11.1.3. 09/10/11.
- 8) Bus routes are now allowed to exit and re-enter the coded network at non-adjacent nodes, e.g., to represent a route which uses minor roads which have not been included in the main network. An exit/entry is indicated by including a “wildcard” node number KANGA (default 9999) in the normal list of nodes. See note 12), Section 6.9.2. 11.1.3. 20/10/11.
- 9) A new set of parameters ERRNO(n) allows selected Warnings, Serious Warnings and Non-Fatal Errors to be upgraded to Semi-Fatal Errors, in effect, a form of DIY WRIGHT = T selection of “vital” errors. See 6.12.3. 11.1.5. 11/12/11.
- 10) Options have been introduced to edit or modify bus routes by either including an initial “delete” record to remove a route with the same name which appears later within the 66666 records or over-writing route frequencies also using a previous 66666 record. See 6.9.6. 11.1.8. 13/01/12.
- 11) The default value of NUC has been changed to 10 from 15. The use of AUTNUC = T or setting NUCJT(3) > 10 for signals is strongly recommended. N.B. If NUC is explicitly set in your .dat file changing the default has no effect. 11.1.8. 27/01/12.
- 12) Non-Fatal errors 285 and 286 – repeated &OPTION or &PARAM records – are now, by default, NAFF under WRIGHT = T. 11.1.9. 15/03/12.

## D.19.2 SATALL

- 1) The post-assignment procedure SATUFC which generates a .UFC file to enable O-D paths to be examined has been extended to accept networks which were originally run using OBA and for which the .UFO files are not suitable for all possible analyses, e.g., SATPIG. See 15.23.5. 11.1.1 10/06/11
- 2) An extra parameter MASL\_M (set under &PARAM in SATNET) sets a lower limit on the number of simulation-assignment loops. See 9.2.3. 11.1.1. 13/06/11
- 3) The rules which determine the convergence parameter UNCRTS in the extra SAVEIT assignment have been altered so that it equals the assignment-simulation GAP value. This should ensure that the SAVEIT assignment neither terminates prematurely nor takes excessive iterations. See 15.23.4. 11.1.1. 13/06/11
- 4) Extra stopping criteria for the assignment-simulation loops with KONSTP = 5 and 6 have been added based on GAP **and** ISTOP (5) and GAP **or** ISTOP (6). See 9.2.3. 11.1.1. 15/06/11.
- 5) An alternative REAL form of ISTOP, RSTOP, has been added which allows the critical stopping criteria to take on values such as 97.3% rather than 97 or 98%. The stopping tests are now all based on the "real" value RSTOP although, due to the way in which integer rounding took place before, the end effect is the same. See 9.2.6.
- 6) The method by which a .UFO file is created following a "normal" Frank-Wolfe assignment (i.e., not OBA) has been made considerably faster by making use of a Spider network (assuming that SPIDER = T) plus an improved internal algorithm. The same methods are also used when the batch procedure SATUFO is run on its own. See 22.5.3. 11.1.6. 12/12/11.

## D.19.3 Simulation

- 1) The "rules" for modelling Y-merges have been altered to allow APRESV to have an impact on **either** arm. See 8.8.3.2. Note in addition that APRESV may now be set as a link-specific value; see 6.4.14 and note 1) under D.19.1. 11.1.1. 13/06/11.
- 2) BB109 is always .TRUE. now (Or, strictly speaking, its value is ignored since wherever it was previously invoked the program now assumes it is TRUE.) 28/08/11.
- 3) Simulation nodes with fixed cost-flow curves (FCF) introduced as well as an improved method to convert intermediate simulation networks into buffer (BST). See Section 15.1. 11.1.2. 09/09/11.
- 4) Blocking back has been "tightened up" on links where there is either (a) traffic entering from centroid connectors at the downstream end of the link or (b) buses exiting from the downstream end. The convergence of the blocking back factors should be improved although the overall impact may not be great. 11.1.3. 17/10/11

- 5) Random delays now contribute to extra queues on links but only if a new parameter SIM111 = T. See 8.6.5. 11.1.3. 17/10/11.
- 6) Turns at signals which have been coded with an X but which have only been included in stages where there are **no** opposing turns do not now qualify for an extra TAX capacity at the end of their green phases. They are currently identified as Warning 79 in **SATNET**. See 6.4.2.2 and 8.2.4. 11.1.8. 19/01/12.
- 7) Capacity reductions caused by “weaving” between motorway junctions (Section 15.40) may now be modelled even when network aggregation (SPIDER = T) is being used; previously it could only be invoked if SPIDER was not used. 11.1.8. See 15.56.7.
- 8) Blocking back rules have been substantially revised for links which are parts of chain. Thus, rather than allowing “internal” blocking back as described in Section 8.5.5.1 of the manual to “spread” the queue within the chain, the “internal” blocking back has been removed in order to (empirically) improve convergence. Thus the full queue is calculated and allocated at the most downstream link in the chain, the blocking back factor is applied at the most upstream link but there is now no blocking back and/or queues on any of the intermediate links. The net impact should be much the same as at present since the important blocking back factor which is at the upstream end of the chain should be the same as before; the main differences are presentational in terms of the distribution of the queue along the links in the chain. 11.1.9. 15/03/12.

#### D.19.4 P1X

- 1) Green arrows to change window positions made active during Joy Ride calculations. 11.1.1. 23/06/11.
- 2) Right mouse click to move up one level on the banner menus; i.e., equivalent to Quit/Return/etc. 11.1.1. 16/08/11.
- 3) An option is now provided to directly enter the node selection procedures from within Global Signal Optimisation within Network Editing, rather than having to do node selection first. 11.1.2. 23/08/11.
- 4) The option to read node data into the **SATDB** node data base directly from an external ASCII file has been extended such that the file need not contain any node data, simply a list of node numbers which are used for selection purposes only. Note, however, that a very similar option is already available within the existing Node Selection procedures. 11.1.2. 23/08/11.
- 5) A text file network description corresponding to the map network links may be output from within either Output Files (11.4.2.3) or Network Edits (11.9.2.5). These files may optionally refer to a sub-set of all map links; e.g., simulation centroid connectors only. 11.1.2. 09/09/11.
- 6) All outputs from Node/Zone/Link Information now go to the .LPP file well as to a separate window. 11.1.2. 26/09/11.

- 7) PMAKE (network editing) permits an existing network .dat file to be converted into an alternative form whereby each data segment (11111, 22222 etc.) is created as a separate file which is referenced by \$INCLUDE in the main .dat file. See 11.9.2.6. 11.1.2. 03/10/11.
- 8) An extra option (#24) in the **SATLOOK** node flow-delay tables allows the **differences** in flows and delays between networks 1 and 2 at a single node to be displayed. 11.1.3. 24/10/11.
- 9) Speeds may optionally be output as MPH rather than KPH (although maybe not as yet in every possible location throughout P1X). 11.1.4. 10/11/11.
- 10) Select Link Analysis has a new option to carry out the analysis on **"multiple"** links; i.e., a series of individual links which are treated in a single pass with the select flows being stored in discrete data base columns. See 11.8.1.11 11.1.4. 10/11/11.
- 11) Selected Link Assignment may also now take advantage of Spider networks (SPIDER = T) which means that SLA calculations become considerably faster by factors of up to 10 times. See 11.8.1.12. 11.1.8. 27/01/12.
- 12) SLA link flows on links which are either upstream or downstream of a selected link may now be "filtered" in or out; e.g., one may identify only those flows which occur **after** a selected link has been passed as these would be the links affected if the selected link were blocked for any reason. See 11.8.1.13. 11.1.8. 27/01/12.
- 13) The geometry of node diagrams has been altered such that if two arms are opposite one another (e.g., north and south) and their lane structures do not match then the method for aligning them has been improved. 11.1.8. 27/02/12.
- 14) Various default parameters within Network Editing / PMAKE such as default speeds on newly created links, etc. are now grouped within a single menu which may be accessed from different points. 11.1.9. 03/03/12.

#### D.19.5 MX

- 1) An option has been included to output zero-value cells under Tuba 3 text file outputs. See 10.15.1.5. Release 11.1. 20/07/11.
- 2) A new set of options has been added within Matrix Manipulation (Option 8 from the master menu) to deal specifically with intra-zonal cells. Either a fixed value may be introduced or a value equal to 0.5 times the minimum cell value within each (origin) row (where the latter application is specifically designed to create an intra-zonal cost from an existing inter-zonal cost matrix). See 10.8.7. 11.1.3. 22/10/11.
- 3) The batch procedure MXM5 has been extended to allow both row **and** column (origin and destination) factors to be used and to be defined within the control file. See Appendix W.3. 11.1.3. 22/10/11.



## D.19.6 SATCH

- 1) Certain errors in Namelist inputs (e.g., unrecognised text names) are now upgraded to Fatal. Release 11.1 31/07/11.
- 2) The SPINE option has been upgraded so that rather than just defining a start and end node (NODES and NODEF) to define an interpolated "spine" various intermediate nodes (NODEM) may also be set. See note 7), 12.1.4. Release 11.1 31/07/11.
- 3) A new option ADDXZ has been added such that, if F, then eXternal Zones are **not** ADDED within the 22222 simulation centroid connectors. See note 8), 12.1.4. Release 11.1.2. 14/09/11.
- 4) A new option to produce a new network .UF file with the simulation nodes **outside** the cordon indicated as "fixed cost flow" nodes: set DOFCF = T. See 12.1.11 and 15.1.4. Release 11.1.3. 14/09/11.
- 5) New option INCLUD = T now creates the various 11111, 22222 etc. data sets as external files referenced by \$INCLUDE within the main network .dat file. See note 10), 12.1.4. Release 11.1.2. 21/09/11.
- 6) New option SZONE = T means that the new zones in the cordoned network are assigned **sequential** numbers 1, 2, 3 ... rather than the "names" used in the old network. See note 8), 12.1.4. Release 11.1.2. 28/09/11.
- 7) The output 55555 data segment includes default co-ordinates for the newly created zones at each cordon point. 11.1.3. 17/10/11.
- 8) If the original network .dat file used \$INCLUDE files plus TOPUP = T so that simulation nodes were allowed to appear twice they will now only appear once in the cordoned network .dat files. 11.1.8. 26/01/12.

## D.19.7 SATDB

- 1) The maximum number of potential data base columns has been increased to 48 with a minimum of 24 (previously 24 and 12). 11.1.4. 01/11/11.

## D.19.8 General Changes

- 1) A set of procedures have been introduced with the objective of creating a level of network representation which is intermediate between buffer and simulation: the Fixed Cost Function (FCF) representation. See 15.1. Release 11.1.3. 08/10/11.

IJW / DVV – 31/03/12



## D.19.9 Version Control

JOB NUMBER: 5101396		DOCUMENT REF: App D.doc				
Revision	Purpose / Description					
		Originated	Checked	Reviewed	Authorised	Date
1	Re-formatted (Final to DVV)	TF / BG	NS	IW	IW	06/05/06
2	D.15 added DVV, Minor typos etc. In D-15	DVV				28/05/06
3	Upgrade to V2 Template	DVV	IW	DVV	IW	28/06/06
3.1i	10.6.15 updates added	DVV				05/07/06
3.1ii	Minor on-going updates	DVV				14/07/06
3.2	Web release – Sept 06	DVV	NP	IW	IW	08/09/06
3.3	Web release – Jan 07	DVV	NP	IW	IW	04/01/07
3.4	SATURN v10.7 Release	DVV	NP	IW	IW	12/03/07
3.5	Web release – Jul 07	DVV	NP	IW	IW	19/07/07
3.6	SATURN v10.8 Release	DVV	NP	IW	IW	09/02/08
3.7	Web release – Jul 08	DVV	NP	IW	IW	07/07/08
3.8	Web release – Dec 08	DVV	NP	IW	IW	12/12/08
3.8.21	Web release – Feb 09	DVV	NP	IW	IW	16/02/09
3.8.22	Web release – Jun 09	DVV	NP	IW	IW	16/06/09
10.9.10	SATURN v10.9 Release (absorb App D17)	DVV	DG	IW	IW	04/09/09
10.9.12	SATURN v10.9 Release (Full)	DVV	DG	IW	IW	22/10/09
10.9.22	Web release – Dec 10	DVV	AG	IW	IW	06/12/10
10.9.24	SATURN v10.9 Release (Full)	DVV	AG	IW	IW	06/05/11
11.01.09	SATURN v11.1 Release (Full)	DVV	AG	IW	IW	31/03/12