

To: Participants in JTC1/SC22 and Others  
From: Jim Moore, Convener, JTC1/SC22/WG9  
Subject: Proposed New Work on Support for High Integrity Applications  
Date: 4 October 2004

The purpose of this note is to solicit volunteers to assist in creating a proposal for new work by SC22 in the area of "Support for High Integrity Applications". If you are interested, please contact me by sending an email:  
<mailto:James.W.Moore@ieee.org>.

At its recent plenary meeting, SC22 approved the following resolution:

**Resolution 04-13: Ad Hoc on the Future Directions for SC 22**

JTC 1/SC 22 resolves that the Ad Hoc on the Future Directions for SC 22 be continued for a period of one year with Jonathan Hodgson as convener. The Ad Hoc is charged to explore the following four areas agreed upon at the Ad Hoc Meeting on the Future of SC 22 held on 6 September 2004:

- Support for High Integrity Applications
- Libraries
- Industrial Consortia
- Standards Education

SC 22 instructs the convener to organize a meeting of the Ad Hoc in March 2005 to report on and prepare recommendations for the 18th SC 22 plenary, on future work directions for SC 22. SC 22 instructs that agenda time at the March meeting is to be given only to those items for which a written contribution is submitted by 15 January 2005. Should no written contributions be submitted for this meeting, the meeting shall be canceled.

I was selected as the coordinator for "Support for High Integrity Applications". In order to prepare for the March 2005 meeting, I need to develop responses to, at least, the following questions:

1. What kind of deliverable would this area produce: Standard, Technical Report, workshop, or other?
2. What kind of structure should SC22 set up to manage any new project, a Working Group or something else.
3. Who should be approached to involve themselves in any Working Group or other structure that SC22 might set create.

The remainder of this note summarizes my own ideas for performing work on this subject. I would like to hear your ideas.

There is a growing body of evidence that when developing software for a system that must exhibit a critical property—such as safety or security—it is appropriate to use

programming languages in a more disciplined manner. We have seen examples of several approaches:

- Special languages, e.g. SPARK [Barnes]
- Language subsets, e.g. MISRA C [Hatton, MISRA]
- Language profiles or dialects, e.g. [Kwon]
- Usage guidelines, e.g. [Erkinnen]

We have also seen examples of disciplined standardization activity on this subject, e.g. ISO/IEC TR 15942, "Guide for the use of the Ada programming language in high integrity systems" [ISO15942] and MISRA C [Hatton, MISRA].

To date, though, nearly every sustained effort has considered individual languages in isolation. There has been no effort to describe the existing languages in a commensurate manner supporting comparison. There has been no effort to provide consensually-validated guidance in how to go about selecting a language suitable to a problem with given integrity requirements.

The proposal is to establish a working group with the charter to:

*Develop language-independent and cross-language guidance for the selection and use of programming languages in high integrity systems.*

The working group could consider the following projects among others:

- A guide (Standard or Technical Report) to selecting a programming language suitable to a high-integrity application
- A comparison (Technical Report) of programming language characteristics suitable to high-integrity usage
- Standards for meta-language constructions—e.g. assertions and other mechanisms for demonstrating correctness—in a manner that is uniform or comparable across programming languages
- Standards for subsets, profiles, or dialects of programming languages suitable for high integrity application
- Guides (probably Technical Reports) for usage of programming languages in a manner suitable for high integrity application

I believe that this work should be focused in a single working group in order to achieve commensurate treatment across the body of programming languages. Furthermore, separating the work from the programming language working groups will permit the consideration of non-ISO languages where appropriate, e.g. usage guidelines for Java. Nevertheless, it is clear that it would be a serious mistake to neglect the resource provided by the working groups of SC22.

Therefore, I would suggest that this working group would be staffed by experts provided by the other programming language working groups as well as by national body experts. Furthermore, the working group would seek participation by other organizations engaged in programming language definition or practices for the use of programming languages in high integrity applications.

## References:

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(Ordering info:

[http://www.amazon.com/exec/obidos/tg/detail/-/0321136160/qid=1093294642/sr=1-3/ref=sr\\_1\\_3/103-2049930-1905419?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0321136160/qid=1093294642/sr=1-3/ref=sr_1_3/103-2049930-1905419?v=glance&s=books) )

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[Erkinnen] Tom Erkkinen, "Developing High-Integrity Software in C and Ada" SAE Technical Paper Series 1999-01-0265

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[Hatton] Les Hatton, "Safer Language Subsets: an overview and a case history, MISRA C," Information and Science Technology, 46 (2004), p. 465-472.

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[ISO15942] ISO/IEC TR 15942:2000, "Information technology -- Programming languages -- Guide for the use of the Ada programming language in high integrity systems"

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[Kwon] Jagun Kwon, Andy Wellings, Steve King, "Ravenscar-Java: A High Integrity Profile for Real-Time Java," Joint ACM Java Grande / ISCOPE 2002 Conference, November 2002, Seattle

(Text at: <http://doi.acm.org/10.1145/583810.583825> )

Also their presentation:

(Text at: <http://www.opengroup.org/rtforum/info/jul2002/slides/wellings.pdf> )

[Mazzanti] Franco Mazzanti, "Coding Regulations for Safety Critical Software Development," Second IEEE International Software Standards Symposium, August 1995

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<http://ieeexplore.ieee.org/iel3/3966/11453/00525958.pdf?tp=&arnumber=525958&isnumber=11453&arSt=134&ared=138&arAuthor=Mazzanti%2C+F.%3B> )

[MISRA] Motor Industry Software Reliability Association (MISRA), "Guidelines for the Use of the C Language in Vehicle Based Software", ISBN 0 9524156 9 0, April 1998.

(Ordering information: <http://www.misra.org.uk/> )