British Computer Society

Special Interest Group

in the

Formal Aspects of Computing Science

BCS-FACS

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

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.

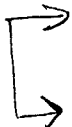02.00   Ann Walshe: NDB: A Binary Relational Database.

02.45   Stephen Bear: VDM Modules and Semantics.

03.30   Tea Break.

04.00   Mario Wolczko: Specifying Garbage Collection Using VDM.

04.45   Finish.

$\vdash$ \vdash

$\mapsto$ \mapsto

$\longmapsto$

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

Feb. 1986	First meeting
Mar. 1986	Application to BSI
Jan. 1987	Proto-Standard vsn 1
Sept 1987	Acceptance by BSI
Dec. 1987	Application to ISO
Mar. 1989	Review Board 1st meeting
May 1989	Draft for Comment
Aug. 1989	Review Board 2nd meeting
Dec. 1989	Review Board 3rd meeting

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, '$\mapsto$', expression ;

Mathematical syntax

mins : $\mathbb{Z}$-**set** $\rightarrow$ $\mathbb{Z}$
-- the minimal element of s
pre -*mins* $(s) \triangleq s \neq \{\}$
post -*mins* $(s,i) \triangleq i \in s \wedge (\forall j \in s)(i \leq j)$

"ASCII" syntax

```
mins  :  Intg-set  -> Intg
--  the minimal element of s
pre-mins(s)  ==  s <> {}
post-mins(s,i)  ==  i in set s
and (all j in set s)(i <= 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.

$is\_wf\_RecordModifier : RecordModifier \times ExpectedType \rightarrow SpecEnv \rightarrow \mathbf{B}$

$is\_wf\_RecordModifier(mk\text{-}RecordModifier(rec, modifiers), expect\_ty)(sp\_env) \quad \triangleq$

    let $valid\_rec\_names =$ if $expect_ty = $ nil

                            then $record\_names(sp\_env)$

                            else $record\_types(expect\_ty, sp\_env)$

    in

  $\exists rec\_nm \in valid\_rec\_names \cdot$

      $is\_wf\_expr(rec, mk\text{-}TypeName(rec\_nm))(sp\_env)$

      $\wedge \; selectors\_of\_correct\_type(rec\_nm, modifiers, sp\_env)$

Language Standard — Outstanding Problems

- Modules

- Error Values

- Looseness

Harmonisation

Complete. E.g.:

- Statements and expressions

- Explicit and implicit specifications

- Concrete syntax:

$$X^*$$ seq of X

$$X \xrightarrow{m} Y$$ map X 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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