



preview

International Council On Systems Engineering UK Chapter Newsletter

IS 2004 in Toulouse

New chair for INCOSE technical board

At the INCOSE board of directors meeting in Toulouse Samantha Brown of BAE SYSTEMS was selected as the new chair of the INCOSE Technical Board. INCOSE is in the process of restructuring its technical activities inline with their 2020Vision for the future of Systems Engineering over the next 15 to 20 years. Samantha will have the task of leading this change team.

I'm sure you will join me in congratulating Samantha on the appointment and wish her luck with this exciting challenge.

Doug Cowper
Editor, Preview

Presentation of awards at IS2004 in Toulouse

The presentation of the Founders Award to Allen Fairbairn and the Gold Circle Award to the UK Chapter took place at the International Symposium in Toulouse. For more news from the event see page 4.



Allen Fairbairn, Founders Award Recipient (Accepted On His Behalf By Phil John)

In brief

On the right lines – systems engineering for the railway industry



The IEE held a very successful systems engineering event for the rail industry on 26th May 2004 at the Bloomsbury Square Training

Centre in London which attracted 80+ delegates from the sector. The event was organised to support the rail industry's increasing use of systems engineering to help manage the complexity we see in today's railway projects.

The presentations opened with a key note address from David Waboso, Executive Director, Technical, Strategic Rail Authority and was followed by presentations from London Underground, Network Rail, Tube Lines, Rail Standards and Safety Board, Thales, JBA Ltd and Lloyds Register. For more information about



the event visit the IEE Professional Network website
www.iee.org/oncomms/pn/systemseng/On_the_right_lines.cfm

Doug Cowper
University College London

Lord Sainsbury opens innovation centre

The Systems Engineering Innovation Centre at Loughborough University was officially launched on 16th July by Lord Sainsbury of Turville, Parliamentary Under Secretary of State for Science and Innovation.

Full report on page 5.



July 2004

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In profile - John Mead, Administrator - INCOSE UK



John started his career as an engineering apprenticeship and studied HNCs in both mechanical and electrical engineering, spent time as a draughtsman, then estimating and tendering engineer before joining Marconi Computers and Marconi communication systems in commercial, marketing and sales positions. John joined Sperry Gyroscope in Bracknell as Sales Manager responsible for the sale of Message Switching Systems around the world. Sperry was acquired by British Aerospace and John was relocated into a Headquarters role with C3I and Systems Integration Marketing responsibilities across the group. John assembled major international bidding teams for NATO and other agencies and national bodies around the world including Meteorological, ICAO and Shipping lines but primarily in the defence and aerospace fields. When British Aerospace decided it no longer required John's Systems team in 93 they were disbanded and John was waved good bye. John decided to try self employment and did a number of part time Sales and Marketing roles for high tech & software companies as well as the role of AFCEA London secretary. This new initiative was going very well and INCOSE at the time was recently over the excitement

of launching in UK, and faced with the reality of making it work. John was invited to participate. Having run voluntary organisations since the days of running the youth club as a youth and a social organisation throughout the Thames Valley, when John first came to Berkshire it seemed to fit.

"How do you see the UK Chapter recruiting and retaining more members?"

We do suffer a fairly high loss rate after the first year of membership although a number of them do return later. I suspect that a lot of this is due to little visible progress in the areas people were looking for in the first place. Someone commented recently that it had been six years since his previous visit to one of our events and that we still seemed to be talking about the same things. Nothing basically wrong with this provided we are making progress but I think that to retain member interest we need to achieve more faster.

A way to do this of course is not for members to sit back and expect the Board to achieve everything but for them to get involved and contribute. Board members all have full time jobs as well. INCOSE is still a young organisation and is in continuing transformation and needs more input from the members.

Get more members involved in making a commitment and helping to achieve the things they want and things will happen. When this is seen as happening more members will stay and more will join, although specific action may well be needed to attract other application areas.

"How do you select the venues for the UK events?"

It is very much a juggling act between guessing how many will attend, if we can get an attractive programme together and getting

it out early enough and booking a venue which fits the requirement or is flexible around the potential requirement as late as possible and trying to make the two meet. This is somewhat a matter of experience although we do now have a fairly predictable size of event. The earlier we can get some guide on likely numbers the better the match will be. After that it is taking recommendations and reputations and doing the leg work inspecting the facilities etc but you do have to take quite a bit on trust as you are rarely allowed into a conference room when someone's conference is in progress or to join in their meals.

"How has the UK Chapter changed over the last ten years?"

I have only known INCOSE since 1996 although as it only started in UK towards the end of 1994 I suppose that is most of it. I initially joined on a one day a week basis. One day a week did not last for long because as the Chapter has grown so has the work although maybe it was the other way around. There used to be a team of six to ten on the SEPDC and also a few on the Communications and Membership Committee and now we are down to just a Chairman as permanent on both. There is now more activity, at least proposed, in establishing Working Groups on specific topics and also Local groups around the country. The UK Chapter has been fairly active in promoting INCOSE throughout Europe, creating in the process a wider need for more international view and interaction with other national Chapters.

"What has been your greatest challenge as the UK Administrator?"

I suppose being part of the '99 Brighton -the first International event outside of North America- team with responsibility for the marketing and sponsorship programme when INCOSE was barely

known outside of North America although this was outside of the normal UK administrator role.

A continual challenge as administrator is to get Systems Engineers to recognise that to achieve adequate numbers of delegates at an event in 6 months time we need to allow time for marketing, registration etc and to start now and should probably have started yesterday. If we do not issue a call for papers such that people can respond with offers of papers that can be selected and then written in time for publicity material etc people cannot book to attend.

"What do you think will be the greatest challenge over the next few years?"

More of the same! To get Systems Engineers to recognise etc (see above), but seriously we are all busy people but this can be eased by thinking ahead and it would be nice to turn up to an event and be able to tell everyone where the event in six months time is being held and what the theme is and to issue a call for papers. I may be wrong but I think an additional benefit would be in receipt of more proposals for papers and a higher level of preparation and quality.

As well as get the various products underway to a stage where they are useful and perhaps use them to convince the rest of any organisation of the value of Systems Engineering. Also sort the ongoing training and accreditation issues for international use.

We have recently witnessed a growing interest in INCOSE because amongst other things several companies are organising / re-organising themselves to become / give more emphasis to Systems Engineering and a much higher percentage of the younger fraternity are taking up the discipline. A lot of work remains but the potential is there.

In profile next time, Allen Fairbairn, Secretary, INCOSE UK

Record membership

What a fantastic start we have had to this year's membership subscriptions. We had reached 300 by about the first week of July when usually it takes us until around Christmas. I know that they are all due by 1st June really but that would be expecting a bit much. The numbers had a boost by the Spring Symposium having in the order of 50 new members - difficult to be exact because some expect their companies to pay and some of these take an awful long time. There is a continuing dribble of enquirers joining, and several more joining with their

fee for the International event in Toulouse who will not yet be in the 1st July number.

This causes Central office a bit of a headache because all Chapters are reporting their membership renewals at this time and central office handle the membership totally for many of the smaller chapters. All this as well as checking the membership position of those applying for Toulouse keeps them flat out. This has all coincided with the introduction of improved facilities for members, a new website, a member CD for each member, currently in draft

form to be delivered with your "Fall" Autumn INSIGHT and doing all of this with the comparatively new on line membership roster.

The new year membership certificates have been delayed but will be forthcoming eventually. Provided your renewal gets to Central office by 30 July you will be taken as a continuing member and should not lose any benefits. If your membership is not received by then you will be regarded as lapsed and not have access to the members' website and will be taken off of the printing and address list for publications. Once off

it takes a while to get back on as the publications lead-time is some weeks.

By the time you read this if you have not already renewed you will already have been removed I guess but if you did intend to renew and wish still to do so please get in touch straight away and we will get you reinstated you as soon as possible.

Why not renew the easy way in future like over 100 others and use the Direct Debit system.

John Mead
UK Administrator

President's corner



Last month INCOSE held its annual International Symposium and this year it was in Toulouse in the Midi-Pyrénées region of France. Given the event being held relatively close to us in Europe and our Chapter's involvement in its organisation as part of Region 3 of INCOSE, we hoped that there would be a particularly strong attendance from the UK Chapter and we were not disappointed ... it was great to see the UK represented by about 75 attendees. The Symposium was, as always, extremely stimulating and well worth attending. Paul Davies, the UK Chapter's Immediate Past President played a major role as the "MC" of the principal plenary sessions and ably demonstrated his bilingual abilities. No doubt these are important in his day job with Thales! It was great to meet systems engineers from all over the world ... Europe, North America, Australia, South Africa were all well represented ... and to see a com-

mon bond between the different nationalities. One person I spoke to, who was at the International Symposium for the first time, remarked at the open and friendly atmosphere in INCOSE, with everyone keen to share ideas and experiences and to learn from each other and with many interesting discussions taking place around the venue ... and not infrequently in the bars, restaurants and cafes nearby! Such informal "networking" is of course a great benefit of such an event in addition to the formal elements, with several parallel streams of papers, tutorials, panel sessions, exhibitor displays and so on. The quality of the formal content seems to get better every year, as does the social side. This year French flair was very much in evidence at the symposium dinner, with entertainment that defies description and that will be long remembered by those present!

The INCOSE President, Professor Heinz Stoewer (a fellow European of course) set out his vision for the challenges of Systems and Systems Engineering and the future of INCOSE. It is clear that the role of INCOSE as the principal worldwide focus for Systems Engineering will strengthen in the coming years and, as members, we have a real opportunity to be involved in contributing to the organisation, to its products and to the direction of the discipline itself. The UK Chapter was the first to be formed outside North America and we are increasingly involved in the way forward. Notably, Samantha Brown has

taken over from William Mackey as Chairperson of the influential Technical Board and I know that she is keen to see UK members contributing to the development of the discipline. There are many opportunities for people to be involved. For example, the INCOSE Handbook on Systems Engineering is to be updated to issue 3 in the coming year and will be, in effect, a "how to" guide in support of the international standard ISO 15288 and members are invited to join the Handbook working group. By joining in such activities you can influence the activities and products of INCOSE and ensure that they address the issues that you need.

There is a real pioneering energy about INCOSE, as demonstrated by the new corporate website, the increasing range of working

groups and products being developed and the new members CD that includes all the core products produced to date and members can look forward to increasing benefits as the many activities bear fruit.

I look forward to seeing you at the next International Symposium, in Rochester, New York State in 2005 but before then we have two important UK events ... the Autumn Assembly this coming November and the Spring Conference next year. Please look out for information about these events and any local events we hold in your area and come along if you possibly can. I look forward to seeing you there!

Prof Phil John
President of the UK Chapter

If you have a question you would like answered by our panel of experts or a point of view you would like to share with Preview readers then please send to:

d.cowper@ucl.ac.uk

or write to:
Preview
c/o UCL Business

Events calendar

SEPTEMBER

6th - 8th September 2004

12th IEEE International Requirements Engineering Conference (RE'04), Kyoto, Japan.
www.re04.org

Mid Sept 2004

London Local Group Requirements Workshop by Praxis Critical Systems, venue TBC

29th September 2004

Introduction to UML Course by Jon Holt. www.iee.org/events/uml.cfm

30th September 2004

Introduction to Requirements Course by Ian Alexander. Le Meridien, Russell Square, London.
www.iee.org/events/intro-req.cfm.

OCTOBER

18th - 21st October 2004

IEMC 2004, Singapore.
www.iemc2004.org

28th - 31st October 2004

Business Essentials for Engineers, Wyboston Lakes, St Neots, Bedfordshire.
http://conferences.iee.org/business_essentials/

NOVEMBER

8th - 9th November 2004

UK Autumn Assembly

Mid Nov 2004

Local London Group "Systems Engineering Management Plan Workshop" venue TBC

2005 January

28th January - 3rd February 2005

INCOSE International Workshop 2005

March

23rd - 25th March 2005

Conference on Systems Engineering Research

July

10th - 15th July 2005

INCOSE 2005, 15th International Symposium, Rochester, USA

If you have an event you would like published in Preview then please contact:
d.cowper@ucl.ac.uk

A short trip to Toulouse

I suspect that when I shot off to Gatwick on Saturday morning to attend the Toulouse event most of the other Brits going were due to enjoy a weekend at home before setting off. Any how I must add there will have been a small number of board members and working group members also arriving before the opening in order to participate in the Board and business meetings which commence on the Saturday morning. I arrived just in time to bump into a lost looking American Project Auditor and staunch member of The Project Management Institute and INCOSE in the hotel lobby and joined him for dinner in the nearby town square. It was fine until we had ordered dinner then the heavens opened and we were thankful we had sat under an awning to dine rather than in the full open air. I only mention this as we discussed many various ways of running an organisation such as INCOSE and I hope that some of it will prove valuable.

On finding the conference centre and registering shortly after 8am on Sunday the whole day of meetings began with the Chapters Meeting. We reviewed, amongst other things, the "Top Five Initiatives" as selected by the board and you will have seen reported recently. A lot of effort is going in this direction and there were presentations on the new web site and the members CD both of which

are /will be improvements in communications with the members from the centre rather than have them go look for it. Expect a members CD to be delivered with your "Fall" INSIGHT. A meeting between the CAB, the board and representatives of each of the Chapters which was a real roomful and was chaired or perhaps choreographed I think is the word by Col David Wright. Not so obviously useful to members but no doubt important for these committees to meet and hear each others views directly once in a while.

Monday started differently with a walk along the river and a visit to the Pont Neuf Bridge now famous as the logo for the 14th INCOSE International Symposium – the first in a non English speaking country. On reaching the venue, which was bright and modern and which we rattled around in a bit, surprise, surprise people were again having meetings. Amongst others I attended the Region 3 i.e. Europe, which in INCOSE includes Israel & South Africa. A useful forum if we ever plan to get a European perspective on SE issues but appearing to move very slowly. Twelve months before they meet again! It is suggested that we may host a meeting at the Autumn Assembly if we can attract the delegates. I also attended a meeting of the Risk Management working group as it appears to be of interest for our next event. The evening was

kicked off with the traditional Ice Breaker Reception in the exhibition hall lots of people in a happy environment with lots of networking and socialising and a chance for me to meet the UK members that never come to events in UK, but were out in force in Toulouse. BAE SYSTEMS were prominent in the exhibition hall all running around in their pink (?) shirts. The walk back across town was interesting as each and every street was slowly being closed down by weight of people and street bands and DJs out to make as much noise as possible. By about 9pm the whole of the enormous square outside of the Capitole was full as was just about every where else with music and dancing – something to do with mid-summer I think not because INCOSE was in town or the European Cup.

Tuesday, the first day of the conference proper, was check out and go home day for me as I had to be in Shrivensham the very next day by lunch time for an afternoon of preparation for a black tie dinner and an AFCEA conference on the Thursday. I did manage another meeting and about 3 papers I think as well as being in the Opening Plenary Session in time to see and photograph Paul Davies in his M/C role: and a very good job he made of it too! This was also the session for presenting the Founders award to Allen Fairbairn (in his absence) for

all of his early efforts for INCOSE UK. The Chapter Gold Circle award I understand was presented during the closing session. This day also closed with drinks in the exhibition hall. Photographs of these and others should be in this newsletter and on the website.

The overall attendance was about 800 I believe which is approximately the number we had in Brighton in 1999. According to the list of Participants list printed on 12 June i.e. with a week still to go was 635 comprising 241 from USA, 122 from the home nation, 78 from UK and 28 countries represented. Interestingly in the attendees by country we had 25 from England, 2 from Scotland and 46 from UK. Sometimes things just do not add up!

It was an interesting visit despite not being able to stay for the main event. Particularly meeting European officials and members who had been to some of our early UK events and some with whom we had organised the first European event in Noordwijk. It was also valuable in seeing how they are doing things these days as we may be able to benefit from some of them: however I do not think that UK will run to different colour shirts for board members and different Working Groups; different colour name badges will suffice for us.

John Mead
UK Administrator

Academic forum

The forum kicked off with a short overview of the previous year's academic forum by Dennis Buede. The 2003 forum addressed the following themes:

1. Advancing Systems Engineering in academia
 - perspectives on starting programmes in Systems Engineering
 - future issues in engineering accreditation
2. Getting ready for future systems
 - major considerations for systems of the future
 - systems engineering in the future

The first session of the 2004 forum was themed a "Global View" and its aim was to debate the possibility of a global template for a Bachelors or a Masters degree in Systems Engineering. The meeting was presented with perspectives from Asia, Europe, Africa, Australia and the US. Some of the key points from these presentations were:

- A major driver for the new System Design Faculty at the Keio University in Tokyo, Ja-

pan, (presented by Yoshiaki Ohkami) is to break down the barriers between faculties and institutes in the university.

- A template for Systems Engineering courses will take



Academic Workshop

some time to develop and implement; however, industry is very interested in one being available.

- The European system (presented by Reinhard Haberfellner) is divided in the Anglo-Saxon BS/MS System and the central European diploma system. In central Europe it seems unlike that a "pure" Bachelors degree in

Systems Engineering will be widely adopted. More likely will be Masters Degrees in Systems Engineering combined with some fields of applications. I felt that the European perspective did not fully address the situation in the UK. The UK and Europe have different approaches to engineering education. This difference is currently being



addressed by the European Union Bologna initiative.

- Stephen Cook's presentation focused on the well developed Systems Engineering MSc programmes in Australia, using the situation in Melbourne as a case study. It was not clear that a template was being offered. At the same time, Australia plays the leading role in providing SE educational services to other countries in South East Asia like Philippines and Indonesia. The demand for these services is rising and the courses must be adjusted to the different educational backgrounds.
- Cihan H. Dagli showed that in the USA there are both "pure" Bachelors and Masters

Programmes and even more programmes in Systems Engineering with specialisation in specific applications fields.

- Philip Rust from South Africa was the only presenter who went out on a limb and proposed a template for Systems Engineering teaching. This template consisted of the following:
 - Systems Engineering Premises and Principles
 - Related Know-how Domains
 - Systems Engineering Knowledge Areas
 - Curriculum Design

The second session was themed "Back to the Basics" and was aimed at showing the *new* Systems Engineering basic laws or

concepts. Donna Rhodes highlighted the following new themes and concepts that should be addressed by Systems Engineering: system architecting, enterprise systems architecting, model-based systems engineering, value-based systems engineering, managing for uncertainty, new collaborative venues and engineering systems as context fields. Ruediger Kaffenberger showed that modelling in SE can be supported by Object-Oriented approach and language! At this point I felt the session had diverged from its main theme!

The session "Local View" dealt with SE in Toulouse and started to get the forum back on track re Systems Engineering education. But then again perhaps not! Pierre Froment from Airbus reported on the integration aspects of systems

testing, specifically concerning the relationships between Airbus and its suppliers to improve efficiently its SE process. The final two presentations were on the two Master courses that will be available in Toulouse at SupAero (Specialised Master for engineers presented by Christophe Garion) and at INSA (Master for students presented by Jean-Charles Maré) which were more case studies than templates.

And the outcome of the forum? Well it's not obvious! The debate about the relevance of undergraduate courses continues and on an international scale one size doesn't seem to fit all.

Based on the notes from the forum chairs Eduard Igenbergs of UT Munich and Gilles Motet of INSA Toulouse.

Doug Cowper
Academic Liaison,
INCOSE UK

A new centre of excellence for dealing with complexity

We live in a world where complexity is rooted in our daily fabric. Our transportation systems, our communication systems and our medical health care infrastructure are but a few examples of how increasingly complex and integrated our world has become.

Our industries are also reacting to this complex world through, for example, coping with evolving technologies which are in many cases disruptive - as well as with the changing nature of the requirements we strive to satisfy for our customers and partners alike. Requirements for a capability that is sustainable over the lifecycle of our products - A lifecycle that, in many cases, exceeds a ten year time span. Requirements that evolve in complexity too and requirements that, when not addressed properly, surprise us with unforeseen challenges and risks.

Systems Engineering is an emerging engineering discipline and a methodical approach to life that BAE Systems believes is crucial to the industry to help deal with this complex world of ours. It is about integrating processes and best practice with team effort to form a structured development plan that addresses the entire product lifecycle from concept through to production and operation.

To address this need, the Systems Engineering Innovation Centre (SEIC), a unique £60million collaboration between BAE Systems, Loughborough University and the East Midlands Development Agency, was officially launched by The Minister for Science and Technology, Lord Sainsbury of Turville at Loughborough on the 16th of July 2004.

Speaking at the launch Lord Sainsbury said, "Innovation - turn-



Sir David Wallace (Vice Chancellor, Loughborough University), Lord Sainsbury of Lord Sainsbury of Turville (Parliamentary Under Secretary of State for Science and Innovation)
Alistair Imrie (Board of BAE Systems),
Peter Phillips (Head of SEIC)

ing new technologies and ideas into commercially successful products - is the key to business success. Partnership working between academia and industry is vital if we are to capitalise on our world-class science and technology base and 'pull through' knowledge from the lab to the business bottom line.

This new Systems Engineering Innovation Centre is an excellent example of partnership working to further our knowledge of systems engineering and exploit this for commercial gain."

Ron Dennis, Chairman and CEO of the McLaren Group, as guest speaker at the launch supported this sentiment with following statement: "I find it extremely encouraging and wholeheartedly support the commitment that this partnership between industry, academia and government is making to further strengthen the

UK's systems engineering skills base. Certainly within the McLaren Group, systems engineering is a fundamental discipline. The investment in this new facility in Loughborough will go a long way

towards ensuring that the UK maintains its track record of providing the world's leading systems engineers."

Finally, Mike Rouse, Group Marketing Director of BAE Systems who helped host the event said, "We are proud to be a major initiator of the SEIC. This will benefit not only our company in providing us with the highly skilled people we need to improve our competitiveness in the marketplace, it will also provide a huge boost to other technologically advanced firms across the region."

More than 150 senior representatives from industry and government attended the launch, many seen as potential partners to the SEIC in its future development. The event celebrated the formation of a new Centre of Excellence which it is hoped will help us all deal - a little better - with complexity and what the future has in store.

Ayman El-Fatary
Customer & Business Development Manager, SEIC

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John Mead on 01344 422325
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UML™ for systems engineering initiative — part four



Introduction.

In the last three articles we looked at the background to SysML, which areas of UML may be modified to support systems engineering, and at some of the new diagrams. In this article, we will look at some of the modifications that will be made to the Activity Diagram, which has been part of UML since version 1.0. The UML 2.0 specification states that "Activity modelling emphasizes the sequence and conditions for coordinating lower-level behaviours, rather than which classifiers own those behaviours. These are commonly called control flow and object flow models. The actions coordinated by activity models can be initiated because other actions finish executing, because objects and data become available, or because events occur external to the flow." In other words, Activity diagrams are normally used to show the overall flow of activities and actions, data and control flow, and the behaviour of the system as a whole, rather than scoped to a part of the system. Actions and activities also run to completion. The SysML modifications to Activity Diagrams include: Control as Data, Parameters, Continuous Systems, Probability and the EFBFD profile. These extensions will allow the modelling of systems that are not merely software systems. This is a key goal of SysML. In order to understand them, the reader should already have an understanding of UML 2.0 Activity Diagrams. We will look at each of these in turn.

Control as Data.

SysML modifies control in Activity diagrams in three interrelated ways to give the functionality of data:

1. In UML 2.0 Activities, control can only enable actions to start. In SysML control can disable actions that are already executing, and behaviours can also declare that they cannot be disabled once started, that is, declare themselves non-interruptible. SysML will allow control tokens to be queued. SysML will allow pins to accept control tokens, calling them control pins. This supports queuing of control and other features of object

nodes.

2. SysML extends control to have a type so that it can be processed by actions, rather than control them.
3. UML 2.0 provides a value action that can insert values into the flow of an activity. SysML defines value actions so that values can be output from activities. Since control is a type, value actions can output control values as well as data values.

Parameters.

SysML defines some extensions to parameters and parameter sets. UML 2 supports declaration of the effect of actions on inputs and outputs. This is recorded on pins. SysML defines the same effects for parameters. UML 2 defines preconditions and postconditions for parameters. SysML also allows them for parameter sets.

Continuous Systems.

SysML provides extensions that might be very loosely grouped under the term "continuous", but are generally applicable to any sort of distributed flow of information and physical items through a system. These are:

SysML defines a model of quantity that binds units to values, and provides restrictions on quantities.

SysML supports restrictions on the rate at which entities flow along edges in an activity, or in and out of parameters of a behaviour. This includes both discrete and continuous flows, either of material, energy, or information.

SysML allows newly arriving values to replace values that are already in the object nodes. It also allows the discarding of values arriving at actions that are already executing or are not already executing, as needed by the application. This allows applications to make use of the most recent information by indicating when old values should not be kept in object nodes.

SysML distinguishes between behaviours that are intended to run indefinitely until they are disabled, and those that run to completion and stop of their own accord (see Figure below).

Finally, SysML provides the definition of collections of entities where the identity of the members of the collection is not important or even determined. For example, a vat of nails or ball bearings, or water in a tank, as collections of unidentified entities. It will also be possible to restrict the size of the collection.

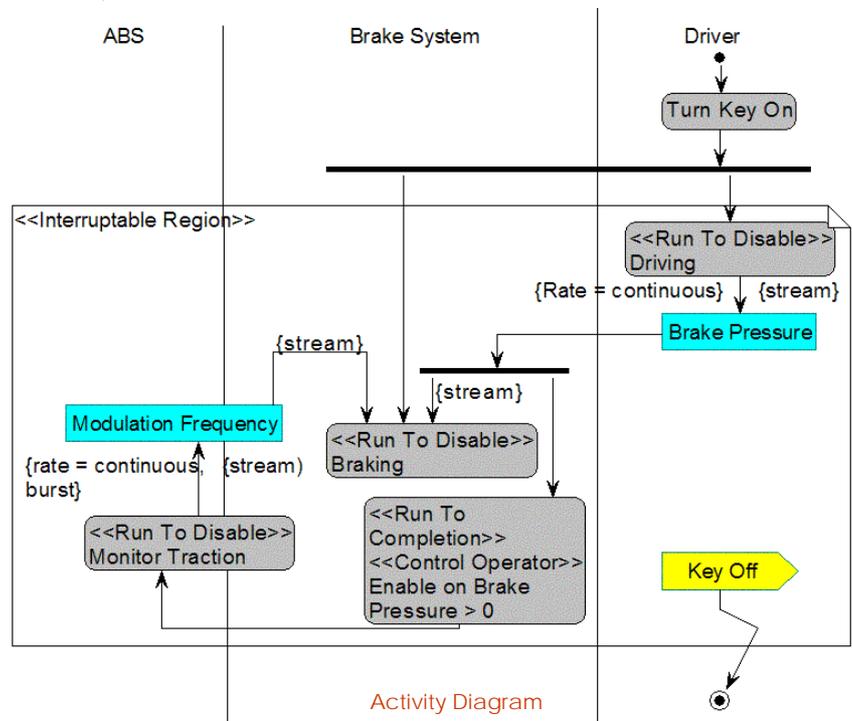
Example.

The figure shown below, which was taken from the SysML specification, shows a simplified model of driving and braking in a car that

tion also flows to a control operator that outputs a control value to enable or disable the Monitor Traction behaviour. No control pins are used on Monitor Traction, so once it is enabled, the continuously arriving enable control values from the control operator have no effect, per UML semantics. When the brake pressure goes to zero, a disable control value is emitted from the control operator. The first one disables the monitor, and the rest have no effect. While the monitor is enabled, it outputs a modulation frequency for applying the brakes as determined by the ABS system.

Probability.

SysML also introduces the con-



has an anti-lock braking system.

Turning the key on starts two behaviours, Driving and Braking, which are the responsibility of the Driver and Brake System respectively, as shown by partitions. These behaviours execute until the key is turned off, as indicated by runToDisable keywords and the interruptible region. The Driving behaviour outputs a brake pressure continuously to the Braking behaviour while both are executing, as indicated by the streaming and rate properties (streaming is a characteristic of UML behaviour parameters that supports the input and output of items while a behaviour is executing, rather than only when the behaviour starts and stops). Brake pressure informa-

tion also flows to a control operator that outputs a control value to enable or disable the Monitor Traction behaviour.

No control pins are used on Monitor Traction, so once it is enabled, the continuously arriving enable control values from the control operator have no effect, per UML semantics. When the brake pressure goes to zero, a disable control value is emitted from the control operator. The first one disables the monitor, and the rest have no effect. While the monitor is enabled, it outputs a modulation frequency for applying the brakes as determined by the ABS system.

Edges can contain expressions evaluating to constant probabilities. The probabilities give the likelihood that a value leaving the decision node or object node will traverse an edge. Output parameter sets may have the same functionality.

SysML extends elements that hold values, such as properties and parameters, with a probability distribution for the values. The distribution can apply to a single instance or execution over time, or to across all instances of a class and or executions of a behaviour.

EFFBD profile.

The Function Flow Block Diagram (FFBD) was one of the first to be used by systems engineers and continues to be widely used today. The purpose of the FFBD is to show the functions that a system is to perform and the order in which they are to be enabled (and performed). It does not contain the semantics for the flow of data between functions, and therefore does not represent any data triggering of functions. The Enhanced FFBD displays the control as well as data flow, which allows the engineer to model data dependencies. Thus, the EFFBD represents

functions, control flows, and data flows. An EFFBD provides a graphical notation to distinguish between triggering and non-triggering data inputs. As with the FFBD, the trigger, which can be data, is required before a function can begin execution. This means that triggers are data items with control implications. It is also possible to show the status of the queuing of triggering data. Based on this description, it is easy to see that many of the changes to Activity Diagrams proposed for SysML have been made to allow engineers to express them as EFFBD's. There are however, some con-

straints on Activity Diagrams for applications that would like to adhere to EFFBD notation:

1. All actions require at least one control edge coming into them.
2. All forks have a corresponding join.
3. The EFFBD OR notation is inclusive. It translates to a UML fork.

One of the advantages of these extensions is that it will allow greater interchange between modelling tools, as spelled out by the AP233 initiative. This will be discussed in a future article.

As always, SysML, Systems Mod-

elling Language, and the SysML logo are trademarks of the SysML Partners. UML is a registered trademark of the OMG. Some of the information in this article has been obtained from the Systems Modelling Language™: SysML™ version 0.3 (first draft). These can be obtained from the OMG and SysML web sites. More information on SysML in general can be found at www.sysml.org.

If you have any questions, please feel free to email me at MatthewH@Artisansw.com.

Matthew Hause
Artisan Software Ltd

Around the regions

London

The London Local Group met on 3rd June at Network Rail in Eversholt Street (next to Euston Station). The event consisted of three case study presentations by Brian Halliday (network Rail), Simon Wills and Kevin Tarling (Parsons Brinkerhoff) on verification and validation on the West Coast Mail Line Modernisation. The three presentations were of a personal perspective and provided an interesting insight into the requirements and V and V work carried out on the project as well as being a useful case study.

I believe the event has wider appeal and therefore I will be suggesting that it is repeated as a session at the Autumn Assembly.

The event was poorly advertised and therefore only a small number

of people managed to attend. The LLG committee will certainly take away some lessons from the event so that we can make better preparations for the next event, which will be in September and will be a "Requirements workshop" by Praxis Critical Systems, Praxis Offices in London, Location and time TBC.

Doug Cowper
University College London
Centre for Systems Engineering



How do you get involved with regional activity?

Are you looking to participate in local INCOSE activities?

Are you looking to set up a regional group?

For more information about regional activities or how to go about setting up a regional group, please contact:

John Mead on 01344 422325
or email: john.mead9:ntlworld.com

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Bristol

The original INCOSE local group in Bristol is about to rise Phoenix like from the flames of its previous incarnation.

The new local group is currently planning a program of activities for next year, the highlight of which should be a planned visit to the Concorde exhibit at Filton.

The first local event will be held in late September and will be

kindly hosted by the University of the West of England. Details of this first event to follow.

An outline of the aims of the Bristol local group, plus contact detail for the steering committee will shortly be available on the INCOSE website.

Rick Adcock
Cranfield University
Centre for Systems Engineering

**INCOSE UK 10th Anniversary
Autumn Assembly 2004 November 8th & 9th
Call for Presentations and Workshops**

The Spring Conference was our most successful to date with over 50 new members joining! Let us continue the momentum towards an even more stimulating Autumn Assembly!

Theme - 'Risking it all'

The 2-day event is aimed at encouraging inter-active discussions / workshops on key issues in the world of systems engineering.

Topics are based on suggestions from members through responses from questionnaires from previous events. However, the call for papers can cover new ground-breaking techniques or pet theories benefitting the Systems Engineering community. If you have always wanted to share your ideas, but never found the time or place, well, now you have the opportunity!. Send in an abstract, with a brief justification of your qualification to speak on the subject. Papers will be selected to construct a valuable stimulating and entertaining event.

The following are a selection of topics that members want to know more about:-

Risk Management :

E.g. Using SE techniques (i.e. requirements, modeling) to identify and manage risks

Interface Management :

E.g. How can SE help to identify and manage interfaces.

Integrating SE and Project management:

E.g. Requirements Management, Architecture, V&V, Re-use ; COTS; Systems of Systems; System Complexity

Metrics:

E.g. What metrics can be generated to measure the value of SE?

Methods and Tools for Systems Engineering:

E.g. Hard and Soft Systems Methods; System Dynamics; Simulation and Modelling.

People Issues in Systems Engineering:

E.g. Skills ; competences; accreditation ; education; training; Continuing Professional Development.

And of course, the most common and regular requests from delegates are for Case Studies ... individuals' experiences, especially in alternative application areas. Share your experiences so we can enrich our understanding and advance our profession. The event is also an excellent opportunity to network and discuss issues with key people, network and discuss issues with key people.

Please email Abstracts to Dipesh Patel (pateldipesh9@aol.com) BY 20th August 2004 LATEST.

Any other matters on the event please contact John.Mead9@ntlworld.com

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