Traffic Software News

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TRANSYT 12 Maintenance Release

TRL is pleased to announce that a new maintenance release of TRANSYT 12 is now available to current maintenance holders (on request to the TRL Software Bureau). This release incorporates a number of improvements and minor repairs which are summarised below. This release (12.1 AE/5) can be used in place of all previous releases of TRANSYT 12.

The main improvement is the addition of a new **Cycle Time Graph.** Users can now generate a graph of overall Performance Index (PI) against a fixed range of cycle times, in addition to the existing Queue, Performance Index, and Cyclic Flow graphs already produced by the Graph Generator.

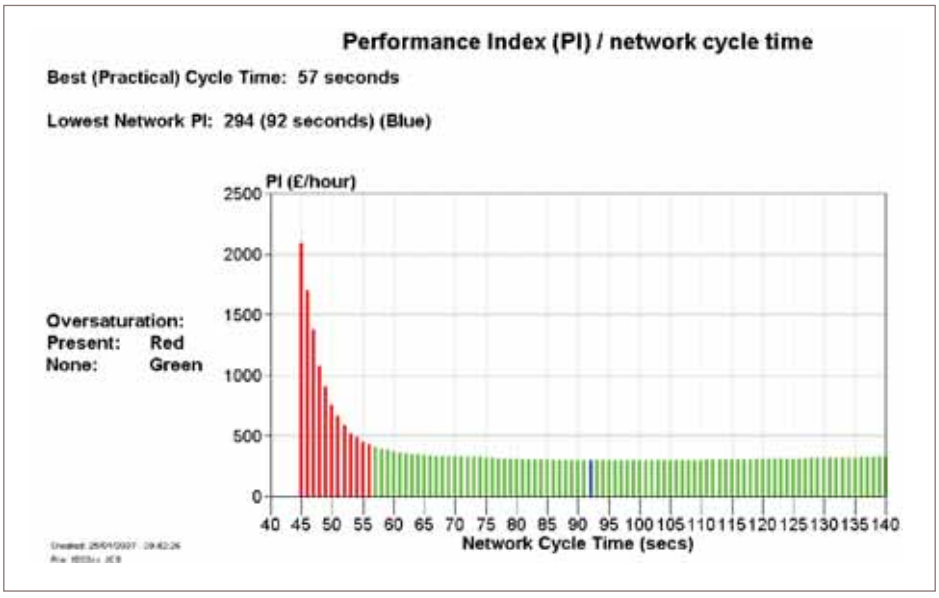
This feature complements CYOP. It does not produce the double-cycling recommendations but does have the benefit of showing PI data based on **full runs of TRANSYT,** as opposed to the node-independent results of CYOP. Cycle times shown in green indicate that no links are over 90% saturated, while cycle times which result in ANY link being over 90% saturated are shown in red. The cycle time producing the lowest PI is stated at the top of the diagram and is indicated on the graph in blue. The lowest cycle time for which no link is over 90% saturated, is also stated i.e. described as the "Best (practical) cycle time".

Other improvements and bug fixes are as follows:

- GUI: Problem of saving data-changes after use of Graph Generator fixed.
- GUI, ANALYSIS and STAGOR programs: Generation and reference to SCR files removed from all programs to avoid identification of them as potentially-malicious code by virus checkers.
- GUI: Graph Generator now recognises bus link data-format allowing bus-only links to be plotted.
- NETCON: Loss of the scrolling, panning and zooming functions is now fixed.
- NETCON: Priority node positions and numbers are no longer knocked out of position when new priority nodes are added. Priority nodes are now named after a local link number instead.

N.B. This repair has necessitated a change to the format of NetCon's .NCE files. When an NCE file of the older format (1.0) is loaded it will be converted automatically to the new format (1.1). **This format is not compatible with earlier releases of TRANSYT 12,** but an option to save to the old format is provided.

To minimise any inconvenience of working with both the old and new formats, we highly recommend encouraging your colleagues to update their version of TRANSYT 12.



- NETCON: Now correctly displays signalled links which are also referenced as a priority link by a giveway link.
- ANALYSIS: TRANSYT no longer automatically adjusts inconsistent node data for those nodes not in the optimisation list. TRANSYT now reports these faults in the data file as errors to be corrected by the user before the run is allowed. This change to TRANSYT has been made because TRANSYT's automatic editing of the data, to make a valid run, was not always consistent with user requirements, and the event was hard to spot as no warning was given when this occurred.
- ANALYSIS: Problems with ten-stage nodes now fixed.
- VIEWER: The latest VIEWER program is supplied, which no longer requires write-access to the application folder to work.

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Creating the future of transport
Software Bureau


FAQ's

This month we bring you our first ever set of OSCADY PRO 'Frequently Asked Questions' in addition to those covering ARCADY, PICADY, and TRANSYT.

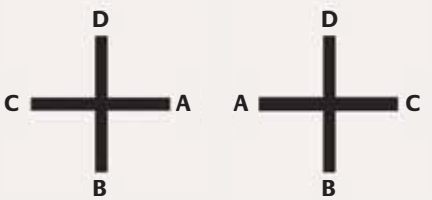
I am using the ODTAB option but OSCADY PRO will not run

For ODTAB flows to work correctly, you must specify turning movements on each lane, via the *Nearside Movement* etc data item fields for each lane. This is so that the ODTAB flows can be allocated across traffic streams according to the left/straight/right movements on the lanes in the traffic streams.

For the turning proportions to be correctly calculated, you must set up the arms to follow the naming convention used in OSCADY Classic, that is, each numbered arm must be positioned clockwise from the previous arm for drive-on-the-left or counter-clockwise for drive-on-the-right. Otherwise, the turning proportions grid will be inconsistent with the ODTAB grid.

Furthermore, ODTAB can only be used when there are either three or four arms in the junction. If your junction has more than four arms and you need to use ODTAB, you could consider merging two close together arms into a single OSCADY PRO arm. (You can then use the *Keep traffic streams on each arm together* option in the Junction Diagram screen to allow the individual traffic streams to be moved separately.)

The arm numbering convention for ODTAB is shown below, where A = Arm 1 etc.



DRIVE-ON-THE-LEFT DRIVE-ON-THE-RIGHT

In more complex cases, it may be better to use the DIRECT data option and input individual flows for each traffic stream.

Can I cut and paste data from/to a spreadsheet?

The *Copy* button on the main toolbar will copy data to the clipboard from most screens. Data is copied from the OSCADY PRO screen you last clicked on, and the exact format depends on the particular screen. See section 5.10 of the OSCADY PRO User Guide for details. In addition, some screens have their own copy and paste buttons, such as the Traffic Flows screen, which allow you to paste data directly from a spreadsheet.

Can I model mutually opposed traffic streams?

You cannot model a situation where traffic stream A both opposes and is opposed by traffic stream B. In fact this is a very complex and as yet unsolved modelling problem. If you need to model this situation, then you should either separate the turning movements out into separate traffic streams, or, if this is not possible, model one of the traffic streams as unopposed and reduce its saturation flow to compensate.

The Practical Reserve Capacity (PRC) is negative for the Critical Cycle Time objective

The Critical Cycle Time objective calculates signal timings which give the shortest cycle time that allows the junction to operate within capacity. Usually, therefore, the PRC for this objective should be precisely zero. However, when using integer phase timings, rounding effects can lead to the PRC being slightly less than zero. We expect to improve this for future releases of the program but, in the meantime, to obtain more accurate results, go to the *View>Options* screen and turn off the *Integer Phase Timings* option.

Is it possible to make reports shorter?

The length and content of reports are determined by the options you choose on the *Report Setup* screen, and you can also choose which sequences/objectives to include in reports by right-clicking on the grid in the Summary Results screen - see section 10.2.5 of the OSCADY PRO User Guide for more details.

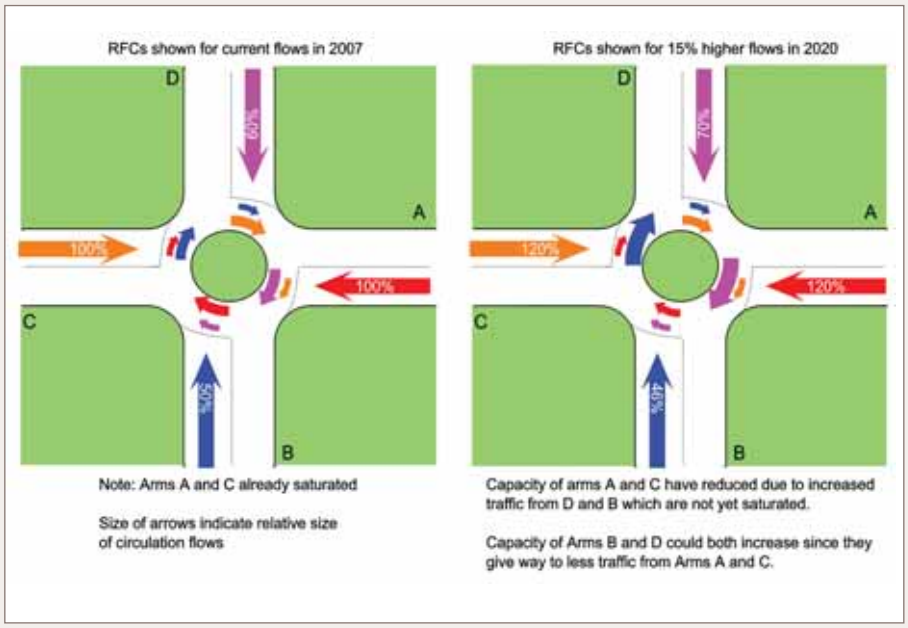
Why does the total vehicles/hour in the final table of the ARCADY output file not match the ODTAB totals?

The difference between the ODTAB demand data and the value shown in the final table is connected to the way ARCADY synthesises the demand profile. ARCADY synthesises a normal curve of the demand based on the input demand data (in the form of ODTAB data). The ODTAB values represent the total demand in a one-hour period. However, the ODTAB synthesised profile always covers a period of 90 minutes, with the first and last 15 minutes assumed to be a flat profile with a flow rate matching the starting flow rate at either end of the synthesised central 60 minute profile (See figure 4-7 in AG49). The values shown in the final output table are based on the full 90 minutes, so give a lower flow-rate figure than the central 60 minute (ODTAB) figure since it includes the flat profile in the extra 15 minutes either side of the peak which reduces the average.

I am evaluating a grade-separated roundabout using ARCADY. After comparing runs for 2006 and for 2013 I am getting some results that appear to suggest that despite increased flows in the future one of the approaches actually benefits. Can this be right?

Changes in flows can have this effect for two reasons. Firstly, changes of demand can alter the circulating flows that flow past each arm. This is because when one arm reaches saturation it will not be able to deliver any more traffic while other more lightly loaded approaches can continue to increase their contribution to the circulating carriageway. In turn, this has the effect of changing the turning proportions past each arm and can occasionally result in an improvement despite the general rise of traffic demand on each approach (see diagram). This effect is often not seen simply because the general increase of traffic will often swamp the reduction effect and all the user will see is a smaller reduction in capacity on one arm compared to the reduction on the others.

In this particular example the reason for the improvement is due to a second, entirely different, effect which is specific to large or grade-separated roundabouts. In 2013 the junction is heavily oversaturated with excessive queuing on all approaches. The flows have been scaled up for 2013 from the base year of 2006. The CIRFLO values (i.e. the mean circulating flow past each arm for the



central 30 minutes of the modelled time period) have been calculated automatically – and here lies the problem! The initial automatic calculation of these values does NOT take account of suppressed demand and so the values used in the 2013 case are wrong. The values for this year need to be manually calculated, taking account of the suppressed demand (see Appendix H of the Application Guide AG49). The values for 2006 may also be wrong and should also be calculated in the same way. This is likely to remove the effect described, i.e. Arm A queues less in 2013 than in 2006.

Remember – Going out on-site and collecting CIRFLO data is the most accurate and robust method. When this is not possible, say, when using predicted data for future years, the calculation of CIRFLOW is a manual iterative process as described in Appendix H. For this situation, ARCADY only works out the values for the first iteration – the rest are up to you. Thankfully the number of iterative steps is usually very small.

What is the recommended/ acceptable approach to modelling a junction to compare existing conditions and future conditions (due to say development)?

To compare overall junction efficiency you can use the overall minutes of delay, but you might also want to ensure no RFC value (ratio of flow to capacity) is too high, particularly on any approaches with high flows. Furthermore, you might wish to ensure that the maximum 'arriving vehicle delay' value on each approach is at an acceptably low value (N.B. this feature is only available in PICADY 5 and ARCADY 6). It also depends on the client requirements, i.e. other client or context-dependent requirements may be relevant.

When comparing scenarios at a junction, say existing (based on traffic counts) and future (based on estimated traffic increases), does the demand data need to be the same type for both scenarios in order to compare the model's calculated output results? e.g. if the existing scenario was modelled using 'DIRECT' data and the future scenario modelled using 'ODTAB' data, would this produce comparable RFC values and would this be an accepted/valid approach ?

Not necessarily - it depends on how close the DIRECT data is to the profile predicted by ODTAB. The best option might be to try to use all of the data you have i.e. use DIRECT rather than dumb-down your results to match those in the future case. At the very least you can compare your current DIRECT run with an ODTAB run using the same data and see if the profiles differ.

One option would be to take the future ODTAB data and create DIRECT data from it by splitting the flow into the separate time segments needed by the DIRECT option. The DIRECT data values can then be set to match the *profile* of your known existing DIRECT data while retaining the original total flow. I would not normally suggest trying to artificially 'create' new data from ODTAB, but in this case you are actually applying more information to achieve it by making an assumption that the *profile* will be the same in the future as it is now. This of course is another 'guess' and the fact that you have made this assumption should be explained to anyone you present the results to.

Why is the default simulated time in TRANSYT set to 120 minutes in the Common Data screen? I know that I can easily reset the default to the 60 minutes which I normally use. How is it related to the 60 minute period you are normally providing flows for and modelling?

The one-hour flow data specified is of course only a 'flow rate' shown in the units "PCU/hour" and not the flow over a one hour period - It is the 'simulated time that determines the modelled time period. The simulated time takes account of the build up of queues over the simulated time - It only affects the results when there is oversaturation within the network. A simulated time of 60 minutes of a 60-second cycle will give the average values for 60 cycles of the network.

The simulated time in TRANSYT set by default to 120 minutes is neither correct or incorrect. It depends really on what you want to do in TRANSYT - this is why the more conservative value is used. It is not a 'default' to be left as it is - it needs to be 'set for purpose'.

For example, if you simply wish to obtain the average results for a 60 minute period then 60 minutes is what you need - not 120. However, if you are more interested in the final queue lengths at the END of a 60 minute period for a heavily congested network (i.e. significant number of links over 90% saturated), then 120 minutes simulated time is better.

This is because the TRANSYT results are an average over the modelled time period, and when the network is congested the queues will be made up mostly by random (due to cycle-to-cycle variation) and oversaturated components. To get an idea of the queue lengths at the end of the 60 minutes you need to double the simulated time to 120 minutes (assuming that the average value will then equate to approximately the queues half-way through the time period. It is not totally right of course, as the final queues also contain the uniform (due the typical cycle) queue component, but it will give a reasonable estimate of the value wanted. The values affected by changing the simulated time will be the delays, queue lengths, and PI values. It does not affect the optimisation process however, so the green times and offsets remain the same as do the degree of saturation values.

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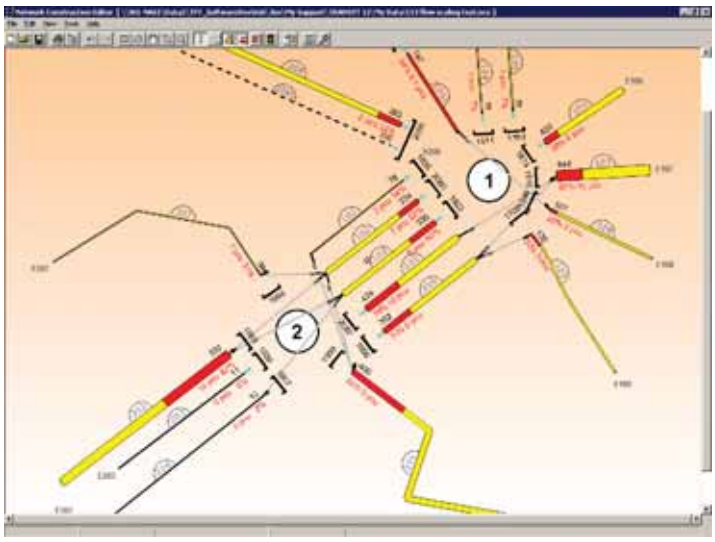
Modifying the default values for the costs of stops (K) and delays (W) in the performance index in TRANSYT/12

As part of the review of the TRANSYT program for TRANSYT/13 the fuel consumption, and more particularly, the default quarterly values of W and K in the Performance Index were reviewed. See Chapter 6 in the TRANSYT 12 USER GUIDE TRL AG48 c, supplied on the software CD, for details of how to edit and save default COMMON VALUES on data card type 1; try it with the sample data set TRL1.DAT. In these example data sets the values of W and K were set to 1420 and 260 respectively, a ratio of 5.462 (W/K) generating a TOTALS PI of 1507.1; they can be easily changed for you to test this out.



A review of current practice in the estimation of fuel consumption relationships found that there had been no recent work using the form of three-stage fuel consumption relationships used in TRANSYT (versions of which are also used in the traffic assignment programs SATURN and CONTRAM). Currently the only satisfactory approach to updating the three fuel consumption equations is to factor the coefficients pro-rata with any evidence on the changing fuel efficiency of vehicles, in a similar way to the revision of the relationships in 1996 (section 3.11.1 in TRANSYT/12 User Guide). Based on the latest evidence on changes in fuel efficiency and the mix of vehicle types, the average car fuel consumption had decreased by 19.2% by 2002. The evidence for other types of vehicles is less clear as changes in vehicle size have offset much of the increases in engine efficiency. It is safest to assume that, as in the 1996 revision, the fuel consumption of non-cars has not changed markedly since 1980.

Assuming that non-cars make up about 14.2% of kilometrage in the urban areas in 2003 (DfT figures), the fuel efficiency per vehicle had increased by 17% since 1980, and per pcu by 16.6%. Coincidentally, these figures are very similar to those used in the 1996 revaluation. For each year after 2002, the parameter values should be factored by the change in fuel efficiencies for cars and HGVs, and fuel prices, assumed in the Feb 2007 DfT guidance note published at http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/pdf/3.5.6.pdf

The Performance Index

Within TRANSYT the Performance Index is a measure of the overall cost of traffic congestion and is usually a weighted combination of the total amount of delay and the number of stops experienced by traffic. The optimisation process within TRANSYT adjusts the signal timings and checks, using the model, whether the adjustments reduce the Performance Index or not. By adopting only those adjustments which reduce the Performance Index, signal timings are successively improved.

The Performance Index (PI), is defined as follows:-

$$PI = \sum_{i=1}^{N} \left(W.w_i.d_i + \frac{K}{100}.k_i.s_i \right)$$

Where N = number of links
W = overall cost per average pcu-hour of delay
K = overall cost per 100 pcu-stops
w_i = delay weighting on link i
d_i = delay on link i
k_i = stop weighting on link i
s_i = number of stops on link i
and PI is measured in money units (£).

The formulation of the PI means that in practice it is only the ratio of K to W that determines the relative importance of delays to stops. Currently (TRANSYT 12) the default values are:-

W = 1420 pence per PCU-hour
K = 260 pence per 100 stops

The ratio of 5.49 (W/K), happens to be the same as that assumed in TRANSYT 8 in 1980. In practice, the ratio has tended to stay at about 5.5 and as the value of time has increased over time so the value of a pcu-stop has been increased pro-rata.

Value of W

Of the two terms in the Performance Index, W is the one most consistently updated and changed in individual TRANSYT schemes since it is directly related to the current values of time. Since 1980 there has been a great deal of research into values of time and the Department for Transport (DfT) has published recommended values at regular intervals. The most current values are based on 2002 prices and are available in WebTAG 3.5.6. Since 1980 it has been recommended practice to value both working time and non-working time (separately now for commuting and other trip purposes), and include passengers' value of time as well. Based on the 2002 situation and values the average vehicle (excluding PSVs) value of time was about £11.28 per hour **(WebTAG 3.5.6, Table 9)**, which is equivalent to £12.20 per pcu-hour in 2006 (assuming a pcu factor of 1.07 in Urban areas excluding PSVs).

Recommendation. The default value for W in 2006 should be £12.20 in 2002 prices.

This value can be increased for future years by using the data in WebTAG 3.5.6 for changes in Values of Time over time (see example below for the change from 2003 to 2006).

Value of K

In most TRANSYT runs, where the value of W has been changed by the user the value of K has simply been assumed to be 18.18% of the value of W, reflecting the ratio of W/K of 5.5. The updated fuel consumption

equations can be used to obtain a more realistic value. In 1980 it was estimated that the resource cost of 100 pcu-stops was about 50 pence (page 12 in Vincent et al, 1980). Assuming a resource cost of fuel of 20.4 pence per litre **(WebTAG 3.5.6, Table 11)**, the cost of 100 pcu-stops is only 21 pence in 2006 at 2002 prices. This very low value arises because of the increase in fuel efficiency over time, and the fact that the real resource price of fuel in 2002 was little different from that in 1980, in contrast to large increases in the value of time per pcu-hour over the same period. The 21 pence above only refers to fuel costs and some wear and tear costs. There are other wear and tear costs associated with acceleration and deceleration but there are no data on which to value this and they are unlikely to substantially increase this value. Additionally the rate of stopping may influence the number of accidents but again there is no direct evidence. However, based purely on economic efficiency terms the current (TRANSYT 8-12) default values in the Performance Index overemphasise the impact of stops.

Recommendation. The default value for K for 2006 should be £0.20 in 2002 prices.

Values for years after 2006 can be obtained by factoring by the increase in fuel efficiency **(WebTAG 3.5.6, Table 13)** and the change in the resource cost of fuel **(WebTAG 3.5.6, Table 14)**. See example below.

It should be noted that minimising resource costs is not the only performance criteria possible and different values in the Performance Index could be used to derived fuel minimisation solutions. The ratio of W to K can be based on the relative fuel estimates of an hour's delay against 100 pcu-stops. Using the adjusted equations, the fuel used for 1 pcu-stop is equivalent to the fuel used in about 30 seconds of delay, suggesting a ratio between W and K of 1.2:1 (3600secs/(30secs*100stops)).

Changes over time in the value of time and the cost of fuel should be reflected in the values of W and K.

Example estimating 2006 values from the 2002 estimates

Step 1 WebTAG 3.5.6 Table 9 gives average value of time per vehicle in 2002 as £11.28 (in 2002 prices)

	Change in value of time from 2002 (Table 3)		Car occupancy change (Table 6)				
	Work	Non-work	Work	Non-work	% Total Change Work	Non-work	%Work travel (Table 7)
Increase =	1.099	1.0856	0.9821	0.9778	1.0796225	1.0614997	0.131

Therefore 2006 cost of occupants time is ((1.0796225 x 0.131) + (1.0614997 x (1 - 0.131))) x £11.28 = £12.00 per vehicle-hour

Step 2 From WebTAG 3.5.6 gives 2002 resource cost as

£0.019 per vehicle km
£0.941 per vehicle-hour (2002 value)

Therefore 2006 cost of resource time is 1.099 x £0.941 = £1.03

Step 3

Therefore total 2006 cost of time is **£12.00 + £1.03** **= £13.03 per vehicle-hour**
= £12.18 per pcu-hour (div by 1.07 pcu/veh)

Step 4 Stops

(a) Real resource cost of fuel 1980/2006 = 0.513246443	(b) Estimated cost per stop in 1980 = £0.005	(c) Fuel consumption / efficiency change 1980-2003=0.80
(a)*(b)*(c)*100 =	**£0.21**	**Per 100 pcu-stops**

Step 5 All time costs of stops and delays to use in TRANSYT

Therefore for 2006

W	**£12.20**	**per pcu-hour**	To nearest 5p
K	**£0.20**	**Per 100 pcu-stops**	To nearest 5p

References

TRANSYT/12 User Guide (2003). Application Guide AG48 Sections 3.11 and 6

WebTAG 3.5.6 (2007) www.webtag.org.uk

Vincent R A, A I Mitchell and D I Robertson (1980) User Guide to TRANSYT version 8. TRRL LR 888. Crowthorne Berks.

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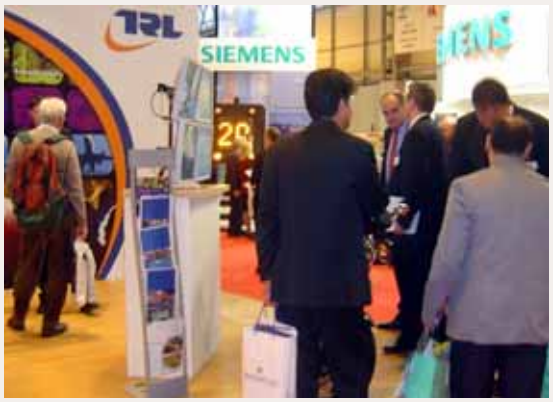
CURRENT PROGRAM VERSIONS

ARCADY	v6.0	AD/4
PICADY	v5.0	AC/3
OSCADY Classic	v5.0	AB/2
OSCADY PRO	v1.02	
TRANSYT	v12.1	AE/5 NEW

(All above have right/left capability)

BUNDLE 3	v3.1	Issue 4
PCMOVA	v1.1	
MOVA SETUP	M6.0.0	
MOVA Comm	M6.0.1	
CONTRAM 8	v8.3a	
MAAP (for Windows)	v4.3.0	
SafeNET	v2.03	
PERS	v1.1	
MTV	v2.1	

Visit TRL at Traffex 2007 (Stand F94)



THE TRL STAND AT TRAFFEX 2005

TRL will be exhibiting once again at Traffex in Birmingham on April 17th – 19th 2007. Traffex delegates will have the opportunity to learn about the latest developments in TRL software, such as **OSCADY PRO** and **PCMOVA.** Visitors to the TRL stand will also be able to learn about the latest TRL developments in traffic control systems, including MOVA and SCOOT. Information will be available regarding TRL's most recent work in traffic management on behalf of clients such as the Department for Transport and Highways Agency, including Dynamic Plan Generation.

Visit us at stand F94

Who's Who

Dr Guillermina Martinez

Guillermina joined TRL in August 2006. She is currently playing a key role in the development of MOVA, applying her knowledge of theoretical scientific hypothesis to solve practical real-world problems. Guille read for her PhD in Cybernetics at Reading University, having gained an MSc in Computational Intelligence at Plymouth University. Her initial graduate and post-grad qualifications were gained in the study of distributed systems and parallel processing at the University of Puebla, Mexico.

Guille has been a university lecturer and worked as a software developer for several governmental organisations. She has an interest in psychology and enjoys programming virtual reality software. Outside TRL, Guille's interests include travelling, bibliography, crafts and gastronomy.

CONFERENCE ANNOUNCEMENT

"Implementing the Traffic Management Act 2004: Progress to date and the Challenges Ahead"

Conference organised by the Institution of Highways and Transportation and TRL

THE INSTITUTION OF HIGHWAYS & TRANSPORTATION

DATE:
Wednesday 14th March 2007

VENUE:
The Royal College of Surgeons, Lincoln's Inn Field, London WC2A 3PE

COST:
£180 +VAT for IHT members, £225 +VAT for non-members

Conference Objectives

TRL and IHT are jointly organising this significant and timely conference on March 14th 2007. The Traffic Management Act 2004 introduced a number of new duties and processes for local traffic authorities to follow in managing their road networks. The conference will aim to provide an opportunity for delegates to learn from experience to date from Traffic Managers and other stakeholders, and identify key challenges and issues for the future.

Why you should attend

By attending this conference you will hear from key stakeholders involved in the implementation of the Traffic Management Act 2004, and related secondary legislation, including the Department for Transport, local authority Traffic Managers, the Highways Agency, and Transport for London.

You will gain an insight into the way in which Traffic Managers are addressing the requirements of the Act locally in terms of the Network Management Duty, and the range of associated issues such as Permit Schemes, Streetworks, Civil Enforcement of Contraventions, and DfT intervention criteria. You will have an opportunity to air your views and to put your questions to the leaders and practitioners in the field.

To book a place, please visit the IHT web site at **www.iht.org** or contact:
Conference Organiser Institution of Highways and Transportation,
6 Endsleigh Street, London WC1H 0DZ
Tel: 020 7391 9956 Fax: 020 7387 2808 Email: conferences@iht.org

COURSES, SEMINARS & USER GROUPS 2007

MOVA User Group
Birmingham City Council, Birmingham B4 7DQ
6th March 2007

Traffic Management Act Conference
Royal College of Surgeons, London
14th March 2007

ARCADY / PICADY Training
2 day training course, Maidenhead
27th – 28th March 2007

TRANSYT Training
2 day training course, Maidenhead
24th – 25th April 2007

SCOOT Training
2 day training course at TRL
15th – 16th May 2007

ARCADY / PICADY User Group
User Group at TRL
12th June 2007

TRANSYT User Group
User Group at TRL
13th June 2007

ARCADY / PICADY Training
2 day training course, Dublin
19th – 20th June 2007

TRANSYT Training
2 day training course, Dublin
21st – 22nd June 2007

OSCADY PRO Training
2 day training course, Maidenhead
3rd – 4th July 2007

If you would like more information on any of the issues raised in this issue please contact us **email: softwarebureau@trl.co.uk** or visit us at **web: www.trlsoftware.co.uk**

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