

File created: 18-Oct-93 16:35:37 {Pele:mv:envos}<LispCore>Sources>CLTL2>LLMVS.;2

previous date: 3-Sep-91 18:10:25 {Pele:mv:envos}<LispCore>Sources>CLTL2>LLMVS.;1

Read Table: INTERLISP

Package: INTERLISP

Format: XCCS

;;
;; Copyright (c) 1986, 1987, 1989, 1990, 1991, 1993 by Xerox Corporation. All rights reserved.

(RPAQQ **LLMVSCOMS**
[

;;; Runtime support for multiple value passing. This file must be present for compiled multiple values to work.

```
(FNS CL:VALUES CL:VALUES-LIST \MVLIST \SIMULATE.UNBIND)
(DECLARE%: DONTCOPY (MACROS \VALUES \VALUES-UFN)
  (LOCALVARS . T))
(VARIABLES CL:MULTIPLE-VALUES-LIMIT)
;; UFNs for the CL:VALUES and CL:VALUES-LIST sub-opcodes of MISCN:
(FNS CL: :VALUES-UFN CL: :VALUES-LIST-UFN)
(PROP FILETYPE LLMVS)
(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILERVARS (ADDVARS (NLAMA)
  (NLAML)
  (LAMA CL:VALUES]))
```

;;; Runtime support for multiple value passing. This file must be present for compiled multiple values to work.

(DEFINEQ

(CL:VALUES

[LAMBDA ARGS

; Edited 30-May-90 16:01 by jds

;; Return multiple values to a caller.

```
(\VALUES (for I from 1 to ARGS collect (ARG ARGS I))
  (AND (IGEQ ARGS 1)
  (ARG ARGS 1]))
```

(CL:VALUES-LIST

[LAMBDA (CL:VALUES)

; Edited 30-May-90 16:02 by jds

;; Given a list of values, return them as multiple values to a caller.

```
(\VALUES CL:VALUES (CAR CL:VALUES])
```

(\MVLIST

[LAMBDA (X)
 (LIST X)]

(\SIMULATE.UNBIND

[LAMBDA (FRAME N RETURNER)

; Edited 25-Nov-87 12:54 by bvm:

;; Simulate the action of N applications of UNBIND occurring in specified FRAME. RETURNER is the frame that will return to FRAME, and hence
;; must be made slow (NIL if my caller). Must be called uninterruptably.

```
(LET* [(NEXT (fetch (FX NEXTBLOCK) of FRAME))
  (SP NEXT)
  (PVAR0BASE (STACKADDBASE (fetch (FX FIRSTPVAR) of FRAME))
  [TO N DO (do
    (SETQ SP (- SP WORDSPERCELL)) REPEATUNTIL (fetch BINDMARKP of (STACKADDBASE SP))
    FINALLY
    ; Pop stack until a bind mark is encountered
    ; Unbind stuff. Bind mark says how many pvars were bound,
    ; and gives the offset of the last of them
    (LET [(LASTPVAR (fetch BINDLASTPVAR of (STACKADDBASE SP))
      (to (fetch BINDNVALUES of (STACKADDBASE SP)) do (\PUTBASE PVAR0BASE LASTPVAR
        65535)
        (SETQ LASTPVAR (- LASTPVAR
          WORDSPERCELL])
      (replace (FX NEXTBLOCK) of FRAME with SP)
      (\MAKEFREEBLOCK SP (- NEXT SP))
    ;; Now explicitly slow return to FRAME, since we have violated the fast return assumptions by blowing away stack between here and there
    (replace (FX FASTP) of (OR RETURNER (\MYALINK)) with NIL])
```

)

(DECLARE%: DONTCOPY

(DECLARE%: EVAL@COMPILE

(PUTPROPS \VALUES MACRO [(MANY ONE CALLER-FRAME)

```

(PROG* ((IMMEDIATE-CALLER (OR CALLER-FRAME (\MYALINK)))
        (CALLER IMMEDIATE-CALLER)
        PREVFRAME)
:: NB: THIS MACRO MUST TRACK VALUES-UFN, EXCEPT FOR THE PC-SETTING CODE. THIS ONE IS
:: USED IN THE FUNCTIONS CL:VALUES AND CL:VALUES-LIST.
:: This macro is used by VALUES and VALUES-LIST to possibly return multiple values. It works by examining the
:: caller to see if the next instruction is MVLIST (currently in the form of a FN1 \MVLIST), which is present in all
:: multiple-value receivers. If so, it bumps the pc past there and returns the MANY expression, whose value is a list
:: of all the values. If it encounters RETURN instead, the call was tail-recursive, so procedure repeats with caller's
:: caller, etc. Otherwise, multiple values are not expected, and the macro returns just ONE value (the first) to the
:: caller.
NEWFRAME
  (RETURN (PROG ((PC (fetch (FX PC) of CALLER))
                (CODE (fetch (FX FNHEADER) of CALLER))
                (NUNBINDS 0)
                BYTE)
            NEWPC
            [SELECTC (SETQ BYTE (\GETBASEBYTE CODE PC))
              ((LIST (OP# RETURN)
                    (OP# \RETURN))
               ; Call is tail-recursive, so iterate. \RETURN is for LLBREAKing.
               (SETQ PREVFRAME CALLER)
               (SETQ CALLER (fetch (FX CLINK) of CALLER))
               (GO NEWFRAME))
              ((OP# FN1) ; Could be MVLIST
               (SELECTQ [\INDEXATOMDEF
                        (NEW-SYMBOL-CODE
                         [\VAG2 (\GETBASEBYTE CODE (+ PC 1))
                          (create WORD
                                   HIBYTE _
                                   (\GETBASEBYTE CODE
                                    (+ PC 2))
                                   LOBYTE _
                                   (\GETBASEBYTE CODE
                                    (+ PC 3))
                          (create WORD
                                   HIBYTE _ (\GETBASEBYTE CODE
                                             (+ PC 1))
                                   LOBYTE _ (\GETBASEBYTE CODE
                                             (+ PC 2))
                                   (\MVLIST
                                    ; Bump PC past the call, and return the values list
                                    (UNINTERRUPTABLY
                                     (COND
                                      ((NEQ NUNBINDS 0)
                                       ; Sigh. We have to simulate the unbinding, since we need to get
                                       ; past the MVLIST.
                                       (\SIMULATE.UNBIND CALLER NUNBINDS
                                        PREVFRAME)))
                                      ;; Update the PC to skip over the FN1 opcode 1+(# of bytes in
                                      ;; a symbol in the code stream):
                                      (replace (FX PC) of CALLER
                                               with (NEW-SYMBOL-CODE (+ PC 4)
                                                                    (+ PC 3))))
                                      (RETURN MANY)))
                                     NIL))
              ((OP# UNBIND)
               ; UNBIND appears. This preserves the top of stack, so it should
               ; also preserve multiple values.
               (add PC 1)
               (add NUNBINDS 1)
               (GO NEWPC))
              ((OP# JUMPX)
               ; Follow the jump (yecch)
               (add PC (COND
                       ((>= (SETQ BYTE (\GETBASEBYTE CODE
                                         (+ PC 1)))
                            128)
                        (- BYTE 256))
                       (T BYTE)))
               (GO NEWPC))
              ((OP# JUMPXX)
               (add PC (SIGNED (create WORD
                                       HIBYTE _ (\GETBASEBYTE
                                                CODE
                                                (+ PC 1))
                                       LOBYTE _ (\GETBASEBYTE
                                                CODE
                                                (+ PC 2))
                                       BITSPERWORD))
                       (GO NEWPC))
              (LET [(JUMPBASE (CONSTANT (CAAR (\FINDOP 'JUMP]
              (COND
                [(<= JUMPBASE BYTE (CONSTANT
                    (CADAR (\FINDOP 'JUMP]

```

```
(add PC (+ (- BYTE JUMPBASE)
           2))
(GO NEWPC]
```

```
(RETURN ONE])
```

(PUTPROPS **VALUES-UFN MACRO**

```
[ (MANY ONE CALLER-FRAME RESULT-IVAR)
  (PROG* ((IMMEDIATE-CALLER (OR CALLER-FRAME (\MYALINK)))
         (CALLER IMMEDIATE-CALLER)
         PREVFRAME)
```

;; NB: THIS MACRO MUST TRACK \VALUES, EXCEPT FOR THE PC SETTING CODE. THIS ONE IS USED IN THE UFNs FOR
 ;; VALUES AND VALUES-LIST.

;; This macro is used by VALUES and VALUES-LIST to possibly return multiple values. It works by examining the caller to see if the
 ;; next instruction is MVLIST (currently in the form of a FN1 \MVLIST), which is present in all multiple-value receivers. If so, it bumps the
 ;; pc past there and returns the MANY expression, whose value is a list of all the values. If it encounters RETURN instead, the call was
 ;; tail-recursive, so procedure repeats with caller's caller, etc. Otherwise, multiple values are not expected, and the macro returns just
 ;; ONE value (the first) to the caller.

```
NEWFRAME
  (RETURN (PROG ((PC (fetch (FX PC) of CALLER))
               (CODE (fetch (FX FNHEADER) of CALLER))
               (NUNBINDS 0)
               BYTE)
          NEWPC
          [SELECTC (SETQ BYTE (\GETBASEBYTE CODE PC))
                ((LIST (OP# RETURN)
                       (OP# \RETURN)) ; Call is tail-recursive, so iterate. \RETURN is for LLBREAKing.
                 (SETQ PREVFRAME CALLER)
                 (SETQ CALLER (fetch (FX CLINK) of CALLER))
                 (GO NEWFRAME))
                ((OP# FN1) ; Could be MVLIST
                 (SELECTQ [\INDEXATOMDEF (create WORD
                                             HIBYTE _ (\GETBASEBYTE CODE
                                                       (+ PC 1))
                                             LOBYTE _ (\GETBASEBYTE CODE
                                                       (+ PC 2))
                                             )
                          \MVLIST ; Bump PC past the call, and return the values list
                          (LET (VALS)
                              (SETQ VALS MANY)
                              ;; This LET & SETQ forces MANY to be computed before we dink with the stack
                              ;; (which seems to destroy some of the values!)
                              (REPLACE (FX NEXTBLOCK) OF IMMEDIATE-CALLER
                                       WITH (LOLOC RESULT-IVAR))
                              (UNINTERRUPTABLY
                               (COND
                                ((NEQ NUNBINDS 0)
                                 ; Sigh. We have to simulate the unbinding, since we need to get
                                 ; past the MVLIST.
                                 (\SIMULATE.UNBIND CALLER NUNBINDS PREVFRAME))
                                )
                               [COND
                                ((EQ CALLER IMMEDIATE-CALLER)
                                 ;; If the immediate caller has the MVLIST, then the PC has already been
                                 ;; bumped, courtesy of the microcode.
                                 (replace (FX PC) of CALLER
                                         with (+ PC 3)))
                                (T ; Otherwise, we should skip over the FN1 \MVLIST.
                                 (replace (FX PC) of CALLER
                                         with (+ PC 3]))
                                (SI::UNWIND IMMEDIATE-CALLER)
                                (RETURN VALS)))
                              )
                          NIL))
                ((OP# UNBIND) ; UNBIND appears. This preserves the top of stack, so it should
                             ; also preserve multiple values.
                 (add PC 1)
                 (add NUNBINDS 1)
                 (GO NEWPC))
                ((OP# JUMPX) ; Follow the jump (yecch)
                 (add PC (COND
                        ((>= (SETQ BYTE (\GETBASEBYTE CODE (+ PC 1)))
                             128)
                         (- BYTE 256))
                        (T BYTE)))
                 (GO NEWPC))
                ((OP# JUMPM)
                 (add PC (SIGNED (create WORD
                                       HIBYTE _ (\GETBASEBYTE CODE (+ PC 1))
                                       LOBYTE _ (\GETBASEBYTE CODE (+ PC 2))
                                       BITSPERWORD))
                 (GO NEWPC))
                (LET [(JUMPBASE (CONSTANT (CAAR (\FINDOP 'JUMP]
                (COND
                 ([<= JUMPBASE BYTE (CONSTANT (CADAR (\FINDOP 'JUMP]
                 (add PC (+ (- BYTE JUMPBASE)
```

FUNCTION INDEX

CL:VALUES1 CL::VALUES-LIST-UFN4 \MVLIST1
CL:VALUES-LIST1 CL::VALUES-UFN4 \SIMULATE.UNBIND1

MACRO INDEX

\VALUES1 \VALUES-UFN3

PROPERTY INDEX

LLMVS4

CONSTANT INDEX

CL:MULTIPLE-VALUES-LIMIT4
