British Computer Society
Special Interest Group
in the
Formal Aspects of Computing Science

The 1989 FACS Christmas Workshop:

Case Studies in VDM

Imperial College, Department of Computing
Wednesday December 20 1989

There are 2 'new' books on VDM scheduled to appear early in 1990. One
is the second edition of Cliff Jones' "Systematic Software Development
using VDM" the other is a collection of VDM Case Studies edited by Roger
Shaw and Cliff Jones. The second of these contains 12 case studies covering
the specification and development of systems over application areas from
Data Base systems, to Object-Oriented Languages to the Design of User
Interfaces.

This year's FACS Christmas meeting will be based on the case study book
and will include both general material and more detailed presentations
based on selected chapters. There will also be up-to-date information on
the development and standardisation of VDM.

The invited speakers are:-

am:
  Cliff Jones     - What is a specification?
  John Dawes     - BSI/VDM standardisation - status report
  Stephen Bear   - VDM modules and semantics

pm:
  Chris George   - A Store Management System
  Ann Walshe     - NDB: a binary relational database
  Mario Wolzcko  - Specifying Garbage Collection using VDM
BCS-FACS
1989 Christmas Workshop

Case Studies in VDM

Room 308, Department of Computing, Imperial College
20 December 1989

Timetable

10.00  Registration and Coffee.

10.30  John Dawes: BSI/VDM Standardisation.

11.00  Cliff Jones: What is Specification?

11.45  Chris George: A Store Management System.

12.30  Lunch.

02.00  Ann Walshe: NDB: A Binary Relational Database.

02.45  Stephen Bear: VDM Modules and Semantics.

03.30  Tea Break.

04.00  Mario Wolcacko: Specifying Garbage Collection Using VDM.

04.45  Finish.
BSI/VDM Standardisation

Status Report December 1989

• Background and History
• Objectives
• Status and Future Plans
Background

January 1986:

- Use of VDM growing
- Toolsets starting
- Dialects proliferating

Support from:

- UK Industry
- UK Universities & Government Establishments
- Europe: Denmark, W.Germany, Netherlands, France
- VDM-Europe
### History

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<tr>
<td>Feb. 1986</td>
<td>First meeting</td>
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<td>Mar. 1986</td>
<td>Application to BSI</td>
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<td>Jan. 1987</td>
<td>Proto-Standard vsn 1</td>
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<td>Sept 1987</td>
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<td>Dec. 1987</td>
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<td>Mar. 1989</td>
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Draft for Comment

- Proto-Standard and Working Papers
- Proto-Standard
- Context Conditions
- The Dynamic Semantics of the BSI/VDM Specification Language
Objectives

• To standardise the specification language (VDM-SL)

• To harmonise the major styles and usages

• To add necessary missing features

• To achieve international acceptance, eventually
Language Standard — Status

- Abstract syntax - stable
- Mathematical syntax - mostly stable
- "ASCII" syntax - agreed
- Context conditions - complete draft soon
- Dynamic semantics - complete, under review
6.6.10 Record Expressions

RecordConstructor ::  tag : TypeName
                 fields : seq of Expr

RecordModifier ::  rec : Expr
                 modifiers : map Id to Expr

11.6.10 Record Expressions

record expression = record constructor
                   | record modifier ;

record constructor = 'mk-', name, '(' , expression list, ')' ;

record modifier = 'μ', '(' , expression, ']', record modification, {' ',',', record modification } '[' )

record modification = identifier, '→', expression ;
Mathematical syntax

\( \text{mins} : \mathbb{Z}\text{-set} \to \mathbb{Z} \)

-- the minimal element of \( s \)

\( \text{pre-mins}(s) \triangleq s \neq {} \)

\( \text{post-mins}(s,i) \triangleq i \in s \land (\forall j \in s)(i \leq j) \)

"ASCII" syntax

\( \text{mins} : \text{Intg-set} \to \text{Intg} \)

-- the minimal element of \( s \)

\( \text{pre-mins}(s) \equiv s \neq {} \)

\( \text{post-mins}(s,i) \equiv i \in \text{set } s \)

and (all \( j \) in set \( s \))(\( i \leq j \))
To see if a record modifier expression is well-formed, find the set of records satisfying the expected type and see if, for one of those, the record being modified is of that type and the modifications are consistent with that type.

\[
\text{is wf RecordModifier} : \text{RecordModifier} \times \text{ExpectedType} \rightarrow \text{SpecEnv} \rightarrow \mathbb{B}
\]

\[
\text{is wf RecordModifier}(\text{mk-RecordModifier}(\text{rec}, \text{modifiers}), \text{expect ty})(\text{sp env}) = \exists \text{rec nm} \in \text{valid rec names} .
\]

\[
\text{is wf expr}(\text{rec}, \text{mk-TypeName(}\text{rec nm}))((\text{sp env}) \wedge \text{selectors of correct type(}\text{rec nm}, \text{modifiers}, \text{sp env})
\]
Language Standard — Outstanding Problems

• Modules
• Error Values
• Looseness
Harmonisation

Complete. E.g.:

• Statements and expressions
• Explicit and implicit specifications
• Concrete syntax:

\[ X^* \quad \text{seq of } X \]
\[ X \rightarrow Y \quad \text{map } X \text{ to } Y \]
Missing Features

• Modules:

  Details being worked out

• Polymorphism:

  Syntax and semantics OK
  Type inference to be worked out
International status

Ballot result awaited
Future Plans

• Publish complete consistent draft: April 1990 (for VDM'90)

• Establish ISO WG19 (if ballot successful)

• Carry on
The Professional Programmers Guide to VDM

John Dawes, ICL Defence Systems

This self-contained handy reference guide is ideal for anyone who wants to read a Vienna Development Method specification with understanding. It is also one of the first books to be published on the new VDM standard.

1990 224 pages  Paper  ISBN 0 273 03151 1  £9.95
BSI IST/5/50 —
VDM Specification Language

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