

Minutes of the COST 247 WG1 Meeting
on Data Type Issues in Extended LOTOS
Warsaw (Poland), 12th-13th of June 1995

*For consideration by ISO experts during the ISO/IEC SC21 meeting
Ottawa (Canada), 20th-26th of July 1995*

Monday the 12th of June, 1995

1 Attendance list

Hubert Garavel (INRIA Rhône-Alpes, France)
Christian Hernalsteen (Université Libre de Bruxelles, Belgium)
Alan Jeffrey (University of Sussex, UK)
Guy Leduc (Université de Liege, Belgium)
Jose Manas (Univ. Polytechnica de Madrid, Spain)
Thierry Massart (Université Libre de Bruxelles, Belgium)
Miljenko Mikuc (University of Zagreb, Croatia)
Manuel Nunez (Universidad Complutense de Madrid, Spain)
Charles Pecheur (Université de Liege, Belgium)
Ina Schieferdecker (GMD Fokus, Germany)
Steve Schneider (University of Royal Holloway, London, UK)
Maarten Steen (University of Kent at Canterbury, UK)
Ken Turner (University of Stirling, UK)
Juan Quemada (Universidad Polytechnica de Madrid, Spain)

2 Opening

The purpose of this WG1 meeting is to contribute to the progress of E-LOTOS in order to prepare the ISO/IEC SC21 meeting in Ottawa (20-27 July 1995).

It should be understood that COST 247 WG1 does not intend to replace nor subvert the official procedures of ISO for making standards.

Although the agreement reached during this COST 247 WG1 meeting have no formal value as far as standardization is concerned, they give a clear indication of the respective opinions of COST 247

attendees, many of whom are also involved in the on-going work on E-LOTOS within ISO. Hubert Garavel volunteers to take the minutes of the meeting.

3 List of input documents

[VAR1] Alan Jeffrey, Guy Leduc, Charles Pecheur. “A discussion of data types in E-LOTOS”. Output document of ISO/IEC JTC1/SC21/WG1 ‘Enhancements to LOTOS’, Paris meeting, February 1995.

[VAR2] Charles Pecheur. Notes on E-LOTOS data types. 8 June 1995.

[VAR3] Simon Thompson. “Comments on ‘A discussion of data types in E-LOTOS’” 6 June 1995

4 Electronic communication facilities

Alan Jeffrey indicates that a mailing list has been established in order to allow specific discussions on data type issues.

One can subscribe to this mailing-list at the following address:

`e-lotos-data-request@cogs.susx.ac.uk`

The address of the mailing-list itself is:

`e-lotos-data@cogs.susx.ac.uk`

The archives of this mailing-list are on the Web:

`http://www.cogs.susx.ac.uk/cgi-bin/mbox2thml?file=e-lotos-data`

Jose Manas mentions that a general mailing on E-LOTOS aspects is also available.

One can subscribe to this mailing-list at the following address:

`elotos-request@dit.upm.es`

The address of the mailing-list itself is:

`elotos@dit.upm.es`

5 Discussion of E-LOTOS data type issues

Alan Jeffrey presents the main aspects of document [VAR1]. A discussion ensues where the issues of compatibility and two-level language (algebraic equations and functional definitions) are evoked.

Then, a list of issues to be discussed is elaborated:

A. “Impure” features

- A.1 Side-effects
- A.2 Non-termination
- A.3 Exception handling

B. Kinds

- B.1 Process as first-class values
- B.2 Gates as first-class values
- B.3 Higher-order functions

- C. Typing
 - C.1 Overloading
 - C.2 Polymorphism
 - C.3 Classes
 - C.4 Subtyping
 - C.5 Recursive types
 - C.6 Type inference
 - C.7 Basic types

- D. Structuring
 - D.1 Modules
 - D.2 Importation of external objects
 - D.3 Scopes

- E. Compatibility
 - E.1 Compatibility with ISO-LOTOS
 - E.2 Compatibility with SML
 - E.3 Integration with E-LOTOS

Tuesday the 13th of June, 1995

6 Participant list

Ed Brinksma (University of Twente, The Netherlands)
Hubert Garavel (INRIA Rhône-Alpes, France)
Kemal Inan (Middle East Technical University, Turkey)
Alan Jeffrey (University of Sussex, UK)
Guy Leduc (Université de Liege, Belgium)
Jose Manas (Univ. Polytechnica de Madrid, Spain)
Manuel Nunez (Universidad Complutense de Madrid, Spain)
Miljenko Mikuc (University of Zagreb, Croatia)
Charles Pecheur (Université de Liege, Belgium)
Ina Schieferdecker (GMD Fokus, Germany)
Steve Schneider (University of Royal Holloway, London, UK)
Maarten Steen (University of Kent at Canterbury, UK)
Ken Turner (University of Stirling, UK)
Juan Quemada (Universidad Polytechnica de Madrid, Spain)
Husnu Yenigun (TUBITAK Software R&D Center, Turkey)

7 Discussion of E-LOTOS data type issues

A preliminary discussion defines the order in which the different items in the above list of issues will be tackled. Then, items A.1 to C.2 are processed in turn.

• A.1 “Impure features” / Side-effects

There is unanimity against the introduction of side-effects in E-LOTOS. This would lead to difficult semantical problems, such as those mentioned in [VAR1].

• A.2 “Impure features” / Non-termination

Alan Jeffrey presents the input document [VAR3], which suggests that E-LOTOS could be designed so as to prevent the user from writing non-terminating functions.

However, it is unanimously agreed that non-terminating functions must be accepted in E-LOTOS, as a consequence of the possibility of defining recursive functions with eager evaluation. Forbidding non-termination would probably reduce the expressiveness of E-LOTOS and burden the specifier.

Two alternative semantics have been discussed in order to define what happens when a value-expression contained in a behaviour expression does not terminate:

- a strict semantics (called “core dump” semantics in [VAR2])
- a non-strict semantics which equates non-termination with deadlock (stop)

The choice of the appropriate semantics is left for further study.

• A.3 “Impure features” / Exception handling

As partial functions will be allowed in E-LOTOS, the introduction of an exception mechanism is considered. The following issues have been discussed: - Are exceptions really needed in practice? - How to propagate and catch exceptions from value expressions to behaviour expressions? - How to unify exceptions in the data part with interruption mechanisms in the control part?

• B.1 Kinds / Process as first-class values

There is unanimity against the idea of having process as “first-class citizen”.

• B.2 Kinds / Gates as first-class values

It appears that this issue is more or less connected to the notion of mobility. A discussion ensues. It is reminded that, during the next ISO/SC 21 meeting in Ottawa, concrete examples will have to be provided in order to justify the need for introducing mobility.

LOTOS and the pi-calculus are compared with respect to their expressiveness. Ed Brinksma and Juan Quemada point out that, due to its value passing mechanism, LOTOS allows for a certain amount of mobility. The main difference between LOTOS and the pi-calculus relies in the fact that the pi-calculus allows the creation of dynamic gates.

It was unanimously agreed that the complexity of the whole pi-calculus should be avoided. Participants are open to a more restricted form of gate as first-class values, provided that a clean and elegant semantics can be found.

• **B.3 Kinds / Higher-order functions**

It is agreed by everybody that higher-order functions are probably not necessary. Having only first-order functions combined with a genericity mechanism seems to be enough.

A discussion ensues, where induction issues are discussed. Alan Jeffrey points out that it is necessary to have some induction mechanism, in order to make proofs. Hubert Garavel adds that induction is also needed to define functions dealing with values of predefined and user-defined types.

It is unanimously agreed that one has to consider which kind of formulas should be provided in signatures for inductive proofs.

• **C.1 Types / Overloading — C.2 Types / Polymorphism**

These issues have been discussed, and several approaches have been proposed:

- Keep genericity and overloaded operations as they exist in ISO LOTOS
- Suppress overloading and introduce instead polymorphic type, as in SML
- Introduce type classes, as in Haskell

It therefore appears that the issues of overloading and polymorphism are strongly related. These questions are left for further studies.

8 Closing

Due to lack of time, the remaining items (C.3 to E.3) are left for further discussion.

Ed Brinksma suggests that concrete examples should be used, in order to avoid “fully-abstract” discussions :-)