

N. Guidance Notes

Overview

Guidance is provided below on the following issues:

- ◆ N.1 SATALL UFS LPT Hanging / Corruption - prior to 11.4.07H.
- ◆ N.2 SAVEIT Approximation
- ◆ N.3 UFO Files & Pre-11.4.07H Release

If you require further technical support, please do not hesitate to contact us at saturnsoftware@atkinsglobal.com

N.1 SATALL UFS LPT Hanging / Corruption - prior to 11.4.07H.

Prior to 11.4.07H, in certain circumstances, SATALL will appear to have successfully completed but subsequent attempts to access the resulting output UFS file (eg using P1X) will generate an exception error or fail to run.

It is an intermittent problem that has been very difficult to reproduce, investigate and resolve. The problem arises with the interaction of Silverfrost's Clearwin+ Graphical User Interface routines, as used by SATURN, and the Windows Operating System.

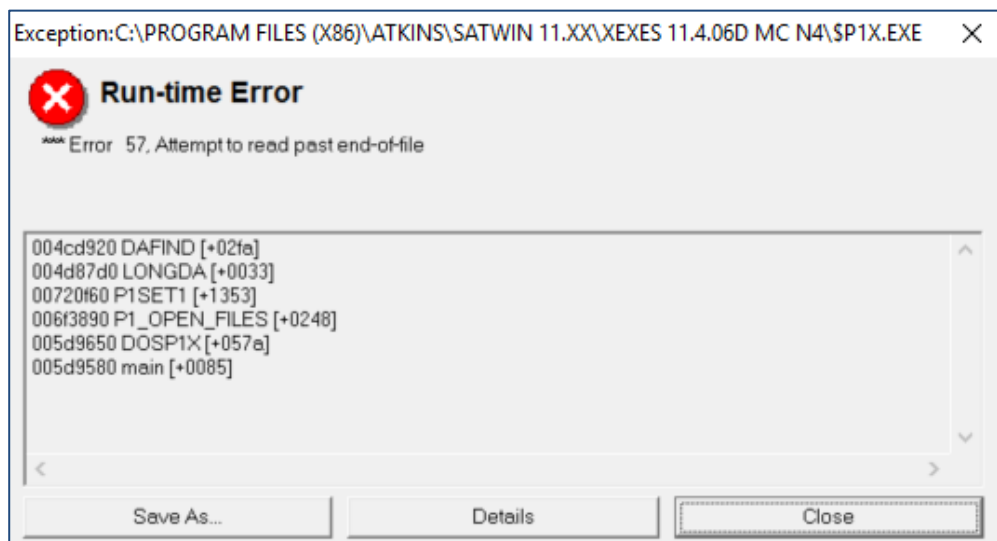
In developing the 11.4.07 release, we have reconfigured the program so that the program closes the files earlier in the process, so if it fails at the very end the files themselves should be complete and usable in subsequent processing. Following discussions with Silverfrost, we have now received updates to the compiler and libraries. We believe from SATURN 11.4.07H onwards this problem is fixed.

For earlier versions, a workaround described below should be used if you hit the problem.

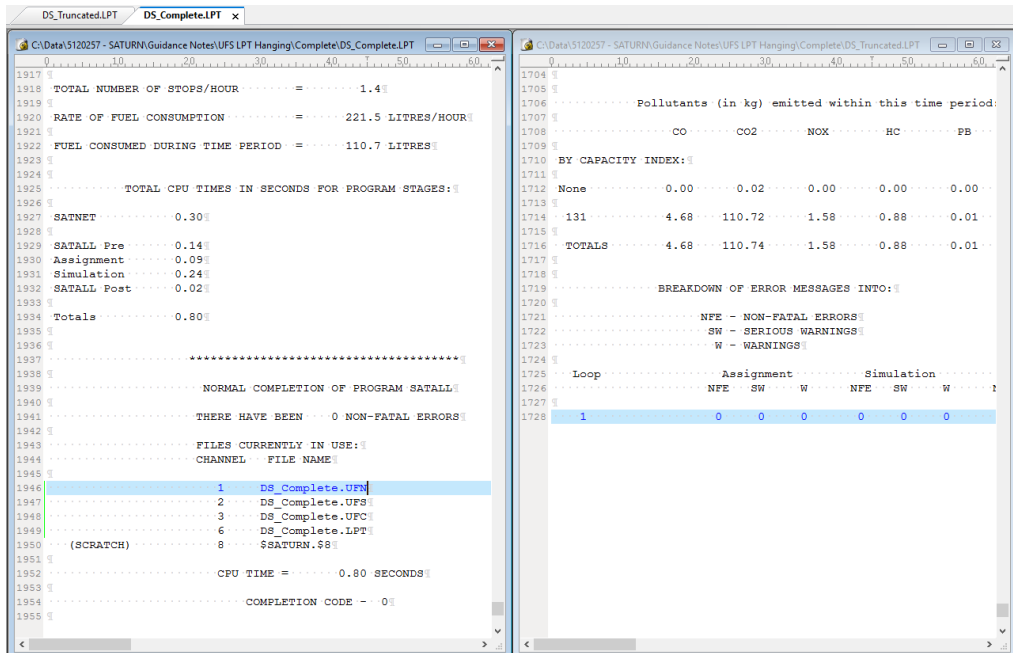
N.1.1 Examples of the Problem

Users will typically encounter the problem in one of four ways:

- 1) When trying to subsequently open or access the UFS file produced by SATALL in another software application (eg P1X or SATLOOK), a Run-time Error message is generated:



- 2) When looking at the SATALL LPT file, the file is truncated as shown on right-hand side file below:



```

1917
1918 TOTAL NUMBER OF STOPS/HOUR ..... = ..... 1.4
1919
1920 RATE OF FUEL CONSUMPTION ..... = ..... 221.5 LITRES/HOUR
1921
1922 FUEL CONSUMED DURING TIME PERIOD = ..... 110.7 LITRES
1923
1924
1925 ..... TOTAL CPU TIMES IN SECONDS FOR PROGRAM STAGES:
1926
1927 SATNET ..... 0.30
1928
1929 SATALL Pre ..... 0.14
1930 Assignment ..... 0.09
1931 Simulation ..... 0.24
1932 SATALL Post ..... 0.02
1933
1934 Totals ..... 0.80
1935
1936
1937 *****
1938
1939 ..... NORMAL COMPLETION OF PROGRAM SATALL
1940
1941 ..... THERE HAVE BEEN ..... 0 NON-FATAL ERRORS
1942
1943 ..... FILES CURRENTLY IN USE:
1944 CHANNEL FILE NAME
1945
1946 1 DS_Complete.UFN
1947 2 DS_Complete.UFS
1948 3 DS_Complete.UFC
1949 6 DS_Complete.LPT
1950 (SCRATCH) 8 $$SATURN.$$
1951
1952 ..... CPU TIME = ..... 0.80 SECONDS
1953
1954 ..... COMPLETION CODE - - 0
1955

1704
1705
1706 ..... Pollutants (in kg) emitted within this time period:
1707
1708 CO CO2 NOX HC PB
1709
1710 BY CAPACITY INDEX:
1711
1712 None ..... 0.00 ..... 0.02 ..... 0.00 ..... 0.00 ..... 0.00
1713
1714 131 ..... 4.68 ..... 110.72 ..... 1.58 ..... 0.88 ..... 0.01
1715
1716 TOTALS ..... 4.68 ..... 110.74 ..... 1.58 ..... 0.88 ..... 0.01
1717
1718
1719 ..... BREAKDOWN OF ERROR MESSAGES INTO:
1720
1721 ..... NFE - NON-FATAL ERRORS
1722 ..... SW - SERIOUS WARNINGS
1723 ..... W - WARNINGS
1724
1725 Loop Assignment Simulation
1726 NFE SW W NFE SW W
1727
1728 1 0 0 0 0 0 0

```

- 3) An unexplained crash or hang within an internal looping process (eg DIADEM-based Variable Demand Model) without any obvious failure mode. In the DIADEM instance, one of the output UFS file may have become corrupted but the problem is not immediately picked-up and DIADEM subsequently fails with an unhelpful error or simply 'hangs'.
- 4) An exception error after SATALL has tried to exit but fails to do so – this problem may still arise but we have not been able to reproduce it to date.

N.1.2 Workaround

As noted above, the problem has been fixed we believe in the majority of circumstances from SATURN 11.4.07G onwards. For earlier versions, the workaround is to change the default parameters so that the software does not use the Clearwin+ graphics libraries. This may be undertaken by either:

- 1) Setting WINDY=F in the network DAT file – this replaces the summary information panels with scrolling text windows (see section 6.3.1 of the User Manual)
- 2) Setting QUIET=T in SatWin or directly via the use of environmental variable command SET QUIET=T (see section 15.55) – this removes all on-screen reporting

Note that neither option changes the results from the assignment.

N.2 SAVEIT Approximation

N.2.1 Background

The SAVEIT Approximation is an integral part of the SATURN assignment and is used to reduce the amount of time taken (and storage space required) to undertake secondary analysis tasks including skimming, select link analysis and cordoning. However, the importance of the SAVEIT approximation (and the associated controlling parameter, NITA_S) on accuracy of the resulting outputs from SATURN is less well understood.

This perception continues to be reinforced by the examination of the SATURN assignments we often receive on the technical support helpdesk that flag inappropriate values for the key NITA_S parameter.

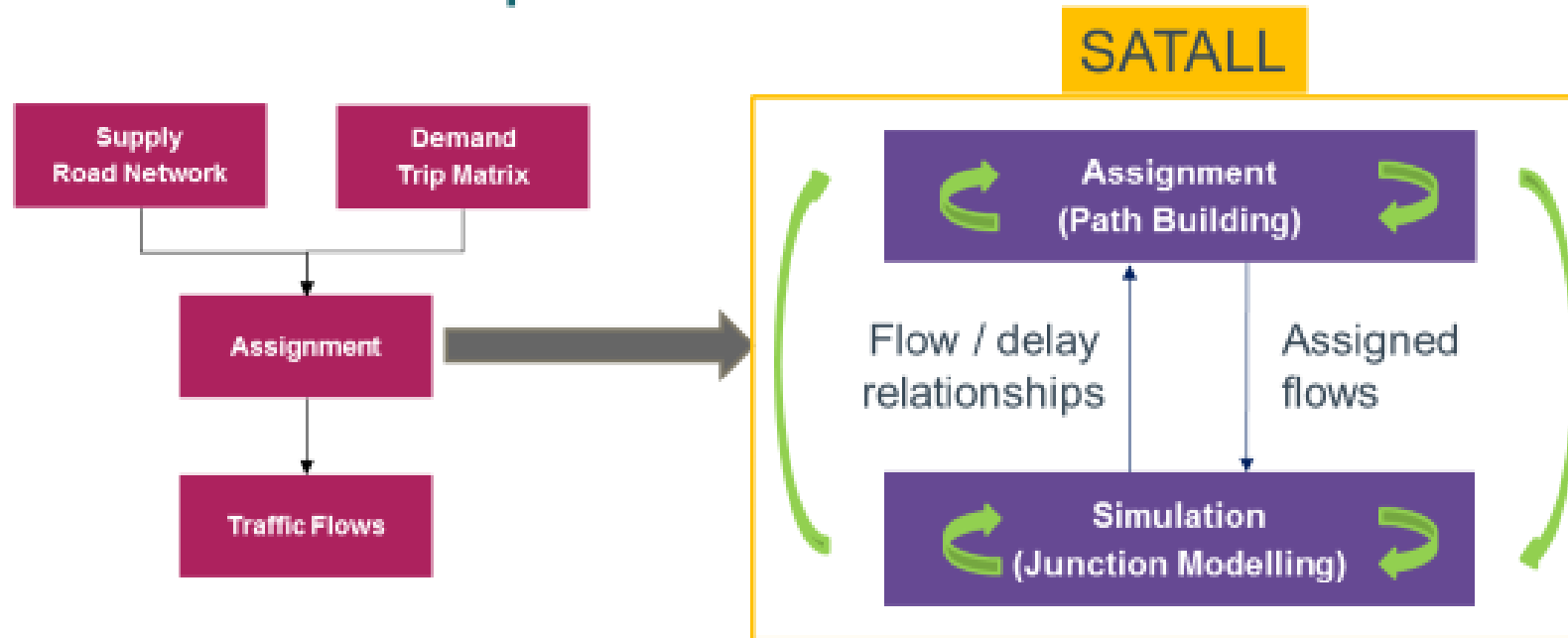
N.2.2 UGM Presentation

To assist users in understand more about the SAVEIT approximation and the possible unintended (and negative) consequences of using incorrect (low) values, Atkins gave a presentation at the 2017 User Group Meeting. The presentation is reproduced below.

A more detailed description of the SAVEIT Approximation is provided in section 15.23 of the User Manual.

SATURN Assignment 101

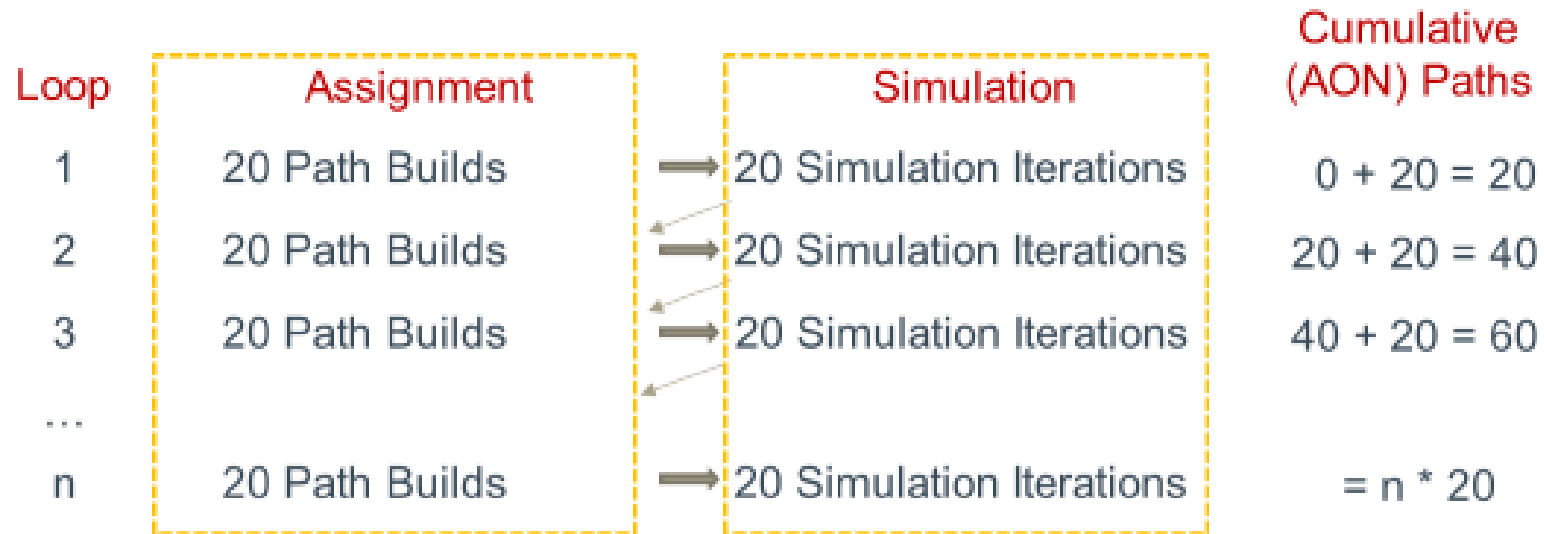
- Quick recap



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Assignment Process



Iterate until Stability (%Flow) & Proximity (%GAP) targets are satisfied

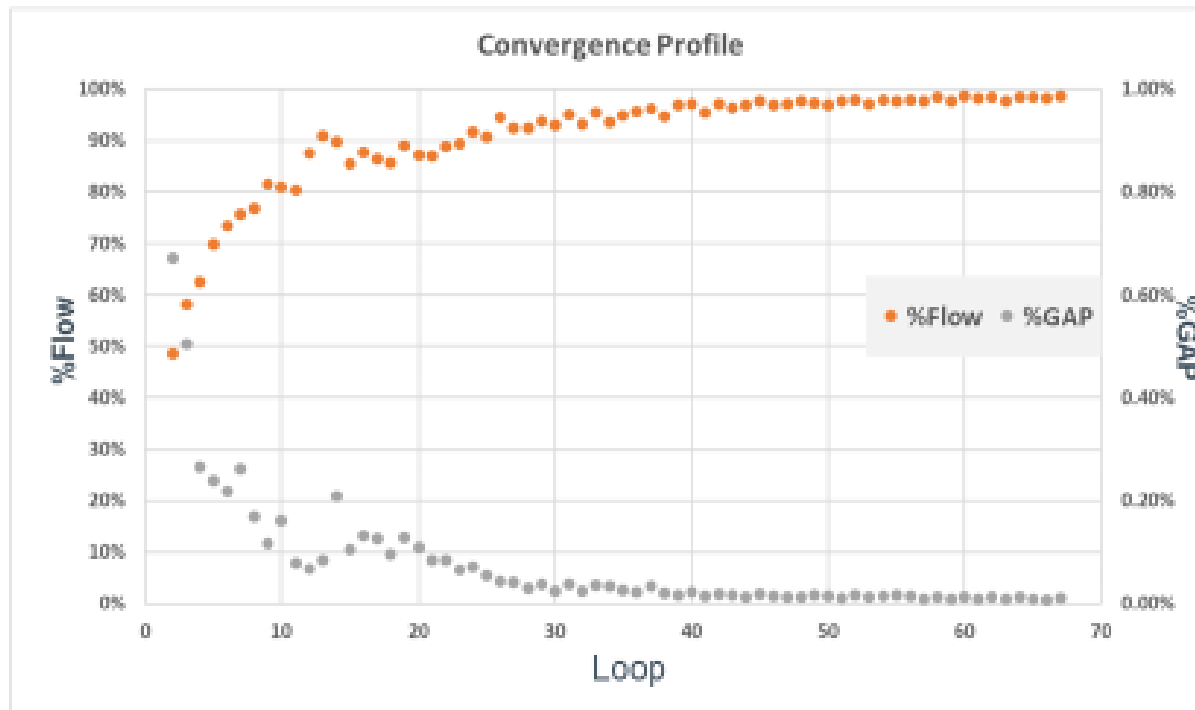
- See Table 1 in LPT file

Potentially, several hundred paths used to create the final assigned flows

- SAVEIT approximation used to reproduce but using fewer paths

Assignment Noise

- Convergence Profile: LPT Table 1 plotted

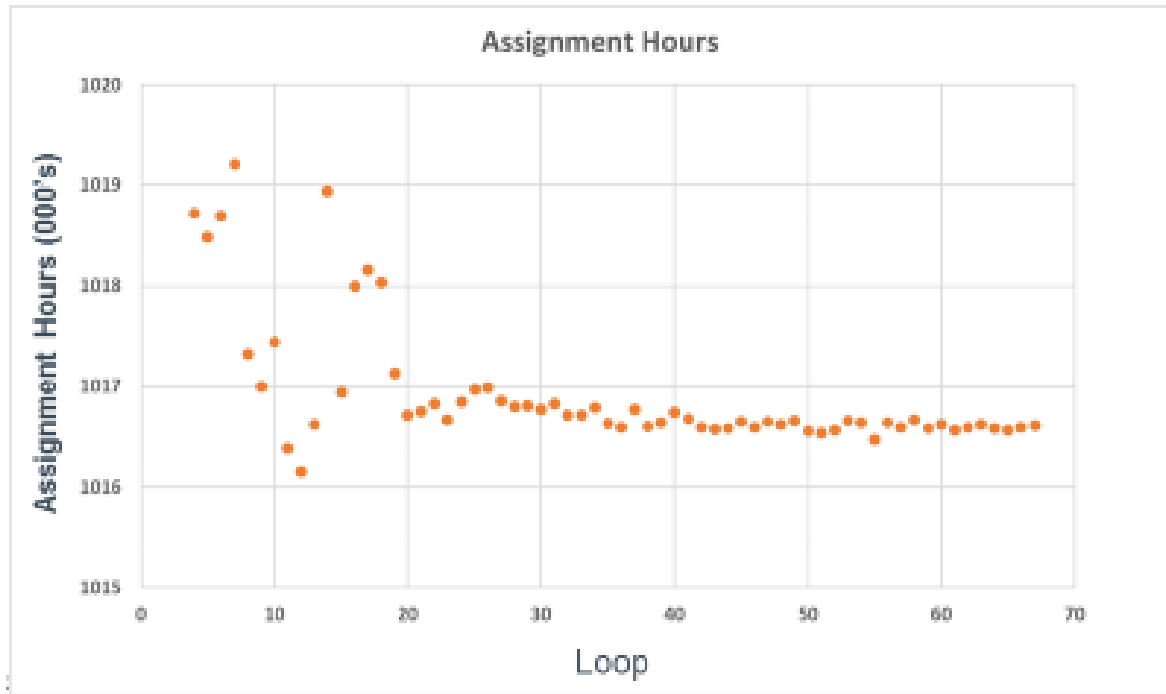


Note:

- Output at end of each loop may be a final converged solution
- NISTOP = 4 but why not 5 instead?
- Each solution will be different
- Variation in each assignment!

Assignment Noise

- Convergence Profile: LPT Table 2 Assignment Hrs



Note:

- As %GAP reduces, variation between successive loops will reduce
- Perfect convergence = identical
- Scheme Appraisal uses the time skims
- Difference of
DM v DS >>
DM (n+1) v DM (n)
& DS (n+1) v DS (n)

Impact on TUBA Scheme Appraisal



- Illustrative Example (i): Commentary

- Cost data stored in the UFC file for secondary analysis
- Recreates assignment using either:
 - the original full set of paths used or a SAVEIT approximation
- By default, **UFC109=T** & **NITA_C=256** so:
 - full set saved unless cumulative path builds > 256
 - otherwise SAVEIT used - maximum no. of path builds set by **NITA_S**
- **Value of NITA_S is very important**
 - If too small (e.g. 25!) then too few paths used in SAVEIT approximation
 - Likely that very poor Wardrop solution (Approximation %GAP >> Final %GAP)
 - **Use v11.4 default: NITA_S=256**

Impact on TUBA Scheme Appraisal

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Member of the OGC-Lloyds Group

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Impact on TUBA Scheme Appraisal - Illustrative Example (iii)



- With & Without Scheme Scenarios, 60 year appraisal
- Shows changes in PVB arising from inaccuracies in the SAVEIT approximation

	Ref Case	Run 1	Run 2	Run 3	Run 4	Run 5
NITA_S	256	25	99	256	256	256
NISTOP	4	4	4	5	4	4
RSTOP	98.5%	98.5%	98.5%	98.5%	97.5%	94.5%
AM - %Flow	98.9%	98.9%	98.9%	98.5%	98.0%	96.7%
AM - %GAP (Main)	0.009%	0.009%	0.009%	0.008%	0.010%	0.036%
AM - %GAP (SAVEIT)	0.010%	0.164%	0.016%	0.008%	0.012%	0.036%
PVB (Index)	100	85 !!!	95	95	95	95

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NB: Scheme / scenario specific!

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N.3 UFO Files & Pre-11.4.07H Release

N.3.1 Background

Over the last few years, the use of UFO paths has been recommended, particularly for larger models, to speed-up all secondary analysis processes. The advantages of the UFO files, as recently highlighted at the Annual User Group Meetings, are summarised below.

SATUFO Files (Another reminder!)

We should be using them by default ...

Store path (origin-based) information
Secondary analysis undertaken using UFO files


Advantages:

- Paths **extracted** rather than **recreated** from existing link costs (UFC)
- Secondary analysis only takes a few minutes
- Same levels of accuracy as the UFC file
- Available in SATLOOK, SATCH, SLAs & SATPIJA
- Create during the assignment (SAVUFO=T) or post-assignment (SATUFO)
 - but for larger models, recommend calling SATUFO separately


Disadvantages:

- Assignments will take longer (an extra process)
but available with Multi-Core (& SatGPU soon!)

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HIGHLY
Recommended



Further details on .UFO files is available in sections 15.23.6 and 22.5 of the User Manual.

N.3.2 Recent Updates

Following the release of SATURN 11.3.12U in November 2015, several inconsistencies have been identified with data stored in .UFO files and their accuracy.

Whilst the inconsistencies are believed to be relatively minor, users are strongly recommended to migrate to the latest SATURN release (11.4.07H at the time of writing) rather than continuing to use older versions, irrespective of whether they are using .UFO files or not.

In the following sections, the previously reported issues to date with the UFO files are summarised for clarity.

N.3.3 Pre-11.3.12W Release (May 2017)

The 11.3.12W Release provided a significant revision to the creation of UFOs to create the problem of truncated paths generated for specific cell ij pairs when there was no demand (ie $T_{ij}=0$).

Where the UFO was used for normal select link analysis or cordoning, by definition T_{ij} was non-zero, and 11.3.12W materially gave the same results. For

N.3.4 11.4.06D Release (February 2018)

As noted above, the subsequent 11.4.06D Release in February 2018 enabled the problem of path truncation for cells $T_{ij}=0$ to be fully resolved by modifying the UFO algorithm rather than relying on the use of very small seeding values (with PLUFO) to prevent the issue being encountered.

N.3.5 11.4.06H Release (August 2018)


Whilst not specifically .UFO related, the 11.4.06H Release in August 2018 has also resolved several recently uncovered issues in the creation of both .UFC and .UFO files, as documented in App E-Latest, and reproduced below:

- ◆ SATALL / P1X / SATLOOK - If the CLIMAX option is used at all then any .UFC file created by SATUFC or any .UFO file created by SATUFO will be compromised - but the flows etc. generated by SATALL are correct. This means that any analysis options such as SLA undertaken in P1X will also be incorrect - the margin of error will be dependent on the relative contribution CLIMAX has on the network costs (and how they subsequently accumulate over the iterative path-building process). NB: any .UFC or .UFO files generated during by the assignment are **not** affected. (see #133)
- ◆ SATUFC - the post-assignment process to generate the .UFC may produce different paths to original SAVEIT=T assignment as it was not receiving the value of UNCRTS used in the equivalent process. The problem also affected by CLIMAX and Q-node issues. Longstanding bug now resolved (see #134)

Recommendations

All users are recommended to migrate to the latest SATURN release to take advantage of the latest functionality and corrections.

N.4 Version Control

JOB NUMBER: 5165870		DOCUMENT REF: App N.doc				
Revision	Purpose / Description					
		Originated	Checked	Reviewed	Authorised	Date
10.9.10	SATURN v10.9 Release	DVV	DG	IW	IW	04/09/09
10.9.12	SATURN v10.9 Release	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
11.1.09	SATURN v11.1 Release (Full)	DVV	AG	IW	IW	31/03/12
11.2.01	SATURN v11.2 Beta Release	DVV	JS	IW	IW	07/12/12
11.2.05	SATURN v11.2 Release (Full)	DVV	JS	IW	IW	17/03/13
11.3.03	SATURN v11.3 Release	DVV	SN	IW	IW	28/02/14
11.3.07	SATURN v11.3.07 Release	DVV	DAS	IW	IW	26/09/14
11.3.10	SATURN v11.3.10 Release	DVV	DAS	IW	IW	19/01/15
11.3.12	SATURN v11.3.12 Release	DVV	DAS	IW	IW	20/04/15
11.4.06	SATURN v11.4.06 Release	DVV	DAS	IW	IW	18/01/18
11.4.07	SATURN v11.4.07 Release	IW	DAS	IW	IW	23/08/18