

# ADA USER JOURNAL

Volume 22  
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# Editorial Policy for *Ada User Journal*

## Publication

*Ada User Journal* – The Journal for the international Ada Community – is published jointly by Ada Language UK Ltd and Ada-Europe. It appears four times a year, on the last days of March, June, September and December. Copy date is the first of the month of publication.

## Aims

*Ada User Journal* aims to inform readers of developments in the Ada programming language and its use, general Ada-related software engineering issues and Ada-related activities in Europe and other parts of the world. The language of the journal is English.

Although the title of the Journal refers to the Ada language, any related topics are welcome. In particular papers in any of the areas related to reliable software technologies.

The Journal publishes the following types of material:

- Refereed original articles on technical matters concerning Ada and related topics.
- News and miscellany of interest to the Ada community.
- Reprints of articles published elsewhere that deserve a wider audience.
- Commentaries on matters relating to Ada and software engineering.
- Announcements and reports of conferences and workshops.
- Reviews of publications in the field of software engineering.
- Announcements regarding standards concerning Ada.

Further details on our approach to these are given below.

## Original Papers

Manuscripts should be submitted in accordance with the submission guidelines (below).

All original technical contributions are submitted to refereeing by at least two people. Names of referees will be kept confidential, but their comments will be relayed to the authors at the discretion of the Editor.

The first named author will receive a complimentary copy of the issue of the Journal in which their paper appears.

By submitting a manuscript, authors grant Ada Language UK Ltd and Ada-Europe an unlimited licence to publish (and, if appropriate, republish) it, if and when the article is accepted for publication. We do not require that authors assign copyright to the Journal.

Unless the authors state explicitly otherwise, submission of an article is taken to imply that it represents original, unpublished work, not under consideration for publication elsewhere.

## News and Product Announcements

*Ada User Journal* is one of the ways in which people find out what is going on in the Ada community. Since not all of our readers have access to resources such as the World Wide Web and Usenet, or have enough time to search through the information that can be found in those resources, we reprint or report on items that may be of interest to them.

## Reprinted Articles

While original material is our first priority, we are willing to reprint (with the permission of the copyright holder) material previously submitted elsewhere if it is appropriate to give it a wider audience. This includes papers published in North America that are not easily available in Europe.

We have a reciprocal approach in granting permission for other publications to reprint papers originally published in *Ada User Journal*.

## Commentaries

We publish commentaries on Ada and software engineering topics. These may represent the views either of individuals or of organisations. Such articles can be of any length – inclusion is at the discretion of the Editor.

Opinions expressed within the *Ada User Journal* do not necessarily represent the views of the Editor, Ada Language UK Ltd, Ada-Europe or their directors.

## Announcements and Reports

We are happy to publicise and report on events that may be of interest to our readers.

## Reviews

Inclusion of any review in the Journal is at the discretion of the Editor.

A reviewer will be selected by the Editor to review any book or other publication sent to us. We are also prepared to print reviews submitted from elsewhere at the discretion of the Editor.

## Submission Guidelines

All material for publication should be sent to the editor. Electronic submission is preferred – typed manuscripts will only be accepted by the Editor by prior arrangement.

Prospective authors are encouraged to contact the Editor by email to determine the best format for submission. Contact details can be found near the front of each edition.

Example papers conforming to formatting requirements as well as some word processor templates are available at:

[www.adauk.org.uk](http://www.adauk.org.uk)

There is no limitation on the length of papers, though a paper longer than 10,000 words would be regarded as exceptional.

# Editorial

Welcome to Volume 22 of the Ada User Journal. As this is the first issue of the Journal under my editorship, it is apt to publicly thank my predecessor Jim Briggs on behalf of the readership, Ada UK and Ada-Europe, for all his hard work. Hopefully the standards set by Jim will be maintained, whilst evolving the Journal to keep it relevant and interesting to the readership.

Thanks are also due to members of the Editorial team for the revised appearance of the Journal, especially to Michael Gonzalez for co-ordinating new cover designs and John Barnes for news and technical article layouts.

The first technical paper in this issue is an expanded version of a talk from the Ada UK Symposium on Distributed Software Systems (November 2000) by David Humphris, discussing distribution via Ada and CORBA. The second paper, again with a theme of distribution, is by Fernando Sánchez. This discusses adaptable distribution protocols for object-oriented languages.

The final paper is an expanded version of a talk given by David Thombs at the recent Ada UK Technology Update day. The paper describes the problems facing procurers of high-integrity software in the near future.

Finally, please take the time to look at the updated web site for Ada UK:  
<http://www.adauk.org.uk>

*Neil Audsley*

*York*

*March 2001*

*Email: [Neil.Audsley@cs.york.ac.uk](mailto:Neil.Audsley@cs.york.ac.uk)*

As we go to print we have just heard of the sad death of Bjorn Kallberg. Bjorn was Treasurer of Ada-Europe and Head of the Swedish delegation to WG9. He was an Ada enthusiast and will be sorely missed. We offer our deepest sympathies to his wife.

# News

*Dirk Craeynest (ed)*

*Offis nv/sa and K U Leuven. Email Dirk.Craeynest@offis.be*

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## Ada-related Events

### Ada Winner in MSO World Programming Contest

*From: Vincent Celier  
<vincent@celier.org>  
Date: Fri, 15 Dec 2000 08:07:50 -0800  
Subject: MSO World Programming Contest  
To: team-ada@acm.org*

Somebody in September indicated on this forum the MSO World Programming Contest.

The URL is <http://www.msoworld.com/programming.html>. This is a contest that happens almost every month.

I participated in October, with a program written in Ada, of course. I was lucky enough that the contest was more challenging than before with regard to the algorithm. I sent my entry after almost 12 hours. Previously, the best entry is received in less than 5 hours. This time, I was surprised to learn that I sent the first entry.

I was even more surprised today when I learned that I won the contest. I understand that there is a prize of US \$500 attached to it.

I want to encourage my fellow Ada developers to participate to this contest. The next one is this next Sunday 17 December 2000.

I understand that it will also be a contest where the algorithm will be more important than the speed of programming.

I know you can do it, and Ada can do it, because I did it myself with Ada!

*From: "W. Wesley Groleau x4923"  
<wwgrol@fw.rsc.raytheon.com>  
Date: Fri, 15 Dec 2000 12:13:29 -0500*

*Subject: Re: MSO World Programming Contest*

*To: team-ada@acm.org*

So an Ada program won AND was the first completed! Congratulations, Vincent, for winning, and thanks for showing folks that Ada is neither a useless anachronism nor a devious trick to slow down programmers.

*From: Vincent Celier  
<vincent@celier.org>*

*Date: Fri, 15 Dec 2000 17:24:30 -0800*

*Subject: Re: MSO World Programming Contest*

*To: team-ada@acm.org*

On the web page, you see currently the problem to be solved at the October contest. To judge contests takes a long time (more than a month). MSO World is mostly ran by volunteers.

The fact that I won the October contest will be announce next week, after the December contest starts at 5PM in Great Britain, next Sunday, 17 December 2000.

By the way, as I won the contest, they are going to send me a cash prize of US \$500. I am sure other Ada developers could be interested in such a prize. For me, I cannot win again for 6 month, but I am still going to compete next Sunday.

### ACM SIGAda 2001 Conference

*From: Currie Colket <colket@mitre.org>  
Date: Tue, 2 Jan 2001 16:46:35 -0500  
Organization: The MITRE Corporation  
Subject: Time to Start Thinking About SIGAda 2001!!!!  
To: team-ada@acm.org*

Happy Millennium!!! With the new year and new millennium, this is a good time to start thinking about how you would like to participate in SIGAda 2001. \* SIGAda 2001 will be hosted by the Twin Cities SIGAda Chapter in Minneapolis/ St. Paul, Minnesota from 30 September to 4 October 2001. This is one of the best times to be in the Twin Cities! Specially with an added attraction to address the construction of reliable software using Ada!

Going back to our traditional roots, SIGAda 2001 has a Call For Participation. \*\* Papers will be selected using a double-blind refereed process. We are interested in receiving contributions in six major categories:

Technical Articles,  
Extended Abstracts,  
Experience Reports,  
Workshops,  
Panel Sessions, and  
Tutorials.

Contributions from practitioners, academia, and students are actively solicited.

This is a great time to think about how you can contribute to benefit the entire Ada community.

For more information, please check out: <http://www.acm.org/sigada/conf/sigada2001/#CFP> or <http://www.acm.org/sigs/sigada/conf/sigada2001/#CFP> (ACM is migrating to a new machine; sometimes one URL works; sometimes the other) or contact me. We look forward to seeing you at SIGAda 2001!

Currie Colket, SIGAda Vice Chair for Meetings and Conferences,  
[colket@mitre.org](mailto:colket@mitre.org), [colket@acm.org](mailto:colket@acm.org)

\* Approval Pending by ACM  
\*\* SIGAda 2000 was a special invited paper conference for the millennium

### Workshop on Software Methods and Tools for Ada 95

*From: Laurent.Nana@univ-brest.fr (Nana)  
Date: Sat, 13 Jan 2001  
To: Dirk.Craeynest@cfmu.eurocontrol.be  
Subject: Workshop on Software Methods and Tools for Ada 95*

Workshop on Software Methods and Tools for Ada 95, 2 - 6 April 2001, Brest, France

Organized by ENST Bretagne, TNI, Ecole Navale and Universite de Bretagne Occidentale. Sponsored by Region Bretagne and Ada Europe

This fourth edition of the 'Workshop on software and methods and tools for Ada 95' will be held in Brest, Brittany, France. Tutorials and technical sessions will address issues related to the design and development of large and complex projects. These tutorials and projects demonstrations will be presented by key experts in the domain of complex systems. An exhibition will also take place during the event to discover the latest technologies and tools.

More detailed information and the complete program can be found on our web page: <http://workshopada.enst-bretagne.fr/>

Why you should attend this Workshop ?

The workshop is a unique opportunity to:

- Obtain useful and insightful information on Ada and software methodologies. The tutorials speakers are well known for both their experience and their teaching excellence.

- Discover through experiences why and how Ada can be used in your software projects. Projects architects will relate their experiences in various technology domains: space industry, defense, aeronautics, transports, safety critical systems.

- Determine if you need to go from Ada 83 to Ada 95 from both the academic people and the first returns of experiences.

- Meet outstanding contributors to Ada 95: from the design of the language to the programming environments through key users.

- Learn the new possibilities of Ada 95 for your needs and your current and future software developments. Ada 95 provide numerous approaches to deal with complex software applications.

- Discover the new products from various vendors. There will be product presentations and an exhibition. Moreover, the attendees will have direct interactions with the vendors and will be able to determine how these tools can be solutions to their current needs.

- Put your hands on Ada 95 compilers and their related tools during labs and technical sessions.

Date and location: April 2-6, 2001 in Brest, France.

This five day session will take place on the campus of ENST de Bretagne and at Ecole Navale (French Naval Academy). The participants at the Workshop will attend a unique event with internal audience and speakers and will have access to computers and will be able to experiment Ada 95 related tools. The location of Brest by the seaside provides outstanding opportunity to learn in a relaxed atmosphere.

Address and points of contact

Yvon Kermarrec, ENST de Bretagne, Departement IASC, BP 832, 29285 Brest, France. Phone: +33 2 29 00 12 85, Fax : +33 2 29 00 10 30

Pierre Dissaux, TNI, Technopôle Brest-Iroise, BP 70801, 29608 Brest Cedex, France, Phone : +33 2 98 05 27 44, Fax : +33 2 98 05 63 50

e-mail: [workshopada@enst-bretagne.fr](mailto:workshopada@enst-bretagne.fr)  
URL : <http://workshopada.enst-bretagne.fr/>

## Public SPARK Course

*From: Rod Chapman <r\_c\_chapman@my-deja.com>*

*Date: Tue, 23 Jan 2001 11:18:14 GMT*

*Subject: ANNOUNCE: Public SPARK*

*Course, April, Bath, UK*

*Newsgroups: comp.lang.ada*

We're pleased to announce the first public "High Integrity Software Engineering with SPARK" course for this year.

This is a 4-day course for managers, regulators and engineers, which presents the principles of the development of high integrity software, and the related certification requirements. It then explains the rationale of SPARK, outlines the language and the principles of static code analysis, and presents the role of the SPARK Examiner in systematic program development.

When: 2nd - 5th April 2001

Where: Praxis Critical Systems' offices in Bath, UK.

For more information, please contact

Jo Holding, Praxis Critical Systems Limited, 20 Manvers Street, Bath BA1 1PX, UK. email: [sparkinfo@praxis-cs.co.uk](mailto:sparkinfo@praxis-cs.co.uk). phone: +44 (0)1225 466991, fax: +44 (0)1225 469006, web: <http://www.sparkada.com/>

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## Ada and Education

### Java vs. Ada as First Language

*From: Jim Briggs*

*<Jim.Briggs@port.ac.uk>*

*Date: Fri, 2 Feb 2001 10:53:12 +0000*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

[ On the claim that no UK university teaches Ada as a first language anymore and that the last one changed to Java this year. -- dc ]

Not true, there is still at least one that hasn't changed to Java!

Here at Portsmouth we still teach Ada as the first language to a wide range of students on our computer science, software engineering and information technology courses. We believe it is the best language to support the teaching of the foundations of programming, especially modularity, readability and correctness. We use GNAT because it gives students better help with error messages than any other compiler we've seen.

We also believe Ada provides an excellent platform from which to go on to teach Java, which we do in the second year for CS and SE students. That was a change this year (we used to teach C++) and seems to have gone well.

We've tried this year teaching Java as the first language for our MSc conversion course students (again replacing C++). That hasn't been a great success but, to be fair, perhaps for reasons nothing to do with choice of language.

Dr Jim Briggs, Department of Information Systems, University of Portsmouth, Burnaby Terrace, 1 Burnaby Road, Portsmouth, PO1 3AE, UK. Tel: +44 (23) 9284 6438. Fax: +44 (23) 9284 6402

*From: Alan Barnes*

*<barnesa@aston.ac.uk>*

*Date: Fri, 2 Feb 2001 13:11:44 +0000*

*Organization: Computer Science, Aston University*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

At least two!

At Aston we teach Ada as a first language (for much the same reasons as Jim Briggs gave). In fact we have just rejected a plan to switch to Java for CS1 and so Ada will continue to be used for the next 3 or 4 years at least. Currently we teach C++ and Eiffel in later years but feel we ought to fit Java in somewhere.

If/when Aston merges with Birmingham Univ. (who teach Java as their first language) we will be pushing to retain Ada!

Dr Alan Barnes, Computer Science, Aston University, Aston Triangle, Birmingham B4 7ET, UK. Telephone: +44 121 359 3611 Ext. 4663. E-Mail: [barnesa@aston.ac.uk](mailto:barnesa@aston.ac.uk). Fax: +44 121 333 6215. WWW: <http://www.cs.aston.ac.uk/~barnes>

*From: Michael Feldman*

*<mfeldman@seas.gwu.edu>*

*Date: Fri, 2 Feb 2001 11:31:51 -0500*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

[...]

> We believe it is the best language to support the teaching of the foundations of programming, especially modularity, readability and correctness. We use GNAT because it gives students better help with error messages than any other compiler we've seen.

Exactly. Our 3rd and 4th year students tell us this also. After they have the perspective of two languages and twocompilers, they tell us how much they miss GNAT.

> We also believe Ada provides an excellent platform from which to go on to teach Java, which we do in the second year for CS and SE students.

[...]

Same here at GW. Ada serve as a good foundation on which to build Java and C++. Our experience mirrors Jim's.

From: Ben Brosgol  
 <brosgol@world.std.com>  
 Date: Fri, 2 Feb 2001 15:31:01 -0500  
 Subject: Java as a 1st language? (was Re: SE-book 6.ed)  
 To: team-ada@acm.org

[...]  
 > We've tried this year teaching Java as the first language for our MSc conversion course students (again replacing C++). That hasn't been a great success but, to be fair, perhaps for reasons nothing to do with choice of language.

I am not surprised that teaching Java as a 1st language has been less than successful, and I suspect that the reasons are language related. A couple of years ago I wrote a paper comparing Ada and Java as a foundation language and pointed out why Ada is the better choice; it's available (updated in March 2000) at <http://www.gnat.com/texts/papers/ada-java-teaching-comparison.pdf>

[ The same paper is also available from <ftp://ftp.cs.nyu.edu/pub/gnat/jgnat/papers/--dc> ]

It is not only "Ada bigots" who have reached the conclusion that Java as a first language is a bad choice. Check the April 1998 issue of SIGPLAN Notices for some papers giving other educators' negative experience at teaching Java at this level. It's possible to use Java as a foundations language without inducing permanent harm on the students, but it takes a lot of care.

Ben Brosgol, Ada Core Technologies, 79 Tobey Road, Belmont, MA 02478, USA. +1-617-489-4027 (voice), +1-617-489-4009 (FAX), brosgol@gnat.com

From: "Marie D'Abato"  
 <dabatom@pr.erau.edu>  
 Date: Sat, 3 Feb 2001 12:43:24 -0700  
 Subject: Re: Java as a 1st language? (was Re: Re: SE-book 6.ed)  
 To: team-ada@acm.org

I was taught Ada as a first language and not only did it provide a great solid foundation for good programming practices, but it made learning any other language a piece of cake! (I graduated last Spring.)

I took Ada for two semesters, later taking C/C++ as a combined one semester course, and Visual C++ and Java later on, by taking Ada first (And having professors that pointed out every reason why Ada was better than other languages hehe) I find it easier to use other languages in a safer way, I know the pitfalls to watch out for, and just by taking Ada it has made me a better programmer all around.

[...] Just my Two Cents! Have a good weekend!

## First-Course Language List

From: dalamb@qucis.queensu.ca (David Alex Lamb)  
 Date: 8 Feb 2001 13:57:57 GMT  
 Organization: Computing & Information Science, Queen's University  
 Subject: Re: Reid First-Course Language List  
 Newsgroups: comp.edu

> The Return of the Reid List. This is Version 21 of the Reid First Course Language List, posted to comp.edu on February 6, 2001.

[ Full list deleted. See also AUJ 20.2 (July 1999), pp.101-102. -- dc ]

Here's the trend in first languages over the recent years. 2001 has only about 2/3 of the sites of previous years so the raw counts are less useful than they once were; I'll post percentages later, and perhaps group languages by type (at least BCPL derivatives versus functional versus other).

| Language     | 95 Q2 | 95 Q4 | 96 Q2 | 96 Q4 | 97 Q2 | 97 Q4 | 98 Q2 | 98 Q4 | 99 Q2 | 01 Q1 |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pascal       | 153   | 157   | 152   | 151   | 148   | 147   | 144   | 144   | 140   | 97    |
| C++          | 27    | 34    | 82    | 87    | 89    | 91    | 100   | 99    | 101   | 88    |
| Ada          | 73    | 73    | 75    | 74    | 85    | 85    | 84    | 84    | 84    | 51    |
| C            | 36    | 39    | 51    | 51    | 50    | 52    | 56    | 56    | 58    | 42    |
| Scheme       | 51    | 50    | 49    | 51    | 51    | 49    | 50    | 50    | 50    | 30    |
| Modula       | 49    | 50    | 49    | 49    | 49    | 49    | 49    | 49    | 48    | 17    |
| Java         | 0     | 0     | 0     | 0     | 0     | 3     | 7     | 8     | 15    | 11    |
| Fortran      | 9     | 8     | 8     | 9     | 9     | 9     | 9     | 9     | 9     | 6     |
| SML          | 5     | 6     | 6     | 6     | 7     | 7     | 7     | 7     | 8     | 0     |
| Oberon       | 1     | 2     | 3     | 3     | 3     | 3     | 4     | 4     | 4     | 0     |
| Turing       | 6     | 6     | 5     | 5     | 5     | 5     | 4     | 4     | 4     | 0     |
| Miranda      | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 0     |
| Smalltalk    | 1     | 1     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 0     |
| Eiffel       | 2     | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 1     |
| ML           | 1     | 1     | 1     | 2     | 2     | 2     | 2     | 2     | 2     | 1     |
| ISETL        | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 2     | 0     |
| Haskell      | 0     | 1     | 1     | 1     | 1     | 2     | 2     | 2     | 2     | 1     |
| ObjPascal    | 1     | 1     | 2     | 2     | 3     | 2     | 2     | 2     | 2     | 2     |
| Beta         | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 0     |
| Blue         | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 0     |
| Orwell       | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 0     |
| Prolog       | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 0     |
| Simula       | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 0     |
| HyperTalk    | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     | 1     |
| ISETL/C      | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| C++/Pascal   | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| VirtualBasic | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 1     |
| Total        | 425   | 442   | 501   | 508   | 519   | 523   | 538   | 538   | 546   | 351   |

From: Randy Crawford  
 <crwfrd@umich.edu>  
 Date: Thu, 08 Feb 2001 14:33:57 -0500  
 Organization: The Center for Parallel Computing  
 Subject: Re: Reid First-Course Language List  
 Newsgroups: comp.edu

Here are the same figures, with the last three columns converted into percentiles (over their respective years). [...]

| Language | 98Q4 | 99Q2 | 01Q1 |
|----------|------|------|------|
| Pascal   | .268 | .256 | .276 |
| C++      | .184 | .185 | .251 |
| Ada      | .156 | .154 | .145 |
| C        | .104 | .106 | .120 |
| Scheme   | .093 | .092 | .085 |
| Modula   | .091 | .088 | .048 |
| Java     | .015 | .027 | .031 |

|              |      |      |      |
|--------------|------|------|------|
| Fortran      | .017 | .016 | .017 |
| SML          | .013 | .014 | 0    |
| Oberon       | .007 | .007 | 0    |
| Turing       | .007 | .007 | 0    |
| Miranda      | .007 | .007 | 0    |
| Smalltalk    | .007 | .007 | 0    |
| Eiffel       | .006 | .005 | .003 |
| ML           | .004 | .004 | .003 |
| ISETL        | .004 | .004 | 0    |
| Haskell      | .004 | .004 | .003 |
| ObjPascal    | .004 | .004 | .006 |
| Beta         | .002 | .002 | 0    |
| Blue         | .002 | .002 | 0    |
| Orwell       | .002 | .002 | 0    |
| Prolog       | .002 | .002 | 0    |
| Simula       | .002 | .002 | 0    |
| HyperTalk    | 0    | .002 | .003 |
| ISETL/C      | 0    | 0    | .003 |
| C++/Pascal   | 0    | 0    | .003 |
| VirtualBasic | 0    | 0    | .003 |
| Total        | 538  | 546  | 351  |

## Ada-related Resources

### ACM SIGAda Job Registry

From: Michael Feldman  
 <mfeldman@seas.gwu.edu>  
 Date: Fri, 8 Dec 2000 22:11:41 -0500  
 Subject: The SIGAda Job Registry is Back!  
 To: team-ada@acm.org

We are happy to announce that the SIGAda job registry is back on the air. Point your browser at <http://www.seas.gwu.edu/~adajobs> and take it from there. It will shortly be linked from the main SIGAda site at <http://www.acm.org/sigada> as well.

This site was developed with funding from ACM SIGAda and the Ada Resource Association (ARA). All the programming was done with GNAT (including GNAT.Spibol) and David Wheeler's AdaCGI package. We are cleaning up the source code for GPL release; when this is done we'll add a button to the site to download the code.

As you can see from the URL, the registry is currently at GW. Eventually we will move this site over to the main SIGAda site, but SIGAda is located at ACM, which is currently running an old version of DEC Unix for which there is no current GNAT. ACM will eventually move to Linux, and once we are able to compile the programs there, we'll move the site.

The long range SIGAda/ARA plan is to merge the AdaIC site into this one. I assume that will happen once we are sure the new site is stably in its proper location

Enjoy!.

Michael B. Feldman - chair, ACM SIGAda Education Working Group Professor, Department of Computer

Science, The George Washington University - Washington, DC 20052 USA

*From: "John McCormick, SIGAda Secretary"*  
*<mccormic@nova.cs.uni.edu>*  
*Date: Wed, 24 Jan 2001 08:06:20 -0600*  
*Subject: Ada Employment Opportunities Database*  
*To: sigada-announce@acm.org*

SIGAda with the assistance of the Ada Resource Association is now providing an Ada Employment Opportunities Database. Anyone may post, search, and browse Ada related job openings. You can access the database from the SIGAda home page <http://www.acm.org/sigada/>

This application was programmed by Hristian Kirtchev entirely in Ada 95, using David Wheeler's Ada interface to CGI (AdaCGI).

## New Web-site AdaPower.net

*From: "David Botton"*  
*<David@Botton.com>*  
*Date: Wed, 3 Jan 2001 00:20:43 -0500*  
*Subject: New! AdaPower.net*  
*Newsgroups: comp.lang.ada*

Ever wished you could have your very own Unix account to play with Ada? Have your own Ada website? Have a CVS server for your Ada project?

Now you can!

Join AdaPower.net!

<http://www.adapower.net>

Already have an Ada web site with your own domain? No problem. I'd be happy to host it for you!

## Ada Rapporteur Group (ARG)

*From: "Randy Brukardt"*  
*<randy@rrsoftware.com>*  
*Date: Wed, 10 Jan 2001 21:43:49 -0600*  
*Subject: Please help the ARG...*  
*Newsgroups: comp.lang.ada*

The ARG needs to find out more about the behavior of stream files on existing Ada compilers in order to resolve AI-00085. Since the results potentially could vary by target, we need your help to get the broadest possible coverage of the behavior of existing compilers. We're especially interested in obscure compilers and obscure targets, but we also need results for all of the mainstream compilers and targets. So feel free to send in all results; we'll follow up if we're getting too many results for a particular compiler/target combination. The test requires: an Ada 95 compiler; a target that supports stream files.

The test is available at [http://www.ada-auth.org/~acats/ai-files/grab\\_bag/ai85.ada](http://www.ada-auth.org/~acats/ai-files/grab_bag/ai85.ada). It's about 600 lines of code, and the output goes to standard output.

Please run this test on as many different Ada compilers and targets as possible. Please send the test results, along with your name, reply e-mail, the compiler used (including version number), and a description of the target (including the operating system name and target) to [agent@ada-auth.org](mailto:agent@ada-auth.org).

Note that the test's Passed and Failed messages depend on a particular interpretation of the Ada Reference Manual (as corrected by Technical Corrigendum 1), and do not necessarily reflect the final interpretation by the ARG for these issues. Thus, a result of Failed does not necessarily reflect that the compiler under test is incorrect. Also note that we are interested in all results, not just those that report Failed. Please submit all Passed and Failed results.

Randy Brukardt, ARG Editor

*From: "Randy Brukardt"*  
*<randy@rrsoftware.com>*  
*Date: Fri, 26 Jan 2001 15:55:39 -0600*  
*Subject: ACAA Web server updated.*  
*Newsgroups: comp.lang.ada*

The ACAA web server at [www.ada-auth.org](http://www.ada-auth.org) has been moved to a new machine. The new server should be more reliable (the old server occasionally stopped serving requests for no apparent reasons) and more responsive.

[ See also "Revised Ada Reference Manual available" in AUJ 21.4 (January 2001), p.238. -- dc ]

The only difference that ought to be visible to users of the site is that the "~acats" part of the URL is no longer needed. (We've insured that it still works, so you don't need to update your bookmarks.) So, access to the master sites for the ACATS ([www.ada-auth.org/acats.html](http://www.ada-auth.org/acats.html)) and AIs ([www.ada-auth.org/ais.html](http://www.ada-auth.org/ais.html)) is a bit easier to describe.

If you experience any problems, please contact me at [agent@ada-auth.org](mailto:agent@ada-auth.org).

Continuing thanks to OCSystems for providing the space and web server for this web site.

Randy Brukardt, ACAA Technical Agent

## Web-site for BASIC to Ada Migration

*From: Anatoly Chernyshev*  
*<achernyshev@adapower.net>*  
*Date: Thu, 18 Jan 2001 00:34:29 +0300*  
*Subject: New Ada page*  
*Newsgroups: comp.lang.ada*

Anyone, especially those people who want to jump from BASIC to Ada, who would like to look at new page related to Ada programming is invited to visit <http://www.adapower.net/~achernyshev>.

## Ada Picture Gallery

*From: Dirk Craeynest*  
*<Dirk.Craeynest@cs.kuleuven.ac.be>*  
*Date: Wed, 31 Jan 2001 15:15:15 +0100*  
*Subject: Re: Ada gif image*  
*To: team-ada@acm.org*

> I am in search for an (approx.) 2x2 inch Ada gif-image with something like "Ada, language for a complex world" or "Ada, managing|mastering complexity" to be included in a lecture announcement text. Can somebody point me to a source?

Check out the "Ada Picture Gallery" on the Ada-Belgium web server at <http://www.cs.kuleuven.ac.be/~dirk/ada-belgium/pictures.html>

It contains a.o. the "official" logo from the then Ada9X project "for use on all new Ada marketing materials. It combines the globe symbol used by the AdaIC with the logotype that reads, "Ada, The Language For a Complex World." 1994/10/18 (From the AdaIC ftp-server, 4 KB)."

I would expect more pictures to be available at <http://www.adaic.com/> & <http://www.adapower.com/>

Hope this helps.

Dirk (Dirk.Craeynest@cs.kuleuven.ac.be for Ada-Belgium e-mail)

PS: Note the latest addition on that Ada-Belgium web page: a color portrait of Ada from a book published in November 1838...

PPS: More publicly available Ada-related pictures are welcome.

Dirk Craeynest, Offis nv/sa - Aubay Group, Weiveldlaan 41/32, B-1930 Zaventem, Belgium  
 Email Dirk.Craeynest@offis.be. Phone +32(2)725.40.25. Fax +32(2)725.40.12

## GNOME/Ada Site and Mailing List

*From: charlet@gnat.com (Arnaud Charlet)*  
*Date: Thu, 08 Feb 2001 09:56:00 GMT*  
*Subject: ANNOUNCE: GNOME/Ada site and mailing list*  
*Newsgroups: comp.lang.ada*

A section on GNOME/Ada is now available at the libre software site (<http://libre.act-europe.fr>) that is intended to give an easy access to all the components allowing access to the GNOME framework for Ada programmers, as well as a discussion list. It is also intended to encourage people to contribute to the GNOME/Ada effort and provide feedback.

To subscribe to this list, simply follow the links, or send a subscribe request to [<gnomeada-request@lists.act-europe.fr>](mailto:<gnomeada-request@lists.act-europe.fr>)

## Ada-related Tools

### SMTP Component

*From: Pascal Obry <p.obry@wanadoo.fr>  
Date: 16 Dec 2000 20:53:35 +0100  
Subject: ANNOUNCE: SMTP component  
Newsgroups:  
comp.lang.ada.fr.comp.lang.ada*

I have just uploaded an SMTP client Ada package into my homepage. The interface is simple and this is the first version to be considered as beta. This package (distributed into the GNAT modified GPL for library) let you send e-mail using an SMTP server.

Documentation is to be found into smtp.ads there is also a simple example on how to use it, here it is:

```
with SMTP;
procedure Test_Mail is
  Server : SMTP.Server := SMTP.
    Initialize("smtp.wanadoo.fr");
  Stat : SMTP.Status;
begin
  for K in 1 .. 2 loop
    SMTP.Send(Server,
      From => SMTP.E_Mail
        ("Pascal Obry",
         "p.obry@wanadoo.fr"),
      To => (SMTP.E_Mail
        ("Pascal Obry",
         "p.obry@wanadoo.fr"),
         SMTP.E_Mail ("Pascal Obry",
         "p.obry@der.edf.fr")),
      Subject => "Well, well...",
      Message => "Simple message " &
        Positive'Image (K),
      Status => Stat);
  end loop;
end Test_Mail;
```

Please do not run it as is as I do not want to get hundred of messages :)

[ And in response to the question "How RFC compliant is it?" -- dc ]

Well it is 100% compliant (or should be :) to a small part of RFC 821.

Pascal Obry, Team-Ada Member, 45, rue Gabriel Peri, 78114 Magny Les Hameaux, France  
<http://perso.wanadoo.fr/pascal.obry>

*From: Pascal Obry <p.obry@wanadoo.fr>  
Date: 12 Jan 2001 19:28:14 +0100  
Subject: ANNOUNCE : new version of  
SMTP component  
Newsgroups: comp.lang.ada,  
fr.comp.lang.ada*

I use this announcement to wish you all an happy New Year.

I'm happy to announce a new version of my SMTP component. Here is the readme.txt as found in the archive. This component is provided as-is and comes with no guaranty.

SMTP - Simple Mail Transfer Protocol  
Copyright (C) 2000-2001 Pascal Obry

This is a component that implements the SMTP (Simple Mail Transfer Protocol). It is distributed in a modified GPL license (GNAT library GPL).

It is a component to show that Ada can send mail too. I just hope that this will help the Ada community. A simple SMTP server implementation is now provided. It will receive a mail, open it, put the mail data into a structure and call a user's callback procedure. Could be the start of a mailing list engine...

The distribution can be found at:  
<http://perso.wanadoo.fr/pascal.obry/contrib.html>

Pascal p.obry@wanadoo.fr  
<http://perso.wanadoo.fr/pascal.obry/>

For people having difficulties with french language even if the only problem here is to find the SMTP keyword in a Web page, here is a direct link to the archive:  
<http://perso.wanadoo.fr/pascal.obry/archive/smtp.tar.gz>

Thanks to all for the feedbacks I got.

*From: Pascal Obry <p.obry@wanadoo.fr>  
Date: 13 Jan 2001 00:03:40 +0100  
Subject: Re: ANNOUNCE : new version of  
SMTP component  
Newsgroups: comp.lang.ada,  
fr.comp.lang.ada*

> I assume that this acts as an SMTP \*client\*, not as a server...

There is a client part (just to send SMTP message) and an SMTP server (you can send mail to it from Emacs/VM or Outlook for example). The server part must be seen as a demo at this stage...

### MIAMS - Library for Messaging Servers

*From: "Chad R. Meiners"  
<crmeiners@hotmail.com>  
Date: Sun, 7 Jan 2001 18:28:05 -0600  
Subject: Announcement: MIAMS public  
release.  
Newsgroups: comp.lang.ada*

I have released my senior capstone project, MIAMS, under the GPL. You can find it at:  
<http://www.adapower.net/~cmeiners/miams/>. Many thanks to David Botton for hosting my project.

Feel free to send comments and criticisms to me via e-mail.

[ From the technical description at URL above: -- dc ]

#### 0.1 Abstract

MIAMS is a software library that provides an internal server protocol to facilitate the building of instant messaging servers. This document describes MIAMS's specifications in detail and provides some examples of how to build the components necessary to construct a server. [...]

#### 1.1 What is MIAMS

MIAMS (Modular Internal Abstract Message Services) is a software library that provides an internal server protocol to facilitate the building of instant messaging servers. This internal protocol is an abstract network meaning that it does not deal with bits on the wire, but instead it provides a network-like interface to software modules which may or may not deal with other real network protocols which do deal with bits on wires. The goals of MIAMS are to allow rapid and reliable instant messaging server development by providing commonly needed resources through an easy to use interface and allowing new resources to be created in a way that they can be easily integrated into existing MIAMS based instant message servers. Thus MIAMS is not a instant messaging server protocol, but instead a library that allows the development of software modules that can be assembled into custom built instant messaging servers. MIAMS accomplishes this by providing a set of services that are used by software modules to interact with each other under a standard set of rules. [...]

### Booch Components

*From: Simon Wright  
<simon@pushface.org>  
Date: Thu, 25 Jan 2001 06:27:14 +0000  
Subject: Booch Components 20010121  
To: team-ada@acm.org*

This release has been uploaded to <http://www.pushface.org/components/bc/> (which at present is the same place as the old <http://www.pogner.demon.co.uk/components/bc/>).

[ See also AUJ 21.3 (October 2000), p.162. -- dc ]

The change that will make most difference to users is a Great Renaming: For Containers with Bounded, Dynamic and Unbounded forms the concrete types no longer include the form name; thus, BC.Containers.Maps declares Abstract\_Map, BC.Containers.Maps.Unbounded declares Map.

The concrete Lists are now declared as plain List rather than Single\_List, Double\_List (there is no Abstract\_List, perhaps there should be!).

The concrete Graphs, Vertices and Arcs are now declared as plain Graph, Vertex and Arc (and the abstract types in BC.Graphs are Abstract\_Graph, Abstract\_Vertex, and Abstract\_Arc).

Besides that,

Maps now have the standard Container generic type Item as the range, and the Map generic type Key as the domain. If you are a Map user, you'll have to change

your code's logic (as well as the type names, see above).

Added generic Copy, Filter functions to BC.Containers.

## PragmAda Reusable Component

*From: Jeffrey Carter <jrcarter@acm.org>  
Date: Thu, 25 Jan 2001 23:04:24 GMT  
Subject: Announce: PragmAda Reusable Components Release  
Newsgroups: comp.lang.ada*

A new release of the PragmARCs is now available at

<http://home.earthlink.net/~jrcarter010/pragmarc.htm>

Hopefully the mirror at adapower.com will be updated soon.

[ See also AUJ 21.4 (January 2001), p.225. -- dc ]

This release makes some enhancements to the regular-expression matcher, and includes a new example/test program for it, strm\_sub.adb. The existing program, mt.adb, has been modified to make use of the new features.

Some other components have received some internal enhancements. See readme.txt for details.

Jeffrey R. Carter, PragmAda Software Engineering

*From: "David Botton" <David@Botton.com>*

*Date: Thu, 25 Jan 2001 19:56:09 -0500  
Subject: Re: Announce: PragmAda Reusable Components Release  
Newsgroups: comp.lang.ada*

The AdaPower mirror is updated and located at <http://www.adapower.com/pragmada>

## Storage Pool Implementations

*From: "David C. Hoos, Sr." <david.c.hoos.sr@ada95.com>  
Date: Tue, 13 Feb 2001 20:29:57 -0600  
Subject: Re: Storage management question.  
To: "GNAT Discussion List" <gnatlist@lyris.seas.gwu.edu>*

[ On using storage pools to prevent memory fragmentation for long-running programs. -- dc ]

> How would you specify the storage size for the storage pool?

Please see my storage pool implementations and some simple test programs that show (among other things) how to specify the size.

[ftp://ftp.ada95.com/pub/storage\\_pools.tgz](ftp://ftp.ada95.com/pub/storage_pools.tgz)

## Standard Template Library

*From: Ted Dennison <dennison@telepath.com>  
Date: Thu, 22 Feb 2001 15:30:10 GMT  
Subject: Re: STL for Ada (was: Re: Ada to C++ translator?)  
Newsgroups: comp.lang.ada*

> I'm very new to Ada (but worked quite some time with C++) and 'till now I read nothing about something like the STL for Ada. Is there a library that gives Ada all the things the STL gives C++? If not, why? STL is mostly generic programming and Ada always claims to do better generics than C++, so why not put such a lib in the standard?

A lot of the lower-level stuff that C++ needs an STL for (eg: decent strings) \*is\* actually in the standard. Familiarize yourself the packages in Annex A of the LRM (<http://www.ada-auth.org/~acats/arm-html/RM-TOC.html>) before you go any further.

As for the higher-level data structures, there are several competing packages (just like the C++ STL has competing packages). The one I tend to lean on is the Booch Components, but others have their own favorites.

The Ada95 Booch Components are available at <http://www.adapower.com/booch/index.html>

## FSMedit - Editor for Finite State Machines

*From: Christoph Grein <christoph.grein@eurocopter.de>  
Date: Mon, 11 Dec 2000  
Subject: Announcement FSMedit 1.3  
Newsgroups: comp.lang.ada*

Due to a Gnat bug (3.12p, 3.13p), a new version with a work-around has been released. There are also some functional additions.

See the History chapter in the documentation.

<http://home.T-Online.de/home/Christ-Urch.Grein/Ada/FSM.html>

[ See also AUJ 21.4 (January 2001), p.227. -- dc ]

## MaRTE OS - Minimal Real-Time Operating System for Embedded Applications

*From: Mario Aldea <aldeam@unican.es>  
Date: Wed, 13 Dec 2000 10:50:10 +0100  
Organization: Universidad de Cantabria  
Subject: New MaRTE OS version released*

MaRTE OS version 0.86 released!

MaRTE OS (Minimal Real-Time Operating System for Embedded Applications) is a real-time kernel for

embedded applications that follows the Minimal Real-Time POSIX.13 subset, providing both the C and Ada language POSIX interfaces.

[ See also AUJ 21.4 (January 2001), p.227. -- dc ]

In this new version new functionality has been added:

- Support for Pentium II (and higher) Local APIC Timer. This allows implementing faster and more accurate timers. It is included as a configuration option when installing MaRTE OS.

Some minor changes and bug fixed have been performed; the most important ones are:

- Fixed bug in timers programming when using TSC and PIT simultaneously.
- Fixed bug in delivery of signals generated by timers.

MaRTE OS is being developed in the Group of "Computadores y Tiempo Real" of the Department of "Electronica y Computadores" of the University of Cantabria. It is not a finished product, but we share it hoping it can be useful for educational or experimental purposes.

MaRTE OS is available under the GNU General Public License.

For more extensive documentation and downloading please visit the following URL:

<http://ctrpc17.ctr.unican.es/marte.html>

For comments, suggestions, doubts, problems, etc., send an e-mail to Mario Aldea:

<mailto:aldeam@unican.es>

## MAST - Modeling and Analysis Suite for Real-Time Applications

*From: Michael Gonzalez <mgh@unican.es>  
Date: Mon, 29 Jan 2001 19:08:52 +0100  
Organization: Universidad de Cantabria  
Subject: MAST: Modeling and Analysis Suite for Real-Time Applications*

MAST 1.0 is now available from: <http://ctrpc17.ctr.unican.es/mast/>

MAST is an open source set of tools that enables modeling real-time applications and performing timing analysis of those applications. The MAST model can be used in a UML design environment to design real-time applications, representing all the real-time behavior and requirements together with the design information, and allowing an automatic schedulability analysis.

The new aspects that can be found in MAST are the following:

- A very rich model of the real time system is used. It is an event-driven model in which complex dependence

patterns among the different tasks can be established. For example, tasks may be activated with the arrival of several events, or may generate several events at their output. This makes it ideal for analyzing real-time systems that have been designed using UML or similar design tools, which have event-driven models of the system. The current version only supports linear distributed systems, but support for multiple-event systems will be available very soon.

- The latest offset-based analysis techniques are used to enhance the results of the analysis. These techniques are much less pessimistic than previous schedulability analysis techniques for distributed systems.

- The toolset is open source and fully extensible. That means that other teams may provide enhancements. The first version is intended for fixed priority systems, but dynamically scheduled systems may be added in the future.

- The tools will support the analysis of both hard and soft timing requirements. The current version only supports hard real-time requirements, but support for soft requirements will be added soon.

You can download MAST, and get more information about it, from:

<http://ctrpc17.ctr.unican.es/mast/>

Michael Gonzalez Harbour, Dpto. de Electronica y Computadores, Universidad de Cantabria, Avda. de los Castros s/n, E-39005 Santander, SPAIN

## Simple Ada MUD - Roleplaying Game

*From: David Kristola <David95037@See-My.Sig>*

*Date: Mon, 1 Jan 2001 15:44:08 -0800*

*Subject: Re: What to Do?*

*Newsgroups: comp.lang.ada*

> In fact, I think one problem Ada had (note past tense) was lack of amateurs. As opposed to such "cool" languages like C++ and Java (and in the old day Turbo Pascal), most hobbyist never hear of Ada, or hear misleading info (see Jargon File). I think these days things are changing a bit (I am judging mainly from this group, AdaPower etc.) I think that if we succeed in making the Ada community larger, by attracting hobbyists, the "real world" situation will improve too.

I've been an Ada advocate on a few of the MUD news groups. Many people over there have not even heard of the language. On the other hand, many are programming MUDs specifically to learn "C/C++".

Good free software is important to most (if not all) hobbyists. Many are students with limited resources exploring new

ideas. GNAT makes Ada freely available (thanks Ada Core Technologies!).

If anyone here is interested in watching the development process, i've been posting new alpha versions of SAM (Simple Ada MUD) on my website:

<http://members.aol.com/drveg/mud/index.html>

## Ada Mode 3.5 for Emacs

*From: Emmanuel Briot <briot@gnat.com>*

*Date: Thu, 01 Feb 2001 10:13:32 GMT*

*Subject: [ANNOUNCE] ada-mode 3.5 for Emacs released*

*Newsgroups: comp.lang.ada*

[ See also "Emacs Ada-mode 3.4a" in AUJ 20.3 (October 1999), p.181. -- dc ]

After more than a year, I am happy to finally announce the new release of the ada-mode for Emacs. It includes a lot of bug fixes since the last version (thanks to all the persons who reported problems), as well as several improvements. Here is a quick and non-exhaustive list of them:

- \* Only one project file is active at any given time. Although this might seem more restrictive than what was there before, this is much much clearer. Switching from one project file to another one is trivially done through the Ada -> project menu.

- \* A new shortcut \C-c\C-f allows you to open a file anywhere one your path, as defined in the project file. For instance, if you want to check one of the runtime file for GNAT (e.g Ada.Text\_IO), simply do \C-c\C-f a-textio.ads (or use completion with TAB key) to open it. You don't need to know where it is installed.

- \* Add cross-references to operators. You can now click on an operator and go to its definition with the standard cross-referencing functions.

- \* The project file editor has been improved and is now much clearer.

- \* Support for which-function-mode has been added. Try typing \M-x which-function-mode and see the name of the subprogram the cursor is in displayed in the status bar!

- \* Defining casing exceptions can not be done for whole words, or part of them. For instance, you can specify that you want chars\_ptr to be printed all lower cases (even if you generally write your identifier with an upper-case first, or that you always want the substring "IO" in upper cases (as in Ada.Text\_IO).

Supported users of Ada Core Technologies or ACT-Europe do not need to download this version, since they already have access to it through their support contract.

The home page for the ada-mode is <http://ada.eu.org/ada-mode> You can get the latest version from there.

I'd like to take the opportunity to thank all the persons who sent patches, especially Stephen Leake and John McCabe, who have both been very important contributors to the ada-mode technology over the years.

Emmanuel

## BUSH - AdaScript Shell

*From: PegaSoft Canada - ALT Drop Box*

*<adalin-1@tiamet.vaxxine.com>*

*Date: Sun, 25 Feb 2001*

*Subject: BUSH - AdaScript Shell*

*To: "GNAT Discussion List"*

*<gnatlist@lyris.seas.gwu.edu>*

BUSH (Business Shell) version 0.1 is available for download from my website at <http://www.vaxxine.com/pegasoft>. BUSH is written entirely in Ada 95. It's been tested on HP-UX and Linux. It's an open source project: contributions and ports to other versions of UNIX are welcome.

BUSH is a Linux shell that uses a language I call "AdaScript", a stripped-down version of Ada 95 for use with shell programming. This prototype version is usable, but it is missing some advanced features like job control.

I've been interested in writing an Ada shell for some time. A few weeks ago I became so frustrated with a Bash shell script I was working on that I created quickly wrote BUSH.

Instructions on how to use BUSH and AdaScript are both posted on the website and included in the download file.

I'm interested in hearing your opinions, but please bear in mind I check this computer only on weekends, so you may have to wait for a reply.

Have a good week everyone.

Ken O. Burtch, Pegasoft, R.R.#1, Jordan Station, ON, Canada L0R 1S0  
[ken@tiamet.vaxxine.com](mailto:ken@tiamet.vaxxine.com)

## Ada Code for Eigenvalue Problem

*From: "Ken Thomas"*

*<kst@ecs.soton.ac.uk>*

*Date: Fri, 1 Dec 2000 09:42:46 -0000*

*Subject: Re: Natural Ada to find eigenvalues/-vectors of matrix*

*Newsgroups: comp.lang.ada*

> I can use LAPACK, but does someone have (or know about) a robust (natural) Ada95 (open source) routine to estimate eigenvalues/-vectors of a positive definite (real) matrix ?

I have extended the "generic\_real\_array" from Drexel to add methods for the eigenvalue problem. It already has an implementation of Jacobi's method. I have added an implementation of the QR

algorithm for real symmetric matrices. I can supply the code if desired.

*From: "Dr. Joachim Schröer"*

*<joachim.schroer@vs.dasa.de>*

*Date: Wed, 6 Dec 2000 14:32:05 +0100*

*Organization: Daimler-Benz Aerospace*

*Subject: Re: Natural Ada to find eigenvalues/-vectors of matrix*

*Newsgroups: comp.lang.ada*

In the late 80's a group of engineers at the MLap (<http://www.mlap.de>) developed a pure Ada 83 version of some EISPACK/LINPACK (HQREW / HQREV among others) subset for controller design algorithms (see Matlab). I still have the undocumented sources. I intended to transit the source to Ada95 (insert the packages into hierachical structures etc.) as I did with a set of generic matrix operation packages before publishing them in the web. But I don't have any time.

If you like, I send you a ZIP with the Ada83 code. It works since years in the department.

Dr. Joachim Schröer, EADS Germany GmbH

### 3D Graphic Engine Ported to Linux

*From: gdemont@my-deja.com*

*Date: Tue, 19 Dec 2000 22:05:33 GMT*

*Subject: Ann: Engine\_3D ported to Linux*

*Newsgroups: comp.lang.ada*

Hi - I hope the title is clear ;-).

[ See also AUJ 21.2 (July 2000), p.104. -- dc ]

A note: the port was done by Duncan Sands. It should work (after compilation by GNAT!) but the whole is of course under construction. More Ada texels to come!

Now, the download. The page is still only on a free server. Click reload, back, forward sometimes - sorry...

- <http://members.nbc.com/gdemont/e3d.htm> (false 404s, long waits, ads, java, browser crashes)

- [http://members.nbc.com/\\_XMCM/gdemont/e3d.htm](http://members.nbc.com/_XMCM/gdemont/e3d.htm) (false 404s, long waits only)

Direct access to the archive :  
[http://members.nbc.com/\\_XMCM/gdemont/e3d/engine3d.tgz](http://members.nbc.com/_XMCM/gdemont/e3d/engine3d.tgz)

Have fun! Gautier

### AdaSDL - Binding to Simple DirectMedia Layer (SDL)

*From: Antonio Vargas*

*<antonio.vargas@clix.pt>*

*Date: Wed, 3 Jan 2001 22:13:21 +0000*

*Subject: Re: New! AdaPower.net*

*Newsgroups: comp.lang.ada*

I'm just making the final tests to an Ada binding do SDL graphics library. [...] I'm also writing html pages about graphics programming in Ada and developing some apps to be used in my math classes. [...]

[ And from a later message: -- dc ]

> Sounds great. SDL is cross platform to Unix and Win32 correct?

The SDL in [www.libsdl.org](http://www.libsdl.org) Open source and cross platform: BeOS, Linux, MacOS and Win32

It's a 100% binding,

I'm already programming windowed and full screen, accelerated (OpenGL) and non accelerated (2D) graphic applications, with sound, in Ada.

I'm just correcting some "rough edges" specially in sound system. Right now it is very dependent on Interfaces.C Since it is my first public release I'm taking a little longer; [...]

*From: Antonio F. Vargas*

*<antonio.vargas@clix.pt>*

*Date: Wed, 7 Feb 2001 04:44:39 +0000*

*Subject: [ANNOUNCE] Binding to SDL graph. lib*

*Newsgroups: comp.lang.ada*

I'm just releasing AdaSDL, a binding to SDL (Simple DirectMedia Layer) a cross-platform library designed to make it easy to write multi-media software (2D, 3D graphics with OpenGL, in window or fullscreen plus sound, mouse, keyboard and joystick interaction.

You can get more information about SDL in [www.libsdl.org](http://www.libsdl.org)

You must be warned of the following:

- I'm a recent newcomer from the C/C++ world which means that I might have some bad habits :-).

- This is my first Ada code.

- SDL is a low level library. It gives you a pointer to a graphics surface that must be manipulated via "Interfaces.C.Pointers" (arghh). Based on this binding I'm making a more reliable Interface avoiding this nasty pointers and acording to better Software Engineering principles. It is not easy due to efficiency problems.

- English is not my natural language.

- The compiler used is Gnat.

- The tested platforms are Windows and Linux. But it is supposed to be portable to all platforms with Gnat and SDL availability.

Please send comments and constructive criticism to this thread or to [avargas@adapower.net](mailto:avargas@adapower.net).

You can get more information and files from <http://www.adapower.net/~avargas> in the topic "My projects".

Thanks in advance for the new ideas, improvements, portability to other compilers and tests in other platforms.

*From: Antonio F. Vargas*

*<antonio.vargas@clix.pt>*

*Date: Fri, 9 Feb 2001 02:06:10 +0000*

*Subject: Re: [ANNOUNCE] Binding to SDL graph. lib*

*Newsgroups: comp.lang.ada*

[...] since SDL loads image files only in \*.bmp format, I've added another (very small) binding to another extra library (SDL\_image) which adds the capability of loading \*.ppm, \*.pcx, \*.gif, \*.jpg, \*.tif, \*.png and \*.tga files

I've also ported to Ada a small application "showimage" which works as an image viewer of the above formats.

Please send feedback. I'm working in complete isolation. No Ada programmers around these islands in the middle of the Atlantic Ocean (Azores).

*From: Antonio F. Vargas*

*<antonio.vargas@clix.pt>*

*Date: Sun, 18 Feb 2001 02:33:41 +0000*

*Subject: New update of AdaSDL*

*Newsgroups: comp.lang.ada*

A new update of AdaSDL has been released.

In this release I've made important changes toward better Ada programming principles. But this still a very raw work. I've received several code fragments and question from some young users that found a link to my site in [www.libsdl.org](http://www.libsdl.org). So I make an important warning: **THIS CODE IS NOT IDEAL TO BE USED BY PEOPLE STARTING TO LEARN Ada**. First you must get a good book or teacher and start with non-graphical coding. I've made this release in order to be helped not to teach others. Despite my degree in Computer Science I'm still an Ada beginner. Anyway, you can email me about things very specific to graphics programming in general or just about this Binding.

### Alibrowse - GtkAda Example Project

*From: "Rajagopalan Srinivasan"*

*<r.srinivasan@worldnet.att.net>*

*Date: Wed, 06 Dec 2000 03:05:07 GMT*

*Subject: Ann : alibrowse 1.6b*

*Newsgroups: comp.lang.ada*

Release 1.6b of alibrowse has been uploaded to <http://alibrowse.sourceforge.net> or <http://www.sourceforge.net/projects/alibrowse>

The release notes for the current release read :

Version 1.6b Dec 5, 2000

- aliscan

Added File Name filtering using the [gnat.regpat](http://www.sourceforge.net/projects/gnat.regpat) package. The filter regular

expression can be overridden via the command line. Searches .ads and .adb files by default.

Nuisance error message when -verbose flag was used is fixed.

Number of error messages did not identify the source file where the error was encountered. Now the first message with respect to a file will also print the filename.

- alibrowse

When the displayed file changes, the main window title is changed to that file name.

The Search mechanism has been moved to a menu item and it is a non modal window. Also supported now are : RegExp searches, forward and backward searches, goto line no's

The file display now (optionally) includes line numbers.

The splitter is positioned at the center of the window at the beginning. The window is sized to be 1/2 of the height and width of the screen.

For those who are not familiar with alibrowse, it is a browser for Ada source code libraries particularly ones with huge number of files as in the case of gnat source code or jgnat or GtkAda.

It is also a small enough program to serve as an example of usage of various Gtk/gnat features.

As always feedback most welcome @ tubinson@sourceforge.net

From: "Rajagopalan Srinivasan"

<r.srinivasan@worldnet.att.net>

Date: Tue, 09 Jan 2001 01:29:34 GMT

Subject: Ann: New version of alibrowse

Newsgroups: comp.lang.ada

I have uploaded version 1.7b of alibrowse - Ada Source Library Browser to <http://alibrowse.sourceforge.net> or <http://www.sourceforge.net/projects/alibrowse>

New features include :

- Optional generation of XML description of the Source Library
- Examples of incorporating xpm graphics into dialogs, toolbars etc.
- Find in Files Dialog as in grep
- Example of usage of CTree widget (in the find in files dialog)
- New techniques for dealing with the "text" widget that have eliminated the nasty "hang"s on Win32 platforms.

Also uploaded to the same area were :

Ada bindings to the zlib compression library, and expat a SAX library written in "C". These are not currently used in alibrowse but I expect to incorporate them in the next edition.

As always, feedback appreciated.

## VAD - Visual Ada Developer

From: Leonid <dulman@attglobal.net>

Date: Fri, 29 Dec 2000 23:27:11 +0200

Subject: ANNOUNCE: Visual Ada

Developer(VAD) version 5.3

Newsgroups: comp.lang.ada

VISUAL ADA DEVELOPER (VAD)

version 5.3

VAD ( Visual Ada Developer ) is a tcl/tk oriented Ada-95 GUI builder which portable to difference platforms, such as Windows NT/9x, Unix (Linux), Mac and OS/2.

[ See also AUJ 21.3 (October 2000), pp.163-164. -- dc ]

What's new

1. From Utils menu you may IMPORT widgets from others projects for example, you may export project to NoteBook page of new project
2. FROM WIZARD menu you may COPY PROPERTIES From early building widget.
3. From HELP - ADA menu you may read my little paper "Non formal introduction to Ada-95"
4. New design
5. Many new samples

VAD 5.3 has four realization for tcl/tk 8.0.x, for tcl/tk 8.2.3, tcl/tk 8.3.1 and for tcl/tk 8.4a2 (last version).

This is a version 5.3 and I hope it will be useful for Ada programmers and easy in work. This is an effective way to build gui oriented system independent applications in pure Ada-95.

VAD 5.3 supports many of image formats such as BMP, XBM, XPM, GIF (with transparency), PNG, JPEG, TIFF and postscript. I use Imgl.2 package

[ See earlier announcements for more details. -- dc ]

VAD 5.3 has internal tcl packages support from Packages menu and internal text editor (Fve), HTML editor (August), XML parser and IDL(corba) to Ada-95 translator

If you have instaled Oratcl 2.6(2.7) package and loaded it, you may directly work with Oracle server from Oracle menu or DBNavigator.

VAD 5.3 is available in <http://members.xoom.com/ldulman/vad.htm>

You may download sources vad53scr.zip, vadhlp.zip, adahlp.zip, vad50tcl.zip, vad50tcl.zip, adastyle.zip, philosophers.zip, vad50idl.zip. and binaries vad53win.zip, pkg83win.zip (WINDOWS 9x/NT) vad53lin.zip, pkg83lin.zip (OpenLinux 2.x, RedHat 6.x)

Leonid Dulman(dulman@attglobal.net)

## Ada for Web Development

From: Pascal Obry <p.obry@wanadoo.fr>

Date: 12 Dec 2000 20:52:44 +0100

Subject: Re: why Ada not used much in commercial server side development

Newsgroups: comp.lang.ada

> [...] The Ada community hasn't produced the right libraries for web server because there aren't many people interested in using Ada for web serving. Write those libraries or bindings to those libraries, and maybe that will change. [...]

Well that's not true. I have since a long time done Web development in Ada. My current environment is AdaCGI (from David Weller) and Template\_Parser (from me, available from my homepage). Both packages used together are already really convenient to build nice Web server (speaking from experience here).

One of them has been presented to Ada France (WORM - for Web Organizer and Research Machine). A distributed project to reference URL with comments, notes and some others data. All this with a search engine (vector based and not boolean based)... The search engine is capable to search on multiple WORM databases, each database can be in whatever platforms (yes all the CGI are built with GLADE)... Anyway this is an Intranet project!

So I repeat everything needed to do CGI based Web server is there.

And soon I will try to swith to AWS (Ada Web Server - available from my homepage) as the base of my Web development. I expect to have WORM ported to AWS (as I think it is mature enough now) to test it on a real application. I let you know...

Pascal Obry, Team-Ada Member, 45, rue Gabriel Peri, 78114 Magny Les Hameaux, France  
<http://perso.wanadoo.fr/pascal.obry>

From: Pascal Obry <p.obry@wanadoo.fr>

Date: Sun, 7 Jan 2001 10:52:29 +0100

Subject: Re: About Window bindings think or thin.

To: team-ada@acm.org

> Is there a standard "web server" for Ada apps, yet? I ask because a server is obviously different than a browser, and incorporating a web server into a program would be the most functional way to utilize a browser as the front end. Is this what AdaWeb does? AdaCGI would utilize an existing web server, I suppose, but then you depend on an existing design and installation, like apache. For a desktop app that may never serve the web or LAN, in a computer that may have no scriptable servers installed, incorporating a dedicated webserver into the backend would be necessary and very

customizable. Is there a dynamic xml to html generator available as an Ada program module?

Have a look at AWS on my homepage. It should be a good start...

[ See also "AWS - Ada Web Server package" in AUJ 21.4 (January 2001), pp.228-229. -- dc ]

Direct links to the english doc: <http://perso.wanadoo.fr/pascal.obry/aws.html>

Contrib page where AWS can be downloaded: <http://perso.wanadoo.fr/pascal.obry/contrib.html>

mostly in French but look for AWS keywords, one of the link here is to downloaded version 0.9 (full Ada).

## Ada Bindings for GUILE (GNU Ubiquitous Intelligent Extension Language)

*From: "Bobby D. Bryant" <bdbryant@mail.utexas.edu>  
Date: Wed, 27 Dec 2000 07:36:33 -0600  
Organization: The University of Texas at Austin  
Subject: Announcement: Ada bindings for GUILE.  
Newsgroups: comp.lang.ada, comp.lang.scheme*

That tiny fraction of the world's population who use both Ada and Scheme will be happy to hear that I have just released a draft set of Ada bindings for the GUILE "high-level" library.

These bindings should be considered alpha quality. They are complete enough that you can get started using them, but they still have various shortcomings, and further experience will probably dictate some changes for them. I have assigned them an arbitrary version number of 0.5.

The bindings are being released under the [GNAT-modified -- dc] GPL. You can read more about them, view them, or download them from my Web page, <http://www.cs.utexas.edu/users/bdbryant/guile-for-ada/>.

Feedback, suggestions, and patches will be welcome.

[ And from another message: -- dc ]

I started a set of Ada bindings for GUILE, the GNU Ubiquitous Intelligent Extension Language, and got far enough along to release an alpha version.

GUILE might be described as "a callable Scheme interpreter", and is useful for scripting support if you're in to that kind of thing. [...]

I have a throw-down demo program for them at the site, but I haven't had time to use them for an "interesting" program yet.

## AdaSockets Binding

*From: Pascal Obry <obry@act-europe.fr>  
Date: Mon, 12 Feb 2001 09:50:58 +0100  
Subject: Re: Adasockets - where to get it now?  
To: team-ada@acm.org*

An uptodate port [for Win32 of Jerry van Dijk's Adasockets -- dc ] is available on my homepage. It has been done by Dmitriy Anisimkov and is based on a more recent Adasockets version.

<http://perso.wanadoo.fr/pascal.obry/contrib.html>

This binding is used by AWS (Ada Web Server).

## Ada95 and the World of Databases

*From: "Beard, Frank" <beardf@spawar.navy.mil>  
Date: Mon, 11 Dec 2000 21:34:14 -0500  
Subject: Re: Ada95 and the world of databases  
To: team-ada@acm.org*

> How does Ada deal with databases? Does it access and support SQL Server, Oracle, XBase, Sybase, or any other databases? If so a list of the bindings and/or libraries would be very helpful.

We use Aonix ObjectAda, which comes with an ODBC binding which we've used to access MS SQL Server and MS Access. ODBC bindings should work with an DB supporting ODBC.

When we were on Unix, we were using Oracle and they had an Ada/Oracle binding they supplied.

But, if your compiler vendor or database vendor doesn't supply something, check out <http://www.adapower.com>. Select the "Source Code" button. Follow the "Operating System Related Examples" link. There is a link under "Windows 32 bit/Win32 API" called "ODBC access from Ada (Botton)".

Under the "Source Code Packages for Reuse" link, there is a link under "Local" called "Ada Binding to the iODBC Driver Manager (Falck)". It has both Windows and UNIX.

Under "Links/Bindings" there is also a link called "MySQL bindings for Ada 95 (Erdmann)".

Seems like there is another binding somewhere else, maybe on another Ada site.

*From: Ada Marketing <adamark@sd.aonix.com>  
Date: Tue, 12 Dec 2000 09:40:45 -0500  
Subject: Re: Ada95 and the world of databases  
To: team-ada@acm.org*

There are ODBC bindings available for most compilers. These would then

essentially give access to any ODBC compliant DB. Most.

*From: Pascal Obry <p.obry@wanadoo.fr>  
Date: Tue, 12 Dec 2000 20:56:49 +0100  
Subject: Re: Ada95 and the world of databases  
To: team-ada@acm.org*

There is an ODBC binding available on my homepage. I think Adapower point to it but I'm not sure. Anyway look for ODBC / databases keyword in: <http://perso.wanadoo.fr/pascal.obry/contrib.html>

*From: Jeff Creem <jeff@thecreems.com>  
Date: Tue, 12 Dec 2000 19:49:18 -0500  
Subject: Re: Ada95 and the world of databases  
To: team-ada@acm.org*

> Under "Links/Bindings" there is also a link called "MySQL bindings for Ada 95 (Erdmann)".

Note that the MySQL binding is a good starting point but it is not a complete binding to the functionality of the mysql libraries.

*From: David Botton <dbotton@yahoo.com>  
Date: Tue, 19 Dec 2000 20:41:51 -0800  
Subject: Re: Ada95 and the world of databases  
To: team-ada@acm.org*

If you will be running on Win32 platforms, I would recommend using ADO via GNATCOM. <http://www.adapower.com/gnatcom> Otherwise ODBC if available on your platform is easy to bind to.

## GNADE - GNU Ada Database Environment

*From: Michael Erdmann <michael.erdmann@snaflu.de>  
Date: Tue, 16 Jan 2001 20:12:02 +0100  
Subject: Announcing ODBC Bindings and Embedded SQL for Ada 95  
To: "GNAT Discussion List" <gnatlist@lyris.seas.gwu.edu>*

The recently initiated subproject of the Ada Linux Team (ALT)

GNU Ada Database Environment (GNADE)

has produced as its first result an ODBC to Ada 95 binding (by Mr.Pfeifer) and a preprocessor for Ad95 (by myself) which expands embedded SQL into ODBC operations. Embedded SQL, as specified by ISO/92, allows to include the SQL queries into the Ada 95 source code. The ODBC interface allows to interface to most of the DBCS's (Postgres, MySQL, Oracle, DB2...).

The implementation presented here, has been done for the Linux Intel platform using GNAT 3.13p and Postgres as DBCS but is believed to be portable to other platforms and DBCS as well.

Testing has been done only on basis of newly written test sources. So if you have legacy code with embedded SQL, please try it and inform me about the result. Because of the limited testing, I assume this version to be a draft version, which will mature based on the feedback I get.

To download the development snapshot 0.1h please goto: <http://www.snafu.de/~boavista/gnade.html>

It is my intention is to make the preprocessor to understand as much ESQ dialect's as possible. But to achieve this, I need urgently your feedback.

The intention of the GNADE Project in general, is to provide all tools, libraries and components needed to form a development environment for database applications written in Ada 95. If you are interested to contribute please drop me a mail!

*From: Michael Erdmann  
<michael.erdmann@snafu.de>  
Date: Mon, 05 Feb 2001 22:24:18 +0100  
Subject: GNADE Release 0.11 available  
To: "GNAT Discussion List"  
<gnatlist@lyris.seas.gwu.edu>*

GNU Ada 95 Database Environment (GNADE)

The draft release 0.11 is available at: <http://www.snafu.de/~boavista/gnade.html>

This release represents the latest product of the ALT subproject GNADE featuring:

- Thin ODBC Bindings.
- Embedded SQL translator based on ISO/92 and other common dialects which generates Ada code working on top of the GNADE ODBC bindings.
- Thin Postgres Ada 95 Binding
- Thin MySQL Binding

Feel free to comment the group activities. If you like to be kept informed about recent changes, or if you like to contribute drop me a mail.

*From: Michael Erdmann  
<michael.erdmann@snafu.de>  
Date: Thu, 08 Feb 2001 21:26:54 +0100  
Subject: Re: GNADE Release 0.11 available  
To: "GNAT Discussion List"  
<gnatlist@lyris.seas.gwu.edu>*

Meanwhile is a mailing list available where the technical issues of the GNADE project are discussed.

Feel free to join the mailing list at: <http://cert.uni-stuttgart.de/mailman/listinfo/gnade-dev>

## Ada-related Products

### ACT - GNU Visual Debugger (GVD)

*From: charlet@gnat.com (Arnaud Charlet)  
Date: Sun, 03 Dec 2000 02:27:30 GMT*

*Subject: ANNONCE: Release of the GNU Visual Debugger  
Newsgroups: comp.lang.ada*

We are pleased to announce the availability of GVD, the GNU Visual Debugger, a general purpose graphical debugger front-end licensed under the GNU General Public License.

Besides providing all the features of other debugger GUIs, GVD includes advanced data display and visualization capabilities. Furthermore, GVD allows the debugging of multi-process/multi-threaded applications in the same debugging session. GVD works with native as well as cross debuggers and can handle several languages in the same debugging session and the same application. Currently C and Ada are supported. Other languages will follow.

GVD can run on a host different from the machine where the debugger is running and provides friendly support for cross-debuggers (VxWorks, Lynx, etc.). For instance, you can use Linux or Windows to debug an application running on a Power PC board with a debugger running on a Sun workstation.

To build GVD we are using the GtkAda GUI technology. GVD comes with all the GtkAda benefits such as a pluggable look-and-feel, a set of very high-level widgets and the ability to have the same look-and-feel on all of your platforms.

You can download GVD and get more information at <http://libre.act-europe.fr>

If you are interested in participating in the GVD development, do not hesitate to contact us (<mailto:libre@act-europe.fr>)

Key points about the GNU Visual Debugger:

- Handles different debuggers. This includes native and cross debuggers (VxWorks, LynxOS, ...).
- Handles remote launching of debuggers and remote access to source files.
- Support for different languages
  - . The GUI can handle several languages during the same debugging session.
  - . The source editor provides advanced display features such as syntax highlighting and source browsing (types, subprograms, ...).
- Easy access to the most frequent operations through contextual menus.
- Graphical data visualization
- Multi-process
  - . Handling of several debuggers (possibly different and on different hosts) at the same time.
  - . Graphical display of the processes list.
  - . Process switching
  - . Simultaneous display of multiple processes
- Multi-task (Ada specific). Similar capabilities as for processes.
- Multi-thread. Similar capabilities as for tasks.

*From: charlet@gnat.com (Arnaud Charlet)  
Date: Tue, 16 Jan 2001 10:23:35 GMT  
Subject: ANNOUNCE: GVD 1.0.2  
Newsgroups: comp.lang.ada*

[ See above for the full announcement. -- dc ]

- New features in GVD 1.0.2:
- Added support for C++ in gdb.
  - Assembly window is now much more efficient.
  - New menu File->Open Source... to open a source file without the explorer
  - Interrupt button implemented under NT
  - First version of the documentation (still a work in progress)
  - First version of the libgvd that can be used from C and any other language
  - Several bug fixes

*From: charlet@gnat.com  
Date: Wed, 17 Jan 2001 10:12:23 GMT  
Subject: Re: ANNOUNCE: GVD 1.0.2  
Newsgroups: comp.lang.ada*

May I suggest that other suggestions, comments and reports are directly sent to the [gvd-devel@lists.act-europe.fr](mailto:gvd-devel@lists.act-europe.fr) mailing list. There is also the [gvd-users@lists.act-europe.fr](mailto:gvd-users@lists.act-europe.fr) lists for general usage questions.

To subscribe to these lists, the simplest is to go to <http://libre.act-europe.fr/gvd> and follow the links.

## Rational - Apex/Solaris 4.0.0

*From: "Greg Bek" <gab@Rational.Com>  
Date: Wed, 7 Feb 2001 12:10:00 -0800  
Subject: Rational Apex 4.0.0b and layered products for Sun Solaris is available by FTP  
To: "Apex Announcements" <apex-announcements@Rational.Com>*

Several messages have been combined into this email to reduce inbox clutter. The 4.0.0b release of Apex and layered products for Solaris is now available for download from our ftp server. Specific URL's and products are listed below.

This release is the first of a series for Apex 4.0.0b. Releases for the other UNIX platforms and NT will follow over the coming months.

Apex 4.0.0b for SGI/IRIX and Alpha/Tru64 are scheduled for late February, Solaris hosted Apex Embedded for PowerPC are scheduled for March.

If you have other schedule questions, please contact your local Rational account team.

Regards, Greg Bek, Product Manager, Rational Software, Cupertino CA 95014

The following message applies to all product releases:

This release is pending Generally Available (GA) status as it goes through the final steps of the manufacturing process. We anticipate that this will be complete within the next 30 days. Once

this release reaches GA status, it will be available for shipping. Until then, it is being provided on this FTP server for immediate access.

[ In all Rational' URLs below, substitute <FTP> by ftp://ftp.rational.com/public. -- dc ]

Follow this link for Rational Apex download and installation instructions. There are 3 ways to do the download. You can use the classic method of the UNIX ftp command, use a web browser, or use Rational's rinstall program to do the FTP download in a user-friendly way.

<FTP>/standard.msgs/  
install\_instructions.html

Product: Rational Apex  
Version: 4.0.0b  
Platform: Sun Solaris  
URL: <FTP>/apex/releases/sol/  
apex.4.0.0b

Product: Rational TestMate  
Version: 4.0.0  
Platform: Sun Solaris  
URL: <FTP>/testmate/releases/sol/  
testmate.4.0.0

Product: Ada Analyzer  
Version: 4.0.1  
Platform: Sun Solaris  
URL: <FTP>/ada\_analyzer/releases/sol/  
ada\_analyzer.4.0.1

Product: AXI (Ada/X Interface)  
Version: 4.1.9  
Platform: Sun Solaris  
URL: <FTP>/axi/releases/sol/axi.4.1.9

Product: SoDA  
Version: 3.1.0b  
Platform: Sun Solaris  
Patch numbers: 200012071-0 200012071-  
1 200101311-1  
URL: <FTP>/soda/releases/update/  
<Patch number>

This patch upgrades a Soda 3.1.0 release for compatibility with Apex 4.0. Included is the updated online documentation, a new Apex domain, and a new TestMate domain. Please see the online release notes for more information.

## Common Object Request Broker Architecture (CORBA)

### AdaBroker Release 1.0pre4

From: Samuel Tardieu <sam@inf.enst.fr>  
Date: Tue, 16 Jan 2001 15:39:45 +0100  
Organization: Ecole Nationale Supérieure  
des Telecommunications  
Subject: AdaBroker 1.0pre4 is released  
Newsgroups: comp.lang.ada

This fourth pre-release fixes a number of problem found in pre3. At this occasion, we would like, once again, to thank

AdaBroker users for their detailed reports and fixes.

AdaBroker is a set of tools and libraries that can be used to develop CORBA applications in Ada. It provides an IDL parser, Ada code generator, the CORBA predefined Ada support packages (defined by the standard Ada mapping), and an ORB supporting CORBA 2.2, including the Portable Object Adapter (POA).

[ See also AUJ 21.3 (October 2000), pp.169-170. -- dc ]

New features in this release include:

- \*Delegations are implemented through a new "-d" flag to idlac.
- \*Several interoperability bugs have been fixed.
- \*Several code generation bugs have been fixed.

Detailed release notes can be found at: <http://adabroker.eu.org/NEWS>

AdaBroker 1.0pre4 is the fourth of a series of pre-releases. These are meant for users to be able to test the new features recently implemented, and report any problems that they will encounter. After this beta-test phase, during which problems are likely to be found and fixed, we will produce a final release of AdaBroker 1.0 that will be meant for production use.

AdaBroker is free software, released under the GNU General Public License. The AdaBroker home page, hosted by the ENST, is located at <http://adabroker.eu.org/>.

Several mailing-lists have been created for discussions around AdaBroker:

- [adabroker@adabroker.eu.org](mailto:adabroker@adabroker.eu.org): general discussions about AdaBroker. To subscribe, send a mail to [adabroker-request@adabroker.eu.org](mailto:adabroker-request@adabroker.eu.org) with the single line subscribe in the body (subject will be ignored)
- [adabroker-announce@adabroker.eu.org](mailto:adabroker-announce@adabroker.eu.org): low-traffic mailing-list that will only carry important information about AdaBroker, such as new releases, beta test announces, etc. To subscribe, send a mail to [adabroker-announce-request@adabroker.eu.org](mailto:adabroker-announce-request@adabroker.eu.org) with the single line subscribe in the body (subject will be ignored)

For the AdaBroker team, Samuel Tardieu

## Ada and Linux

### GNU Visual Debugger RPM

From: "Juergen Pfeifer"  
<[juergen.pfeifer@gmx.net](mailto:juergen.pfeifer@gmx.net)>  
Date: Mon, 4 Dec 2000 05:39:59 +0100  
Subject: RPM for GVD uploaded  
To: "GNAT Discussion List"  
<[gnatlist@lyris.seas.gwu.edu](mailto:gnatlist@lyris.seas.gwu.edu)>

I just uploaded the first RPM for the brandnew GNU Visual Debugger (GVD). This is a hot new gdb GUI frontend from ACT. This tool is really looking very promising:-)

Look at <http://www.gnuada.org/rpms313p.html#GVD> for the RPM.

## Ada Linux Team RPM Build System

From: "Juergen Pfeifer"  
<[juergen.pfeifer@gmx.net](mailto:juergen.pfeifer@gmx.net)>  
Date: Mon, 18 Dec 2000 16:52:46 +0100  
Subject: ANNOUNCE: ALT buildsystem sources  
To: "GNAT Discussion List"  
<[gnatlist@lyris.seas.gwu.edu](mailto:gmatlist@lyris.seas.gwu.edu)>

As promised some time ago I'm making available the build system I'm using to produce the ALT RPMs. Florian Weimer provided a CVS repository for the sources of the build system.

Let's assume you want to install your CVS based ALT build system in \$HOME/ALT. Please then do the following:

```
export CVSROOT=":pserver:  
anoncvs@hornet.rus.uni-stuttgart.de/  
var/cvs"  
cd $HOME  
cvs login # (use empty password)  
cvs -z9 co -d ALT gnuada/alt-build
```

(replace the export statement by an appropriate setenv if you use csh).

The compressed datastream is approx. 1MB, so it shouldn't take too long to install it on your machine.

Now please read \$HOME/ALT/Doc/README.BUILD.txt and follow the instructions to run your own build.

I'm currently working on a more detailed documentation how to write your own ALT compliant RPM packages.

## US Mirror for www.gnuada.org

From: "Juergen Pfeifer"  
<[juergen.pfeifer@gmx.net](mailto:juergen.pfeifer@gmx.net)>  
Date: Wed, 17 Jan 2001 00:48:02 +0100  
Subject: New gnuada.org mirror  
To: "GNAT Discussion List"  
<[gnatlist@lyris.seas.gwu.edu](mailto:gmatlist@lyris.seas.gwu.edu)>

On <http://www.gnuada.org/mirrors.html> you can find the new mirror located in the US: <http://us.gnuada.org>.

Thanks to David Botton for hosting the mirror and thanks to him and Sam Tardieu for their very fast response to setup this server. It took only a few hours from my initial request to a fully operational mirror running in the gnuada.org domain.

BTW: there is a new RPM of the latest ncurses binding on our RPM pages.

## More GNAT Ports

*From: "Juergen Pfeifer"*  
 <juergen.pfeifer@gmx.net>  
*Date: Tue, 19 Dec 2000 02:47:12 +0100*  
*Subject: NetBSD port available*  
*To: "GNAT Discussion List"*  
 <gnatlist@lyris.seas.gwu.edu>

Please note that on [www.gnuada.org/netbsd.html](http://www.gnuada.org/netbsd.html) we now have a NetBSD-1.4.2 port of GNAT-3.12p available. Many thanks to Berndt Josef Wulf from downunder for this port.

*From: "David Botton"*  
 <David@Botton.com>  
*Date: Thu, 4 Jan 2001 23:02:35 -0500*  
*Subject: Re: New! AdaPower.net*  
*Newsgroups: comp.lang.ada*

FreeBSD 4.2 comes with GNAT on the CDs. Very Cool :-)) You can also get it in the ports section on [www.freebsd.org](http://www.freebsd.org)

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## Ada and Microsoft

### Claw Introductory Edition - High Level Binding for Microsoft Windows

*From: "Randy Brukardt"*  
 <randy@rrsoftware.com>  
*Date: Wed, 20 Dec 2000 21:05:07 -0600*  
*Subject: Announce: Claw Introductory Edition is available*  
*Newsgroups: comp.lang.ada*

The Claw Introductory Edition is now available for download from: [www.rrsoftware.com/html/prodinf/claw/clawintro.html](http://www.rrsoftware.com/html/prodinf/claw/clawintro.html)

The Claw Introductory Edition is a replacement for the old Claw Demo. It provides a portion of the full Claw functionality for free personal (non-commercial) use, as well as for evaluations.

This version includes a variety of changes and improvements over the old Claw Demo, including:

- Additional controls: Scroll bars, trackbars;
- Basic registry and socket operations;
- Additional example programs (Simple HTML Server, Diners);
- Clarified the license terms;
- Builder: Object Show and Select dialogs; and
- Builder: Improved toolbars.

For more information, contact R.R. Software, Inc. at 800-722-3248, at [sales@rrsoftware.com](mailto:sales@rrsoftware.com), or visit our website ([www.rrsoftware.com](http://www.rrsoftware.com)).

### Example of Ada using Microsoft .NET

*From: "David Botton"*  
 <David@Botton.com>  
*Date: Fri, 22 Dec 2000 04:41:06 -0500*

*Subject: Ada using Microsoft .NET example now up on AdaPower*  
*Newsgroups: comp.lang.ada*

With the help of GNATCOM, I created a simple package that allows access to all the "managed classes" of Microsoft's .NET platform. That includes all the OS services, GUI classes, etc. etc. etc.

It is a just a quick example that creates a dialog box and pops it on the screen.

You will need to have .NET installed on your system, currently that means installing the .NET SDK from MS's site. (But the source may prove interesting even if you don't have the SDK)

The example is on the GNATCOM page at <http://www.adapower.com/gnatcom>

All COM objects created using GNATCOM are usable from .NET

### JEWL 1.4 - John English's Window Library for MS Windows

*From: John English <je@bton.ac.uk>*  
*Date: Thu, 25 Jan 2001 16:04:46 +0000*  
*Organization: University of Brighton*  
*Subject: ANNOUNCE: JEWL 1.4*  
*Newsgroups: comp.lang.ada*

JEWL (John English's Window Library) is a set of Ada packages aimed at novices which enables reasonably sophisticated GUI applications to be built with a minimum of effort. JEWL is distributed under the terms of the GNU General Public License. It is currently available for MS Windows only.

[ See also AUJ 21.2 (July 2000), pp.118-119. -- dc ]

A new release of JEWL is now available for download. See the JEWL webpage at <http://www.it.bton.ac.uk/staff/je/jewl/> for details of how to obtain the new version. The documentation is also available for browsing on the website.

New features in version 1.4:

- \* Support for drawing bitmaps on canvases and playing sound files
- \* Added several new operations for measuring and changing window sizes and positions, setting the input focus, etc.
- \* Canvases can now handle keyboard events as well as mouse events
- \* The absolute origin of a frame can now be specified when it is created
- \* Documentation now includes HTML versions of public package specs for easy browsing of specifications
- \* Many other minor enhancements, and a couple of new examples.

John English, Senior Lecturer, Dept. of Computing, University of Brighton, [je@brighton.ac.uk](mailto:je@brighton.ac.uk), <http://www.it.bton.ac.uk/staff/je>

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## References to Publications

### Multiple Inheritance

*From: john.mccabe@baesystems.com*  
*Date: Mon, 4 Dec 2000 14:39:09 +0000*  
*To: team-ada@acm.org*

[ On a complaint that Ada couldn't be used for a project: "The main reason is lack of multiple inheritance in Ada 95." -- dc ]

Interesting, especially as section 4.6 of the Ada 95 Rationale goes into some detail on how to implement Multiple Inheritance in Ada.

Perhaps the 'reason' should be changed to 'developers can't be bothered to try to understand how to use Multiple Inheritance in Ada 95'.

*From: Carlisle Martin C Dr USAFA/DFCS*  
 <Martin.Carlisle@usafa.af.mil>  
*Date: Mon, 4 Dec 2000 07:52:49 -0700*  
*To: team-ada@acm.org*

It should be noted that Ada 95 also supports "multiple views" (see Section 4.6.3 of the Ada 95 Rationale).

Admittedly the syntax is more complex than Java interfaces, and dynamic testing of interfaces (does object X support interface Y?) is not allowed; however, it would seem adequate for their purposes [...]

See also: "Multiple Inheritance in Ada 95." In "Early Projects using Ada at the Air Force Academy." S. Grier. Ada Letters 18(1):92-109, January 1998. (Presented at ASEET '97).

Martin C. Carlisle, Assistant Professor of Computer Science, US Air Force Academy

*From: Thomas Quinot*  
 <quinot@inf.enst.fr>  
*Date: Mon, 4 Dec 2000 16:09:23 +0100*  
*To: team-ada@acm.org*

Yes. Approaches for the implementation of several variants of multiple inheritance are also detailed in:

'Object-Oriented Programming and Reuse in Ada 9x', presented in the tutorials of Tri-Ada '93 by Alfred Strohmeier, Stéphane Barbey and Magnus Kempe.

Thomas Quinot, Département Informatique & Réseaux, ENST, 46 rue Barrault, 75634 Paris CEDEX 13

### 2nd Print of High Integrity Ada: the SPARK Approach

*From: r\_c\_chapman@my-deja.com*  
*Date: Fri, 12 Jan 2001 11:17:43 GMT*  
*Subject: ANNOUNCE: 2nd print of High Integrity Ada: The SPARK Approach now available*  
*Newsgroups: comp.lang.ada*

We're pleased to announce the availability of the 2nd print of "High Integrity Ada: The SPARK Approach" by John Barnes and Praxis Critical Systems.

This printing updates the book to cover new features of the SPARK Examiner release 5.0, which is included on the accompanying CDROM. The new print can be identified by the CDROM, which is labelled "Release 2.0 August 2000". The ISBN number is 0-201-17517-7.

Owners of the first printing can upgrade their SPARK Examiner by downloading the update available on our website at <http://www.sparkada.com/>

All the best, Rod Chapman, SPARK Team, Praxis Critical Systems  
rod@praxis-cs.co.uk

*From: r\_c\_chapman@my-deja.com*  
*Date: Tue, 16 Jan 2001 10:13:32 GMT*  
*Subject: Re: ANNOUNCE: 2nd print of High Integrity Ada: The SPARK Approach now available*  
*Newsgroups: comp.lang.ada*

It has been brought to my attention that Addison Wesley's Website at <http://cseng.aw.com/> has not yet been updated with details of the new book. No doubt this will be corrected in the near future...

## Rational Edge Newsletter

*From: Tom Timberlake*  
*<thomas.c.timberlake@boeing.com>*  
*Date: Tue, 16 Jan 2001 08:05:13 -0800*  
*Subject: favorable press from Rational*  
*To: team-ada@acm.org*

Ada is mentioned in a favorable light in the current issue of the Rational Edge newsletter at [http://www.therationaledge.com/content/jan\\_01/f\\_craftsci\\_kb.html](http://www.therationaledge.com/content/jan_01/f_craftsci_kb.html).

On the last page of the article and again in the conclusion, Ada is given more than faint praise and is even compared with C++ in a favorable light.

It would be nice to have a design language or modeling tool that could visually describe the architecture of an entire system -- including all types of design elements -- in a uniform way.

Although such a design language or modeling tool does not currently exist, there is an implementation language that maps surprisingly well to the elements of the universal design pattern: Ada95. The popular object-oriented language C++, on the other hand, performs rather poorly when it comes to implementing data flow managers and I/O servers.

Go Ada!

*From: "Hans-Olof Danielsson" <Hans-Olof.Danielsson@swipnet.se>*  
*Date: Wed, 17 Jan 2001 17:28:41 +0100*  
*Subject: Re: What to Do?*  
*Newsgroups: comp.lang.ada*

Read [http://www.therationaledge.com/content/jan\\_01/f\\_craftsci\\_kb.html](http://www.therationaledge.com/content/jan_01/f_craftsci_kb.html) to find out the powerful mapping capacity of Ada 95 compared to the C++-language family (C++ and Java) and also to find interesting thoughts about Software Development! [...]

Danitek AB, Dragspelsv. 20, S-732 32 Arboga, Sweden

## Online Ada95 Courses

*From: Marin David Condic*  
*<mcondic.auntie.spam@acm.org>*  
*Date: Thu, 08 Feb 2001 14:08:24 -0500*  
*Subject: Re: ? Online beginners/intermediate Ada95 course?*  
*Newsgroups: comp.lang.ada*

> Can someone please tell me where I can find a good interactive Ada95 course I can take online?

A good place to start looking for \*any\* Ada material is:  
<http://www.AdaPower.com/>

Look under "Learn Ada" and in particular at the "Lovlace Tutorial". Other resources there are good too, but this interactive tutorial is maybe what you are specifically looking for.

See also:  
<http://www.learnada.com/index.htm>

Bard Crawford put together an excellent "Get to know Ada quickly" book here that is available in printed form or in hypertext.

Good luck and don't be afraid to ask for help here.

Marin David Condic, Quadrus Corporation,  
<http://www.quadruscorp.com/>,  
mcondic@quadruscorp.com

## Technical Corrigendum to ISO/IEC 8652:1995 Approved by SC22

*From: "Joyce L. Tokar"*  
*<tokar@attglobal.net>*  
*Date: Sat, 24 Feb 2001 14:33:10 -0700*  
*Subject: Technical Corrigendum to ISO/IEC 8652:1995*  
*To: team-ada@acm.org*

I am happy to announce that the Technical Corrigendum to ISO/IEC 8652:1995 was approved by SC22 without comment. It will go directly to publication. The text that we submitted for ballot may be regarded as the final approved text.

Joyce Tokar, Head of Delegation, US TAG SC 22/WG 9

## Ada Inside

### Netherlands - JVM on PDA to Drive Communications Radio

*From: "Rob Veenker"*  
*<veenker@xs4all.nl>*  
*Date: Thu, 4 Jan 2001 21:42:11 +0100*  
*Subject: Re: Is JGNAT production ready?...*  
*Newsgroups: comp.lang.ada*

> I am working on some Java application that is heavily using threads. Programming multithreaded applications in Java is, ehem... sorry... no fun. Therefore, I have undusted my Ada83 skills, upgraded to 95 and I am thinking about using JGNAT for this part of application that uses threads, with the rest in plain Java. This is commercial application, and I have no room for mistakes. Mistakes would be expensive. Therefore, the question(s): what is the quality of JGNAT? Is here anybody who has experience with using JGNAT for medium-size real life projects? Linking JGNAT modules with Java modules? Quality of JGNAT threads? [...]

I have used JGNAT (supported version) on a project that involved running an application on a handheld PC using a JVM. There was a mix of Java and Ada source and after some puzzling at first, I managed to get Ada to call Java (including calls from tasks) and Java to call Ada packages (classes).

It saved me the trouble of learning a new language and I too really needed the tasking support from Ada since I was implementing a proprietary protocol for driving a communications radio. The main penalty of using JGNAT is that you get quite a few runtime Java classes to link with your code. This was of some concern to me because a PDA doesn't have much :-)

The project was relatively small but I got a good impression of JGNAT. It matched up to my expectations. [...]

### France - Aircraft Carrier "Charles de Gaulle"

*From: Jean-Pierre Rosen*  
*<rosen.adalog@wanadoo.fr>*  
*Date: Thu, 25 Jan 2001 07:28:33 +0100*  
*Organization: Adalog*  
*Subject: About the "Charles de Gaulle"*  
*To: team-ada@acm.org*

The "Charles de Gaulle" is France brand new nuclear aircraft carrier, launched a couple of months ago. I read recently in a paper that "it was remarkable and unusual that NO software problem was discovered during field testing".

Of course you guessed it: a big part of the software is in Ada (with some C++ TBH). Coincidence, coincidence...

(BTW: there was a big noise in the press about the breaking of one propeller. Apart from the above article, nobody talked about the big software success. Something that works is not an information... Maybe that's why we don't see Ada more often in the press :-)

J-P. Rosen (Rosen.Adalog@wanadoo.fr), <http://pro.wanadoo.fr/adalog>

## USA / FAA - Air Traffic Management System

*From: Michael Feldman*

*<mfeldman@seas.gwu.edu>*

*Date: Wed, 31 Jan 2001 10:46:22 -0500*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

> [...] as far as I am aware, Lockheed-Martin are using it in a non-defence/aerospace related application [...]

This depends on whether you count commercial air traffic management as aerospace. Lockheed-Martin has a big piece of the FAA system here in the US, mostly in Ada. It is probably the biggest project in the Washington area in which actual Ada development is done (as opposed to contracting offices for work done elsewhere).

Several of my students are working there, on co-ops or post-graduation. I know the people there and this is not bogus.

[...] and don't forget the Ada project summary at

<http://www.seas.gwu.edu/~mfeldman/ada-project-summary.html>

If any of the listings there are outdated, I'll be glad to correct them, but I don't think any are bogus. My sources have generally been people close enough to the projects to know.

(As I've said in this forum before, it's very hard to get good information on real projects, especially in the commercial sectors, and many of my informants were quite adamant that I was not to disclose their names!)

Yours truly,

Michael B. Feldman - chair, ACM SIGAda Education Working Group, Professor, Department of Computer Science, The George Washington University - Washington, DC 20052 USA

## USA / Omnitech - Robotic Control Systems

*From: James Rogers*

*<jimmaureenrogers@worldnet.att.net>*

*Date: Fri, 23 Feb 2001 19:49:19 GMT*

*Subject: Re: Increased Interest In Ada?*

*Newsgroups: comp.lang.ada*

[...] PharLap offers a very nice PC/104 RTOS implementing a subset of the Win32 API. Aonix bundles this solution with an Ada compiler that runs on a PC. The Aonix Ada compiler can target either the PC or the PC/104 board, allowing simple unit testing of many packages on the PC, and the remaining testing on the PC/104 board.

The PharLap operating system comes with a useful collection of capabilities including LAN networking (ftp, telnet, http, TCP/IP, etc.)

There could be additional packages created for this solution to address devices not on the PC/104 hardware stack, such as RS232 ports, etc.

On my previous job I successfully used this system to develop robotic control systems interfacing both with user interface devices and vehicle control interfaces. Robotic devices were all manufactured by our company and controlled through a Controller Area Network (CAN) interface. We also manufactured our own PC/104 CAN card which plugs into the PC/104 hardware stack.

Information about those products can be viewed at <http://www.omnitech.com>

Jim Rogers, Colorado Springs, Colorado USA

## Indirect information on Ada usage

[ Extracts from job-ads and other postings illustrating Ada usage around the world. - - dc ]

*From: David Carlson*

*<david\_carlson@oxfordcorp.com>*

*Date: Tue, 2 Jan 2001 11:00:32 -0500*

*Organization: Oxford Global Resources, INC*

*Subject: opportunity*

*To: team-ada@acm.org*

Developers: [...] let you know about a opportunity I have in Connecticut. I have a client with a contract need for someone to do Ada development work for the next 12+ months. The core skill set is Ada, C is a plus, real-time embedded, and any real-time operating system. This position also requires a secret clearance. [...]

*From: kepps@technisource.com*

*Date: Tue, 30 Jan 2001 17:17:33 -0600*

*Subject: Great Ada Opportunity*

*To: team-ada@acm.org*

[...] I have some great opportunities [...] in the Great Huntsville, AL. There are about 10 to 15 opportunities for those of you with Ada, Fortran, C++, and various other software tools. Ada is the main thing here!!! [...]

*From: glascoed@aol.com*

*Date: 31 Jan 2001 10:02:39 GMT*

*Subject: Job Opportunity: Ada : Telecommute*

*Newsgroups: comp.lang.ada*

We have several temp to perm positions for Ada programmers in McLean, Va. Possibility for telecommuting. Previous work in Military environments a plus. All levels needed. [...]

*From: pbrletic@comsys.com*

*Date: Wed, 31 Jan 2001 19:30:20 GMT*

*Subject: Ada/C++ Developers Needed- Many Positions Open*

*Newsgroups: comp.lang.ada*

[...] We are currently seeking to fill multiple positions for [...] Ada Developers at a large government contracting firm in Rockville, MD.

The work will include development and maintenance in support of air traffic control radar.

Ideal candidates will possess the following: 3-5 years of complete software life cycle development, strong working knowledge of C/C++ and Ada 83 or Ada95, and prior experience with development in either AIX or Solaris environments. Big plusses include Air Traffic Management/control software development experience, flight data processing experience, GUI interface development experience, familiarity with OSI/MOTIF software, prior experience with MOTIF compliant X-widget development, prior experience with NetView software, C++ shell scripting experience, experience with algorithmic intensive systems, and simulation problem determination product development. [...]

[ From a reply: -- dc ]

> C++ shell scripting experience, [?]

It's like the Cshell, but with even more randomness added. [IW]

*From: Anh Vo <anh\_vo@udlp.com>*

*Date: Fri, 9 Feb 2001 10:24:09 -0500*

*Subject: Re: Looking for Ada work...*

*To: team-ada@acm.org*

There are currently six positions need to filled at United Defense in Santa Clara / San Jose California. We are using Ada 95 along with ROSE and other tools. In addition, this project is 100% Object Oriented Programming. No clearance is required. [...]

## Ada in the UK

*From: john.mccabe@baesystems.com*

*Date: Wed, 31 Jan 2001 09:52:56 +0000*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

> I don't know of anyone outside the defence industry in the UK using Ada [...]

It's mainly used in defence and aerospace in the UK, but recently there has been some demand for it in the financial markets in the city. One company in particular has been looking for Ada staff (both contract and permanent) to work on smart-card applications. Also I believe Reuters use it heavily and, as far as I am aware, Lockheed-Martin are using it in a non-defence/aerospace related application [...]

Jobserve is one of the better places to see where the demand for Ada is. Although you don't get company names and so on, I guess if you were researching its use the agents may supply that information. [...]

## Ada in Context

### Ada and Java

*From: Alan and Carmel Brain*

*<aebrain@dynamite.com.au>*

*Date: Tue, 19 Dec 2000 20:24:50 +1100*

*Subject: Re: Sucky Software at NASA*

*To: team-ada@acm.org*

It's possible to make reasonably reliable systems using Java. It's capable - in the right hands, with the right tools - of being not too bad, especially compared to C++ in any of its guises. But...

I wouldn't like to bet my life on such a system, even the best Java I've ever written. And I now have a reasonable number of KLoCs of both languages under my belt.

OTOH I have bet my life, and others lives, on Ada-83 code I've written.

It's marginally easier to implement some OO constructions in Java than Ada-95, though the difference may be a matter of personal taste. The various library classes, from JDOM to SWING provide functionality in a neat way, and the Javadoc facilities are great, [...]

But all you have to do is look at  
for (int i=0;i<foo;i++)  
and you'll see that the C foundation of Java cripples it. And as for any task involving numerical analysis, or interfacing with peculiar peripherals (no representation, no roll-your-own integers or floats, no fixed point types...) it just won't cut the mustard.

*From: mark\_lundquist@my-deja.com*

*Date: Thu, 11 Jan 2001 21:01:25 GMT*

*Subject: Re: Do we need "Mission-Critical" software? Was: What to Do?*

*Newsgroups: comp.lang.ada*

I think a good case could be made that Ada is Java++...

Ada runs on the JVM.

Java believes in strong static typing. That's a step in the right direction, but they kept the impoverished type system of C++. Ada has a type system that's not only strong, but rich as well. To start

with, you can have subtypes, and you have the ability to create user-defined primitive types, etc.

Java wanted to get rid of pointer-related bugs. Unfortunately, you kind of have to have pointers! So Java is a by-reference language, hiding the pointer-ness of everything so that it's impossible to do math on pointers. By-reference languages have their own problems, though. Ada solves the pointer arithmetic problems by distinguishing between pointers and addresses, and by defining pointers to be something other than scalar types.

Java figured out that truth value has nothing to do with integer math, so it got a Boolean type like Ada's.

Java believes that support for concurrency belongs in the language, not just some random OS library. Java is right about that! They just didn't think it through all the way and botched the details.

Java wanted to have better namespace control, so Java has packages. These are better than C++ namespaces and more like Ada packages. But the encapsulation construct in Java is still the "class", and in at least two important senses (there are several) of the value of "separation of interface and implementation", Java classes fall short, because method bodies are defined in the class declaration. (And no, Java "interface"s are not the answer to this).

Java's arrays are bounds-checked. That's good. Ada has a more generalized system of range constraints that is involved with both arrays and the subtyping system. This allows for automated range assertions beyond just for array accesses, and makes it possible for the compiler to eliminate many run-time array bounds checks.

All these things can be viewed either negatively as half-measures, or positively as steps in the right direction. The idea is that Java incorporated all these elements for good reasons, and the fuller support that Ada gives them is better.

So that's one way to spin it, what do you think?

*From: Tom Moran <tmoran@acm.org>*

*Date: Sun, 28 Jan 2001 17:00:08 -0800*

*Organization: Decision Aids*

*Subject: Re: SE-book 6.ed*

*To: team-ada@acm.org*

Now that Microsoft is going to replace Java with C#, what's the prognosis for Java?

(Today at my local computer bookstore they were having a sale on Java books. To make room for C# books? ;)

## Quality is Important

*From: "Marc A. Criley"*

*<mcquad@earthlink.net>*

*Date: Wed, 06 Dec 2000 13:17:29 GMT*

*Subject: Re: Status of Ada??*

*Newsgroups: comp.lang.ada*

> First, I like Ada very much myself, even though I have hardly used it for real work until now and have just grasped the "basics". The reason I asked is quite trivial and well known: product quality alone doesn't sell anything. There are plenty of examples in the recent history of computing, OS/2 vs. Win95 being a rather prominent one.

I've been told from time to time that "quality isn't a major issue with customers", and MS Windows is usually cited as the proof. Problem is that there's a big difference between Windows, with huge marketing dollars and a de facto monopoly, and the products put out by more typically-sized companies.

I've evaluated numerous products for home and professional use, both open source and proprietary, and have seen plenty of instability and bugginess (sometimes their own demos wouldn't even work!). And you know what? Buggy products got rejected.

When you're a *small* company, in a small or highly competitive market (neither of which applies to Microsoft), quality DOES matter.

Marc A. Criley, Senior Staff Engineer, Quadrus Corporation

*From: Tony <jedilowe@adamantium.net>*

*Date: Wed, 20 Dec 2000 19:57:27 -0600*

*Subject: Re: Sucky Software at NASA*

*To: team-ada@acm.org*

I am sympathetic to your interest in fantastic software failures. I have a file of my own collecting interesting stories of engineering failures, but by doing so I think we miss the forest for the trees. While a multi-million dollar error chalked up to a line of code or two is interesting, it is very difficult to make an argument that languages, design methodology, processes, and so on can catch unexpected errors when the system is deployed in an environment (e.g. Mars, the internet 8) that has not been predicted in test cases. This problem is not really specific to software engineering, but we are a bigger victim due to our arrogance (or naiveté) to take on such a vast responsibility in controlling systems.

What seems to be a better direction to go with 'sucky software' is the really basic stuff. What failures exist because of poor practices that repeatedly cause a loss of 5 minutes or fifty cents. How much time is wasted by engineers hunting down errors because the compiler did not make a sensible check, or the engineer is allowed

to goof. How much time do I waste when a web developer makes an error on the 4th of 6 pages of forms to fill out and I start over again 3 times before writing a nasty e-mail to tell them to get it fixed? I think these are much more applicable 'sucky software' problems, and in many ways more interesting to see why people hang on to silly taboos. [...]

*From: john.mccabe@baesystems.com*  
*Date: Thu, 21 Dec 2000 09:25:22 +0000*  
*Subject: Re: Sucky Software at NASA*  
*To: team-ada@acm.org*

I would tend to agree with this. I have read the article now, and I feel it is rather harsh on the software engineers who, as many people have pointed out, were probably told by someone in management that there was no need to re-test after the wiring had been changed on the legs for example.

I have experience of working in the European space industry during the period just after the Ariane V disaster. There was obviously a lot of arrogance involved in that incident (especially as far as the management is concerned) but again the failure was blamed on the code.

Ultimately any software product can only ever be as good as the requirements ask it to be. If the requirements do not state what is wanted clearly, succinctly and unambiguously then there are always going to be failures of this sort.

There is a lot of crap software around, especially from the likes of Microsoft. This is well known, but you generally don't hear of any catastrophic failures caused by Microsoft programs. On the other hand, failures such as the Mars probes get headline news because of:

- 1) The costs involved in the development
- 2) The hopes of those involved and interested in other planets (of which there are many).

No one really expects Microsoft products to work properly so it's not a big deal when they don't, but it should be.

## No News is Good News, but not Good Publicity

*From: "S. Ron Oliver"*  
*<sroliver@csc.calpoly.edu>*  
*Date: Thu, 25 Jan 2001 08:18:39 -0700*  
*Subject: Re: About the "Charles de Gaulle"*  
*To: team-ada@acm.org*

> [...] nobody talked about the big software success. Something that works is not information... Maybe that's why we don't see Ada more often in the press :-)

This is precisely correct. For years when one of my academic colleagues would say "Nobody is using Ada" I would ask "Why do you say that?" Invariably the answer was "You never hear about it." I

would immediately reply something like "That's because software written in Ada WORKS, and we only pay attention to things that DON'T work. That's why Microsoft and almost anything written in C becomes so well-known - that software all SUCKS!" Naturally, the colleague was usually a C-freak. The response was usually a very blank stare and shake of the head. People (no matter how intelligent they are) who believe it is reasonable to develop software in C are generally not able to understand even the simple logic of this phenomenon. :))

*From: Dirk Craeynest*  
*<Dirk.Craeynest@cs.kuleuven.ac.be>*  
*Date: Thu, 25 Jan 2001 16:59:28 +0100*  
*Subject: Re: About the "Charles de Gaulle"*  
*To: team-ada@acm.org*

For the annual Ada-Belgium Seminar a few years ago, I was trying to get some presentations about operational Ada applications in order to get reports on the maintenance of such systems.

We had to drop the idea, because for all systems we knew of we couldn't find any presenters...

The systems worked so well that there was almost no maintenance team for them, and the few people remaining told me there really wasn't anything to report. Usually, the only kind of "maintenance" required was to make minor modifications to the software when some hardware had to be changed (for example due to running out of stock to replace broken pieces and so being forced to use "newer" similar hardware). These changes typically were very local and straightforward.

As a result, most of the development teams moved on to new projects, and only a few people did some minor maintenance at irregular times, almost as an extra task outside their normal work.

Ada seems to be the victim of its own success...

Dirk (Dirk.Craeynest@cs.kuleuven.ac.be for Ada-Belgium e-mail)

Dirk Craeynest, Offis nv/sa - Aubay Group, Weiveldlaan 41/32, B-1930 Zaventem, Belgium.  
 Email Dirk.Craeynest@offis.be. Phone +32(2)725.40.25. Fax +32(2)725.40.12

## More Newcomers on Comp.lang.ada Newsgroup

*From: Mark Lundquist*  
*<mark@rational.com>*  
*Date: Fri, 12 Jan 2001 13:33:17 -0800*  
*Subject: More newbies on C.L.A: what does it mean?*  
*To: team-ada@acm.org*

The last few months I've been trying to keep up on reading comp.lang.ada again...

It seems like the percentage of Ada newcomers is a lot higher than it used to be. Is it just me, or have others noticed this as well?

I don't mean the ones that are obviously homework questions. ("Yeah, you just happen to really need a program to {bubble sort, play tic-tac-toe, find prime numbers}... right...").

Quite a few seem to be, well, not professional programmers nor educated programmers -- for example, they don't seem to know the difference between a computer, an OS, and a language, and think whenever they express a solution in a PL that all the facilities they're using are somehow provided by the PL. You know what I mean...

Yet people at this level are trying out Ada. Either they have not been exposed to the false myths about Ada, or they have decided not to let everyone else do their thinking for them.

Is this significant? "Please discuss..." :-)

P.S. For some the term "newbie" has a derogatory connotation -- I don't mean it that way at all...

*From: Tom Moran <tmoran@acm.org>*  
*Date: Fri, 12 Jan 2001 14:35:51 -0800*  
*Subject: Re: More newbies on C.L.A: what does it mean?*  
*To: team-ada@acm.org*

> Is it just me, or have others noticed this as well?

I agree. It's curious why, and it's sometimes hard to figure out what level answer to give, but I'm sure it's a Good Thing.

*From: Jeff Castellow*  
*<castellow@ns.kreative.net>*  
*Date: Sat, 13 Jan 2001 14:21:13 -0500*  
*Subject: Re: More newbies on C.L.A: what does it mean?*  
*To: team-ada@acm.org*

I will assume there are newcomers because the Ada market is growing, somewhere. The cause: find out where...

## Ada is Ready when You Are

*From: "Roepe, Marsha S."*  
*<MRoepe@dcmde.dcma.mil>*  
*Date: Tue, 6 Feb 2001 16:45:54 -0500*  
*Subject: Re: Ada and Embedded Systems*  
*To: team-ada@acm.org*

[ Referring to the article about Joyce Tokar in the latest DDC-I Online News, available at [http://www.ddci.com/news/news\\_vol2num1.html](http://www.ddci.com/news/news_vol2num1.html): -- dc ]

Great tag line:

Ada is ready when you are.

We've been tossing around slogans for a while, and this is the best one yet.

# Conference Calendar

This is a list of European and large world-wide events that may be of interest to the Ada community. More information on items marked ♦ is available elsewhere in the *Journal*. The information here is extracted from the online *Conference announcements for the international Ada community* at <http://www.cs.kuleuven.ac.be/~dirk/ada-belgium/events/list.html> on the Ada-Belgium webserver. These pages contain full announcements, calls for papers, calls for participation, programmes, URLs etc and are updated regularly.

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## 2001

- 02-04 April      **9th Object Technology Conference (OT'2001)** Oxford, England. Topics include: Technology (Component technology, Internet technology, Languages, Distributed systems, Small and embedded systems); Practice (Patterns and pattern languages, Comparative experience, Lessons learned/experience reports); etc. Organised by the OOPS Specialist Group of the British Computer Society and the IEE.
- 02-05 April      **High Integrity Software Engineering with SPARK** course Bath, UK. Organized by Praxis Critical Systems.
- 02-06 April      **4rd Workshop on Software Methods and Tools for Ada 95** Brest, France. Organized by ENST Bretagne, TNI, Ecole Navale and Universite de Bretagne Occidentale. Sponsored by Region Bretagne and Ada-Europe.
- 02-06 April      **European Joint Conferences on Theory and Practice of Software (ETAPS'2001)** Genova, Italy. Events include: CC 2001, International Conference on Compiler Construction; ESOP 2001, European Symposium On Programming; FASE 2001, Fundamental Approaches to Software Engineering; FOSSACS 2001, Foundations of Software Science and Computation Structures; TACAS 2001, Tools and Algorithms for the Construction and Analysis of Systems. Includes a.o. the following events:
- 31 March      **ETAPS2001 - 1st Workshop on Language Descriptions, Tools and Applications (LDTA'2001)** Topics include: description of (programming) languages, development and/or generation of tools for these languages, applications of these formalisms and tools, etc.
- 02 April      **ETAPS2001 - Fundamental Approaches to Software Engineering (FASE'2001)** Topics include: Scientific analysis of software development methods for large-scale systems; Experience reports on the effectiveness of development methods in industrial practice; Integration of formal methods with current best practices industrial software development, in particular object-oriented analysis and design; Rigorous approaches to the design of reactive and distributed software systems; etc.
- 02-06 April      **ETAPS2001 - 7th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS'2001)** Topics include: verification and construction techniques; validation techniques in practice; analytical techniques for real-time, hybrid and safety-critical systems; tool environments and tool architectures; etc.
- 02-06 April      **Absolute Software - Public Ada Courses** Carlsbad, California, USA Topic: Ada 83 (Ada 95 on 2001/03/12-16)
- 02-06 April      **International Conference on Practical Software Quality Techniques & Testing Techniques (PSQT/PSTT'2001 East)** Orlando, Florida, USA
- 04-06 April      **7th International Symposium on Software Metrics (Metrics'2001)** London, UK Co-located with: ESCOM2001 (European Software Control and Metrics conference)
- 04-06 April      **2nd International Conference on Software Testing (ICSTEST'2001)** Bonn, Germany. Topics include: Railway and Safty-Critical Systems; Technical and Embedded Systems; etc.

- 09-11 April **5th International Conference on Empirical Assessment and Evaluation in Software Engineering (EASE'2001)** Staffordshire, UK
- 16-19 April **21st International Conference on Distributed Computing Systems (ICDCS'2001)** Phoenix, Arizona, USA. Topics include: the entire breadth of distributed computing.
- 17-20 April **8th Annual IEEE International Conference and Workshop on Engineering of Computer Based Systems (ECBS'2001)** Washington, D.C., USA. Topics include: Component-Based System Design; Distributed Systems Design; Embedded Real-Time Software Systems; Integration Engineering; Modeling and Analysis of Complex Systems; Open Systems; Reengineering & Reuse; Reliability, Safety, Dependability, Security; Standards; System Evolution; Verification & Validation; etc.
- 18-20 April **8th Annual European Concurrent Engineering Conference (ECEC'2001)** Valencia, Spain Theme: "Concurrent Engineering: the Path to Electronic Business" Co-located with: EUROMEDIA 2001 (Multimedia, Telematics, and Web Technology) Topics include: Implementation Techniques; Formal Methods and Techniques; Networking and Distribution in CE; Practical Applications and Experiences; etc.
- 23-27 April **International Parallel and Distributed Processing Symposium (IPDPS'2001)** San Francisco, California, USA Topics include: Parallel Programming Languages; Programming Environments and Tools for Parallel and Distributed Platforms; Compilers and Optimizations for Parallel and Distributed Processing; Operating System and Runtime Support for Parallel and Distributed Computing; Applications of Parallel and Distributed Computing; etc. Includes a.o. the following events:
- 23 April **5th Workshop on Runtime Systems for Parallel Programming (RTSPP)**
- 23 April **6th International Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS'01)** Topics include: Concepts and languages for high-level parallel programming; Concurrent object-oriented programming; Distributed objects and components; Structured parallel programming (skeletons, patterns, ...); Software engineering principles for parallel system; High-level programming environments; Implementation techniques for high-level programming models; etc.
- 23 April **6th International Workshop on Formal Methods for Parallel Programming: Theory and Applications (FMPPTA'2001)** Topics include: Foundations of frameworks for parallel and distributed computing; Case studies describing the use of formal methods to solve practical problems; etc.
- 25-27 April **7th Symposium on Engineering of Complex Automation Systems (EKA'2001)** Braunschweig, Germany (note: the conference language is German)
- 02-04 May **4th IEEE International Symposium on Object-oriented Real-time distributed Computing (ISORC'2001)** Magdeburg, Germany Topics include: programming (ORC paradigms, object models, etc.); distributed systems (middleware platforms, inter-operability, security, fault tolerance, etc.); operating systems (real-time kernels, synchronization, scheduling, etc.); software engineering specification, design, verification, validation, testing); applications such as embedded systems (automotive, avionics, consumer electronics); etc.
- 09-11 May **4th European Conference on Software Measurement and ICT Control (SMA 2001)** Heidelberg, Germany Theme: "Managing ICT in internetworked enterprises" Topics include: Evaluating new ICT-related methods, techniques and tools; System and software cost and quality benchmarking studies; System and software quality measurement and prediction; Empirical investigations of system and software quality and costs; etc.
- 10-12 April **Workshop on Object-Oriented Modelling of Embedded Real-Time Systems** Herrsching am Ammersee, Germany Topics include: Development of reusable components; Experience reports of OO projects; Extensions of OO modelling languages; etc.; also Object-Oriented Real-Time Modelling Contest. Deadline for submissions: April 8, 2001 (abstracts for Master Thesis workshop)

- 11-20 April **23rd International Conference on Software Engineering (ICSE 2001)** Toronto, Ontario, Canada
- 14-18 May ♦ **6th International Conference on Reliable Software Technologies - Ada-Europe'2001** Leuven near Brussels, Belgium Sponsored by Ada-Europe, in cooperation with ACM SIGAda Includes a.o. the following event:
- 14 May **Ada-Europe'2001 - Workshop on Exception Handling for a 21st Century Programming Language** Aims of the workshop are: to share experience on how to build modern systems that have to deal with abnormal situations; to discuss how solutions to those needs can be developed employing standard Ada features including the current exception handling paradigm; and to propose new exception handling mechanisms / paradigms that can be included in future revisions of the Ada language and also fit high integrity language profiles for safety critical systems.
- 21-23 May **2nd International Conference on eXtreme Programming and Flexible Processes in Software Engineering (XP'2001)** Villasimius, Sardinia, Italy
- 29 May – 06 June **14th Annual International Internet & Software Quality Week 2001 (QW'2001)** San Francisco, California, USA Theme: "The Internet Wave" Topics include: E-Commerce Reliability / Assurance; Application of Formal Methods; Software Reliability Studies; Application Quality of Service (QoS); Object Oriented Testing; Productivity and Quality Issues; Real-Time Software; Real-World Experiences; Defect Tracking / Monitoring; Risk Management; etc.
- 30 May – 06 June **7th IEEE Real-Time Technology and Applications Symposium (RTAS'2001)** Taipei, Taiwan, ROC
- 04-05 June **7th International Workshop on Requirements Engineering: Foundation for Software Quality (REFSQ'2001)** Interlaken, Switzerland In conjunction with the CAiSE\*2001 conference
- 04-08 June **13th Conference on Advanced Information Systems Engineering (CAiSE'01)** Interlaken, Switzerland Theme: "Software Engineering meets Information Systems Engineering" Topics include: Distributed, Web and Mobile Architectures; Object-Oriented Technologies and their Application in IS; Languages and Protocols for IS; Componentware and IS; System Re-Engineering; Modularity and Re-Usability in IS; Advanced Application Domains; etc.
- 11-14 June **European Software Engineering Process Group Conference (Euro-SEPG'2001)** Amsterdam, the Netherlands
- 11-15 June **7th IEEE International Conference on Engineering of Complex Computer Systems (ICECCS'2001)** University of Skevde, Skevde, Sweden Topics include: Design and analysis of complex software systems; Formal methods for complex systems; Techniques for emerging web-based complex systems; etc.
- 18-22 June **15th European Conference on Object-Oriented Programming (ECOOP'2001)** Budapest, Hungary Topics include: Analysis and design methods; Concurrent, real-time, and parallel systems; Design patterns; Distributed and mobile systems; Language design and implementation; Programming environments; etc. Includes a.o. the following events:
- 18-19 June **ECOOP2001 - Workshop on Multiparadigm Programming with OO Languages (MPOOL'2001)** Topics include: non-OO programming with OO languages; merging functional/logic/OO/other programs (language crossbinding); module systems vs. object systems; OO design patterns and their relation to functional patterns; etc. Deadline for abstract submissions: April 17, 2001
- 18 June **ECOOP2001 - 4th Workshop on Object-Oriented Architectural Evolution** Deadline for participation submissions: April 1, 2001
- 18-19 June **ECOOP2001 - 11th Workshop for PhD Students in Object-Oriented Systems (PhDOOS'2001)** Topics include: Concurrent, real-time, parallel systems; Patterns; Distributed and mobile object systems; Language design and implementation; Programming environments; Reflection, adaptability,

composability and reusability; etc. Deadline for abstract submissions: April 13, 2001

- 18-22 June **18th International Conference and Exposition on Testing Computer Software (TCS'2001)** Washington, D.C., USA Theme: "Meeting the New Challenges of Testing" In cooperation with: Association for Computing Machinery (ACM) SIGSoft; American Society for Quality (ASQ) Software Division; IEEE Reliability Society; Software Technology Support Center (STSC).
- 20-22 June **ACM SIGPLAN 2001 Conference on Programming Language Design and Implementation (PLDI)** Snowbird, Utah. PLDI is a forum where researchers, developers, educators, and practitioners can exchange information on the latest practical and experimental work in the design and implementation of programming languages. The PLDI conference seeks original research papers that focus on practical issues in the design, development, implementation and use of programming languages. Emphasis is placed on novel language designs, innovative and creative approaches to compile-time and run-time technology, and results from experimental studies of actual implementations. Includes the following events:
- 18-19 June **ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering (PASTE '01)** Snowbird, Utah, USA In conjunction with ACM SIGPLAN PLDI'2001 Conference on Programming Language Design and Implementation
- 19 June **1st ACM SIGPLAN Workshop on Optimizations of Middleware and Distributed Systems (OM'2001)** Snowbird, Utah, USA In conjunction with ACM SIGPLAN PLDI'2001 Conference on Programming Language Design and Implementation Topics include: Scalable and reliable middleware architectures; Optimizations of transaction management and load balancing; Tools for middleware application development; Programming models, language support, and design patterns; Verification and debugging of middleware; Real-world case studies of middleware-based applications; etc.
- 22-23 June **ACM SIGPLAN 2001 Workshop on Languages, Compilers, and Tools for Embedded Systems (LCTES'2001)** Snowbird, Utah, USA In conjunction with ACM SIGPLAN PLDI'2001 Conference on Programming Language Design and Implementation Topics include: Programming Languages and Optimization for Embedded Systems; System Software for Embedded Systems; Standardization; etc.
- 25-27 June **9th International Conference on High Performance Computing and Networking Europe (HPCN Europe'2001)** Amsterdam, The Netherlands
- 25-28 June **2001 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'2001)** Las Vegas, Nevada, USA Topics include: Parallel/Distributed applications; Reliability, Software and hardware fault-tolerance (system- and application-level); Real-time and embedded systems; Object Oriented Technology and related issues; Software tools and environments for parallel and distributed platforms: Operating systems, compilers, languages, debuggers, monitoring tools, software engineering on parallel/distributed systems, ...; Education: parallel and distributed processing in computer science curriculum (both graduate and undergraduate levels); Recent history (1990-2000) of parallel/distributed processing and what to expect during the next decade (2000-2010) if history repeats itself; etc. Includes a.o. the following sessions:
- 25-28 June **PDPTA'2001 - XML and Distributed Applications**
- 25-28 June **PDPTA'2001 - Distributed Software Architectures** Topics include: middleware for distributed software architecture; architectural styles and models for applications based on mature and emerging technologies; industrial applications, case studies, best practices, and experience reports on distributed software architecture; other aspects and applications related to distributed software architecture; etc.

- 26 June **Workshop on Concurrency in Dependable Computing** Newcastle upon Tyne, UK In conjunction with the International conference on Application of Concurrency to System Design (ICACSD 2001) and the 22nd International Conference on Application and Theory of Petri Nets.
- 09-11 July **International Conference on Computational Intelligence for Modelling, Control and Automation (CIMCA'2001)** Las Vegas, Nevada, USA Includes: sessions on Parallel Computing and Ada; Programming (Ada) and Computational Intelligence.
- 09-11 July **2nd International Conference on Parallel and Distributed Computing, Applications, and Techniques (PDCAT'2001)** Taipei, Taiwan Topics include: Programming languages; Parallel programming paradigms; Parallelizing compilers; Object-Oriented technology; Tools and environments for software development; etc.
- 16-17 July **6th International Workshop on Formal Methods for Industrial Critical Systems (FMICS'2001)** Paris, France Topics include: Tools for the design and development of formal descriptions; Verification and validation of complex, distributed, real-time systems and embedded systems; Case studies and project reports on formal methods related projects with industrial participation (e.g. safety critical systems, mobile systems, object-based distributed systems); etc.
- 22-26 July **2001 Rational Software User Conference** Denver, U.S.A.
- 27-29 August **7th International Conference on Object-Oriented Information Systems (OOIS '2001)** Calgary, Canada Theme: "Object-Oriented and Web-Based Frameworks for Information Systems" Topics include: OOIS Architectures (OO components/COTS, OO patterns, OO middle-ware, OO distributed systems, ...); OOIS Processes (Reuse processes, Maintenance/support processes, ...); Web-based OOIS (On-line courses/tutorial systems, ...); etc. Deadline for submissions: April 16, 2001
- 28-31 August **European conference on Parallel Processing (Euro-Par'2001)** Manchester, UK Topics include: Support Tools and Environments; Compilers for High Performance; Distributed Systems and Algorithms; Parallel Programming: Models, Methods and Languages; Object-Oriented Architectures, Tools and Applications; Parallel and Distributed Embedded Systems; etc.
- 28-31 August **Working IEEE/IFIP Conference on Software Architecture (WICSA'2001)** Amsterdam, The Netherlands
- 03-07 September **2001 International Conference on Parallel Processing (ICPP'01)** Valencia, Spain Sponsored by The International Association for Computers and Communications. In cooperation with The Ohio State Univ. and U. Politec. de Valencia. Topics include: Programming Methodologies and Tools, Compilers and Languages, Internet Computing, OS and Resource Management, Network-Based Computing, Web and Multimedia, etc.
- 03-07 September **6th International Conference on Parallel Computing Technologies (PaCT'2001)** Novosibirsk, Russia Topics include: Languages, environment and software tools supporting parallel processing; Teaching parallel processing; etc.
- 04-06 September **EUROMICRO Workshop on Software Process and Product Improvement** Warsaw, Poland In conjunction with the 27th EUROMICRO Conference Topics include: Component-based software development; Dependability of software systems; Software engineering standards; etc.
- 04-06 September **EUROMICRO Workshop on Component-based Software Engineering** Warsaw, Poland In conjunction with the 27th EUROMICRO Conference Topics include: Component Development Processes; Design, Implementation, Testing; Component Specification; Components for Real-time Systems; Case Studies; etc.
- 04-07 September **Parallel Computing 2001 (ParCo2001)** Naples, Italy.
- 04-07 September **5th International Enterprise Distributed Object Computing Conference (EDOC'2001)** Seattle, Washington, USA Topics include: Software architectures and component based development for Enterprise systems; Architecture and interoperability issues in large-scale enterprise systems; Modelling, methodologies and technology for component based development; Deployment, operation, maintenance and evolution of Enterprise components and services; Performance, scalability and reliability in Enterprise software; Fault-tolerance and dependable Enterprise systems; Case studies and experience reports; etc.

- 08-12 September **International Conference on Parallel Architectures and Compilation Techniques (PACT'2001)** Barcelona, Catalunya, Spain Topics include: Parallel architectures and computation models, Compilers for parallel computer systems, Applications and experimental systems studies, Parallel programming languages and algorithms, etc.
- 09-13 September **3rd International Symposium on Generative and Component-Based Software Engineering (GCSE'2001)** Erfurt, Germany Deadline for submissions: May 14, 2001
- 10-13 September **3rd International Conference on Product Focused Software Process Improvement (Profes'2001)** Kaiserslautern, Germany Topics include: Quality of Software in Embedded Systems, Telecom and Internet Applications, Mobile Applications and Services; Technology Transfer; Industrial Experiences and Case Studies; etc.
- 10-14 September **Joint 8th European Software Engineering Conference (ESEC) and 9th ACM SIGSOFT International Symposium on the Foundations of Software Engineering (FSE-9)** Vienna, Austria
- 17-19 September **3rd IFIP WG 6.1 International Working Conference on Distributed Applications and Interoperable Systems (DAIS'2001)** Krakow, Poland Topics include: Experiences from development of distributed applications; Scalability issues in distributed applications; Experiences with distributed platforms and their scalability; Components and frameworks for distributed applications; etc.
- 18-20 September **3rd International Symposium on Distributed Objects and Applications (DOA'2001)** Rome, Italy Topics include: Design patterns for distributed object design; Database services, in particular persistency, transaction, query and replication services; Integration of distributed object and Web technologies; Interoperability-supporting environments; Methodologies to develop distributed object applications; Reintegration of legacy systems in DOC environments; Design of CORBA, COM- and Java-based broker applications; Reliability, fault-tolerance and recovery; Real-time ORB middleware; Reports on Best Practice; etc. Deadline for submissions: April 1, 2001
- 30 Sept. – 04 October **2001 ACM SIGAda Annual International Conference (SIGAda'2001)** Twin Cities, Minnesota, USA (approval pending by ACM)
- 01-05 October **4th International Conference on the Unified Modeling Language (UML'2001)** Toronto, Canada Theme: "Modeling Languages, Concepts and Tools"
- 02-05 October **8th Working Conference on Reverse Engineering (WCRE'2001)** Stuttgart, Germany Topics include: Experience reports (successes and failures) on reverse engineering or reengineering efforts; Techniques, tools, and enabling technologies for reengineering, reverse engineering, renovation, reuse, and migration; Software visualization; Software evolution and reengineering; Integration of reverse engineering and forward engineering; Code-based management systems to support reverse engineering; Wrapping and interfacing legacy systems; Formal methods in reverse engineering; etc. Deadline for paper submissions: May 1, 2001
- 08-12 October **25th Anniversary Annual International Computer Software and Applications Conference (COMPSAC'2001)** Chicago, Illinois, USA Theme: Invigorating Software Development Topics include: Component-based software development; Object-oriented technology; Safety and security; Software reliability; Distributed systems; Embedded systems; Internet and Web-based systems; Middleware systems; etc.
- 14-18 October **16th Annual ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA'2001)** Tampa Bay, Florida, USA Deadline for submissions: July 20, 2001 (Posters, Demonstrations, Doctoral Symposium, and Student Volunteers)
- 17-19 October **Colloque Francophone sur la Modelisation des Systemes Reactifs (MSR '2001)** Toulouse, France
- 24 October **♦ Symposium on Reliable Object-Oriented Programming (SROOP)** London, UK. OO has become a key feature of system design and implementation. Reliable systems are increasingly using OO techniques, often replacing traditional structured approaches. Programming languages like Ada 95, Java and C++ each offer subtly different ways of representing objects, their attributes and their methods. How can those features be used reliably? Are there features that are unsafe or

inappropriate? What architectures can be employed to make implementation easier or more verifiable? Where do patterns and frameworks fit in?. This Symposium will address many of these issues and more.

- 28-31 October      **20th IEEE Symposium on Reliable Distributed Systems (SRDS'20)** New Orleans, USA Topics include: Distributed systems with reliability, availability, security, safety, and/or real-time requirements; Security and High Confidence Systems; Formal methods and foundations for reliable distributed computing; Distributed objects and middleware systems; Distributed and Web-based application systems; etc. Deadline for submissions: April 2, 2001
- 06-10 November    **IEEE International Conference on Software Maintenance (ICSM'2001)** Florence, Italy Theme: "Systems and Software Evolution in the era of the Internet" Topics include: Design for maintenance; Internet and distributed systems; Software reusability; Tools and environments; Commercial off-the-shelf (COTS); Freeware and open source applications; Programming languages; etc.
- 12-16 November    **IFIP/ACM International Conference on Distributed Systems Platforms (Middleware'2001)** Heidelberg, Germany Topics include: integration of middleware platforms with web and Java technologies; real-time middleware platforms including real-time ORBs; reliable middleware platforms including fault-tolerant ORBs; applications of middleware technologies including telematics and commerce; distributed systems management and interactive configuration and development tools; etc. Deadline for submissions: May 7, 2001 (abstract), May 15, 2001 (paper), June 15, 2001 (tutorial, poster, etc.).
- 03-06 December    **22nd IEEE Real-Time Systems Symposium (RTSS'01)** London, UK Topics include: embedded systems, software engineering, programming languages and run-time systems, middleware systems, design and analysis tools, formal methods, case studies, applications, etc. Deadline for submissions: May 1, 2001
- 10 December        **Birthday of Lady Ada Lovelace, born in 1815 Happy Programmers' Day!**

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## 2002

- 10-13 March        **2002 ACM Symposium on Applied Computing (SAC'02)** Madrid, Spain Deadline for submissions: September 1, 2001 (papers, tutorials)

## Symposium on Reliable Object-Oriented Programming (SROOP)

*Wednesday 24<sup>th</sup> October 2001*

*The Institution of Electrical Engineers, Savoy Place, London*

**Question:** What has object-oriented design and programming to offer the implementation of reliable systems?

**Answer:** A lot!

OO has become a key feature of system design and implementation. Reliable systems are increasingly using OO techniques, often replacing traditional structured approaches. Programming languages like Ada 95, Java and C++ each offer subtly different ways of representing objects, their attributes and their methods. How can those features be used reliably? Are there features that are unsafe or inappropriate? What architectures can be employed to make implementation easier or more verifiable? Where do patterns and frameworks fit in?

This Symposium will address many of these issues and others. The audience will consist of programmers, system designers, tool vendors, managers responsible for tools and languages, and those involved in the assurance of quality in reliable systems. There will be a healthy mix of principles and practice.

We invite contributions on any of the following themes:

- object-oriented design and programming
- system reliability
- system architectures
- patterns and frameworks
- design languages and notations supporting reliable design
- applications of the above particularly in areas such as user interfaces and Internet programming

The organisers are particularly interested in reports of experience gained in *applying* the above.

### Call for Papers

**Authors are invited to submit abstracts (recommended length no more than one side of A4) addressing the above themes. The abstracts, which will be refereed, should be submitted by email to Rod Chapman at [rod@praxis-cs.co.uk](mailto:rod@praxis-cs.co.uk). Acceptable formats are Microsoft Word, HTML or plain ASCII. The deadline for submissions is Monday 18<sup>th</sup> June. Authors will be notified approximately four weeks later. Accepted abstracts will be distributed to delegates at the symposium. Selected full papers will be published after the Symposium in the *Ada User Journal*.**

Further Information: SROOP Administrator, PO Box 322, York, YO10 3GY, UK  
 Phone: +44-(0)1904-412740  
 Fax: +44-(0)1904-426702  
 E-mail: [admin@adauk.org.uk](mailto:admin@adauk.org.uk)  
 Website: [www.adauk.org.uk](http://www.adauk.org.uk)

Organising Committee: Jim Briggs, University of Portsmouth (Chairman); Rod Chapman, Praxis Critical Systems; Bill Taylor, Rational Software Ltd; Brian Tooby, BAE SYSTEMS Avionics Ltd; Helen Byard, Symposium Administrator.



## 6th International Conference on Reliable Software Technologies **Ada-Europe'2001**

Leuven, Belgium May 14-18, 2001

In 2001, the 6th International Conference on Reliable Software Technologies will take place in Leuven, Belgium, from May 14th to May 18th. The conference offers a technical program and exhibition, plus a series of tutorials and a workshop.

The conference provides an international forum for researchers, developers and users of reliable software technologies. Presentations and discussions cover applied and theoretical work currently conducted to support the development and maintenance of software systems.

The technical program includes keynote addresses, session papers by the international community with refereed contributions from many countries. The proceedings of the conference will be published in the Lecture Notes in Computer Science (LNCS) Series by Springer. An exhibition concurrent to the conference offers an opportunity to explore the latest developments by the commercial marketplace. The tutorials on Monday and Friday offer an excellent opportunity to obtain in-depth knowledge in important technologies in the field.

Leuven is one of Europe's ancient university towns with many old beautiful buildings. The town hall, the famous Beguinage (Begijnhof), the churches, cloisters and colleges stand silent witness to the rich history of Leuven and make it the interesting place it is. Leuven is only 25 km (15 miles) away



from Brussels, the capital of Belgium and the seat of the European Union. This year, K.U.Leuven university celebrates its 575th anniversary. The Conference will take place in the unique setting of the classicist buildings of Maria-Theresia College, situated in the historical centre of Leuven.

<http://www.ada-europe.org/conference2001.html>



In cooperation with



KATHOLIEKE UNIVERSITEIT  
**LEUVEN**

## Preliminary Program

The information presented here is preliminary - please refer to the conference website for the latest details.

<http://www.ada-europe.org/conference2001.html>

### Overview of the week

|  | Morning   | Late Morning                | After Lunch   | Afternoon   |
|--|---|-----------------------------|---|---|
| <b>Monday<br/>May 14th</b><br>Tutorials & Workshop     | Non-standard techniques in Ada - <i>Art Duncan, RPI, USA</i>  |                             |   |   |
|  | Practical experiences of safety-critical Ada technologies<br>- <i>Peter Amey &amp; Rod Chapman, Praxis Critical Systems, UK</i> |                             |   |   |
|  | Early reliability measurement and improvement -<br><i>Jeff Tian, SMU, USA</i>   |                             | An introduction to XML<br>- <i>Gregory Neven, Maarten Coene &amp; Roel Adriaensen, K.U.Leuven, Belgium</i>                  |   |
|  | Workshop on exception handling for a 21st century programming language  |                             |   |   |
| <b>Tuesday<br/>May 15th</b><br>Sessions & Exhibition   | Building formal requirement models for reliable software<br><i>Axel van Lamsweerde UCL, Belgium</i>                             | Program Analysis            | Distributed Systems   | Using Ada in interactive digital television systems<br><i>Pascal Heraud, CANAL+</i> |
|  |   | Software Process            | Vendor presentations  |   |
| <b>Wednesday<br/>May 16th</b><br>Sessions & Exhibition | Testing from formal specifications, a generic approach<br><i>Marie-Claude Gaudel, Université de Paris-Sud</i>                   | Real-Time Systems           | Dependable Systems  | APIs and Components   |
|  |   | Language and Patterns       | Vendor presentations  | Vendor presentations  |
| <b>Thursday<br/>May 17th</b><br>Sessions & Exhibition  | Logic versus Magic in critical systems<br><i>Peter Amey, Praxis Critical Systems, UK</i>  | Real-Time Kernels           | System Evolution  | Can Java meet its real-time deadlines?<br><i>Brian Dobbing, Aonix Europe Ltd.</i>   |
|  |   | Standard Formats: UML & XML | Vendor presentations  |   |
| <b>Friday<br/>May 18th</b><br>Tutorials                | From full concurrency to safe concurrency - <i>John Harbaugh, Boeing, USA</i>   |                             |   |   |
|  | Building distributed systems with Ada<br>- <i>Samuel Tardieu, Laurent Pautet &amp; Thomas Quinot, ENST, France</i>              |                             |   |   |
|  | Implementing design patterns in Ada: sequential programming idioms - <i>Matthew Heaney, USA</i>                                 |                             | Architecture centered development and evolution of reliable real-time systems<br>- <i>Bruce Lewis &amp; Ed Colbert, USA</i> |   |

### Exhibition

The exhibition opens in the mid morning break on Tuesday and runs until after the Thursday afternoon break. Each exhibitor will have at least one half hour presentation slot during the vendor track; details of the schedule are not yet available. The mid morning and mid afternoon breaks are one hour to give attendees ample opportunity to visit the exhibition.

At the time of writing eight exhibitors - ACT, Aonix, DDC-I, Irvine Compiler, Praxis Critical Systems, Rational, TNI and Top Graph'X - have come forward and others have expressed interest. Contact the conference organisers for more details.

### Sponsoring

A sliding scale of sponsorship provides a range of benefits. All levels include display of your logo on the conference web site and in the program. The lowest level of support is very affordable! Please see the website for more details

## Social Program

### Monday evening: Welcome reception

The welcome reception will be an informal gathering point for conference attendees. Nibbles and drinks, especially Belgian Beer, will be served. *Details to be announced.*

### Tuesday evening: Civic reception



Tour of the Town Hall followed by a reception there hosted by the City of Leuven.

The Town Hall of Leuven is pictured on the front cover and features in the logo of the city on the back page. It is located on the Grand Market, its construction started in 1439 and it is one of the master pieces of Flamboyant Gothic in Belgium, expressing its character through four corner turrets, two ridge turrets and a balustrade all

around the building. The Town Hall has three floors. Between the windows are oriels each of which with two niches; three corner-turrets also have niches. The carved bases of these niches represent biblical subjects. The motif 'sin-punishment' is often repeated. These scenes had a didactic and admonishing function, not only for the common people but also for the judges who resided in the building.

The 236 statues in the niches were only placed after 1850. The whole set has become the Leuven pantheon! In contrast to the figures in the bases who wear Burgundian clothes, the statues in the niches wear the clothes of the period in which they lived. The two rows of the ground floor represent artists, scholars and eminent citizens of the Leuven past. The first floor displays figures who symbolise the municipal privileges and the patron saints of the parishes. On the second floor the Counts of Leuven and the Dukes of Brabant are visible; the turrets represent biblical figures.

Since the nineteenth century three restorations have taken place. The latest was finished in 1983 and repaired the war damage, suffered when a bomb scraped the façade and did not explode...

The Town Hall is across from Saint-Peter's Church, the oldest church in Leuven. It is thought to have been founded in 986. The first church burnt down in 1176. The construction of the present Gothic building, much larger than the Romanesque church, started in 1425 and was practically completed in 1497. Of the three towers that were planned, one of which should have reached a height of 170 meters, only the bases remain. In 1541 when the height of 50 meters was reached, work was stopped. The subsoil was not stable enough to support a higher tower. After some collapses, the tower was lowered to its present level. The successive architects did not change the original plans and this brought about a fine example of pure Brabantine Late Gothic Style.

### Wednesday evening: Banquet

Banquet in the Faculty club of the university, at the Great Beguinage - *remember to book this on the registration form as it is not covered by the conference fee.*

The 'Begijnhof', or 'garden of the Begijns', was founded in the 13th century outside the town wall of the time. The oldest houses date from the 16th century when the original houses were replaced by brick structures. The 72 houses are generally named after a saint or a Biblical event.

The church, dedicated to St. John the Baptist, is early Gothic. The date of construction, 1305, is carved into the right buttress of the north portal. Approximately 300 'Begijns' lived in the 'Begijnhof' in the 17th century. The 'Begijns' or 'Beguines' were women who lived a religious life but kept their own property and supported themselves. They did not make perpetual vows. The movement was very strong throughout the Low Countries.

The 'Begijnhof' was taken over by the Welfare Commission in 1925. Except for the church, it was sold to the University in 1962 under the condition that the entire complex be restored.

The 'Groot Begijnhof' is now a University residential quarter for students, professors, and employees of the University. Foreign guests are also housed here. There is room for 500 people.

The Infirmary of the 'Begijnhof' has been converted into the Faculty Club.

### Thursday evening: Brewery visit

A guided visit of the famous brewery Stella Artois hosted by Interbrew.

Interbrew can trace its origins back to 1366 to a brewery called Den Hoorn, located in Leuven. In 1717, Sebastien Artois, the master brewer, purchased the brewery and changed its name to Artois. Interbrew was formed in 1987 from the merger of Brasseries Artois, then the second largest brewer in Belgium, and Brasseries Piedboeuf, then the largest brewer in Belgium and the brewer of Jupiler.

During the visit we will be able to see the whole brewing process.

To make beer, brewers use water and barley to create a sweetened liquid (called the wort), which they flavour with hops, then ferment with yeast. The basic process may be simple but the execution is highly sophisticated. The



three most important stages are malting, brewing and fermentation - followed by maturation, filtering and bottling. All of these stages will be visited during the visit.

After the visit there will be time to taste different beers !

## Organizers

### Conference Chair

Karel De Vlaminck  
K.U.Leuven  
Department of Computer Science  
Celestijnenlaan 200 A  
B-3001 Leuven (Heverlee), Belgium  
Karel.DeVlaminck@cs.kuleuven.ac.be

### Program Co-Chairs

Dirk Craeynest  
Offis nv/sa & K.U.Leuven  
Weiveldlaan 41/32  
B-1930 Zaventem, Belgium  
Dirk.Craeynest@cs.kuleuven.ac.be

Alfred Strohmeier  
Swiss Fed. Inst. of Technology Lausanne  
Software Engineering Lab  
CH-1015 Lausanne EPFL,  
Switzerland  
Alfred.Strohmeier@epfl.ch

### Tutorial Chair

Luc Bernard  
OFFIS nv/sa, Belgium  
lbn@offis.be

### Exhibition Chair

Yvan Barbaix,  
K.U.Leuven, Belgium  
Yvan.Barbaix@cs.kuleuven.ac.be

### Publicity Chair

Andrew Hately  
Eurocontrol - CFMU, Belgium  
Andrew.Hately@eurocontrol.be

### Finance Co-Chairs

Karel De Vlaminck  
K.U.Leuven, Belgium  
Karel.DeVlaminck@cs.kuleuven.ac.be

Marc Gobin  
Royal Military Academy, Belgium  
Marc.Gobin@info.rma.ac.be

### Local Organization Chair

Yolande Berbers  
K.U.Leuven, Belgium  
Yolande.Berbers@cs.kuleuven.ac.be

### For any information, please contact:

Esther Renson (Conference Secretariat)  
Department of Computer Science  
K.U.Leuven  
Celestijnenlaan 200A  
B-3001 Leuven,  
Belgium

Tel: ++32(0)16327640

Fax ++32(0)16327996

email: ae2001-info@cs.kuleuven.ac.be

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The organizers thank the exhibitors (preliminary list)



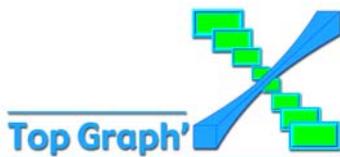
DDC-I



Praxis  
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# Integrating Ada into a Distributed Systems Environment

*David Humphris*

*Aonix Europe Ltd, Partridge House, Newtown Road, Henley on Thames, Oxon, RG9 1HG, UK  
Tel: +44-(0)1491-415023; Fax: +44-(0)1491-571866; Email: dhumphris@aonix.co.uk*

## Abstract

*There is now a wider acceptance of technologies that are either explicitly designed for distributed systems applications or fit naturally into this arena.*

*Ada has many strengths for particular application areas; such as high-integrity system. However it can be desirable to integrate Ada with applications written in languages other than Ada. These other applications could be distributed across other platforms, which leads to the requirement to integrate Ada into a distributed system.*

*This paper considers a couple of approaches for realizing the use of Ada within distributed systems.*

## 1 Introduction

Distributed Systems can be desirable so that individual computers can be physically placed in the most appropriate location, to provide features such as redundancy for high availability systems, to separate systems with dissimilar requirements or simply because performance requirements can not be readily achieved with a individual self-contained system.

Ada has particular strengths for some applications areas such as high-integrity systems; where its strengths are indisputable. However other languages address certain application domains better than Ada; such as graphical user interfaces. For some of these languages there are also a wide range of pre-existing code repositories that can not be ignored in today's climate of every increasing system complexity and reducing time-scales.

Below are described a couple of approaches for realizing the use of Ada within distributed systems. It will look at the use of Ada in applications that are built around the CORBA technology and the integration of Ada with Java and its plethora of existing class libraries that can be used in a distributed environment.

## 2 CORBA

CORBA (Common Object Request Broker Architecture) [1, 2] is a widely used standard that is an architecture and specification for creating, distributing, and managing distributed program objects in a network. It allows programs at different locations and developed by different vendors to communicate in a network through an "interface broker." CORBA was developed by a consortium of

vendors through the Object Management Group [3], which currently includes over 500 member companies. Both International Organization for Standardization and X/Open have sanctioned CORBA as the standard architecture for distributed objects (which are also known as components).

The CORBA framework for distributing objects consists of the following elements:

- An Object Request Broker (ORB), which provides clients and servers of distributed objects with the means to make and receive requests of each other. ORBs can also provide object services, such as a Naming Service that lets clients look-up objects by name, or Security Services that provide for secure inter-object communications.
- Methods for specifying the interfaces that objects in the system support. These interfaces specify the operations that can be requested of the object, and any data variables available on the object. CORBA offers two ways to specify object interfaces: an Interface Definition Language (IDL) for static interface definitions, and a Dynamic Invocation Interface (DII), which lets clients access interfaces as first-class objects from an Interface Repository. The DII is analogous in some ways to the Java Reflection API.
- A binary protocol for communication between ORBs, called the Internet Inter-ORB Protocol (IIOP) that runs over TCP/IP.

### 2.1 CORBA and Ada

There are ORBs available on the market, which provide Ada APIs onto the CORBA architecture. For example, ORBExpress from OIS and ORBAda from TopGraphX have both been successfully used with Aonix's ObjectAda™ [4].

The typical components of an Ada CORBA solution are:

- Libraries to support both the issuing and receiving of remote object operation requests for server components or to support the issuing of requests only for client components.
- An activation environment with a daemon is responsible for dynamically launching and re-launching the server processes as required.

- An IDL-to-Ada95 translator is used to generate Ada stubs from an IDL description that defines the distributed component methods and their profiles.
- An interface repository to allow the applications to determine the interface properties of objects at runtime.

This support provides the means to allow Ada code to make and receive requests to and from distributed CORBA objects.

## 2.2 Example Project

One example of a project that has used Ada with CORBA is the Kingcat MCAS project that was presented at the 2000 Ada Europe conference in Germany [5].

The Kingcat MCAS project developed an Integrated Monitoring, Control and Alarm System (MCAS) to provide a set of touch button screens in place of conventional shipboard controls and instruments aboard a 70-foot high-tech catamaran designed for offshore cruising. This was implemented in Ada95 and Java.

Signals are received from sources distributed throughout the yacht (engine, electrical systems, navigational systems, etc.) and this information is used to update displays, sound alarms and record logs.

They have 5 ruggedized Windows NT workstations running on a local area network with 15.1 inch XGA LCD TFT colour touch screen displays.

The system has soft real-time requirements requiring fast response and a high throughput. The system was required to be robust with zero-maintenance and to continue to provide safe operation even in the case of partial hardware or software failures.

They choose Ada95 for the non-visual components because of its robustness and real-time application support. They use Java for the GUI implementation due to its strength for developing state-of-the-art and portable GUI interfaces. CORBA was chosen due to the requirement for highly reliable communications between distributed heterogeneous objects and because there are Object Request Brokers available for both Ada and Java.

This used Aonix's ObjectAda™ for Windows NT v7.1.1, ORBExpress (on the Ada side) and VisiBroker (on the Java side).

## 3 Java

While Ada has proved itself to be a superior language for supporting the development and maintenance of large systems [6, 7]. Its use leads to better productivity, reduced costs, more reuse, much lower error rates (especially early on) and significantly lower maintenance costs. While Ada may be an appropriate language for the development of large long-lived systems, its wider applicability is somewhat limited by a lack of standardised Application Programmer Interfaces (APIs). Because of this, Ada has been largely restricted to the development of software for critical systems such as aircraft, railways and air traffic

control. Ada has seen very little use in main stream computing.

Java, on the other hand, has become popular for the development of portable main stream applications. Its flexibility is due in part to the availability of a wide range of portable APIs. If these Java APIs are made available to Ada programmers, then Ada can become a more viable language for development of the same kinds of applications while maintaining the characteristics required for the cost effective development and maintenance of large systems.

Java is expressly designed for use in the distributed environment of the Internet. Java can be used to create complete applications that may run on a single computer or be distributed among servers and clients in a network.

With interfaces such as JavaBeans Java provides the framework for providing reusable software components.

Java provides support for developing multi-language, distributed system via its Java RMI (Remote Method Invocation) and CORBA protocols.

A brief description of what these are is given below. A full description of the Java and Distributed Systems development can be found in more complete texts [8, 9].

### 3.1 Java RMI

The Java Remote Method Invocation (RMI) package is a Java-centric scheme for distributed systems. RMI offers some of the critical elements of a distributed object system for Java, plus some other features that are made possible by the fact that RMI is a Java-only system. RMI has object communication facilities that are analogous to CORBA's IIOP, and its object serialization system provides a way for you to transfer or request an object instance by value from one remote process to another.

When using RMI with other languages then you will need to use the Java Native-code Interface (JNI) to link to remote objects implemented in languages other than Java.

An advantage of RMI is that it is likely to be easier for experienced Java programmers to learn than CORBA.

The main packages to support RMI are:

- *java.rmi* - The main RMI package. Supports things like defining and locating RMI objects of a network. It also provides the security semantics and some exception types.
- *java.rmi.activation* - Supports the instantiation of remote objects on the server by the client.
- *java.rmi.dgc* - Supports distributed garbage collection. Normally handled automatically.
- *java.rmi.registry* - Supports RMI object naming registry.
- *java.rmi.server* - Provides the base class for all RMI server objects. It also implements the communications scheme.

### 3.2 CORBA support within Java

An overview of CORBA has been given in a preceding section.

You use CORBA with Java IDL or RMI/IIOP (Internet Inter-ORB Protocol - binary protocol for communication between ORBs) to communicate directly with remote CORBA objects.

An advantage of CORBA is that it was designed from the outset to support systems written in a variety of implementation languages (Ada, Java, C, and C++).

It is more mature than RMI with more services and distribution options, such as high-level interfaces for naming, security and transaction services.

The CORBA communication model is a peer-to-peer ORB model, whereas the RMI model is server-centric.

The main package to support CORBA is:

- *org.omg.CORBA* - Contains the bulk of the Java classes in the Java IDL API. This supports the mapping between Java and the CORBA module defined in IDL. This includes an *ORB* class, which is a Java implementation of an ORB, and the *Object* interface, which serves as the root class for all CORBA objects.

### 3.3 Other Java Distribution packages

Below I have listed some of other standard APIs that are likely to be of interest for support of distributed systems:

- *java.net* - The main package to provide access to objects via URLs. Supports things like TCP-streaming, DNS queries and sockets.
- *javax.ejb* - The primary package in the Enterprise JavaBeans (EJB) API. EJB is a framework for distributed component-based enterprise computing. It combines RMI and standard JavaBeans.
- *java.sql* - Contains the JDBC (Java DataBase Connectivity) that sends SQL statements to relational databases and retrieves the results.
- *javax.jms* - Implements the Java Message Service (JMS), which provides a message-based communication between Java processes. This communication is asynchronous; the recipient receives and acts on the message at some later time. This is different to RMI where the sender of a message waits for a response before continuing.
- *javax.naming* - Supports the JNDI (Java Naming and Directory Interface). This provides the means to name and access objects.
- *javax.servlet* - Provides the support for servlets. These are pieces of Java code that run within a server to provide a service to a client.
- *javax.transaction* - Supports the JTA (Java Transaction API). This defines the interfaces with a transaction

manager, which sits between an application and some shared resources.

### 3.4 Integration with Ada

The question for this paper is how best to integrate Ada with Java to allow Ada developers to benefit from Java support for distribution and extensive libraries of existing components.

The integration of Ada with Java APIs can be achieved in a number of ways. One approach is that adopted within the AppletMagic™ compiler [10] developed by Intermetrics Inc. This is a special Ada compiler which can generate code to run on the Java Virtual Machine (JavaVM) and is supplied with Ada bindings to the Java API's. This approach provides a good solution for the development of portable software such as applets for the internet.

There are, however, cases in which the use of a native Ada compiler is required or desirable. In such cases a different approach to that of AppletMagic is needed to integrate Ada with Java APIs. The Java Native Interface (JNI), which supports the integration of Java and C, offers an approach to using Java APIs with native Ada compilers. The JNI is a C library supplied with the Sun Java Development Kit (JDK) [11]. It allows C programmers to make requests on the JavaVM to create Java objects, call methods and to read/write fields. By creating an Ada binding to the JNI, Ada applications could be written to create and manipulate Java objects in the same way.

While JNI Ada bindings are sufficient to provide Ada with access to Java classes, they do not provide an 'Ada like' interface to each Java class. To call a Java method using JNI bindings, the programmer would ordinarily make a series of calls to the JNI to obtain a class ID and method ID, to marshal the required parameters for the call and to request the JavaVM to call the method. This does not follow the normal Ada procedure calling mechanism and would be impractical for normal application development. Ideally, an Ada package corresponding to each Java class in a given Java API should be available to the Ada programmer. The specifications of such packages would contain subprograms corresponding to the methods of each class thus providing a simple 'Ada style' interface. The Ada package bodies would manage the low-level interface to the JNI using the JNI bindings.

AdaJNI (**Ada** to **Java Native Interface**) is an implementation of this JNI based integration approach

## 4. AdaJNI

AdaJNI (**Ada** to **Java Native Interface**) is an implementation of the JNI based integration approach described above. The runtime system comprises four major components which interact with an Ada application built with a compilation system such as Aonix ObjectAda™ for Windows [4], and the Java environment provided by Sun JDK [11], as depicted in Figure 1.

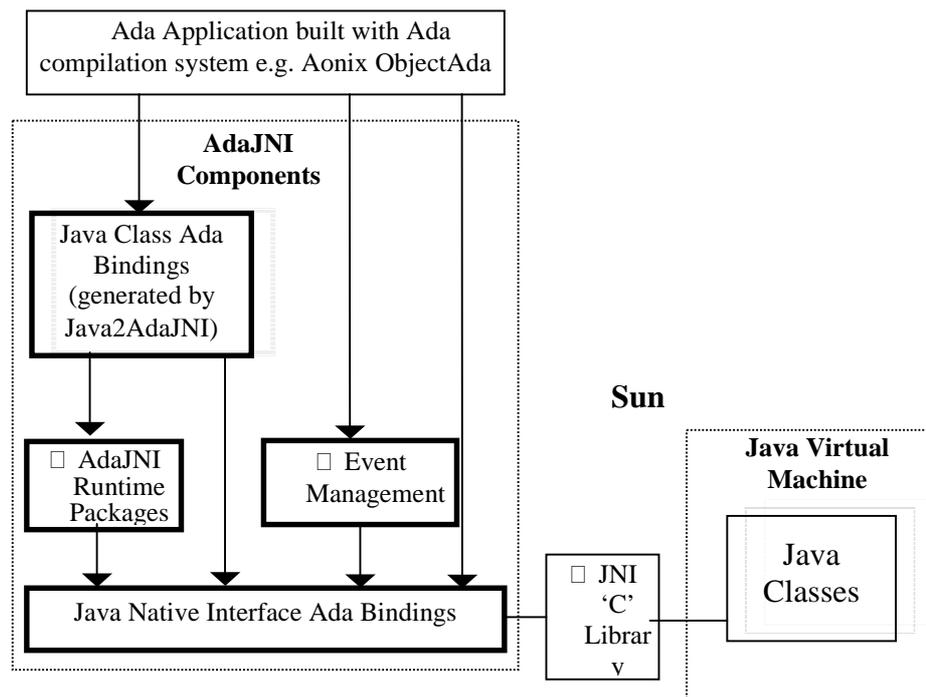


Figure 1: The AdaJNI Architecture

The *Java Native Interface Ada Bindings* are the basis upon which AdaJNI is constructed. They provide a low-level interface to the Java Virtual Machine using the JNI API. The *AdaJNI Runtime Packages* manage the mapping of Java language features such as arrays, strings and exceptions to Ada, as well as the marshalling of parameters passed to Java methods.

The *Java Class Ada Bindings* provide an interface between the Ada application and Java classes. These bindings comprise an Ada package for each Java class required by the application. The specifications of such packages provide an "Ada Style" interface to a specific class including all of the class' constructors, methods, and fields. The binding package bodies contain code, which maps the Ada interface to the underlying JavaVM via the *JNI Ada Bindings* and *Runtime Packages*.

The *Event Management* component integrates the Java 1.1 Event Model [12] with the AdaJNI environment and thus Ada.

#### 4.1 Binding Generator Tool

In order to ensure that Ada developers are able to make use of any Java API, a tool has been developed to automatically generate the *Java Class Ada Bindings* described above. As depicted in Figure 2, *Java2AdaJNI* processes Java classes and (optionally) Java source code to generate Ada source code in the form of Ada packages which provide access to the services of a specified Java class. When a class is processed, *Java2AdaJNI* will extract information about the

class using the standard *java.lang.reflect* API. This information is used to generate an Ada package specification containing data types and subprograms, which correspond to the constructors, methods and fields of the Java class. *Java2AdaJNI* also generates a corresponding package body, which contains the Ada code required to interface the Java class.

While functional bindings can be generated solely from information provided via the *java.lang.reflect* API, such bindings will not have correct parameter names for constructors and methods because the API does not provide parameter name information. In such cases, parameters are named P1, P2 etc.

If, on the other hand, a Java source file is processed, parameter names and *JavaDoc* comments are extracted from the source file. This information is used in conjunction with information extracted via the *java.lang.reflect* API to generate a complete binding, which includes the correct parameter names for constructors and methods along with documentation comments.

*Java2AdaJNI* has been used to generate complete bindings to all of the normal Java API's (Awt, lang, net etc.) [13] and the Java Foundation Classes [14] without any manual re-working. The tool can also be used by the Ada programmer to generate bindings to other Java classes. In short, *Java2AdaJNI* provides the Ada programmer with immediate access to any software which has a Java API.

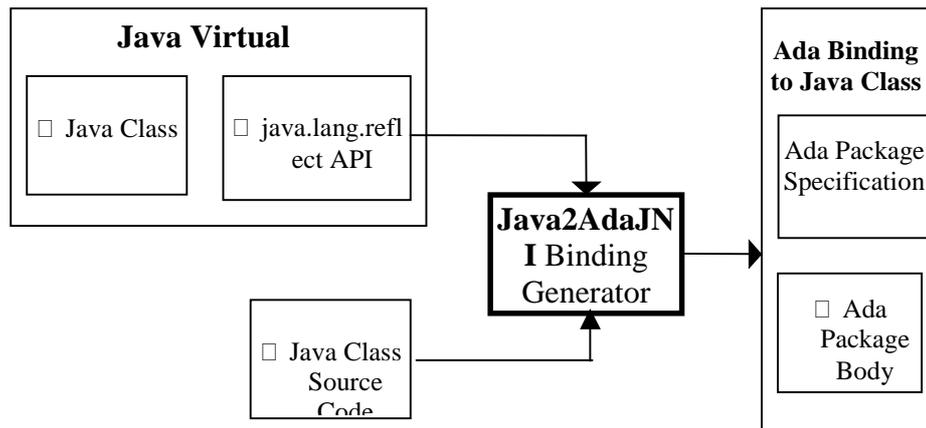


Figure 2.: The Java2AdaJNI Binding Generator

## 4.2 Mapping Java Classes to Ada

In general terms, the AdaJNI approach maps each Java class to a separate Ada package. Each package contains a tagged record *Object* type that reflects the corresponding Java class inheritance hierarchy. A *Reference* type is also declared as an access type to the *Object* type. Values of these *Reference* types are initialised by constructors and refer to Java objects managed by the JavaVM. The remainder of each package comprises Ada subprograms corresponding to each constructor and method of the class along with subprograms to manipulate any fields in the Java class.

For a tool such as *Java2AdaJNI* to be effective it must automatically and completely generate these Ada packages so that the Ada programmer can make use of any Java class without delay. In order to achieve this aim a number of issues have been addressed during the development of AdaJNI.

- Circularities in Java Classes
- Mapping Java Names to Ada Names
- Java Constructors
- Abstract Classes and Methods
- Java Interfaces
- Java Arrays
- String Handling
- Java Exceptions
- Inner Classes Abstract Classes and Methods
- Method and Constructor Parameter Names Abstract Classes and Methods
- JavaDoc Comments Abstract Classes and Methods
- Ada Tasking Abstract Classes and Methods

- Event Handling Abstract Classes and Methods

A detailed description of how these issues are handled can be found in "Using Java™ APIs with Native Ada Compilers" [15].

## 4.3 Applications of AdaJNI

AdaJNI supports the use of Ada and Java in a wide variety of software architectures including stand-alone applications, client server systems, and systems distributed over local and/or wide area networks. Applications can comprise components written in any combination of Ada and Java. Ada components can make use of Java APIs and can communicate with components written in Java using the AdaJNI system.

In standalone applications, Ada programs can make use of Java API's via AdaJNI bindings. If such applications are limited to using only the standard Ada packages and Java API's which are supported on a variety of platforms, the application code will compile on those platforms without any changes. That is, the applications are portable at the source level.

Applications can also comprise a combination of Ada and Java components. AdaJNI can be used to generate Ada bindings to Java components of the application as well as standard Java and third party APIs. This architecture allows use of the most appropriate language for each component. More importantly, it allows the integration of existing/legacy Ada and Java code to build new systems.

Java provides a comprehensive set of APIs for the development of distributed applications (as described in section 3). By using AdaJNI, Ada programs can make use of the same APIs thus allowing the development of applications comprising Ada and Java components distributed over local and/or wide area networks. The use of AdaJNI in client server architectures would allow the server component to be developed using robust native Ada compilers. The server would use AdaJNI bindings to

communicate with clients running in a Java Virtual machine. The client software could be written in Java or Ada using one of the Ada byte code compilers.

#### 4.4 A Small AdaJNI Example

This section shows how AdaJNI can be used to generate an Ada binding to a simple Java class and how that binding can be used to call Java methods from Ada.

##### 4.4.1 The Java Class

The following Java class contains a single method, which displays the text 'Hello Ada!' a number of times as determined by the integer parameter 'count'. The remainder of this section shows how this class can be called from Ada.

```
public class ExampleClass {
  public void sayHello(int count) {
    int i;
    for ( i=0; i<count ;i++ )
      System.out.println("Hello Ada!");
  }
}
```

##### 4.4.2 The Ada Binding

The *Java2AdaJNI* binding generator tools can be used to create an Ada binding to the class described above. The primary specification for such a binding is shown below. In producing this specification, *Java2AdaJNI* analyses the Java source file described above along with the associated Java class file produced when the class is compiled using the *javac* Java compiler.

```
package Ada_JNI.Bindings.Example_Class is
  type Object is
    new Ada_JNI.Bindings.Java_Lang.Object.Object
    with null record;
  type Reference is access all Object'class;
  function New_Example_Class
    ( Env: Ada_JNI.Java.Java_Env :=
      Ada_JNI.Java.Current_Env )
    return Reference;
  procedure Say_Hello
    ( Ref : access Object;
      Count : in Ada_JNI.Java.Int.Java_Int;
      Env : in Ada_JNI.Java.Java_Env
        := Ada_JNI.Java.Current_Env );
end Ada_JNI.Bindings.Example_Class;
```

Note that the Java source code is not necessary to generate the above specification. *Java2AdaJNI* can generate a complete binding from the class file alone. In such cases, however, *Java2AdaJNI* is unable to generate proper parameter names for methods and constructors because they are not stored in Java class files.

##### 4.4.3 Use of the Ada Bindings

The following Ada program makes use of the Ada binding described above. It declares a new object reference called "*My\_Object*". The body of the procedure creates a Java object by calling the constructor function

"*New\_Example\_Class*". Finally, the "*Say\_Hello*" method is called for the newly created object.

```
with Ada_JNI.Bindings.Example_Class;
procedure Example is
  My_Object :
  Ada_JNI.Bindings.Example_Class.Reference
  :=
  Ada_JNI.Bindings.Example_Class.New_Example_Class;
begin
  Ada_JNI.Bindings.Example_Class.Say_Hello
    ( Ref => My_Object, Count => 10 );
end Example;
```

#### 4.5 AdaJNI Conclusion

An approach to using Java APIs with native Ada compilers has been described. The approach, which is based on use of the Java Native Interface, has been implemented in a system called AdaJNI that interfaces to the Aonix ObjectAda™ product [4] and the Java Native Interface in the Sun Java Development Kit [11]. AdaJNI includes a tool that automatically generates Ada bindings to any given Java class as well as a small runtime to support the operation of such bindings. A number of issues associated with the mapping of Java to Ada have been raised and addressed during the development of AdaJNI. These issues have been discussed in this paper.

## 5 Summary

This paper has given an overview of two different approaches for integrating Ada into distributed systems. One based on the well defined, mature CORBA standard and the other on a technology that provides the ability to easily leverage the into the world of Java and the support that this then provides to create distributed systems.

These are not the only solutions available. I also am aware that distributed systems have been built using ObjectAda™ for Windows along with its support of the Microsoft SDK, OLE libraries and utilities, Win32 bindings and Microsoft Win32 help files.

## Acknowledgements

David Humphris acknowledges Shayne Flint for the information on AdaJNI.

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# Adaptability of Distribution Protocols in Object-Oriented Languages

Fernando Sánchez<sup>1</sup>, Roberto Rodríguez<sup>2</sup>, Juan M. Murillo<sup>1</sup>, Juan Hernández<sup>1</sup>

<sup>1</sup> Departamento de Informática, Universidad de Extremadura, Avda. Universidad s/n, 10071, Cáceres, Spain; Email: fernando@unex.es

<sup>2</sup> Teleserver Extremadura, S.L., Avda. Alemania, 1, 10001, Cáceres, Spain; Email: rrodriguez@teleserver.es

## Abstract

Adaptability is one of the most important research areas in object-oriented systems. It tries to cope with system evolution by adding/replacing components with minimum effort. Nevertheless, at the present time, object-oriented languages do not provide enough support for the development of true adaptable software because either i) the different computational aspects that appear in these systems, such as synchronization, concurrency control, distribution, coordination, basic behavior, etc. are mixed in the same component or, ii) if they are properly separated in different components, once these components are woven the resulting executable piece of software is too rigid to be adapted at run time. Although several techniques or proposals such as Design Patterns or AspectJ have been proposed, they are not totally satisfactory. With Design Patterns one can achieve certain degree of dynamic adaptability, but future changes in the resulting application must be known at design phase. AspectJ achieves static adaptability. It allows separation of different aspects but, when they are integrated, the resulting code is too rigid to be adapted at run time. In this paper, we present the Disguises Model, a model mainly thought for a clear and consistent separation of the synchronization, concurrency control and distribution aspects (called disguises) from the behavioral aspect. Whereas the model allows behavioral code to be written in a standard language like Java, it provides a different language for the specification of disguises and a third language for the specification of the composition rules between the disguises and behavioral components. This composition language allows synchronization, distribution and concurrency control policies to be added, replaced or reconfigured at run-time, which is the main contribution of the proposed model. The techniques here presented have been satisfactorily integrated in Java using as distribution protocols RMI and several implementations of CORBA. In this paper we only focus on the distribution aspect and Java, but the same architecture and ideas are being currently applied to Ada and CORBA.

## 1. Introduction

Frequently, large and complex systems have to cope with a continuous change of requirements during their life. Consequently, these systems tend to grow and change after they have been developed. In order to adapt to changing requirements, the demand has risen for adaptable software. This research area has been named adaptability of software, which can be defined as the ability to deal with new/changing requirements with minimum effort. In this definition, the meaning of effort must be understood as the number of modules that are created or modified when changes in the requirements are necessary. In practice, these changes may appear not only at compile-time but also at run-time.

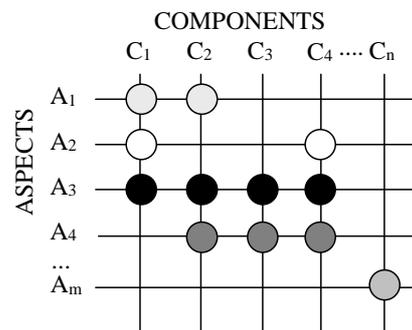


Figure 1. Relation between aspects and components

Adaptability is not a new area of interest. The different programming methodologies proposed so far have had, among their main goals, the development of easily maintainable and modifiable software. In this sense, object oriented programming has proposed abstraction mechanisms such as classes, objects, interfaces, methods (procedures, functions), etc. for defining the functional elements of systems. However, many systems have properties that don't necessarily align with the object-oriented system's functional components. Synchronization constraints, persistence, distribution protocols, replication, coordination, real-time constraints, etc., are aspects of a system's behavior that tend to cut-across groups of functional components. Consequently, programming them using current object-oriented languages results in spreading aspect code through many components, and the source code becomes a tangled mess of instructions for different purposes (See A<sub>1</sub>-A<sub>4</sub>, C<sub>1</sub>-C<sub>4</sub> in Figure 1).

```

public class BankAccount {
    private int balance;
    public BankAccount (int Ini)
    { balance = Ini;}
    public void deposit (int amount)
    { balance += amount; }
    public void withdraw (int amount)
    { balance -= amount; }
    public int getBalance ()
    { return balance; }
}

```

**Figure 2. BankAccount class**

```

public class Client {
    public Client (BankAccount ba) {
        ba.deposit (1000);
        ba.withdraw (1000);
        Print (ba.getBalance());
    }
    public static void main (String args[]) {
        BankAccount ba = new BankAccount (0);
        new Client (ba);
    }
}

```

**Figure 3. Client class**

```

import java.rmi.*;
public class Client {
    public Client () {
    }
    public static void main (String args[]) {
        try {
            BankAccountIF obj =
                (BankAccountIF)Naming.lookup
                ("//norba.unex.es/BankAccountService");
            obj.deposit (1000); obj.withdraw (1000);
            Print (obj.getBalance());
        } catch (Exception e) {
            System.out.println (e.printStackTrace());
        }
    }
}

```

**Figure 4. Client class using RMI**

Under this situation, dependencies between components are increased, opportunities for programming errors are introduced, and components become less reusable. In short, the source code is difficult to reason about, to develop and to evolve. The introduction of new requirements affecting a single aspect may involve the modification of other aspects, thus expanding the number of components that must be changed or modified. And this situation is clearly against the definition of adaptability given before.

Our research group has been recently working on the adaptability of synchronization and coordination aspects [6]. In this article we present the application of these ideas to the distribution aspect in order to obtain a dynamic, transparent and protocol independent object distribution, using the Disguises Model [8].

The rest of the article is as follows: section 2 presents the problem that the distribution aspect introduces from the adaptability point of view. Section 3 shows the solution provided by the Disguises Model and a visual tool developed upon the model. Finally, section 4 summarizes conclusions and future works.

## 2. The Problem

In order to show the problem we are interested in, let us consider a class simulating the behaviour of a bank account. It's implemented in Java due to RMI being used as distribution protocol but, obviously, you can obtain the same with Ada and CORBA. Figure 2 shows the BankAccount class with its typical operations: deposit, withdraw and getBalance. Figure 3 shows a Client class requesting several account operations.

### 2.1 Object Distribution

From both pieces of code it is deduced that the client and the account are located at the same node. Let us suppose that our bank grows up and there's the possibility for objects to be located at different nodes. To implement this new aspect, we can choose between different distribution protocols such as CORBA, RMI or DCOM. Let us suppose that our choice is RMI. Figure 4 shows the Client class. The implementation of the BankAccount class and its interface are shown in Figure 5 and 6 respectively.

The account functionality is the same: put money, get money and ask for the balance. We can think about reusing this functionality and adding only the new distribution property. However, as shown in Figure 5, it's not possible to reuse this functionality and it has to be implemented again when introducing the distribution aspect. Moreover, the account implementation cannot be benefited by the use of inheritance because it's not possible to express multiple inheritance in Java, and BankAccount must inherit from UnicastRemoteObject. The same holds for the client class: before using the account service, a remote reference must be generated, so the client functionality must be redefined.

### 2.2 Using other protocols

The problem is more evident if we want BankAccount to be accessed by clients that do not understand RMI protocol but they can communicate under other protocols such as CORBA. In this case we can change the BankAccount implementation so that it can be published under CORBA. But, in this situation, it's not possible to be accessed by clients of both types at the same time. As a solution [2] we can think about coding two proxies for the account, one implemented in CORBA and the other one in RMI. These objects capture messages and redirect them to the functional object (Figure 7).

```

import java.util.*;
import java.lang.*;
import java.rmi.*;
import java.rmi.server.*;

public class BankAccountImpl extends
UnicastRemoteObject implements BankAccountIF {
    private int balance;
    private String serviceName;
    public BankAccountImpl (int IniAmount, String s)
    throws RemoteException {
        super();
        balance= IniAmount;
        serviceName = s;
    }
    public void deposit (int amount)
    throws java.rmi.RemoteException;
    { balance += amount.intValue(); }
    public void withdraw (int amount)
    throws java.rmi.RemoteException;
    { balance -= amount.intValue(); }
    public int getBalance ()
    throws java.rmi.RemoteException;
    { return balance; }
    static public void main (String args[]) {
        System.setSecurityManager (new
            RMISecurityManager());
        try {
            BankAccountImpl o = new BankAccountImpl
                (0,"BankAccountService");
            Naming.rebind
                ("//norb.unex.es/BankAccountService",o);
            System.out.println
                ("BankAccountService registered");
        } catch (Exception e) {
            System.out.println (e.printStackTrace());
        }
    }
}

```

Figure 5. BankAccount class using RMI

```

public interface BankAccountIF extends
java.rmi.Remote{
    public void deposit (int amount)
    throws java.rmi.RemoteException;
    public void withdraw (int amount)
    throws java.rmi.RemoteException;
    public int getBalance ()
    throws java.rmi.RemoteException;
}

```

Figure 6. BankAccount interface

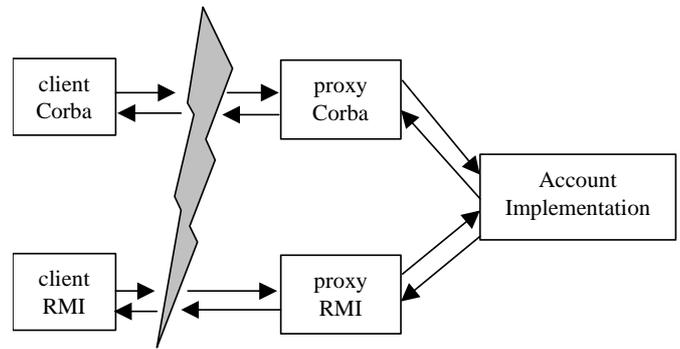


Figure 7. CORBA and RMI proxies for the account

This solution could be acceptable since the functionality is encapsulated in one class, and the distribution aspect is specified in two different classes. However, the problem appears at the client side: what happens if a client has to communicate with different accounts using different protocols? The client functionality cannot be reused, and we have to create as many client classes as distribution protocols we use to communicate with the accounts. Each client class has the same functionality, only the distribution code changes (its connection with the account). To solve this problem, we can adopt the same solution proposed for the `BankAccount` class, that is, create two proxies (RMI and CORBA) in such a way that client class only implements the basic functionality, and, when a service is demanded from the account, it will be done through the appropriate proxy depending on the chosen protocol.

However, this solution has two important problems from the adaptability point of view:

- *It's not generic.* Proxies are only useful for `Client` or `BankAccount` classes. Other different classes cannot take advantage of these proxies although they want to communicate with the same protocols.
- It does not allow an effective *static adaptability*, in the sense that new independent properties such as synchronization, internal state, multiple views, access control, coordination, etc, cannot be added without redefining classes. This also implies that runtime addition cannot be done, that is, it does not provide *dynamic adaptability*.

Our interest is focused on developing a solution allowing the distribution of objects in a transparent, dynamic and generic way, so the programmer has not to recode the distribution aspect for each distributed class. This solution must not interfere with the addition of new non-functional object properties such as synchronization, coordination, access control, etc.

## 2.3 Studied solutions: AspectJ and Design Patterns

AspectJ [4] is a promising proposal for obtaining a high degree of adaptability. Its based on separating the different aspects of a system in different components. These aspects are implemented in different languages more appropriate

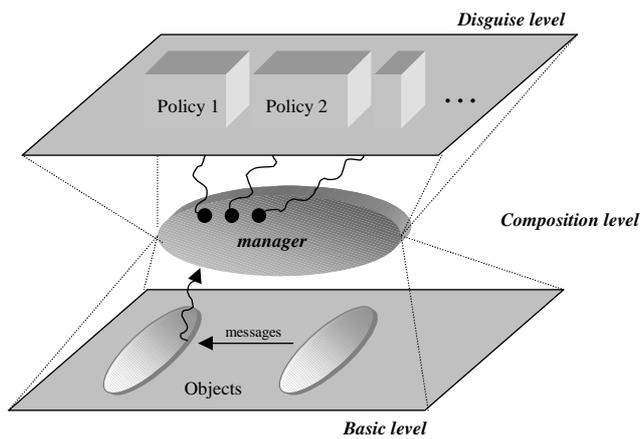


Figure 8. Basic structure of the Disguises Model

for the specification of these aspects than traditional languages such as Java, Ada or C++. However, with the current implementation, once the different components are integrated, the resulting piece of code is too rigid to be adapted at run time, that is, the dynamic adaptability goal is not achieved.

Other possible solution to be considered is Design Patterns [3]. Design Patterns are one of the most important concepts in software engineering; they are very useful when we exactly know the problem to be modeled and the changes that can appear in the future. However, when initial requirements change during the object's life, and new properties that were not considered before appear, the design can lead to a big explosion in the number of classes or a continuous extension of classes and redefinition of methods. New requirements at compile time can complicate enormously the class hierarchy. New requirements at run time can be impossible to achieve if they weren't considered at design phase.

What Design Patterns really do is going around the problem. They can separate aspects but later on they use inheritance as composition mechanism which is too inflexible to cope with the evolution of systems [1]. The solution must be transforming the circumventing of Design Patterns in features of the languages. It's necessary an adequate mechanism for specifying separately different aspects of the final object behaviour, and a mechanism able to compose these aspects so they can evolve independently at compile and run time. This mechanism is the feature to look for and it is what we propose with the Disguises Model.

### 3. The Solution: Disguises Model

The solution we propose is based on the Disguises Model [7]. The model was firstly created to provide a clear and consistence separation of the synchronization and concurrency control aspects from the basic object behaviour. However, its design allows us to consider other object properties such as distribution.

```
disguise RemoteDisguise (String policy, String service,
                          String node){
    preactions:
    nocontinue allMethods: distribute
    //All the methods are redirected
};
```

Figure 9. Generic disguise for accessing a remote object

```
String[] params = {"norba.unex.es",
                  "BankAccountService", "rmi"};
account1.addDisguise (RemoteDisguise, params)
```

Figure 10. Addition of a remote disguise using the composition syntax

The model (Figure 8) uses computational reflection techniques [5]; when a message arrives to an object, it is redirected to an object manager, located at a meta-level, which is in charge of applying the corresponding synchronization policies. Synchronization policies are implemented in a specific language in separated components (disguises) that can be applied to objects with different behaviour, different interface, but the same synchronization rules. The composition between an object and its disguises is done by a composition language which allows adding, deleting and replacing synchronization policies at compile time as well as run time.

Our objective in this paper with this example is to demonstrate how, applying this model, the distribution aspect can be separated from the functional code of the object. The benefit from this is that the process of converting an object into a distributed one under any protocol, even at run time, is transparent for client and server objects. The distribution aspect will be encapsulated in disguises.

#### 3.1 The client side

As a first approach to the solution a new disguise is created allowing transparent client access to a remote object using RMI (Figure 9). The disguise will be applied (Figure 11) to an instance of `BankAccount` (`account1`) which is local for the client. This allows to get remote access to another instance of `BankAccount` (`account2`) registered as `BankAccountService`. To do this the following parameters have to be specified: node where the remote object is located, name of the remote service and distribution protocol to be used. The addition of a disguise to `account1` can be made at compile time using the composition language (Figure 10), or at run time using a graphical interface that can interact with the objects developed by the model. Each message arriving at the disguised object (`account1`) will be captured by the disguise and sent to the remote object. In this way the disguise becomes a proxy that will not execute any computation. The disguise doesn't refer to the class being

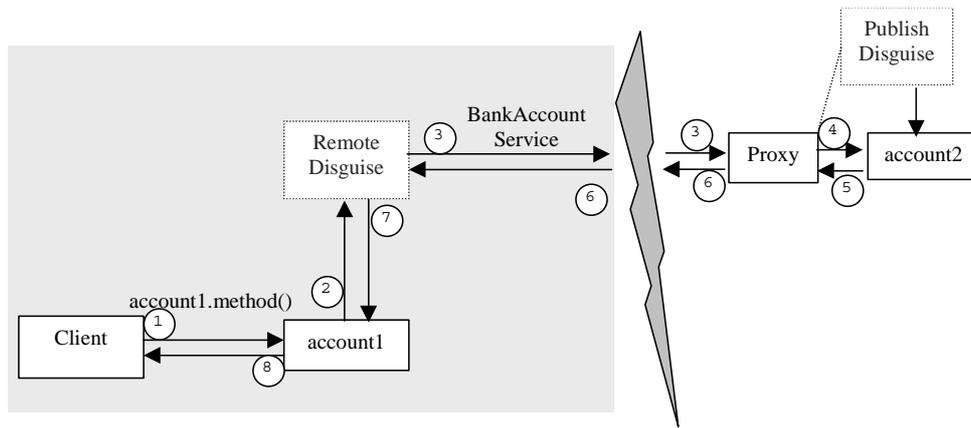


Figure 11 Application of disguises for the BankAccount example

```
disguise PublishDisguise (String policy, String service,
                          String node){ }
```

Figure 12. Generic disguise for publishing an object

disguised, so obtaining a generic solution that can be applied to any other class.

A special package of classes named `GeneralRemote` is used to process the disguise appearing in Figure 9. This package, which will be explained later, contains several classes to work with distribution protocols, currently RMI and several implementations of CORBA. In this case, it is needed to use `nocontinue` and `distribute` keywords to obtain the following functionality: automatically *generating an interface* from a class and *generating a remote reference* to a remote object knowing its name service. Then, for each method invocation arriving at the local server, a *remote method call* is done to the previous generated reference. Obviously, this process is transparent for `Client` and `BankAccount` classes.

Graphically, what it is obtained is the situation depicted in Figure 11 where the client side is shown in the shadowed area. `RemoteDisguise` redirects all messages to the server object, which is the reference generated in the disguise using the parameters specified at the composition phase (Figure 10).

### 3.2 Server side

Once the client side has been solved, again a disguise can be used for publishing the server object under the chosen protocol. Again, the process is transparent for the remote object. Figure 12 shows a disguise that publishes the `BankAccount` object under the chosen distribution protocol. In this case, we use the `publication` method from `GeneralRemote` class which follows the necessary steps to create an object published under the specified protocol passed as a parameter. This object has the same interface as the disguised object. The object that is accessed

```
String[] params = {"BankAccountService",
                  "BankAccount", "rmi"};
account2.addDisguise (PublishDisguise, params)
```

Figure 13. Adding the Publish disguise using the composition language

remotely is not the computational object, but a proxy created only to be accessed remotely. The composition of the `Publish` disguise is shown in Figure 13 and a general view of the final solution is shown in Figure 11.

### 3.3 GeneralRemote Package

The `GeneralRemote` package is a special one created for containing all the classes related to object transparent distribution. Its main class has the same name, `GeneralRemote`, and its in charge of implementing the abstract steps that are common to the main distribution policies. Its a more or less complex class that makes use of Java reflective facilities. Its interface is shown in Figure 14 where the methods closely related to the distribution policy are abstract, two for each side. These methods are implemented in child classes that store the features of a specific distribution policy. Currently, a RMI child class and several CORBA child classes have been developed. In the future the number of child classes must grow in order to cope with other distribution issues. For implementing this example and other examples about replication [7], this interface is enough.

### 3.4 VisualDisguise: tool for the Disguises Model

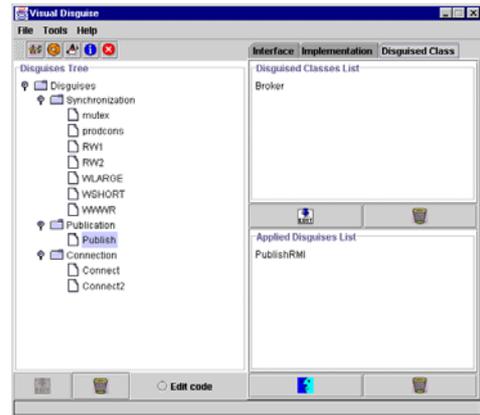
In order to simplify the composition process, a visual tool (`VisualDisguise`) has been developed. In Figure 15 a library of available disguises is provided. On the right of the same figure you have the different classes of a given application and, for each class, its attached disguises. Figure 16 shows a window to do the binding between parameters and/or method signatures and Figure 17 shows a registry of objects running on the system with the disguises they currently have got. This visual tool is currently being used in a prototype of a control system with soft real time constraints.

```

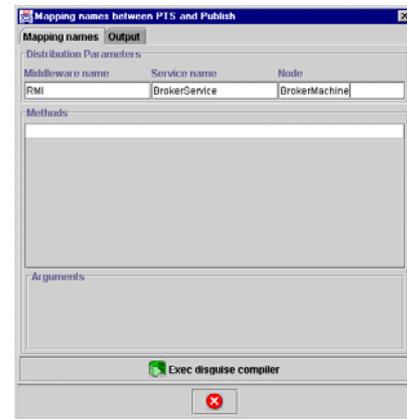
public class GeneralRemote {
    public GeneralRemote () { // constructor }
    protected void buildDistributionInterface();
    /* Generates the ClassName interface, naming it as
        ClassName+IF */
    /* Client side */
    abstract protected void buildProxyStubClass(
        String service) throws Exception;
    /* Create the proxy stub class code */
    abstract protected void makeStub() throws Exception;
    /* Create the distribution layer related to the distribution
        policy */
    final protected Object proxyStubInstance()
        throws Exception;
    /* Get an instance of the proxy stub class */
    final public Object connection(String node,
        String serviceName, Object localObject);
    /* Creates a remote reference to an Object according
        with parameters */

    /* Server side */
    abstract protected void buildProxyClass(String node,
        String service);
    /* Create the proxy class code */
    abstract protected void makeSkeleton()
        throws Exception;
    /* Create the distribution layer related to the distribution
        policy */
    final protected void publishProxy(Object localObject)
        throws ClassNotFoundException,
        IllegalAccessException, InstantiationException,
        NoSuchMethodException,
        InvocationTargetException;
    /* Publish the Proxy class under the required
        distribution policy */
    final public void publication (String node,
        String serviceName, Object localObject);
    /* Generates and publishes a Proxy class with the same
        interface than the disguised object */
    
```

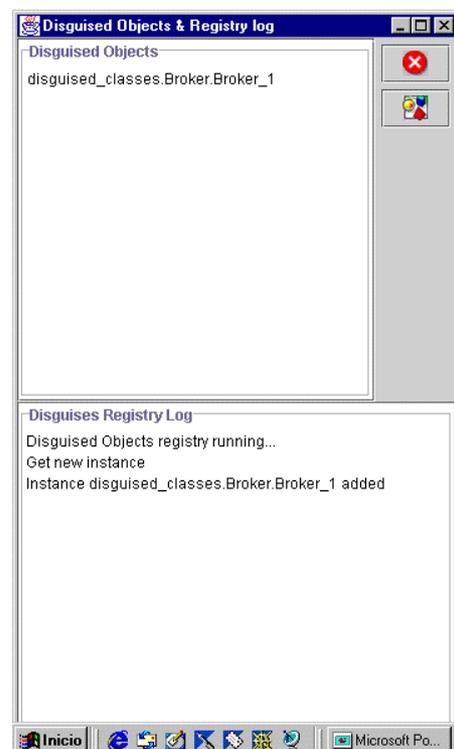
**Figure 14 GeneralRemote interface**



**Figure 15 Classes and disguises**



**Figure 16 Binding process**



**Figure 17 Objects and disguises**

#### 4. Conclusions and Future Work

It has been shown how can be obtained a transparent, dynamic and protocol independent object distribution through a consistent and clear separation of the distribution aspect applying the Disguises Model. Although this model was firstly developed to cope with the synchronization and concurrency control aspects, its behaviour with the distribution aspect is promising. The model applies reflective techniques. The provided solution doesn't interfere with the addition/deletion/modification of new object properties such as synchronization, coordination, access control, multiple views, internal state, etc. The proposal here presented has been verified using the Disguises Model with RMI and three different implementations of CORBA (commercial and not commercial). The computational cost associated with the addition of new proxies is insignificant because they only add local calls.

Although the language being considered is Java, at the time of writing this paper an Ada version is being developed.

Future works include applying the same ideas of aspect separation to the design phase using UML. The first prototype has been developed considering the synchronization and concurrency control aspects. Distribution aspect is the next step. From the same UML design it will be possible to generate Ada applications as well as Java applications with separated disguises for different aspects.

#### Acknowledgements

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# The Major Issues for MOD Software Procurement over the Next Five Years<sup>\*</sup>

*Dr. David Thombs*

*Specialist Procurement Services / Cost Forecasting, Defence Procurement Agency, Abbey Wood #187, Bristol BS34 8JH, UK; Tel: +44-(0)1179-132754; Fax +44-(0)1179-132922; Email: sps-cf14@dpa.mod.uk*

## Summary

*Military systems have utilised bespoke software for many years and, until recently defence software was regarded as being at the leading edge with defence recognised as a prime driver in software development. The situation has changed and at the start of the 21<sup>st</sup> century, defence is a niche player in the software marketplace. In addition, difficulties with software metrics and risk assessment and a massively increasing demand for software, have resulted in a number of problems. The key problems which the MOD must attack over the next five years are:*

- *How to effectively exploit Software of Unknown Pedigree (SOUP) components in Defence Systems, in particular in Safety Critical Systems.*
- *How to implement an effective quantitative standardised software metrics programme in Defence Projects*
- *How to minimise the effects of the IT skills shortage.*

*The issues are non trivial, but it is seen as vital that the MOD should take a proactive role with its contractors in tackling these problems. Some pointers are given to potential ways forward on each of the issues.\**

## Introduction

Specialist Procurement Services are part of the UK Defence Procurement Agency and provide services to DPA and Defence Logistics Organisation (DLO) Integrated Project Teams (IPTs), covering:

- Cost Forecasting (CF)
- Pricing
- Quality Assurance
- Asset Accounting

SPS/CF provides Whole Life Costs allowing the MOD to choose between a series of options to fill a capability gap

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and to permit budgets to be set. SPS/CF also carries out Cost Forecasting research and development. SPS/CF14 provides cost forecasting for software used in defence systems and costs forecasts for Command and Control Systems.

It is widely recognised within SPS and the wider community that software cost forecasting is the most difficult of forecasting activities but is essential within the context of the MOD SMART Acquisition Initiative. SMART Acquisition requires IPTs, to provide accurate and precise cost, schedule and performance forecasts. Progress against these forecasts are used to judge the performance of the IPTs. It is therefore obvious that DPA and DLO IPTs are now clearly focussed on these three variables and are keen to ensure that all risks and uncertainty are taken into account when preparing estimates. Software is a major risk to an increasing number of projects and the situation is getting worse as more functionality is implemented in software.

As Head of CF14, I see a number of major software issues facing the MOD over the coming years which affect both the cost forecasting and the MOD at large. This paper discusses three major problems which will have serious effects over the next five years.

## Background

It is not necessary to re-iterate the litany of software intensive projects in both the public and private sector which, over that last half decade have failed to deliver, in terms of cost, schedule or performance, or in many cases have failed on all three parameters. Gurus by the van load have examined the problems and promoted a variety of solutions but, in spite of the prodigious amount of intellectual effort expended, the spectres of cost and schedule overruns and shortfalls in performance are still a reality.

The problems we have encountered over the years will not be solved overnight and because the size of the problem is growing, the potential for even more disasters is greater. Massive growth can be seen in the COTS software market, revenues amounted to \$121 billion in 2000 and forecast growth is 27% per year over the next three years [1]. In the bespoke software market the data is even more dramatic. It is estimated that 180 billion lines of COBOL are in current use and this accounts for 80% of the installed software

|                   | High end computing, infrastructure and applications | High end computing R&D | HCI and Information Management | Large scale networking | Software design and productivity | High confidence software and systems | Social economic and workforce | Total  |
|-------------------|---|------------------------|--------------------------------|------------------------|----------------------------------|--------------------------------------|-------------------------------|--------|
| FY2000 allocation | 528.9   | 208.6                  | 230.0                          | 299.8                  | 98.7                             | 92.0                                 | 85.0                          | 1543.0 |
| FY2001 bids       | 761.6   | 291.4                  | 334.7                          | 368.8                  | 160.5                            | 98.3                                 | 120.9                         | 2136.2 |

**Table 1: US Federal IT R&D Programmes \$m**

base. This represents an investment of around \$10 trillion<sup>9</sup> in development costs alone and of course many times this figure in support costs. It is estimated that the current world wide annual IT marketplace is \$1335 billion [2].

The United States President's Information Technology Advisory Committee (PITAC) report of Feb 1999 [3], raised a number of major concerns regarding the US IT Industry which resulted in the National Science and Technology Council releasing, *Information Technology, The 21<sup>st</sup> Century Revolution* [4], a supplement to the Presidents FY2001 budget. The following quote from the Executive Summary sums up the size of the problem:

*“ ..... During the past decade, more than 40 percent of U.S. investments in new equipment have been in computing devices and information appliances, and since 1995 more than a third of all U.S. economic growth has resulted from IT enterprises. Today, more than 13 million Americans hold IT-related jobs, which are being added at six times the rate of overall job growth. More than 800,000 jobs were created by IT companies in the past year alone. ....But obstacles to continued progress remain. Federal support for the kinds of far-reaching technologies that brought us the Internet is still not keeping pace with rapid developments in IT .....the Federal government must significantly increase its investments in those revolutionary technologies that will propel U.S. leadership in the 21st century.”*

In other words the wage bill alone for IT in the USA is around \$1 trillion / year.

The PITAC report noted problems in the following areas:

- ⇒ High end computing, infrastructure and applications.
- ⇒ High end computing R&D.
- ⇒ HCI and Information Management.
- ⇒ Large scale networking.

<sup>9</sup> It is quite difficult to get these numbers into context, but the following figures are useful for comparison:

|                            |                |
|----------------------------|----------------|
| Total UK export in 1998    | \$271 billion  |
| Total USA exports 1998     | \$663 billion  |
| UK GDP 1999                | \$1290 billion |
| USA GDP 1999               | \$9225 billion |
| Total UK retail book sales | \$4 billion    |
| UK new car sales 1998      | \$33 billion   |

- ⇒ Software design and productivity.
- ⇒ High confidence software and systems.
- ⇒ Social economic and workforce.

The following findings were made for software:

- ⇒ Demand for software far exceeds the Nation's ability to produce it.
- ⇒ The Nation depends on fragile software.
- ⇒ Technologies to build reliable and secure software are inadequate.
- ⇒ The diversity and sophistication of software systems are growing rapidly.
- ⇒ More and more often, common activities of ordinary people are based on software.
- ⇒ The Nation is under investing in fundamental software research.

The following Major Recommendation was made:

- ⇒ Make fundamental software research an absolute priority

The following Recommendations were made:

- ⇒ Fund more fundamental research in software development methods and component technologies.
- ⇒ Support fundamental research in human-computer interfaces and interaction.
- ⇒ Fund more fundamental research in information management techniques to (1) capture, organize, process, analyze and explain information and (2) make information available for its myriad uses.
- ⇒ Make software research a substantive component of every major information technology research initiative.
- ⇒ Increase current funding for software research over fiscal years 2000-2004.

The report also addressed problems in the IT Workforce and notes the following research issues:

- ⇒ Environment and Culture—how the environment, culture, and other social contexts (such as households, neighborhoods, and communities) influence the attractiveness of IT, and how interest in and use of IT shapes the developmental environment, with particular emphasis on understanding the issues of different age groups
- ⇒ IT Educational Continuum—how the educational environment influences students' progress from grade school to workforce entry, and why students with the potential to succeed in IT disciplines take educational

paths that make it difficult for them to enter the IT workforce

⇒ IT Workplace—why women and minorities with the potential to succeed in the IT workforce take alternative career paths, what barriers and obstacles they must overcome in an IT career path, and how the IT workplace can foster increased retention and advancement of these groups ITW will emphasize multidisciplinary collaboration among researchers in IT, the social sciences, and education.

The funding was increased, resulting in the following allocations for FY2000 and bids for FY2001 as shown in Table 1. The table makes interesting reading and I will come back to the issues raised later.

Last year the USA General Accounting Office reported on DOD software development and acquisition [5]. GAO directed DoD to:

*“provide this report by language in the Committee's report to accompany the National Defense Authorization Act for fiscal year 2000, Senate Report 106-50. The requirement was established because the Committee was concerned that DOD had not taken sufficient actions to address costly and long-standing software development and acquisition problems, which have been documented in many GAO, Inspector General, and department studies. Senate Report 106-50 also required GAO to review and comment on Defense's response”*

The following extracts are of particular interest:

“Defense efforts to identify and adopt best practices in software development

*“..... Defense noted that in the future it may increase emphasis on this area by promoting the use of commercial software or other proven software and by establishing a clearinghouse to store existing and proven software components for reuse. Each of these potential initiatives would facilitate the identification and adoption of best practices.*

*Although defense's response addresses its policy to adopt best practices, implementation of this policy has yet to be formalized. For example, Defense has not provided guidance to software program managers on how to identify or adopt such practices. Also, even though some Defense units have information available on best practices, managers' use of data from such sources is not mandatory. In particular, although the Software Program Manager's Network has developed a 16-point plan of critical software practices, Defense has no formal program implementing the plan. Instead, Defense encourages program managers to take advantage of the network's support.”*

“How risk management is used in a project or program's software development process

*“..... However, the portion of the response dealing with the risk management process is not accurate.*

*Specifically, it reflects the use of risk management in the systems engineering and system design processes but not in software development. This is problematic because experience has shown that the software component of major acquisitions (versus hardware or firmware) is the source of most system risk, and the component most frequently associated with late deliveries, cost increases, and performance shortfalls. Private industry and government organizations have widely recognized this risk by endorsing and accepting the models and methods that define and determine an organization's software process maturity developed by Carnegie Mellon University's Software Engineering Institute (SEI).”*

“The metrics required to serve as an early warning of evolving problems, measure the quality of the software product, and measure the effectiveness of the software development or acquisition process

*“.....Defense officials told us these efforts will be used to develop a core set of software metrics to assist in the measurement and tracking of software process improvements. They also plan to implement automated metrics collections and the use of software analysis tools, depending on future funding and acceptance by Defense components.”*

“How Defense ensures that duplication of ongoing software development efforts are minimized; how commercial software and previously developed software solutions are used to the maximum extent practicable

*“....Defense's response partially addresses the issue. Defense discusses two clearinghouse and analysis centers for software that are available to DOD program managers: the Data and Analysis Center for Software and the Defense Technical Information Center. However, there is no mention of any Defense policy or guidance relating to the use of these centers to reduce duplicative software development or that Defense even promotes their use.*

*.....Defense noted in its opening remarks that it may establish a clearinghouse to store existing and proven software components that are ready for reuse. Should Defense establish this clearinghouse, Defense managers would have such a source.*

*.....In addition, part of Defense's response is either inaccurate or outdated. It discusses two Defense entities that we were informed are no longer in operation--the Software Reuse Initiative Program Management Office and the Army Software Reuse Center.”*

“The portion of defense software expenditures used for rework

*“....Defense states that it does not know the amount of money that it spends on software maintenance*

|                      | 1998      | 1999      | 2000       | 2001       | 2002       | 2003       |
|----------------------|-----------|-----------|------------|------------|------------|------------|
| United Kingdom       |           |           |            |            |            |            |
| Demand               | 1,670,652 | 1,761,153 | 1,905,740  | 2,046,954  | 2,212,059  | 2,348,827  |
| Supply               | 1,573,948 | 1,605,942 | 1,685,272  | 1,782,263  | 1,914,637  | 2,019,254  |
| % Shortage           | 6%        | 9%        | 12%        | 13%        | 13%        | 14%        |
| Total Western Europe |           |           |            |            |            |            |
| Demand               | 8,771,581 | 9,465,229 | 10,420,587 | 11,205,233 | 12,167,193 | 13,071,337 |
| Supply               | 8,312,534 | 8,612,655 | 9,188,511  | 9,815,252  | 10,607,398 | 11,331,109 |
| % Shortage           | 5%        | 9%        | 12%        | 12%        | 13%        | 13%        |

**Table 2: Total IT Skills Shortages**

*annually nor the cost segments that make up this total, such as costs for planned enhancements and costs for problem fixes. Defense also indicates that there is no practical way to separate the amount expended for planned enhancements from that expended for product fixes.”*

**“DoD COMMENTS**

*“In providing oral comments on a draft of this letter, Defense generally agreed with our findings. We have incorporated Defense’s specific comments where appropriate.”*

In the UK SMART Acquisition reform was prompted by the following observation from the National Audit Office (NAO) and others.

*“UK defence procurement projects continue to show time and cost overruns which would significantly exceed the new performance targets agreed between MOD and Treasury. As part of MOD’s forward expenditure plan Defence equipment is becoming increasingly complex and diverse, demanding more flexible and shorter acquisition procedures (i.e. quicker introduction of new technologies). The UK’s Armed Forces are facing less predictable threats and a wider range of tasks, so new technology needs to be deployed more quickly. Defence industry is restructuring, with companies merging or allying within the UK and internationally, requiring a new MOD relationship with industry.”*

The objectives of Smart Acquisition are:

- ⇒ To deliver projects within the performance, time and cost parameters approved at the time the major investment decision is taken.
- ⇒ To replace the current MOD procurement process by one based on acquiring military capability progressively, at lower risk, and with optimisation of trade-offs between military effectiveness, time and whole life cost.
- ⇒ To cut the time for key new technologies to be introduced into the frontline, where needed to secure military advantage and industrial competitiveness.

In 2000 IDC published the report *Europe’s growing IT skills crisis* [6] and noted a number of interesting points:

*“..... Western European skills shortage will become more acute unless urgent action is taken. In order to capture the scale of the IT skills shortage, IDC has included both full-time IT related jobs as well as IT generated tasks executed on a partial job description basis. Demand for IT skills is expected to grow from approximately 9.47 million IT professionals in 1999 to 13.07 million in 2003 while supply is set to grow from 8.61 million in 1999 to 11.33 million in 2003.” (see Table 2).*

*“The widening skills shortage in Western Europe threatens to increase the costs of production due to higher salaries, deferred projects, lower productivity, an increase in outsourcing and the use of offshore resources to supplement local resources. Most importantly, skills to support electronic business environments will be key to economic success. Training schemes and partnerships between governments and IT suppliers will go some way to addressing the shortage from a supply side perspective. Additionally, many skilled European IT professionals and professionals from other countries find IT opportunities in the US more attractive than those in Europe. European governments can address this issue of retaining IT skills and attracting IT skills from abroad relatively quickly and it is imperative that it does so if Europe wishes to remain competitive in tomorrow’s global economy.”*

Many similar reports have been published in the USA, for example, The Information Technology Association of America published a report, *Bridging the Gap: Information Technology Skills for a New Millennium* [7], which examined the situation in the USA and came to the following conclusion:

*“There are more than a million good reasons to consider a career in the Information Technology (IT) industry today. That’s because employers will create a demand in this country for roughly 1.6 million IT workers this year. With demand for appropriately skilled people far exceeding supply, half of these positions--843,328--will likely go unfilled. In a total U.S. IT workforce of 10 million, that shortfall means one job in every dozen will be vacant.”*

| Order by financial size in FY 2001                  | % of total | Order by increase from FY2000 to FY2001             | % increase |
|---|------------|---|------------|
| High end computing, infrastructure and applications | 36         | Software design and productivity                    | 63         |
| Large scale networking                              | 17         | HCI and Information Management                      | 46         |
| HCI and Information Management                      | 16         | High end computing, infrastructure and applications | 44         |
| High end computing R&D                              | 14         | Social economic and workforce                       | 42         |
| Software design and productivity                    | 8          | High end computing R&D                              | 40         |
| Social economic and workforce                       | 6          | Large scale networking                              | 23         |
| High confidence software and systems                | 5          | High confidence software and systems                | 7          |

Table 3: US Federal IT R&D Programmes

| Position | Skill        |
|----------|--------------|
| 1        | Internet     |
| 2        | Java         |
| 3        | C++          |
| 4        | SQL          |
| 5        | UNIX         |
| 6        | Oracle       |
| 7        | Windows NT   |
| 8        | Visual Basic |
| 9        | HTML         |
| 10       | C            |
| 11       | TCP/IP       |
| 12       | XML          |
| 13       | Lan          |
| 14       | OO           |
| 15       | Wan          |
| 16       | Windows      |
| 17       | <b>Ada</b>   |
| 18       | Solaris      |
| 19       | Corba        |
| 20       | Wap          |

Table 4: SSP/Computer Weekly league table of jobs most in demand

Computer Weekly conduct regular surveys of jobs advertised in the publication; Table 4 shows the situation in the last quarter of 2000. (It is interesting to note that in the previous quarter Ada was in 31<sup>st</sup> position and probably moved up to 17<sup>th</sup> position due to the MOD placing several large Defence contracts).

The DoD/Software Program Manager's Network's (SPMN) view of the skill shortage is:

*“There is no question that the workforce shortage will impede the DoD's ability to develop and maintain critical systems. While offshore resources remain available in the short term, the feasibility and advisability of using such resources in support of military needs is clearly an important issue of national security.”*

**Discussion**

Reference to the PITAC report and the subsequent federal funding for IT research would seem to indicate that from a USA point of view, the order of importance is shown in Table 3.

The PITAC report noted severe problems with software, in particular, demand exceeding supply, fragile, unreliable and insecure software, and under investment in research. The report also required the USA to make fundamental software research an absolute priority. However the

funding position does not reflect this situation. In terms of FY2001 funding software design and productivity represents only 8% of the total and high confidence systems and software a mere 5% and although the funding for software design has been increased by 63%, this is still only 63% of not very much. But high confidence systems come out of the equation very badly and suffer the lowest increase – a mere 7%. It is interesting to note that the next lowest increase is on large scale networking which has an increase in funding over three times larger in percentage terms. I find it incredible that, given the content of the PITAC report, high end computing, networking, HCI and data management should swallow over 80% of the total funding. Which are the key issues from the PITAC report? If we ignore the bias in the funding, I maintain that the key issues are:

- ⇒ Software design and productivity
- ⇒ High integrity software
- ⇒ Social and workforce issues

The GAO report on DoD software problems raises many difficult issues and picking out the important ones is not easy, however my set of major problems are:

- ⇒ COTS software and re-use
- ⇒ Risk management
- ⇒ Metrics

The Smart Acquisition system emphasises the following:

- ⇒ Metrics
- ⇒ Risk management
- ⇒ Reduced development timescales

Workforce studies, both in the USA and Western Europe point to a massive shortfall in IT skills in the immediate future. The problem will not be solved with the plans in place at the moment. It therefore follows that skills shortages are still a major issue.

In the early days of computing, military applications, both in the USA and the UK, were at the leading edge of technology. However, despite a current yearly software spend by the DoD of \$20 billion per year and a MOD spend of around \$1.5 billion, the picture has changed. It is now estimated that military software accounts for less the 1.5% of the market worldwide and this figure is likely to reduce to less than 0.5% within the next ten years years. In the current climate and in the immediate future, military software developers are niche players in the

international software market. It is therefore not surprising that both the MOD and the DoD have required military projects to utilise COTS software where ever possible. The problem is of course much wider than the use of COTS components, which have been used in military systems for many years, but as indicated in the GAO report, we should be covering the whole alphabet of OTS (COTS, GOTS, MOTS etc) and re-use of legacy components. Software re-use has been recognised as a good thing for many years and if software design really is an engineering discipline, then component based software engineering must be the way to go in the future. However, the problems are far from trivial and, for example the use of Software of Unknown Pedigree (SOUP) in safety critical systems is currently attracting a good deal of attention in the UK and is the subject of many conferences and papers. SPS/CF is currently completing a 12 month study in this field with the following objectives:

- ⇒ To provide MOD project managers with a set of guidelines for the use of SOUP in Safety Critical systems.
- ⇒ To define a cost model to allow the prediction of Whole Life Costs for these systems.

The conclusions of the research are not surprising (e.g. it is not possible to use 'black box' software components to build SIL 3 and 4 software enforcing functions). The implications for defence are very serious. It is certainly possible to build safety critical systems using SOUP components but our ability to validate these systems lags far behind. Without standards to define the evidence to be supplied with the software components including, verifiable process, product and usage data, it is difficult to see how we can move forward. The data supplied with a component must be identical to that which would be expected for an in-house designed and supported item. Similar problems existed in the semiconductor market, but some of the problems have been alleviated by the adoption of the ARM AMBA specification for component design. This facilitates design re-use by specifying the documentation to be produced, covering the design, simulation models, test sets and performance data. (Concerns exist for the use of SOUP in Mission Critical Systems and Business Systems but the problems are less acute and can often be solved by other means.) Hence problem number 1 is:

***How to effectively exploit SOUP components in Defence Systems, in particular, in Safety Critical Systems.***

Interesting Issues:

- ⇒ Standards
- ⇒ Schemes in other industry sectors
- ⇒ Intellectual property
- ⇒ Legislation
- ⇒ Who takes the lead
- ⇒ Open source software

One of the common themes of the reports cited, concern the areas of metrics and risk management. Many software metrics have been defined over the years, often with little

recognition of measurement theory [8] and of course have proved to be almost worthless in practise. A microcosm of the problems encountered with software metrics are visible in the SOUP issues discussed above. The lack of basic data about SOUP components results in V&V problems, costing problems and support problems. Both the DoD and MOD have tried to implement Department wide software metrics systems without success and both departments have ad-hoc project specific systems collecting inconsistent, badly defined data. It is a fact of life that software represents a major risk to many defence projects but without software metrics which obey basic measurement theory, it is very difficult to see how these risks can be managed. The characteristics of quantitative measurement have been known for many years, the principles are well known and are the basis of all engineering. The following minimum set of characteristics apply to all measurement:

- ⇒ Measurements are quantitative, not qualitative, they are expressed in terms of numerical values and units. For example expressing programmer experience on a scale of 1-5 in a cost model is not a quantitative measurement.
- ⇒ Measurement Devices are critical. It is not possible to measure the length of a flea with a foot rule or the weight a car on a kitchen scale. The measuring device used must be capable of the appropriate resolution and have the range needed. Where are the measurement devices for software?
- ⇒ Calibration and Standards. Measurement devices must be calibrated and have a known measuring error when the measurement is made. Calibration is related to the science behind any measurement device. Where is the science behind software metrics?
- ⇒ Reproducibility. Quantitative measurements are reproducible.

Lord Kelvin's statements made about measurement at the end of the 19<sup>th</sup> century are as true today as they were then.

*"To measure is to know."*

*"If you can not measure it, you can not improve it."*

*"In physical science the first essential step in the direction of learning any subject is to find principles of numerical reckoning and practicable methods for measuring some quality connected with it. I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the state of Science, whatever the matter may be."*

Mind you, he also stated that:

*"I can state flatly that heavier than air flying machines are impossible."*

SPS/CF is currently conducting a scoping study to define a minimum set of standard quantitative software metrics which could be collected by MOD Projects and which would allow:

- Effective management of risk in software intensive projects.
- Facilitate more accurate cost forecasting.

Hence problem number 2 is:

***How to implement an effective quantitative standardised software metrics programme in Defence Projects.***

Interesting Issues:

- ⇒ Standards
- ⇒ DoD initiatives
- ⇒ Partnering versus confrontation.
- ⇒ Education

It is clear from most data sources that IT will be facing a major skills shortage in the coming years. It is most unlikely that the effects of this shortage will be evenly spread and some sectors will be more badly hit than others. Reference to the Computer Weekly job survey shows the skills in demand are not those which traditionally have been used for the development and support of military software. The SPMN's view is that serious problems will emerge, even for the maintenance of critical systems. In addition it must be accepted that developing military software is no longer sexy and the jobs which pay most, attract the best brains, and are perceived as the future, are in e-commerce, games and the web. Resolution of these issues is not easy but must be tackled. Howard Rubin [9] maintained that companies could act to minimise the effects by performing the following:

- ⇒ Develop and nurture new sources of labour through university alliances, creation of cross discipline training/retraining programs, and global labour sourcing.
- ⇒ Reformulate internal compensation and reward programs to keep high-value staff, attract new staff at rates which make economic sense, and binding employees to the company; reward needed skills and behaviours and use core staff to attract new staff.
- ⇒ Manage the skill inventory as an active portfolio; use forecasting and projections; and invest in redevelopment and retraining.

⇒ Focus on increasing the leverage of the existing staff; higher productivity and quality through reuse; capturing and disseminating knowledge; reducing rework.

⇒ Leverage external knowledge in the form of packages, systems outsourcing and business process outsourcing

The MOD in conjunction with its contractors could consider at least some of these activities. Hence problem number 3 is:

***How to minimise the effects of the IT skills shortage.***

Interesting Issues:

- ⇒ Co-operation between MOD and its contractors to address the issues
- ⇒ The future of Ada

## Conclusions

I have identified the three issues, which in my opinion will have a major effect on MOD software acquisition over the next five years. All three are important and in many ways interact with each other and can not be solved by letting market forces decide. As a matter of urgency, the MOD must take a proactive role in addressing these issues and plan for the future. Once again in the software field, we don't have a silver bullet.

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# Ada-Europe Associate Members (National Ada Organisations)

## Ada-Belgium

attn. Dirk Craeynest  
c/o Offis nv/sa  
Weiveldlaan 41/B32  
B-1930 Zaventem  
Belgium

Phone: +32-2-725-40-25  
Fax: +32-2-725-40-12  
Email: Dirk.Craeynest@offis.be  
URL: [www.cs.kuleuven.ac.be/~dirk/ada-belgium](http://www.cs.kuleuven.ac.be/~dirk/ada-belgium)

## Ada-Spain

attn. Francisco Perez-Zarza  
P.O. Box 50.403  
E-28080 Madrid  
Spain

Phone: +34-1-627-8247  
Fax: +34-1-309-3685  
Email: fperez@ceselsa.es  
URL: [www.adaspain.org](http://www.adaspain.org)

## Ada in Denmark

attn. Jorgen Bundgaard  
c/o DDC-I  
Gl. Lundtoftevej 1B  
DK-2800 Lyngby  
Denmark

Phone: +45-45-871144  
Fax: +45-45-872217  
Email: [jb@ddci.dk](mailto:jb@ddci.dk)

## Ada in Sweden

Ada I Sverige  
c/o Mariadata  
Box 1085  
SE-141 22 Huddinge  
Sweden

Phone: +46-08-779-88-30  
Fax: +46-08-774-37-93  
Email: [info@ada-i-sverige.se](mailto:info@ada-i-sverige.se)  
URL: [www.ada-i-sverige.se](http://www.ada-i-sverige.se)

## Ada-Deutschland

attn. Dr. Peter Dencker  
Aonix GmbH  
Durlacher Allee 95  
D-76137 Karlsruhe  
Deutschland

Phone: +49-721-98653-22  
Fax: +49-721-98653-98  
Email: [dencker@aonix.de](mailto:dencker@aonix.de)  
URL: [ada-deutschland.de](http://ada-deutschland.de)

## Ada –Switzerland

attn. Henri Roethlisberger  
EINEV, Ecole d'Ingenieurs de l'Etat de Vaud  
CP 587  
CH-1401 Yverdon-les-Bains  
Switzerland

Phone: +41-24-423-22-63  
Fax: +41-24-425-00-50  
Email: [roethlisberger@einev.ch](mailto:roethlisberger@einev.ch)

## Ada-France

chez Fabrice Kordon  
48 rue Vergniaud  
F-75013 Paris  
France

Phone: +33-1-44 27 61 89  
Fax: +33-1-44 27 62 86  
Email: [bureau@ada.eu.org](mailto:bureau@ada.eu.org)  
URL: [www.ada-france.org](http://www.ada-france.org)

## Ada Language UK

attn. Helen Byard  
P.O. Box 322  
York YO10 3GY  
UK

Phone: +44-(0)1904-412740  
Fax: +44-(0)1904-426702  
Email: [admin@adauk.org.uk](mailto:admin@adauk.org.uk)  
URL: [www.adauk.org.uk](http://www.adauk.org.uk)

# Ada UK 2001 Sponsors

## **ACT Europe**

Contact: *Franco Gasperoni*

8, Rue de Milan, 75009, Paris, France

Tel: +33-1-49-70-67-16

Email: sales@act-europe.fr

Fax: +33-1-49-70-05-52

URL: www.act-europe.fr

## **Alenia Marconi Systems**

Contact: *Don Harvey*

Eastwood House, Glebe Rd., Chelmsford, Essex, CM1 1QW, UK

Tel: +44-(0)1276-696901

Email: info@aonix.co.uk

Fax: +44-(0)1491-571866

URL: www.aonix.co.uk

## **Aonix Europe Ltd**

Contact: *Neil Michniak*

Partridge House, Newtown Rd., Henley on Thames, Oxon, RG9 1HG, UK

Tel: +44-(0)14941-415000

Email: info@aonix.co.uk

Fax: +44-(0)14941-571866

URL: www.aonix.com

## **ARTISAN Software Tools**

Contact: *Peter Kibble*

Stamford House, Regent St., Cheltenham, Glos., GL50 1HN, UK

Tel: +44-(0)1242-229320

Email: peterk@artisansw.com

Fax: +44-(0)1242-229301

URL: www.artisansw.com

## **BAE SYSTEMS**

Contact: *Paul McCormack*

Warwick House, PO Box 87, Farnborough Aerospace Centre, Farnborough, Hants, GU14 6YU, UK

Email: Paul.McCormack@baesystems.com

URL: www.baesystems.com

## **Data Systems and Solutions**

Contact: *Dave Woodhall*

SEAS Building, Sinfin Lane, Derby, DE24 8BJ, UK

Tel: +44-(0)1332-771700

Email: info@ds-s.com

Fax: +44-(0)1332-770921

URL: www.ds-s.com

## **EDS**

Contact: *Lee Edwards*

Hartley House, 15 Bartley Wood Business Park, Bartley Way, Hook, Hants., RG27 9XA, UK

Tel: +44-(0)1256-741122

Email: swep.sales@eds.com

Fax: +44-(0)1256-741132

## **First Matrix Ltd**

Contact: *Alan Barker*

Old Lion Court, High St., Marlborough, Wilts., SN8 1HQ., UK

Tel: +44-(0)1672-515510

Email: arb@ftmx.com

Fax: +44-(0)1672-515514

## **Green Hills Software Ltd**

Contact: *Jon Williams*

Chancery Court, Lincoln Rd., High Wycombe, Bucks., HP12 3RE., UK

Tel: +44-(0)1494-429336

Email: sales-uk@ghs.com

Fax: +44-(0)1494-429339

URL: www.ghs.com

## **IPL Information Processing Ltd**

Contact: *Ian Gilchrist*

Eveleigh House, Grove St., Bath, BA1 5R., UK

Tel: +44-(0)1225-475114

Email: ipl@iplbath.com

Fax: +44-(0)1225-444400

URL: www.iplbath.com

## **LDRA Ltd**

Contact: *Jim Kelly*

24 Newtown Rd., Newbury, Berks., RG14 7BN, UK

Tel: +44-(0)635-528828

Email: sales@ldra.com

Fax: +44-(0)635-528657

URL: www.ldra.com

## **Objektum**

Contact: *Derek Russell or Ahmed Amin*

Units 2/3 Cranleigh Works, The Common, Cranleigh, GU6 8SB, UK

Tel: +44-(0)1483-278178

Email: info@objektum.com

Fax: +44-(0)1483-275384

URL: www.objektum.com

## **Praxis Critical Systems Ltd**

Contact: *Peter Amey*

20 Manvers St., Bath, BA1 1PX, UK

Tel: +44-(0)1225-469991

Email: sparkinfo@praxis-cs.co.uk

Fax: +44-(0)1225-466006

URL: www.praxis-cs.co.uk

## **Rational Software Ltd**

Contact: *Roger Bowser*

Kingswood, Kings Ride, Ascot, Berks., SL5 8AJ, UK

Tel: +44-(0)1344-295000

Email: info@rational.com

Fax: +44-(0)1344-295001

URL: www.rational.com

## **John Robinson & Associates**

Contact: *John Robinson*

2 Curren St., Oakenshaw, Bradford, W. Yorks., BD12 7DP, UK

Tel: +44-(0)1274-691935

Email: John@jr-and-assoc.demon.co.uk

Fax: +44-(0)8700-558750

URL: www.jr-and-assoc.demon.co.uk

## **Telelogic UK Ltd**

Contact:

Chancery House, 8 Edward St., Birmingham, B1 2RX, UK

Tel: +44-(0)121-2346600

Email: info@telelogic.com

Fax: +44-(0)121-2346611

URL: www.telelogic.com

## **TNI Europe Ltd**

Contact: *Tony Elliston*

58a Mill St., Congleton, Cheshire, CW12 1AG, UK

Tel: +44-(0)1260-291449

Email: info@tni-europe.com

Fax: +44-(0)1260-291449

URL: www.tni-europe.com

## **Wind River Systems UK Ltd**

Contact: *David Bew*

Unit 5 & 6, 1<sup>st</sup> Floor, Ashted Lock Way, Aston Science Park, Birmingham, B7 4AZ, UK

Tel: +44-(0)121-3590999

Email: inquiries-uk@windriver.com

Fax: +44-(0)121-3804444

URL: www.windriver.com