

File created: 18-Oct-93 16:25:22 {Pele:mv:envos}<LispCore>Sources>CLTL2>LLINTERP.;1

previous date: 31-Dec-92 01:36:17 {Pele:mv:envos}<LispCore>Sources>LLINTERP.;6

Read Table: INTERLISP

Package: INTERLISP

Format: XCCS

```
::
;; Copyright (c) 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1990, 1991, 1992, 1993 by Venue & Xerox Corporation. All rights reserved.
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;; within the meaning of the copyright law, is furnished under license,
;; and may not be used, copied and/or disclosed except in accordance
;; with the terms of said license.
```

(RPAQQ LLINTERPCOMS

```
[ [E ; Don't fontify these common functions
  (SETQ FNSLST
    (LDIFFERENCE FNSLST
      ' (EVALV PROG SET SETQ RETURN GO QUOTE AND OR PROGN COND PROG1 FUNCTION EVAL APPLY]
  (COMS ; For calling interpreted functions
    (FNS \INTERPRETER \INTERPRETER1 \SETUP-COMPILED-CLOSURE-CALL \STKNAME))
  (COMS ; EVCALL ufn.
    (FNS \ENVCALL.UFN \SETUP-ENVIRONMENT-CALL))
  (COMS ; recursive interpreter
    (FNS EVAL \EVAL \EVALFORM \EVALFORMASLAMBDA \EVALOTHER APPLY APPLY* \CHECKAPPLY* \KAPPLYARGS
      DEFEVAL)
    (DECLARE%: DONTCOPY (MACROS .APPLY.))
  (COMS ; Free variable manipulation
    (FNS EVALV \EVALV1 \EVALVAR BOUNDP SET \SETVAR SETQ \STKSCAN \SETFVARSLOT))
  (COMS ; PROG and friends
    (FNS PROG \PROG0 \EVPROG1 RETURN GO EVALA \EVALA ERRORSET SI::ERRORSET-PRINT-FUNCTION))
  (COMS ; LET and friends -- need these in the init
    (FNS LET LET* \LET0 \LET*))
  (FNS QUOTE AND OR PROGN COND \EVPROGN PROG1)
  (COMS (VARS (\DEFEVALFNS NIL)
    (\EVALHOOK))
    (SPECVARS *EVALHOOK*)
    (ADDVARS (LAMBDA SPLST LAMBDA NLAMBDA CL:LAMBDA OPENLAMBDA))
    (GLOBALVARS \DEFEVALFNS \EVALHOOK LAMBDA SPLST CLISPARRAY)
    (DECLARE%: DONTEVAL@LOAD DOCOPY (VARS (CLISPARRAY))
      (P (MOVD? 'SETQ 'SETN NIL T)))
    (GLOBALVARS CLISPARRAY))
  [COMS ; Evaluating in different stack environment
    (FNS ENVEVAL ENVAPPLY FUNCTION \FUNCT1 \MAKEFUNARGFRAME STKEVAL STKAPPLY RETEVAL RETAPPLY)
    (DECLARE%: DONTEVAL@LOAD DOCOPY ; For bootstrapping, IL:FUNCTION is as good as CL:FUNCTION
      (P (MOVD? 'FUNCTION 'CL:FUNCTION NIL T]
  (COMS ; Blip and other stack funniness
    (FNS BLIPVAL SETBLIPVAL BLIPSCAN)
    (FNS \REALFRAMEP)
    [INITVARS (OPENFNS ' (APPLY* SETQ AND OR COND SELECTQ PROG PROGN PROG1 ARG SETARG ERSETQ
      NLSETQ RESETFORM RESETLST RESETVARS RPTQ SAVESETQ SETN UNDONLSETQ
      XNLSETQ]
      (VARS \BLIPNAMES)
      (GLOBALVARS BRKINFOLST)
      (GLOBALVARS \BLIPNAMES OPENFNS)))
  (COMS (FNS RAIDCOMMAND RAIDSHOWFRAME RAIDSTACKCMD RAIDROOTFRAME PRINTADDRS PRINTVA READVA READATOM
    READOCT SHOWSTACKBLOCKS SHOWSTACKBLOCK1 PRINCOPY NOSUCHATOM)
    (FNS BACKTRACE \BACKTRACE \SCANFORNTENTRY \PRINTSTK \PRINTFRAME \PRINTBF)
    (DECLARE%: EVAL@COMPILE DONTCOPY (COMS * RAIDCOMS)))
  (COMS (FNS CCODEP EXPRP SUBRP FNTYP ARGTYPE NARGS ARGLIST \CCODEARGLIST \CCODEIVARSCAN)
    (COMS ; Translation machinery for new LAMBDA words
      (PROP VARTYPE LAMBDA TRAFNS)
      (ALISTS (LAMBDA TRAFNS)))
    (DECLARE%: DONTCOPY (MACROS \CCODENARGS \CCODEFNTYP \CCODEARGTYPE)))
  (COMS ; CONSTANTS mechanism
    (FNS CONSTANTS CONSTATNEXPRESSIONP)
    (INITVARS (COMPVARMACROHASH (HASHARRAY 100)))
    ; We need this initialized for the INIT, so don't put it off. (It used
    ; to start out NIL and get set later)
    (ADDVARS (CONSTANTFOLD FNS PLUS IPLUS TIMES ITIMES DIFFERENCE IDIFFERENCE QUOTIENT IQUOTIENT IMIN
      IMAX IABS LLSH LRSH LOGOR LOGXOR LOGAND OR AND))
    (GLOBALVARS COMPVARMACROHASH CONSTANTFOLD FNS))
  (DECLARE%: EVAL@COMPILE DONTCOPY DONTEVAL@LOAD (LOCALVARS . T))
  (SPECVARS *TAIL* *FN* *FORM* *ARGVAL*)
  (DECLARE%: EVAL@COMPILE DONTCOPY (ADDVARS (LAMS FAULTEVAL FAULTAPPLY)))
  (DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILERVARS
    (ADDVARS (NLAMA CONSTANTS PROG1 COND PROGN OR AND QUOTE LET* LET GO PROG SETQ)
      (NLAML FUNCTION RETURN)
      (LAMA BOUNDP APPLY* \INTERPRETER])
```

:: For calling interpreted functions

(DEFINEQ

(\INTERPRETER

; Edited 21-Jan-91 18:02 by jds

:: the microcode calls this function instead if it is given an expr or an undefined function to call --- the name of the function/sexpression which is
:: supposed to be called is given as an extra argument

```
(PROG ((FN (ARG N N))
(NACTUAL (SUB1 N))
(NA 0)
DEF ARGLIST NEXTRA NTSIZE TYPE NNILS ENV)
(COND
((LITATOM FN)
(CHECK (NOT (fetch (LITATOM CCODEP) of FN)))
(SETQ DEF (fetch (LITATOM DEFPONTER) of FN)))
(T (SETQ DEF FN)))
[COND
((TYPEP DEF 'COMPILED-CLOSURE)
(RETURN (\MISCAPPLY* (FUNCTION \SETUP-COMPILED-CLOSURE-CALL)
DEF)))
((TYPEP DEF 'CLOSURE)
(SETQ ENV (CLOSURE-ENVIRONMENT DEF))
(SETQ DEF (CLOSURE-FUNCTION DEF])
(COND
((NLISTP DEF)
(GO ERR)))
(RETURN (.CALLAFTERPUSHINGNILS.
(SELECTQ (CAR DEF)
(CL:LAMBDA (RETURN (\INTERPRETER-LAMBDA N DEF ENV FN)))
([LAMBDA NLAMBDA OPENLAMBDA]
[SETQ ARGLIST (CAR (OR (LISTP (CDR DEF))
(GO ERR]
(SETQ NNILS (IPLUS (SETQ NEXTRA
(COND
((LISTP ARGLIST)
; spread function
(for X in ARGLIST
do (COND
((OR (NULL (\DTEST X 'LITATOM))
(EQ X T))
(LISPERROR "ATTEMPT TO BIND NIL OR T" X)))
; Process one argument
(SETQ NA (ADD1 NA)))
(COND
((IGREATERP NA NACTUAL)
(IDIFFERENCE NA NACTUAL))
(T 0)))
((NULL ARGLIST)
; spread function
0)
((EQ ARGLIST T)
(LISPERROR "ATTEMPT TO BIND NIL OR T" ARGLIST))
(T
; Nospread--needs to bind exactly one variable, the arg name. LAMBDA* also needs to set that arg
; to the number of actual args, but that can be done by diddling the slot currently occupied by the fn
; name. Never any 'extra' args to worry about
(\DTEST ARGLIST 'LITATOM)
(SETQ NA 1)
0)))
(PROG1 (SETQ NTSIZE (CEIL [ADD1 (UNFOLD NA (CONSTANT (
WORDSPERNAMEENTRY
]
WORDSPERQUAD))
; round number of nametable entries up to next quadword, leaving room for a zero. add in overhead.
; NA is now in units of 'cells' since there two words in a cell.
)
(FOLDHI (fetch (FNHEADER OVERHEADWORDS) of T)
WORDSPERCELL)
(SUB1 CELLSPERQUAD))))
(FUNARG (GO FUN))
(GO ERR))
(\INTERPRETER1 ARGLIST NNILS NTSIZE NACTUAL NEXTRA FN DEF)))
FUN
; FUNARG -- Interlisp "closure" of form (FUNARG fn stackptr). Subsumed by common lisp lexical closures.
[RETURN (PROGN (\SMASHLINK NIL (\STACKARGPTR (CADDR DEF)))
(SPREADAPPLY (CADR DEF)
(for I from 1 to (SUB1 N) collect (ARG N I]
ERR (RETURN (FAULTAPPLY FN (for I from 1 to NACTUAL collect (ARG N I]))
```

(\INTERPRETER1

; Edited 27-Jan-91 12:48 by jds

```
[LAMBDA (ARGLIST NNILS NTSIZE NACTUAL NPVARARGS FN DEF)
(PROG ((*TAIL* (CDDR DEF))
(INTERPFRAME (\MYALINK))
HEADER NT NILSTART)
```

(SETQ HEADER (fetch (FX FNHEADER) of INTERPFRAME)) ; The function header of code for \INTERPRETER
 ;; Build a nametable for INTERPFRAME that identifies the vars in ARGLIST as the NACTUAL IVAR's that were passed to it as arguments plus
 ;; the NPVARARGS extra NIL's that we implement as PVAR's. We build the nametable out of space that was allocated on the stack by
 ;; \INTERPRETER pushing many NIL's

(SETQ NT (ADDSTACKBASE (CEIL (+ (SETQ NILSTART (- (fetch (FX NEXTBLOCK) of INTERPFRAME)
 (UNFOLD NNILS WORDSPERCELL)))
 (UNFOLD NPVARARGS WORDSPERCELL))
 WORDSPERQUAD)))

;; Address of our synthesized nametable: NNILS cells back from the end of INTERPFRAME, leaving space for additional 'PVARs' we are using as
 ;; extra NIL args, rounded up to quadword

(UNINTERRUPTABLY
 [COND
 ((NOT ARGLIST) ; No args, no nametable
)
 ((LISTP ARGLIST)
 (for ARG in ARGLIST as ARG# from 0 as NT1 from (fetch (FNHEADER OVERHEADWORDS) of T)
 by (CONSTANT (WORDSPERNAMEENTRY)) as NT2 from (+ (fetch (FNHEADER OVERHEADWORDS)
 of T)
 NTSIZE)
 by (CONSTANT (WORDSPERNTOFFSETENTRY))
 do (SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX ARG))
 [SETSTKNTOFFSET-RAW NT NT2 (COND
 ((< ARG# NACTUAL)
 IVARCODE)
 (T ; Say it's the nth PVAR, where n is out of the range of the real
 ; PVARs
 ; PVARCODE))
 (COND
 ((< ARG# NACTUAL)
 ARG#)
 (T ; Say it's the nth PVAR, where n is out of the range of the real
 ; PVARs
 (IPLUS (FOLDLO (- NILSTART (fetch (FX FIRSTPVAR) of INTERPFRAME))
 WORDSPERCELL)
 (- ARG# NACTUAL] ; (SETSTKNTOFFSET-RAW NT NT2 (COND ((< ARG#
 ; NACTUAL) (+ IVARCODE ARG#)) (T ; Say it's the nth PVAR,
 ; where n is out of the range of the real PVARs (+ PVARCODE
 ; (FOLDLO (- NILSTART (fetch (FX FIRSTPVAR) of
 ; INTERPFRAME)) WORDSPERCELL) (- ARG# NACTUAL))))))
) ; Note: area is initialize to NIL's (zero), so end of nametable
 ; already has its zeroes
)
 (T ; Nospread. Store lone arg in nametable
 (SETSTKNAME-RAW NT (fetch (FNHEADER OVERHEADWORDS) of T)
 (\ATOMVALINDEX ARGLIST))
 (SETSTKNTOFFSET-RAW NT (+ (fetch (FNHEADER OVERHEADWORDS) of T)
 NTSIZE)
 IVARCODE
 (COND
 ((EQ (CAR DEF)
 'NLAMBDA) ; It's the first (and only) arg
 0)
 (T ; Use the n+1'st arg, which currently is our framename (FN)
 (\PUTBASEPTR \STACKSPACE (+ (fetch (BF IVAR) of (fetch (FX BLINK) of INTERPFRAME)
)
 (UNFOLD NACTUAL WORDSPERCELL))
 NACTUAL) ; set arg's value to be number of real args
 NACTUAL])

;; now fix up header of NT

(replace (FNHEADER %#FRAMENAME) of NT with FN) ; use #FRAMENAME to denote no reference counting
 (replace (FNHEADER NTSIZE) of NT with NTSIZE)
 (replace (FNHEADER NLOCALS) of NT with (fetch (FNHEADER NLOCALS) of HEADER))
 ; Probably doesn't matter, since there are no FVARs in that
 ; frame
 ; Do I need to worry about STK, NA, PV, START, ARGTYPE ?
 ; --- probably not
 (replace (FX NAMETABLE) of INTERPFRAME with NT))

EVLP

;; Now that we have 'bound' the arguments, just evaluate the forms in the LAMBDA/NLAMBDA as progn

(COND
 ((CDR *TAIL*)
 (\EVAL (CAR *TAIL*))
 (SETQ *TAIL* (CDR *TAIL*))
 (GO EVLP))
 (T (RETURN (\EVAL (CAR *TAIL*]))


```

(COND
  (SLOWP (replace (FX %#BLINK) of NEWFX with INTERPBF)
    (replace (FX %#CLINK) of NEWFX with (OR INTERPCLINK INTERPALINK))
    ;; If INTERPCLINK is NIL, the original frame was not SLOW, so ALINK = CLINK and INTERPALINK has its low bit off
    (replace (FX %#ALINK) of NEWFX with (LOGOR INTERPALINK 1)))
  (T (replace (FX %#ALINK) of NEWFX with INTERPALINK)))
(replace (FX FNHEADER) of NEWFX with CODE)
[PROGN (replace (FX PC) of NEWFX with (fetch (FNHEADER STARTPC) of CODE))] ; Initialize PVAR region
(SETQ SP (fetch (FX FIRSTPVAR) of NEWFX))
(SETQ NPVARS (UNFOLD (ADD1 (fetch (FNHEADER PV) of CODE))
  CELLSPERQUAD))
(COND
  ((SETQ ENV (fetch (COMPILED-CLOSURE ENVIRONMENT) of CLOSURE))
    ; Set first pvar to closure environment
    (\PUTBASEPTR \STACKSPACE SP ENV)
    (add SP WORDSPERCELL)
    (add NPVARS -1)))
  (RPTQ NPVARS (PROGN ; Fill in rest of Pvar region with 'unbound'
    (\PUTBASE \STACKSPACE SP 65535)
    (add SP WORDSPERCELL))
  (PROGN ; Make free block after this frame
    (replace (FX NEXTBLOCK) of NEWFX with (add SP (fetch (FX PADDING) of NEWFX))) ; Need extra junk quad after the pvar region
    (\MAKEFREEBLOCK SP (IDIFFERENCE STKEND SP))
    (CHECK (fetch (FX CHECKED) of NEWFX)))
  (replace (IFPAGE MiscFXP) of \InterfacePage with NEWFX])

```

```

(\STKNAME
  [LAMBDA (POS) ; Edited 27-Jan-91 14:20 by jds
    ;; Get the frame name from the stack frame at POS. If that's an interpreter frame, get it's caller's frame name.

```

```

(LET ((NAME (fetch (FX FRAMENAME) of POS))
      (if (EQ NAME '\INTERPRETER)
          then [\GETBASEPTR \STACKSPACE (LET ((BFLINK (fetch (FX BLINK) of POS))
            (+ (fetch (BF IVAR) of BFLINK)
              (TIMES (CL:1- (fetch (BF NARGS) of BFLINK))
                WORDSPERCELL))
          else NAME]))
)

```

;; EVCALL ufn.

(DEFINEQ

```

(\ENVCALL.UFN ; Edited 18-Apr-88 18:25 by bvm
  [LAMBDA (\INTERRUPTABLE)
    (\MISCAPPLY* (FUNCTION \SETUP-ENVIRONMENT-CALL])

```

```

(\SETUP-ENVIRONMENT-CALL ; Edited 4-Aug-88 11:39 by bvm
  [LAMBDA NIL

```

;;; Called in the misc context by ufn for ENVCALL, a variant on APPLYFN that takes on the stack: ..args.. #args codeblock environment. Replace the ufn
 ;;; frame by the frame that would result if we had correctly done the call in microcode. This is a normal function call of the codeblock with the one
 ;;; additional wrinkle that the environment is stored in PVAR0.

```

(LET* ((UFNFX (fetch (IFPAGE MiscFXP) of \InterfacePage))
       (UFNNEXT (fetch (FX NEXTBLOCK) of UFNFX))
       (UFNBF (fetch (FX BLINK) of UFNFX))
       (UFNIVAR (fetch (BF IVAR) of UFNBF))
       (CALLER (fetch (FX CLINK) of UFNFX))
       (CALLNEXT (fetch (FX NEXTBLOCK) of CALLER))
       CODE ENV NA NACTUALS STKEND SLOWP LOCNARGS FREESIZE NEEDED SIZE ARGSTART NEWSTACK IVAR)
  [SETQ LOCNARGS (STACKADDBASE (- CALLNEXT (UNFOLD 3 WORDSPERCELL))
    ; Location in caller's stack of number of args, followed by
    ; CODEBLOCK and ENV
    ; Fetch nargs, codeblock and environment from caller's stack
  (SETQ NACTUALS (\GETBASEPTR LOCNARGS 0))
  (SETQ ENV (\GETBASEPTR LOCNARGS 4))
  (SETQ CODE (\GETBASEPTR LOCNARGS 2))
  (SETQ NA (fetch (FNHEADER NA) of CODE)) ; Number args expected
  (SETQ NEEDED SIZE (fetch (FNHEADER STKMIN) of CODE))
  (SETQ ARGSTART (- CALLNEXT (UNFOLD (+ NACTUALS 3)
    WORDSPERCELL))) ; Address of first argument to function
  (if (AND (> NACTUALS NA)
    (>= NA 0))
    then ; More args than expected. No need to retain/copy them (and it's
    ; best not to, since STKMIN calculation assumes expected args,
    ; not lots more)
    (SETQ NACTUALS NA))
  (if (AND (if (EQ UFNBF (fetch (FX DUMMYBF) of UFNFX))
    then ; BF and FX contiguous
    T
    else ; Yecch. Non-contiguous BF and FX. Toss the BF and do slow

```

```

; case
(\MAKEFREEBLOCK UFNIVAR (+ WORDSPERCELL (- UFNBF UFNIVAR)))
(SETQ UFNIVAR (fetch (FX DUMMYBF) of UFNFX))
; For next \makefreeblock -- have to blow away this dummybf
NIL)
(EQ UFNIVAR CALLNEXT)
(PROGN
  (SETQ FREESIZE (- UFNNEXT UFNIVAR))
  (bind SZ while (type? FSB UFNNEXT) do
    (add FREESIZE (SETQ SZ (fetch (FSB SIZE)
                                  of UFNNEXT)))
    (add UFNNEXT SZ))
  (> FREESIZE NEEDEDSize)))
then
; Normal case: there's enough space to build the frame on top of
; ufn frame. Args are already there (we will lop them from
; caller's frame), so no copying to do.
(SETQ STKEND UFNNEXT)
(SETQ NEWSTACK ARGSTART)
else
; Have to make a discontinuous frame elsewhere
; Discard ufn frame (and dummy bf before it in the
; non-contiguous case)
(SETQ NEWSTACK (\FREESTACKBLOCK (+ NEEDEDSize (UNFOLD NACTUALS WORDSPERCELL))
                                UFNIVAR))
; Get a free block big enough for fn plus the args we'll have to
; copy
(SETQ STKEND (+ NEWSTACK (fetch (FSB SIZE) of NEWSTACK)))
(\BLT (STACKADDBASE NEWSTACK)
  (STACKADDBASE ARGSTART)
  (UNFOLD NACTUALS WORDSPERCELL))
; Copy args to new frame
(\MAKEFREEBLOCK ARGSTART (- CALLNEXT ARGSTART))
; Free up space taken in caller by args
(SETQ SLOWP T))
(SETQ IVAR NEWSTACK)
(add NEWSTACK (UNFOLD NACTUALS WORDSPERCELL))
(replace (FX NEXTBLOCK) of CALLER with ARGSTART)
; Shorten caller's frame to account for args removed
(if (>= NA 0)
  then
; Fill in NIL for defaulted args
(RPTQ (- NA NACTUALS)
  (\PUTBASEPTR (STACKADDBASE NEWSTACK)
    0 NIL)
  (add NEWSTACK WORDSPERCELL)))
(PROGN
  (\PUTBASE (STACKADDBASE NEWSTACK)
    0 \STK.BF.WORD)
  (replace (BF IVAR) of NEWSTACK with IVAR)
  (CHECK (fetch (BF CHECKED) of NEWSTACK)))
; Fix up BF trailer cell
; Clear BF flags
(PROGN
  ;; Now build the FX header
  (add NEWSTACK WORDSPERCELL)
  (\PUTBASE (STACKADDBASE NEWSTACK)
    0
    (LLSH \STK.FX \STK.FLAGS.SHIFT))
  (replace (FX NOPUSH) of NEWSTACK with T)
  ; Clear FX flags
  ; When we return to the user context, don't want any value to
  ; appear on stack
  ; ALINK field for fast case
  [LET ((ALINK (+ CALLER \#ALINK.OFFSET)))
    (COND
      (SLOWP
        ; Have to make non-contiguous frame slow. Set each piece
        ; manually to avoid redundant computation from the computed
        ; record fields
        (replace (FX %#BLINK) of NEWSTACK with (fetch (FX DUMMYBF) of NEWSTACK))
        (replace (FX %#CLINK) of NEWSTACK with ALINK)
        (replace (FX %#ALINK) of NEWSTACK with (LOGOR ALINK 1))
        ; 1 is the slow bit
      )
      (T (replace (FX %#ALINK) of NEWSTACK with ALINK)
        (replace (FX FNHEADER) of NEWSTACK with CODE)
        (replace (FX PC) of NEWSTACK with (fetch (FNHEADER STARTPC) of CODE))))
  [LET ((SP (fetch (FX FIRSTPVAR) of NEWSTACK))
    (NPVARS (UNFOLD (ADD1 (fetch (FNHEADER PV) of CODE))
      CELLSPERQUAD)))
    ;; Fill in rest of FX
    [PROGN
      ; Initialize PVAR region
      (if ENV
        then
          ; Set first pvar to closure environment
          (\PUTBASEPTR (STACKADDBASE SP)
            0 ENV)
          (add SP WORDSPERCELL)
          (SETQ NPVARS (SUB1 NPVARS)))
        (RPTQ NPVARS (PROGN
          ; Fill in rest of Pvar region with 'unbound'
          (\PUTBASE (STACKADDBASE SP)
            0 65535)
          (add SP WORDSPERCELL))
        (PROGN
          ; Make free block after this frame
          (replace (FX NEXTBLOCK) of NEWSTACK with (add SP (fetch (FX PADDING) of NEWSTACK)))
          ; Need extra junk quad after the pvar region
          (CHECK (> STKEND SP))

```

```
(\MAKEFREEBLOCK SP (- STKEND SP))
(CHECK (fetch (FX CHECKED) of NEWSTACK]
(replace (IFPAGE MiscFXP) of \InterfacePage with NEWSTACK])
```

)

:: recursive interpreter

(DEFINEQ

(EVAL

```
[LAMBDA (U \INTERNAL)
(DECLARE (SPECVARS \INTERNAL)) (* Imm "19-AUG-81 23:04")
(EVAL U])
```

(\EVAL

```
[LAMBDA (FORM) (* Imm " 3-NOV-81 15:42")
```

:: ufn for Interlisp EVAL opcode.

(COND

```
((LISTP FORM)
(\EVALFORM FORM))
((LITATOM FORM)
(\EVALVAR FORM))
((NUMBERP FORM)
FORM)
(T (\EVALOTHER FORM])
```

(\EVALFORM

```
[LAMBDA (*FORM* TEMP)
(DECLARE (SPECVARS *FORM*)
(ADDTOVAR LAMS FAULTEVAL)) ; Edited 29-Jun-87 16:42 by amd
```

::: eval of LISTP

(PROG NIL
RETRY

[COND

```
((LITATOM (SETQ TEMP (CAR *FORM*)))
(COND
((fetch (LITATOM CCODEP) of TEMP)
(SELECTQ (fetch (LITATOM ARGTYPE) of TEMP)
(1 (GO NLSPREAD))
(3 (GO NLNOSPREAD))
(GO EVLAM))))
```

(T (SETQ TEMP (fetch (LITATOM DEFPOINTER) of TEMP] ; EXPR OR UDF
; TEMP is now definition of EXPR

(CL:TYPECASE TEMP
((OR COMPILED-CLOSURE CLOSURE) ; falls out

```
(CONS (SELECTQ (CAR TEMP)
(NLAMBDA (COND
((OR (LISTP (SETQ TEMP (CADR TEMP)))
(NULL TEMP))
(GO NLSPREAD))
(T (GO NLNOSPREAD))))))
((CL:LAMBDA LAMBDA OPENLAMBDA)
(GO FAULT)))
(T (GO FAULT)))
```

EVLAM

:: THIS FUNCTION'S DEFINITION VERY DEPENDENT ON THE SPECIAL MACRO IN ALAP FOR COMPILING IT. --- SEE CEVALFORM

```
(RETURN (PROG ((*ARGVAL* 0)
(*TAIL* *FORM*)
(*FN* (CAR *FORM*)))
(DECLARE (SPECVARS *ARGVAL* *FN* *TAIL*))
RETURN (.EVALFORM.]
```

NLSPREAD
(RETURN (SPREADAPPLY (CAR *FORM*)
(CDR *FORM*)))

NLNOSPREAD
(RETURN (SPREADAPPLY* (CAR *FORM*)
(CDR *FORM*)))

FAULT
(COND
([AND CLISPARRAY (LISTP (SETQ TEMP (GETHASH *FORM* CLISPARRAY)
(SETQ *FORM* TEMP)
(GO RETRY)))
(RETURN (FAULTEVAL *FORM*])

(\EVALFORMASLAMBDA

```
[LAMBDA (FAULTX) (* Imm "29-Apr-86 13:06")
```

```
(PROG ((*ARGVAL* 0)
      (*TAIL* FAULTX)
      (*FN* (CAR FAULTX)))
(DECLARE (SPECVARS *ARGVAL* *FN* *TAIL*))
(RETURN (.EVALFORM.])
```

(\EVALOTHER

```
[LAMBDA (X)
;; evaluate some other data type (not atom or list)
(PROG NIL
  (RETURN (SPREADAPPLY* (CDR (OR (FASSOC (TYPENAME X)
                                         \DEFEVALFNS)
                                (RETURN X))))
          X]))
```

(APPLY

```
[LAMBDA (U V \INTERNAL)
(DECLARE (SPECVARS \INTERNAL))
(.APPLY. U V)]
```

(APPLY*

```
[LAMBDA U
(PROG [(DEF (AND (IGREATERP U 0)
                (ARG U 1)
```

```
LP (COND
   [(LITATOM DEF)
    (COND
     [(fetch (LITATOM CCODEP) of DEF)
      (COND
       ((EQ (fetch (LITATOM ARGTYPE) of DEF)
            3)
        (GO NOSPR))
       (T (GO SPR)
           ; EXPR
           (SETQ DEF (OR (LISTP (fetch (LITATOM DEFPOINTER) of DEF))
                        (GO FAULT))
                       ((CCODEP DEF)
                        (GO SPR))
                       ((NLISTP DEF)
                        (GO FAULT)))
                (SELECTQ (CAR DEF)
                 ([LAMBDA CL:LAMBDA]
                  NIL)
                 (FUNARG
                  (SETQ DEF (CADR DEF))
                  (GO LP))
                 (NLAMBDA (COND
                          ((AND (CAR (LISTP (CADR DEF)))
                               (NLISTP (CADR DEF)))
                           (GO NOSPR))))
                  (OPENLAMBDA)
                  (GO FAULT))
                 (GO FAULT))
                (GO FAULT))
    (RETURN (SELECTQ U
```

; Ignore environment of funarg? This is obsolete anyway.

```
(1) (SPREADAPPLY* (ARG U 1))) ; no args
(2) (SPREADAPPLY* (ARG U 1) ; 1 arg
      (ARG U 2)))
(3) (SPREADAPPLY* (ARG U 1) ; 2 args
      (ARG U 2)
      (ARG U 3)))
(4) (SPREADAPPLY* (ARG U 1) ; 3 args
      (ARG U 2)
      (ARG U 3)
      (ARG U 4)))
(SPREADAPPLY (ARG U 1)
 (for I from 2 to U collect (ARG U I])
FAULT
[RETURN (FAULTAPPLY DEF (for I from 2 to U collect (ARG U I])
NOSPR
; NLAMBDA*
(RETURN (SPREADAPPLY* (ARG U 1)
 (for I from 2 to U collect (ARG U I]))
```

(\CHECKAPPLY*

```
[LAMBDA (FN)
(* bvm%: " 7-Jul-86 17:13")
```

;;; APPLY* compiles open as: [PUSH each arg, PUSH #args, PUSH FN, CHECKAPPLY*, APPLYFN] CHECKAPPLY* should merely return FN in the case where FN is a LAMBDA or a NLAMBDA spread. The only case it needs to handle special is NLAMBDA nospread.


```

(PROG ((DEF FN))
  [COND
    [(LITATOM DEF)
      (COND
        ((NOT (fetch (LITATOM CCODEP) of DEF)) ;EXPR
          (SETQ DEF (fetch (LITATOM DEFPOINTER) of DEF)))
        ((EQ (fetch (LITATOM ARGTYPE) of DEF)
          3)
          (GO NOSPR))
        (T (RETURN FN])
      ( (AND NIL (TYPEP DEF 'COMPILED-CLOSURE))
        ;; Give a symbol this definition so APPLYFN can call it. This is an utter kludge. It can never work with preemptive scheduling, and
        ;; even without it is vulnerable to an interrupt between CHECKAPPLY* and APPLYFN
        (\PUTD '*\CHECKAPPLY*\HACK DEF)
        (RETURN '*\CHECKAPPLY*\HACK]
    (COND
      ((AND (LISTP DEF)
        (EQ (CAR DEF)
          'NLAMBDA)
        (LISTP (SETQ DEF (CDR DEF)))
        (CAR DEF)
        (NLISTP (CAR DEF)))
        (GO NOSPR))
      (T (RETURN FN)))
  NOSPR
  (RETURN (LIST 'LAMBDA NIL (LIST 'QUOTE (SPREADAPPLY* FN (\CKAPPLYARGS]))

```

```

(\CKAPPLYARGS
  [LAMBDA NIL
    (PROG ((FRAME (fetch (FX ALINK) of (\MYALINK)))
      ACNT PTR VAL)
      [SETQ ACNT (STACKGETBASEPTR (SETQ PTR (IDIFFERENCE (fetch (FX NEXTBLOCK) of FRAME)
        WORDSPERCELL]
      (CHECK (SMALLPOSP ACNT))
      [FRPTQ ACNT (push VAL (STACKGETBASEPTR (SETQ PTR (IDIFFERENCE PTR WORDSPERCELL]
      (RETURN VAL]))

```

```

(DEFVAL
  [LAMBDA (TYPE FN)
    (PROG ((F (FASSOC TYPE \DEFVALFNS))
      [COND
        (F (SETQ \DEFVALFNS (DREMOVE F \DEFVALFNS]
      [COND
        (FN (SETQ \DEFVALFNS (CONS (CONS TYPE FN)
          \DEFVALFNS]
        (RETURN (CDR F))

```

```

)
(DECLARE%: DONTCOPY
(DECLARE%: EVAL@COMPILE
(PUTPROPS .APPLY. MACRO [(U V)
  (PROG ((DEF U))
    LP [COND
      ((LITATOM DEF)
        (COND
          ((NOT (fetch (LITATOM CCODEP) of DEF))
            (* EXPR)
            (SETQ DEF (fetch (LITATOM DEFPOINTER) of DEF)))
          ((EQ (fetch (LITATOM ARGTYPE) of DEF)
            3)
            (GO NLSTAR))
          (T (GO NORMAL]
        [COND
          ((LISTP DEF)
            (SELECTQ (CAR DEF)
              (NLAMBDA (AND (NLISTP (CADR DEF))
                (CADR DEF)
                (GO NLSTAR)))
              (FUNARG (SETQ DEF (CADR DEF))
                (GO LP))
              NIL))
            ((NULL DEF)
              (RETURN (FAULTAPPLY U V]
          NORMAL
            (RETURN (SPREADAPPLY U V))
          NLSTAR
            (* NLAMBDA*)
            (RETURN (SPREADAPPLY* U V])

```

:: Free variable manipulation

(DEFINEQ

(EVALV

```
[LAMBDA (VAR POS RELFLG)
  ;; EVAL of a LITATOM without uba error
  (COND
    (POS (\SMASHLINK NIL (\STACKARGPTR POS]
    (PROG1 (\EVALV1 VAR)
      (COND
        (RELFLG (RELSTK POS))))))])
```

(* Imm "6-Apr-84 16:37")

(\EVALV1

```
[LAMBDA (VAR)
  (COND
    ((OR (NULL (\DTEST VAR 'LITATOM))
         (EQ VAR T))
     VAR)
    (T (\GETBASEPTR (\STKSCAN VAR)
                    0)))
```

(* Imm "24-DEC-81 00:08")

(\EVALVAR

```
[LAMBDA (VAR)
  ;; EVAL of a LITATOM
  (COND
    ((OR (NULL VAR)
         (EQ VAR T))
     VAR)
    (T (LET ((VP (\STKSCAN VAR))
              (VAL)
              (COND
                ((EQ (SETQ VAL (\GETBASEPTR VP 0))
                     'NOBIND)
                 ; Value is NOBIND, even if it was not found as the top-level
                 ; value. This is consistent with BOUNDP.
                (FAULTEVAL VAR))
        (T VAL]))
```

; Edited 30-Jan-87 13:28 by Pavel

(BOUNDP

```
[CL:LAMBDA (CL::VAR)
  ;; True if VAR is bound or has top level value
  (AND (CL:SYMBOLP CL::VAR)
        (NOT (EQ (\GETBASEPTR (\STKSCAN CL::VAR)
                               0)
                  'NOBIND]))
```

; Edited 30-Jan-87 16:59 by Pavel

(SET

```
[LAMBDA (VAR VALUE)
  (COND
    ((NULL VAR)
     (AND VALUE (LISPERROR "ATTEMPT TO SET NIL OR T" VALUE)))
    (T (PROG [(VP (\STKSCAN (\DTEST VAR 'LITATOM]
      (COND
        ((EQ (\HILOC VP)
              \STACKHI)
         (\PUTBASEPTR VP 0 VALUE))
        ((EQ VAR T)
         (OR (EQ VALUE T)
              (LISPERROR "ATTEMPT TO SET NIL OR T" VALUE)))
        (T (\RPLPTR VP 0 VALUE)))
      (RETURN VALUE]))
```

(* Imm "24-FEB-82 16:11")

(\SETVAR

```
[LAMBDA (VAR VALUE)
  (COND
    ((NULL VAR)
     (AND VALUE (LISPERROR "ATTEMPT TO SET NIL OR T" VALUE)))
    (T (PROG [(VP (\STKSCAN (\DTEST VAR 'LITATOM]
      (COND
        ((EQ (\HILOC VP)
              \STACKHI)
         (\PUTBASEPTR VP 0 VALUE))
        ((EQ VAR T)
         (OR (EQ VALUE T)
              (LISPERROR "ATTEMPT TO SET NIL OR T" VALUE)))
        (T (\RPLPTR VP 0 VALUE)))
      (RETURN VALUE]))
```

(* Imm "24-FEB-82 16:11")

(SETQ

```

[NLAMBDA U
  (\SETVAR (CAR U)
    (PROG ((*TAIL* (CDR U))
      (DECLARE (SPECVARS *TAIL*))
      (RETURN (PROG1 (\EVAL (CAR *TAIL*))
        (PROG NIL
          LP (COND
            ((LISTP (SETQ *TAIL* (CDR *TAIL*)))
              (\EVAL (CAR *TAIL*))
              (GO LP))))))
    ; (SETQ X Y + 3) must try to eval + in order to get dwim involved.
    (* Imm "24-DEC-81 00:19")
  )

```

(\STKSCAN

```

[LAMBDA (VAR)
  ; Edited 27-Jan-91 14:48 by jds

```

;; Returns pointer to place where VAR is bound

```

(PROG ((FX (fetch (FX ALINK) of (\MYALINK))
  (ATOM# (\ATOMVALINDEX VAR))
  NTSIZE A VARINFO PVAROFFSET NT FVAR)
  FRAMELP
  [COND
    ((fetch (FX INVALIDP) of FX)
      (RETURN (fetch (VALINDEX VCELL) of ATOM#]
      ; Reached top of stack without finding a binding
    (SETQ NT (fetch (FX NAMETABLE) of FX))
    (SETQ NTSIZE (fetch (FNHEADER NTSIZE) of NT))
    (SETQ NT (\ADDBASE NT (fetch (FNHEADER OVERHEADWORDS) of T)))
  TABLELP
  [COND
    ((EQP (SETQ A (GETNAMEENTRY NT 0))
      0)
      ; End of name table
    (GO ENDTABLE))
    (EQP A ATOM#)
    ; Found ATOM#. See if it is really bound here
    (SELECTC (NTSLOT-VARTYPE (SETQ VARINFO (GETNTOFFSETENTRY NT NTSIZE)))
      (IVARCODE
        ; Is bound in BF
        ; IVAR
        [RETURN (STACKADDBASE (IPLUS (UNFOLD (\LOLOC (NTSLOT-OFFSET VARINFO))
          WORDSPERCELL)
          (fetch (BF IVAR) of (fetch (FX BLINK) of FX]))
          ; Local may or may not be bound yet
        (SETQ PVAROFFSET (IPLUS (UNFOLD (\LOLOC (NTSLOT-OFFSET VARINFO))
          WORDSPERCELL)
          (fetch (FX FIRSTPVAR) of FX))))
      [COND
        ((fetch (PVARSLLOT BOUND) of (STACKADDBASE PVAROFFSET))
          ; PVAR
          (RETURN (STACKADDBASE PVAROFFSET]))
        (FVARCODE
          ; If FVAR is looked up, we can use it.
          [SETQ FVAR (ADDSTACKBASE (IPLUS (UNFOLD (\LOLOC (NTSLOT-OFFSET VARINFO))
            WORDSPERCELL)
            (fetch (FX FIRSTPVAR) of FX]
          [COND
            ((fetch (FVARSLLOT LOOKEDUP) of FVAR)
              (SETQ FVAR (fetch (FVARSLLOT BINDINGPTR) of FVAR))
              (RETURN FVAR))
            (T (GO ENDTABLE))))
        (SHOULDNT]
      [SETQ NT (\ADDBASE NT (CONSTANT (WORDSPERNAMEENTRY)
        (GO TABLELP)
      ENDTABLE
      (SETQ FX (fetch (FX ALINK) of FX))
      (GO FRAMELP])

```

(\SETFVARSLLOT

```

[LAMBDA (VAR NEWBINDING)
  ; Edited 20-Feb-91 01:07 by jds

```

;; Sets the freevar binding slot of VAR in caller's frame to point at NEWBINDING

```

(PROG ((FX (\MYALINK))
  (ATOM# (NEW-SYMBOL-CODE VAR (\ATOMVALINDEX VAR)))
  NTSIZE A VARINFO NT)
  (SETQ NT (fetch (FX NAMETABLE) of FX))
  (SETQ NTSIZE (fetch (FNHEADER NTSIZE) of NT))
  (SETQ NT (\ADDBASE NT (fetch (FNHEADER OVERHEADWORDS) of T)))
  TABLELP
  [COND
    ((NULL-NTENTRY (SETQ A (GETSTKNAMEENTRY NT 0)))
      (ERROR "Binding slot not found in caller's frame" VAR))
    ((AND (EQP A ATOM#)
      (EQP (NTSLOT-VARTYPE (SETQ VARINFO (GETSTKNTOFFSETENTRY NT NTSIZE)))
        FVARCODE))
      (replace (FVARSLLOT BINDINGPTR) of (ADDSTACKBASE (IPLUS (UNFOLD (\LOLOC (NTSLOT-OFFSET VARINFO))
        WORDSPERCELL)
        (fetch (FX FIRSTPVAR) of FX)))
        with NEWBINDING)
      (RETURN NEWBINDING)))
    (SETQ NT (\ADDBASE NT (CONSTANT (WORDSPERNAMEENTRY)

```

(GO TABLELP)]

)

:: PROG and friends

(DEFINEQ

(PROG

[NLAMBDA U

; Edited 21-Jan-91 18:33 by jds

:: PROG unpacks the argument list and changes any EVAL type forms by evaluating the form and then smashing the name and value

:: NOTE --- this mechanism might confuse DWIM someday because the arguments inside the PROG are evaluated at a time when the PROG

:: frame is in a very funny state: the 'values' are the variables, and the variables are NIL

(PROG ((NVARs 0)

(VARLST (CAR U))

NTSIZE NNILs)

(for VAR in VARLST do

; Count number of vars to bind, check validity

(COND

((OR (NULL (\DTEST (COND

((LISTP VAR)

(SETQ VAR (CAR VAR)))

(T VAR))

'LITATOM))

(EQ VAR T))

(LISPERROR "ATTEMPT TO BIND NIL OR T" VAR)))

(add NVARs 1))

(RETURN (.CALLAFTERPUSHINGNILS. (SETQ NNILs (IPLUS NVARs (SETQ NTSIZE

(CEIL [ADD1 (UNFOLD NVARs (CONSTANT (

WORDSPERNAMEENTRY

]

WORDSPERQUAD))

(FOLDHI (fetch (FNHEADER OVERHEADWORDS)

of T)

WORDSPERCELL)

(SUB1 CELLSPERQUAD)))

(\PROG0 U U NNILs NVARs NTSIZE VARLST)])

(\PROG0

[LAMBDA (*FIRSTTAIL* *TAIL* NNILs NVARs NTSIZE VARLST)

; Edited 27-Jan-91 14:32 by jds

(DECLARE (SPECVARS *TAIL* *FIRSTTAIL*))

(PROG NIL

[COND

(VARLST

:: Create a nametable inside progframe where PROG pushed all those nils

(PROG ((PROGFRAME (\MYALINK))

HEADER NT NILSTART)

(SETQ HEADER (fetch (FX FNHEADER) of PROGFRAME))

(SETQ NT (ADDSTACKBASE (CEIL (IPLUS (SETQ NILSTART (IDIFFERENCE (fetch (FX NEXTBLOCK

)

of PROGFRAME)

(UNFOLD NNILs

WORDSPERCELL)))

(UNFOLD NVARs WORDSPERCELL))

WORDSPERQUAD)))

:: NT is address of our synthesized nametable: beginning of NIL's, not counting additional PVARs we are about to bind,

:: rounded up to quadword

[for VAR in VARLST as VALUEOFF from NILSTART by WORDSPERCELL

do ; evaluate initial values first

(COND

((LISTP VAR)

(PUTBASEPTR \STACKSPACE VALUEOFF (\EVPROG1 (CDR VAR]

; then build NT

(UNINTERRUPTABLY

(for VAR in VARLST as VAR# from (FOLDLO (IDIFFERENCE NILSTART (fetch (FX FIRSTPVAR)

of PROGFRAME))

WORDSPERCELL)

as NT1 from (fetch (FNHEADER OVERHEADWORDS) of T) by (WORDSPERNAMEENTRY)

as NT2 from (IPLUS (fetch (FNHEADER OVERHEADWORDS) of T)

NTSIZE)

by (CONSTANT (WORDSPERNTOFFSETENTRY))

do [SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX (COND

((LISTP VAR)

(CAR VAR))

(T VAR]

(SETSTKNTOFFSET-RAW NT NT2 PVARCODE VAR#))

(replace (FNHEADER %#FRAMENAME) of NT with 'PROG)

(replace (FNHEADER NTSIZE) of NT with NTSIZE)

; Do I need to worry about STK, NA, PV, START, ARGTYPE

; NLOCALS? --- no

(replace (FX NAMETABLE) of PROGFRAME with NT)])

EVLFP

(COND

```

((NULL (SETQ *TAIL* (CDR *TAIL*)))
 (RETURN NIL))
(T (\EVAL OR (LISTP (CAR *TAIL*))
 (GO EVLP)))
(GO EVLP])

```

(\EVPROG1

```

[LAMBDA (*TAIL*) (* Imm "14-MAY-80 13:00")
 (DECLARE (SPECVARS *TAIL*))
 (PROG1 (\EVAL (CAR *TAIL*))
 [PROG NIL
 LP (COND
 ((LISTP (SETQ *TAIL* (CDR *TAIL*)))
 (\EVAL (CAR *TAIL*))
 (GO LP]))])

```

(RETURN

```

[NLAMBDA (FORM) (* bvm%: "10-Nov-86 18:22")
 (DECLARE (LOCALVARS . T))
 (PROG ((MV (CL:MULTIPLE-VALUE-LIST (\EVAL FORM))
 (FRAME (\MYALINK)))
 LP (COND
 ((EQ (fetch (FNHEADER FRAMENAME) of (fetch (FX NAMETABLE) of FRAME))
 (FUNCTION \PROG0))
 (SETQ FRAME (fetch (FX CLINK) of FRAME)) ; Its caller, i.e. PROG
 (\SMASHRETURN NIL FRAME) ; Make us return to PROG with this value
 (RETURN (CL:VALUES-LIST MV)))
 ([NOT (fetch (FX INVALIDP) of (SETQ FRAME (fetch (FX CLINK) of FRAME]
 (GO LP))
 (T (LISPERROR "ILLEGAL RETURN"]])

```

(GO

```

[NLAMBDA U (* bvm%: "10-Nov-86 18:17")
 (PROG ((FRAME (\MYALINK))
 (LABEL (CAR U))
 GOTAIL FIRSTARG)
 LP [COND
 ((EQ (fetch (FNHEADER FRAMENAME) of (fetch (FX NAMETABLE) of FRAME))
 (FUNCTION \PROG0))
 (COND
 ([SETQ GOTAIL (FMEMB LABEL (CDR (STACKGETBASEPTR (SETQ FIRSTARG (fetch (BF IVAR)
 of (fetch (FX BLINK)
 of FRAME]
 ;; first argument of \PROG0 is the actual tail of the prog, which can contain the labels. Second argument is the 'current' *TAIL*
 (STACKPUTBASEPTR (IPLUS FIRSTARG WORDSPERCELL)
 GOTAIL) ; Reset *TAIL* in the \PROG0 frame
 (\SMASHRETURN NIL FRAME) ; Fix it so we return to \PROG0 to continue evaluating after label
 (RETURN NIL])
 (COND
 ([NOT (fetch (FX INVALIDP) of (SETQ FRAME (fetch (FX CLINK) of FRAME]
 (GO LP))
 (T (LISPERROR "UNDEFINED OR ILLEGAL GO" LABEL])

```

(EVALA

```

[LAMBDA (X A) ; Edited 21-Jan-91 18:13 by jds

```

;;; Evaluate X after spreading alist A on stack

```

(PROG ((NVAR 0)
 NTSIZE NNILS TMP)
 (for VAR in A do ; Count number of vars to bind, check validity
 (COND
 ((OR [NULL (SETQ TMP (\DTEST (CAR (\DTEST VAR 'LISTP))
 'LITATOM]
 (EQ TMP T))
 (LISPERROR "ATTEMPT TO BIND NIL OR T" TMP)))
 (add NVARS 1))
 (RETURN (.CALLAFTERPUSHINGNILS. (SETQ NNILS (IPLUS NVARS (SETQ NTSIZE
 (CEIL [ADD1 (UNFOLD NVARS (CONSTANT (
 WORDSPERNAMEENTRY
 ]
 WORDSPERQUAD))
 (FOLDHI (fetch (FNHEADER OVERHEADWORDS)
 of T)
 WORDSPERCELL)
 (SUB1 CELLSPERQUAD)))
 (\EVALA NNILS NVARS NTSIZE X A])

```

(\EVALA

```

[LAMBDA (NNILS NVARS NTSIZE FORM ALIST) ; Edited 27-Jan-91 16:39 by jds
 (PROG ((CALLER (\MYALINK))

```

NILSTART NT HEADER)

:: Create a nametable inside CALLER where EVALA pushed all those nils

```
(SETQ HEADER (fetch (FX FNHEADER) of CALLER)) ; The function header of code for EVALA
(SETQ NT (ADDSTACKBASE (CEIL (IPLUS (SETQ NILSTART (IDIFFERENCE (fetch (FX NEXTBLOCK) of CALLER)
                                                                    (UNFOLD NNILS WORDSPERCELL)))
                                                                    (UNFOLD NVARs WORDSPERCELL))
                                                                    WORDSPERQUAD)))
```

:: Address of our synthesized nametable: beginning of NIL's, not counting additional PVARs we are about to bind, rounded up to quadword

```
(UNINTERRUPTABLY
  (for PAIR in ALIST as VAR# from (FOLDLO (IDIFFERENCE NILSTART (fetch (FX FIRSTPVAR) of CALLER)
                                         WORDSPERCELL)
    as NT1 from (fetch (FNHEADER OVERHEADWORDS) of T) by (WORDSPERNAMEENTRY) as NT2
    from (IPLUS (fetch (FNHEADER OVERHEADWORDS) of T)
            NTSIZE)
    by (CONSTANT (WORDSPERNTOFFSETENTRY)) as VALUEOFF from NILSTART by WORDSPERCELL
    do (PUTBASEPTR \STACKSPACE VALUEOFF (CDR PAIR))
       (SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX (CAR PAIR)))
       (SETSTKNTOFFSET-RAW NT NT2 PVARCODE VAR#))
```

:: now fix up header of NT

```
(replace (FNHEADER %#FRAMENAME) of NT with 'EVALA)
(replace (FNHEADER NTSIZE) of NT with NTSIZE) ; Do I need to worry about STK, NA, PV, START, ARGTYPE ?
                                              ; --- probably not
(replace (FX NAMETABLE) of CALLER with NT)
(RETURN (\EVAL FORM])
```

(ERRORSET

[LAMBDA (FORM FLAG) ; Edited 6-Mar-87 14:39 by amd

:: (proceed-case (handler-bind ...)), but open-coded to avoid a proceed-case literal

```
(LET (SI::NLSETQ-VALUE)
  (CL:IF (EQ (LET [*PROCEED-CASES* (CONS SI::NLSETQ-PROCEED-CASE *PROCEED-CASES*)]
              (SI::*NLSETQFLAG* (NEQ FLAG T))
              (*CONDITION-HANDLER-BINDINGS* (CL:IF FLAG
                                              *CONDITION-HANDLER-BINDINGS*
                                              (CONS '(CL:ERROR . SI::NLSETQHANDLER)
                                                  *CONDITION-HANDLER-BINDINGS*)))
        (DECLARE (SPECVARS SI::*NLSETQFLAG*))
        (CL:CATCH *PROCEED-CASES*
          (CL:SETQ SI::NLSETQ-VALUE (LIST (\EVAL FORM)))
          :NORMAL))
        :NORMAL)
  SI::NLSETQ-VALUE
  NIL))
```

(SI::ERRORSET-PRINT-FUNCTION

[LAMBDA (DATUM STREAM) (DECLARE (IGNORE DATUM)) (* bvm%: "11-Nov-86 21:40")

```
(PRIN1 "Unwind to ERRORSET" STREAM])
```

:: LET and friends -- need these in the init

(DEFINEQ

(LET

[NLAMBDA U (DECLARE (LOCALVARS . T)) ; Edited 21-Jan-91 18:14 by jds

:: LET unpacks the argument list and changes any EVAL type forms by evaluating the form and then smashing the name and value

```
(LET ((NVARs 0)
      (VARLST (CAR U))
      NTSIZE NNILs)
  (for VAR in VARLST do ; Count number of vars to bind, check validity
    (COND
      ((OR (NULL (\DTEST (COND
                          ((LISTP VAR)
                           (SETQ VAR (CAR VAR)))
                          (T VAR))
                          'LITATOM))
           (EQ VAR T))
          (LISPERROR "ATTEMPT TO BIND NIL OR T" VAR)))
      (add NVARs 1))
    (.CALLAFTERPUSHINGNILS. (SETQ NNILs (IPLUS NVARs (SETQ NTSIZE (CEIL [ADD1 (UNFOLD NVARs (CONSTANT
                                                                                          (
                                                                                          WORDSPERNAMEENTRY
                                                                                          ]
                                                                                          WORDSPERQUAD))
                                                                                          (FOLDHI (fetch (FNHEADER OVERHEADWORDS) of T)
                                                                                          WORDSPERCELL)
                                                                                          (SUB1 CELLSPERQUAD))))
                          (LETO (CDR U)
```

NNILS NVARs NTSIZE VARLST])

(LET*

[NLAMBDA U

(DECLARE (LOCALVARS . T))

; Edited 21-Jan-91 23:02 by jds

;; LET* unpacks the argument list and changes any EVAL type forms by evaluating the form and then smashing the name and value

(LET* (NVARs 0)

(VARLST (CAR U))

NTSIZE NNILS)

(for VAR in VARLST do

; Count number of vars to bind, check validity

(COND

((OR (NULL (\DTEST (COND

((LISTP VAR)

(SETQ VAR (CAR VAR)))

(T VAR))

'LITATOM))

(EQ VAR T))

(LISPERROR "ATTEMPT TO BIND NIL OR T" VAR)))

(add NVARs 1))

(.CALLAFTERPUSHINGNILS. (SETQ NNILS (IPLUS NVARs (SETQ NTSIZE (CEIL [ADD1 (UNFOLD NVARs (CONSTANT

(WORDSPERNAMEENTRY

WORDSPERQUAD))

(FOLDHI (fetch (FNHEADER OVERHEADWORDS) of T)

WORDSPERCELL)

(SUB1 CELLSPERQUAD)))

(\LET* (CDR U)

NNILS NVARs NTSIZE VARLST])

(\LETO

[LAMBDA (*TAIL* NNILS NVARs NTSIZE VARLST)

(DECLARE (LOCALVARS . T)

(SPECVARS *TAIL*))

; Edited 27-Jan-91 14:35 by jds

(PROG NIL

[COND

(VARLST (PROG ((PROGFRAME (\MYALINK)

HEADER NT NILSTART)

(SETQ HEADER (fetch (FX FNHEADER) of PROGFRAME))

(SETQ NT (ADDSTACKBASE (CEIL (IPLUS (SETQ NILSTART (IDIFFERENCE

(fetch (FX NEXTBLOCK)

of PROGFRAME)

(UNFOLD NNILS WORDSPERCELL)))

(UNFOLD NVARs WORDSPERCELL))

WORDSPERQUAD))

;; NT is address of our synthesized nametable: beginning of NIL's, not counting additional PVARs we are about to bind,
;; rounded up to quadword

[for VAR in VARLST as VALUEOFF from NILSTART by WORDSPERCELL

do ; evaluate initial values first

(COND

((LISTP VAR)

(PUTBASEPTR \STACKSPACE VALUEOFF (\EVPROG1 (CDR VAR]

; then build NT

(UNINTERRUPTABLY

(for VAR in VARLST as VAR# from (FOLDLO (IDIFFERENCE NILSTART (fetch (FX FIRSTPVAR

of PROGFRAME))

WORDSPERCELL)

as NT1 from (fetch (FNHEADER OVERHEADWORDS) of T) by (CONSTANT (

WORDSPERNAMEENTRY

))

as NT2 from (IPLUS (fetch (FNHEADER OVERHEADWORDS) of T)

NTSIZE)

by (CONSTANT (WORDSPERNTOFFSETENTRY))

do [SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX (COND

((LISTP VAR)

(CAR VAR))

(T VAR]

(SETSTKNTOFFSET-RAW NT NT2 PVARCODE VAR#))

(replace (FNHEADER %#FRAMENAME) of NT with 'LET)

(replace (FNHEADER NTSIZE) of NT with NTSIZE)

; Do I need to worry about STK, NA, PV, START, ARGTYPE

; NLOCALS? --- no

(replace (FX NAMETABLE) of PROGFRAME with NT))]

EVLP

(COND

[(NULL (CDR *TAIL*))

(RETURN (\EVAL (CAR *TAIL*))

(T (\EVAL (CAR *TAIL*))

(SETQ *TAIL* (CDR *TAIL*))

(GO EVLP])

(\LET*

```
[LAMBDA (*TAIL* NNILS NVARs NTSIZE VARLST)
  (DECLARE (LOCALVARS . T)
    (SPECVARS *TAIL*))
```

; Edited 27-Jan-91 14:37 by jds

```
(PROG NIL
  [COND
    (VARLST (PROG ((PROGFRAME (\MYALINK))
      HEADER NT NILSTART)
      (SETQ HEADER (fetch (FX FNHEADER) of PROGFRAME))
      (SETQ NT (ADDSTACKBASE (CEIL (IPLUS (SETQ NILSTART (IDIFFERENCE
        (fetch (FX NEXTBLOCK)
          of PROGFRAME)
        (UNFOLD NNILS WORDSPERCELL)))
        (UNFOLD NVARs WORDSPERCELL))
        WORDSPERQUAD)))
      ;; NT is address of our synthesized nametable: beginning of NIL's, not counting additional PVARs we are about to bind,
      ;; rounded up to quadword
      ;; First build the nametable. This differs from LET in that the nametable is built in reverse order and the PVARs are
      ;; marked unbound before we start evaluating the forms. This way, we get the right semantics of nested LET's.
```

```
(UNINTERRUPTABLY
  (FOR VAR IN VARLST AS VAR# FROM (FOLDLO (IDIFFERENCE NILSTART
    (FETCH (FX FIRSTPVAR)
      OF PROGFRAME))
    WORDSPERCELL)
    AS VALUEOFF FROM NILSTART BY WORDSPERCELL AS NT1
    FROM (IPLUS (UNFOLD (SUB1 NVARs)
      (CONSTANT (WORDSPERNAMEENTRY)))
      (FETCH (FNHEADER OVERHEADWORDS) OF T))
    BY (IMINUS (CONSTANT (WORDSPERNAMEENTRY))) AS NT2
    FROM (IPLUS (UNFOLD (SUB1 NVARs)
      (CONSTANT (WORDSPERNAMEENTRY)))
      (FETCH (FNHEADER OVERHEADWORDS) OF T)
      NTSIZE)
    BY (IMINUS (CONSTANT (WORDSPERNTOFFSETENTRY)))
    DO [SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX (COND
      ((LISTP VAR)
        (CAR VAR))
      (T VAR)
      (SETSTKNTOFFSET-RAW NT NT2 PVARCODE VAR#)
      (PUTBASE \STACKSPACE VALUEOFF 65535))
      (replace (FNHEADER %#FRAMENAME) of NT with 'LET*)
      (REPLACE (FNHEADER NTSIZE) OF NT WITH NTSIZE)
      ; Do I need to worry about STK, NA, PV, START, ARGTYPE
      ; NLOCALS? --- no
      (REPLACE (FX NAMETABLE) OF PROGFRAME WITH NT))
      (FOR VAR IN VARLST AS VALUEOFF FROM NILSTART BY WORDSPERCELL
        DO
          ; evaluate initial values first
          (PUTBASEPTR \STACKSPACE VALUEOFF (IF (LISTP VAR)
            THEN (\EVPROG1 (CDR VAR))
            ELSE NIL])
```

EVLV

```
(COND
  [(NULL (CDR *TAIL*))
    (RETURN (\EVAL (CAR *TAIL*))
      (T (\EVAL (CAR *TAIL*))
        (SETQ *TAIL* (CDR *TAIL*))
        (GO EVLV])
```

)

(DEFINEQ

(QUOTE

```
[NLAMBDA U
  (CAR U)]
```

(AND

```
[NLAMBDA U
  (DECLARE (SPECVARS *TAIL*))
  (OR (NLISTP U)
    (PROG ((*TAIL* U))
      LP (RETURN (COND
        ((NLISTP (CDR *TAIL*))
          (\EVAL (CAR *TAIL*)))
        ((\EVAL (CAR *TAIL*))
          (SETQ *TAIL* (CDR *TAIL*))
          (GO LP]))
```

(OR

```
[NLAMBDA U
  (DECLARE (SPECVARS *TAIL*))
  (AND (LISTP U)
    (PROG ((*TAIL* U))
      LP (RETURN (COND
```

(* Imm " 9-May-86 13:45")


```

(NLISTP (CDR *TAIL*))
(\EVAL (CAR *TAIL*))
(T (OR (\EVAL (CAR *TAIL*))
      (PROGN (SETQ *TAIL* (CDR *TAIL*))
              (GO LP])))

```

(PROGN

```

[NLAMBDA U
  (DECLARE (SPECVARS *TAIL*))
  (AND (LISTP U)
        (PROG ((*TAIL* U)
                LP (COND
                    [(NLISTP (CDR *TAIL*))
                     (RETURN (\EVAL (CAR *TAIL*)
                                (T (\EVAL (CAR *TAIL*))
                                    (SETQ *TAIL* (CDR *TAIL*))
                                    (GO LP]))

```

; MUST be a NLAMBDA* with internal call to EVAL for dwimsake

(COND

```

[NLAMBDA U
  (DECLARE (SPECVARS *TAIL*))
  (PROG ((*TAIL* U)
         VAL)
    LP (RETURN (COND
                ((NLISTP *TAIL*)
                 (COND
                  (*TAIL* (LISPERROR "UNUSUAL CDR ARG LIST" *TAIL*))
                  (T NIL)))
                ((SETQ VAL (\EVAL (CAAR *TAIL*)))
                 (COND
                  ((CDAR *TAIL*)
                   (\EVPROGN (CDAR *TAIL*)))
                  (T VAL)))
                (T (SETQ *TAIL* (CDR *TAIL*))
                   (GO LP])))

```

(* Imm "25-APR-80 18:03")

(\EVPROGN

```

[LAMBDA (*TAIL*)
  (DECLARE (SPECVARS *TAIL*))
  (PROG NIL
    LP (COND
        ((CDR *TAIL*)
         (\EVAL (CAR *TAIL*))
         (SETQ *TAIL* (CDR *TAIL*))
         (GO LP))
        (T (RETURN (\EVAL (CAR *TAIL*]))

```

(* Imm "18-Feb-86 01:44")

(PROG1

```

[NLAMBDA U
  (DECLARE (SPECVARS *TAIL*))
  (AND (LISTP U)
        (PROG ((*TAIL* U)
                (RETURN (PROG1 (\EVAL (CAR *TAIL*))
                               [PROG NIL
                                LP (COND
                                    ((LISTP (SETQ *TAIL* (CDR *TAIL*)))
                                     (\EVAL (CAR *TAIL*))
                                     (GO LP]))]))

```

(* Imm "14-MAY-80 12:59")

)

(RPAQQ \DEFEVALFNS NIL)

(RPAQQ \EVALHOOK NIL)

(DECLARE%: DOEVAL@COMPILE DONTCOPY

(SPECVARS *EVALHOOK*)

(ADDTOVAR LAMBDA SPLST LAMBDA NLAMBDA CL:LAMBDA OPENLAMBDA)

(DECLARE%: DOEVAL@COMPILE DONTCOPY

(GLOBALVARS \DEFEVALFNS \EVALHOOK LAMBDA SPLST CLISPARRAY)

(DECLARE%: DONTEVAL@LOAD DOCOPY

(RPAQQ CLISPARRAY NIL)

(MOVD? 'SETQ 'SETN NIL T)

)

```
(DECLARE%: DOEVAL@COMPILE DONTCOPY
(GLOBALVARS CLISPARRAY)
)
```

:: Evaluating in different stack environment

(DEFINEQ

(ENVEVAL

```
[LAMBDA (FORM APOS CPOS AFLG CFLG) (* bvm%: "18-AUG-81 23:29")
(\CALLME '*ENV*)
(\SMASHLINK NIL (AND APOS (\STACKARGPTR APOS))
(AND CPOS (\STACKARGPTR CPOS)))
(COND
(AFLG (RELSTK APOS)))
(COND
(CFLG (RELSTK CPOS)))
(EVAL FORM])
```

(ENVAPPLY

```
[LAMBDA (FN ARGS APOS CPOS AFLG CFLG) (* lmm "15-Aug-84 17:53")
(\CALLME '*ENV*)
(\SMASHLINK NIL (AND APOS (\STACKARGPTR APOS))
(AND CPOS (\STACKARGPTR CPOS)))
(COND
(AFLG (RELSTK APOS)))
(COND
(CFLG (RELSTK CPOS)))
(.APPLY. FN ARGS])
```

(FUNCTION

```
[NLAMBDA (FN ENV) (* bvm%: "11-Nov-86 21:23")
(COND
(ENV (if NIL
then (LIST 'FUNARG FN (STKNTH -1 'FUNCTION))
else (ERROR "FUNARGs no longer supported--use Common Lisp lexical closures" FN)))
(T FN])
```

(\FUNCT1

```
[LAMBDA (NNILS NVARs NTSIZE VARLST) ; Edited 27-Jan-91 14:39 by jds
(PROG ((FUNCTFRAME (\MYALINK))
HEADER NT NILSTART)
(SETQ HEADER (fetch (FX FNHEADER) of FUNCTFRAME))
(SETQ NT (ADDSTACKBASE (CEIL (IPLUS (SETQ NILSTART (IDIFFERENCE (fetch (FX NEXTBLOCK) of FUNCTFRAME)
(UNFOLD NNILS WORDSPERCELL)))
(UNFOLD NVARs WORDSPERCELL))
WORDSPERQUAD)))
```

:: NT is address of our synthesized nametable: beginning of NIL's, not counting additional PVARs we are about to bind, rounded up to quadword

```
(for VAR in VARLST as VALUEOFF from NILSTART by WORDSPERCELL do (\PUTBASEPTR (ADDSTACKBASE VALUEOFF)
0
(EVAL VAR)))
; then build NT
```

```
(UNINTERRUPTABLY
(for VAR in VARLST as VAR# from (FOLDLO (IDIFFERENCE NILSTART (fetch (FX FIRSTPVAR) of FUNCTFRAME))
WORDSPERCELL)
as NT1 from (fetch (FNHEADER OVERHEADWORDS) of T) by (CONSTANT (WORDSPERNAMEENTRY)) as NT2
from (IPLUS (fetch (FNHEADER OVERHEADWORDS) of T)
NTSIZE)
by (CONSTANT (WORDSPERNTOFFSETENTRY)) do (SETSTKNAME-RAW NT NT1 (\ATOMVALINDEX VAR))
(SETSTKNTOFFSET-RAW NT NT2 PVARCODE VAR#))
(replace (FNHEADER %#FRAMENAME) of NT with '*FUNARG*)
(replace (FNHEADER NTSIZE) of NT with NTSIZE)
(replace (FX NAMETABLE) of FUNCTFRAME with NT))
(RETURN (\MAKESTACKP NIL FUNCTFRAME])
```

(MAKEFUNARGFRAME

```
[LAMBDA (ENV) ; Edited 21-Jan-91 18:19 by jds
```

```
(\CALLME 'FUNARG)
(PROG ((NVARs 0)
NTSIZE NNILs)
(for VAR in ENV do ; Count number of vars to bind, check validity
(COND
((OR (NULL (\DTEST VAR 'LITATOM))
(EQ VAR T))
(LISPERROR "ATTEMPT TO BIND NIL OR T" VAR)))
(add NVARs 1))
(SETQ ENV (.CALLAFTERPUSHINGNILS. (SETQ NNILs (IPLUS NVARs (SETQ NTSIZE
(CEIL [ADD1 (UNFOLD NVARs (CONSTANT
(WORDSPERNAMEENTRY
```

```

]
      WORDSPERQUAD))
(FOLDHI (fetch (FNHEADER OVERHEADWORDS)
            of T)
      WORDSPERCELL)
      (SUB1 CELLSPERQUAD)))
; ENV POINTS TO COPY OF FUNCTION FRAME
(\SMASHLINK (FUNCT1 NNILS NVARs NTSIZE ENV))
      (fetch (STACKP EDFXP) of ENV)
      0 0)
(RETURN ENV])

```

(STKEVAL

```

[LAMBDA (POS FORM FLG INTERNALFLG) ; Imm "25-APR-80 00:08"
  (\SMASHLINK NIL (\STACKARGPTR POS))
  (AND FLG (RELSTK POS))
  (EVAL FORM])

```

(STKAPPLY

```

[LAMBDA (POS FN ARGs FLG) ; Imm "15-Aug-84 17:55"
  (\CALLME '*ENV*)
  (\SMASHLINK NIL (\STACKARGPTR POS))
  (AND FLG (RELSTK POS))
  (.APPLY. FN ARGs])

```

(RETEVAL

```

[LAMBDA (POS FORM FLG INTERNALFLG) ; bvm%: "11-Nov-86 20:53"
  ;; Return from POS with the value of evaluating FORM in the dynamic context of POS
  ;; Anyone know what INTERNALFLG is for?
  (\CALLME '*ENV*)
  (LET ((FX (\STACKARGPTR POS))
        RETURNEE)
    (if (fetch (FX INVALIDP) of (SETQ RETURNEE (fetch (FX CLINK) of FX)))
        then (LISPERROR "ILLEGAL STACK ARG" POS))
    (\SMASHRETURN NIL FX) ; unwind stack back to POS--we need to keep that dynamic
                          ; environment
    (AND FLG (RELSTK POS))
    (CL:MULTIPLE-VALUE-PROG1 (EVAL FORM) ; finally, return from POS
      (SI::UNWIND RETURNEE]))

```

(RETAPPLY

```

[LAMBDA (POS FN ARGs FLG) ; bvm%: "11-Nov-86 12:04"
  ;; Return from POS with the value of applying FN to ARGs in the dynamic context of POS
  (\CALLME '*ENV*)
  (LET ((FX (\STACKARGPTR POS))
        RETURNEE)
    (if (fetch (FX INVALIDP) of (SETQ RETURNEE (fetch (FX CLINK) of FX)))
        then (LISPERROR "ILLEGAL STACK ARG" POS))
    (\SMASHRETURN NIL FX) ; unwind stack back to POS--we need to keep that dynamic
                          ; environment
    (AND FLG (RELSTK POS))
    (CL:MULTIPLE-VALUE-PROG1 (.APPLY. FN ARGs) ; finally, return from POS
      (SI::UNWIND RETURNEE]))

```

)

(DECLARE%: DONTEVAL@LOAD DOCOPY

(MOVD? 'FUNCTION 'CL:FUNCTION NIL T)

)

:: Blip and other stack funniness

(DEFINEQ

(BLIPVAL

```

[LAMBDA (BLIPTYP IPOS FLG) ; Edited 18-Feb-91 16:48 by jds
  (PROG ([FRAME (COND
    ((NULL IPOS)
     (\MYALINK))
    (T (\STACKARGPTR IPOS])
  (A (NEW-SYMBOL-CODE BLIPTYP (\ATOMVALINDEX BLIPTYP)))
  I)
  (SELECTQ BLIPTYP
    ((*TAIL* *FORM* *FN* *ARGVAL*))
    (RETURN (AND (EQ FLG T)
      0)))
  (RETURN
  (COND
    (EQ FLG T) ; Count number of blips of type BLIPTYP at FRAME
    (COND

```

```

((NOT (SETQ I (\VAROFFSET FRAME A)))
0)
(EQ BLIPTYP '*ARGVAL*) ; the value of *ARGVAL* is the number of *ARGVAL* blips in this
; frame
(OR (\GETBASEPTR \STACKSPACE I)
0))
(T 1))
(T (PROG NIL
(OR FLG (SETQ FLG 1))
FRAMELP
[COND
((SETQ I (\VAROFFSET FRAME A))
(SELECTQ BLIPTYP
(*ARGVAL* [COND
((IGREATERP FLG (SETQ I (OR (\GETBASEPTR \STACKSPACE I)
0)))
; Fewer blips here than FLG
(SETQ FLG (IDIFFERENCE FLG I)))
(T ; Scan the temporary region for the value of the FLG'th
; *ARGVAL* blip
(RETURN (PROG ((NXT (fetch (FX NEXTBLOCK) of FRAME))
(P (fetch (FX FIRSTTEMP) of FRAME)))
LP (CHECK (ILESSP P NXT))
[COND
((EQ (\GETBASEPTR \STACKSPACE P)
'*ARGVAL*)
;; \EVALFORM pushes the atom *ARGVAL*, then each argument. We want
;; the FLG'th arg, counting from the end backwards
(add P (UNFOLD (ADD1 (IDIFFERENCE I FLG))
WORDSPERCELL))
(CHECK (ILESSP P NXT))
(RETURN (\GETBASEPTR \STACKSPACE P])
(add P WORDSPERCELL)
(GO LP])
(COND
((ILESSP (SETQ FLG (SUB1 FLG))
1)
(RETURN (\GETBASEPTR \STACKSPACE I])
NEXT
(COND
([NOT (fetch (FX INVALIDP) of (SETQ FRAME (fetch (FX CLINK) of FRAME])
(GO FRAMELP])

```

(SETBLIPVAL

; Edited 18-Feb-91 16:49 by jds

```

[LAMBDA (BLIPTYP IPOS N VAL)
(PROG ([FRAME (COND
((NULL IPOS)
(\MYALINK))
(T (\STACKARGPTR IPOS]
(A (NEW-SYMBOL-CODE BLIPTYP (\ATOMVALINDEX BLIPTYP)))
I)
(SELECTQ BLIPTYP
(*TAIL* *FORM* *FN* *ARGVAL*))
(RETURN))
(COND
((NOT N)
(SETQ N 1))
((ILESSP N 1)
(ILLEGAL.ARG N)))
FRAMELP
[COND
((SETQ I (\VAROFFSET FRAME A))
(SELECTQ BLIPTYP
(*ARGVAL* [COND
((NOT (SETQ I (\GETBASEPTR \STACKSPACE I)))
; No argvals
)
((IGREATERP N I)
(SETQ N (IDIFFERENCE N I)))
(T ; Scan the temporary region for the value of the Nth *ARGVAL*
; blip
(RETURN (PROG ((NXT (fetch (FX NEXTBLOCK) of FRAME))
(P (fetch (FX FIRSTTEMP) of FRAME)))
LP (CHECK (ILESSP P NXT))
[COND
((EQ (\GETBASEPTR \STACKSPACE P)
'*ARGVAL*)
; \EVALFORM pushes the atom *ARGVAL*, then each
; argument. We want the N'th arg from the end
(add P (UNFOLD (ADD1 (IDIFFERENCE I N))
WORDSPERCELL))
(CHECK (ILESSP P NXT))
(RETURN (\PUTBASEPTR \STACKSPACE P VAL])
(add P WORDSPERCELL)

```

```

                                (GO LP])
      (COND
        ((ILESSP (SETQ N (SUB1 N))
                 1)
         ; All other blip types are just the value of the blip binding
         (RETURN (\PUTBASEPTR \STACKSPACE I VAL]
      (COND
        ([NOT (fetch (FX INVALIDP) of (SETQ FRAME (fetch (FX CLINK) of FRAME]
                   (GO FRAMELP])

```

BLIPSCAN

```

[LAMBDA (BLIPTYP IPOS)
  (PROG ([FRAME (COND
    ((NULL IPOS)
     (\MYALINK))
    (T (\STACKARGPTR IPOS]
    OFF A)
    (SETQ A (SELECTQ BLIPTYP
      ((*FORM* *TAIL* *FN* *ARGVAL*)
       (NEW-SYMBOL-CODE BLIPTYP (\ATOMVALINDEX BLIPTYP)))
      (RETURN)))
    LP (COND
      ([AND (SETQ OFF (\VAROFFSET FRAME A))
        (NOT (AND (EQ BLIPTYP '*ARGVAL*'
                    (NULL (GETBASEPTR \STACKSPACE OFF]
                    (RETURN (\MAKESTACKP NIL FRAME)))
        ([NOT (fetch (FX INVALIDP) of (SETQ FRAME (fetch (FX CLINK) of FRAME]
                   (GO LP))
        (T (RETURN])
  )
)
(DEFINEQ

```

\REALFRAMEP

```

[LAMBDA (FRAME INTERPFLG)
  (LET ((NAME (fetch (FNHEADER FRAMENAME) of (fetch (FX FNHEADER) of FRAME)))
        (BFLINK)
        ; note that the selection is on the fnheader's name rather than the nametable name. \REALFRAMEP is thus not affected by SETSTKNAME
        (AND (CL:SYMBOLP NAME)
              (SELECTQ NAME
                (*ENV*
                 NIL)
                (\INTERPRETER T)
                (ERRORSET (NEQ (\STKARG 2 FRAME)
                               'INTERNAL))
                ((EVAL APPLY)
                 (\SMASHLINK NIL FRAME)
                 (SELECTQ \INTERNAL
                   ((INTERNAL SELECTQ)
                    NIL)
                    T))
                (OR (NOT (LITATOM NAME))
                    (COND
                     ((FMEMB NAME OPENFNS)
                      INTERPFLG)
                     (T (OR (NEQ (CHCON1 NAME)
                                   (CHARCODE \))
                            (EXPRP NAME)
                            (FASSOC NAME BRKINFOLST]))

```

```

(RPAQ? OPENFNS ' (APPLY* SETQ AND OR COND SELECTQ PROG PROGN PROG1 ARG SETARG ERSETQ NLSETQ RESETFORM RESETLST
  RESETVARS RPTQ SAVESETQ SETN UNDONLSETQ XNLSETQ))

```

```

(RPAQQ \BLIPNAMES (*TAIL* *FORM* *FN* *ARGVALS*))

```

```

(DECLARE%: DOEVAL@COMPILE DONTCOPY
)

```

```

(GLOBALVARS BRKINFOLST)
)

```

```

(DECLARE%: DOEVAL@COMPILE DONTCOPY
)

```

```

(GLOBALVARS \BLIPNAMES OPENFNS)
)

```

```

(DEFINEQ

```

RAIDCOMMAND

```

[LAMBDA NIL
  (DECLARE (USEDFREE ROOTFRAME ALINKS? RAIDIX FRAME# VPRINTLEVEL))
  (FRESHLINE T)
  (PROG (CMD)
    (SELECTQ (ALLOCAL (SETQ CMD (ASKUSER NIL NIL "@ " '(Q "uit [confirm]" CONFIRMFLG T)

```

```
(%i '^N - remote return [confirm]" NOECHOFLG T  
CONFIRMFLG T RETURN '^N)  
(L "isp stack ")  
(%
```

```

"Lisp stack " NOECHOF LG T EXPLAINSTRING "^L -- Lisp stack from arbitrary frame or context" RETURN '^L)
(F "rame ")
(%)
"Next frame " EXPLAINSTRING "LF - next frame" RETURN 'LF)
(^ " Previous frame ")
(A "tom top-level value of atom: ")
(D "efinition for atom: ")
(P "roperty list for atom: ")
(V " -- show object at Virtual address: ")
(B "lock of storage starting at address: ")
(S "how raw stack from address: ")
(C "ode for function:")
(%Å "Basic frame at: " EXPLAINSTRING "^F - print
basic frame at octal address" RETURN
'^F)
(%Û "frame extension at: " EXPLAINSTRING "^X -
print frame extension at octal address" RETURN
'^X)
(W "alk stack blocks starting at: ")
(K " " EXPLAINSTRING "K -- Set linKtype for stack
ops")
(_ " Set word at address: ")
(%- " Set value of atom " EXPLAINSTRING "^V -- Set
value of atom" RETURN '^V)
(%Ï "atom number for atom: " EXPLAINSTRING "^O -
look up atom" RETURN '^O)
(Z "Zap Print level to: ")
(I "nspect InterfacePage [confirm]" CONFIRMFLG T)
(U " -- Show remote screen [confirm]" CONFIRMFLG T
)
("
" " RETURN NIL)
(%Û " Enter Lisp " EXPLAINSTRING "^Y -- Enter
Lisp" RETURN '^Y)

T)))

(^N (RETURN 'RETURN))
(Q (TERPRI T)
(RETURN 'QUIT))
(NIL)
(A (PRINCOPY (GETTOPVAL (READATOM))))
(P (PRINCOPY (GETPROPLIST (READATOM))))
(C (PRINTCODE (READATOM)
T RAIDIX))
(V (PRINCOPY (READVA)))
(B (PRINTADDRS (READVA)
(READOCT " for (number of words): ")))
(S (PRINTADDRS (ADDSTACKBASE (READOCT))
(READOCT " for (number of words): ")))
(D (PRINTADDRS (fetch (LITATOM DEFINITIONCELL) of (READATOM))
2))
(^O (PRINTNUM .I2 (\ATOMVALINDEX (READATOM))
T))
(^V (PROG ((ATM (READATOM))
(printout T " to be ")
(SETTOPVAL ATM (READ T T))))
((L ^L)
(RAIDSTACKCMD CMD))
(F [RAIDSHOWFRAME (SETQ FRAME# (PROG1 (READ T T)
(READC T]))
(LF (OR FRAME# (SETQ FRAME# 0))
(printout T "(" .I1 (add FRAME# 1)
)" " T)
(RAIDSHOWFRAME FRAME#))
(^ (COND
((OR (NULL FRAME#)
(ILEQ FRAME# 1))
(printout T "No previous frame" T))
(T (printout T "(" .I1 (add FRAME# -1)
)" " T)
(RAIDSHOWFRAME FRAME#))))
(^F (\PRINTBF (READOCT)
NIL
(FUNCTION PRINCOPY)))
(Z [ALLOCAL (LET [(A (PROG1 (READ T T)
(READC T)))
(D (PROG1 (READ T T)
(READC T]
(COND
((AND (FIXP A)
(FIXP D))
(SETQ VPRINTLEVEL (CONS A D)))
(T (PRINTOUT T "Must be two integers, car level then cdr level" T)
(ERROR!])
(W [SHOWSTACKBLOCKS (COND
((EQ (PEEK T)
,%

```

)

```

                                (READC T)
                                (fetch (IFPAGE StackBase) of \InterfacePage))
                                (T (READOCT])
(^X (\PRINTFRAME (READOCT)
    'PRINCOPY))
(^Y (TERPRI T)
    (USEREXEC ':%:))
(K (SETQ ALINKS? (EQ (ASKUSER NIL NIL " Set link type for stack operations to "
    '(A "links
    ")
    (C "links
    ")
    T)
    'A)))
(_ (PROG ((VA (READVA)))
    (printout T " Currently ")
    (PRINTNUM .I7 (GETBASE VA 0)
    T)
    (printout T " to be ")
    (PUTBASE VA 0 (READOCT))))
(I [ALLOCAL (COND
    [(NULL (GETD 'INSPECT)
    (RECLOSE 'IFPAGE)
    (INSPECT [(COND
        ((LISTP VMEMFILE)
        (VMAPPAGE (fetch (POINTER PAGE#) of \InterfacePage)))
        (T (PROG [(PAGE (NCREATE 'VMEMPAGEP)
            (SETVMPTR (VGETTOPVAL '\InterfacePage))
            (\BINS (GETSTREAM VMEMFILE)
            PAGE 0 BYTESPERPAGE)
            (RETURN PAGE]
            'IFPAGE))
        (T (PRIN1 " Can't -- no record for IFPAGE"]
    (TERPRI T))
    (U (SHOWREMOTESCREEN))
    (HELP))
(RETURN NIL])

```

(RAIDSHOWFRAME

(* bvm%: "27-Jan-85 15:27")

```

[LAMBDA (N)
  (PROG [(FRAME (OR ROOTFRAME (RAIDROOTFRAME])
    [FRPTQ (SUB1 N)
    (COND
      ((fetch (FX INVALIDP) of (SETQ FRAME (COND
          (ALINKS? (fetch (FX ALINK) of FRAME))
          (T (fetch (FX CLINK) of FRAME]
      (RETURN (printout T N " is beyond the bottom of the stack" T)
    (\BACKTRACE FRAME FRAME T NIL T T NIL (FUNCTION PRINCOPY)
    NIL RAIDIX])

```

(RAIDSTACKCMD

(* bvm%: "28-Jan-85 12:16")

```

[LAMBDA (CMD)
  (DECLARE (USEDFREE FRAME# ROOTFRAME))
  (PROG (FRAME)
    (SETQ FRAME# 0)
    [COND
      ((EQ CMD 'L)
      (RAIDROOTFRAME))
    (T (SETQ ROOTFRAME (SELECTQ (SETQ FRAME (ASKUSER NIL NIL "in context (? for help): "
    '(P "age fault")
    (G "arbage collection")
    (K "eyboard handler")
    (H "ard Return")
    (S "tack manipulator")
    (R "eset")
    (M "iscellaneous")
    (F "rame at location: "))
    T))
    (P (fetch (IFPAGE FAULTFXP) of \InterfacePage))
    (G (fetch (IFPAGE GCFXP) of \InterfacePage))
    (K (fetch (IFPAGE KbdFXP) of \InterfacePage))
    (H (fetch (IFPAGE HardReturnFXP) of \InterfacePage))
    (S (fetch (IFPAGE SubovFXP) of \InterfacePage))
    (R (fetch (IFPAGE ResetFXP) of \InterfacePage))
    (M (fetch (IFPAGE MiscFXP) of \InterfacePage))
    (COND
      ((AND (ILESSP (SETQ FRAME (READOCT))
        WORDSPERPAGE)
        (ILESSP (\GETBASE \InterfacePage FRAME)
        (fetch (IFPAGE EndOfStack) of \InterfacePage))
        (type? FX (\GETBASE \InterfacePage FRAME)))
        (\GETBASE \InterfacePage FRAME))
      ((type? FX FRAME)
      FRAME)
    (T (PRINTNUM .I7 FRAME)

```



```

(printout T " not a valid frame." T)
(RETURN]
(FRESHLINE T)
(\BACKTRACE ROOTFRAME NIL T NIL NIL NIL ALINKS? (FUNCTION PRINCOPY)
 1 RAIDIX])

```

(RAIDROOTFRAME

```

[LAMBDA NIL (* bvm%: "27-Jan-85 15:26")
(SETQ ROOTFRAME (PROG1 (COND
  ((ALLOCAL (LISTP VMEMFILE))
   (PRIN1 "in TeleRaid Context" T)
   (fetch (IFPAGE TELERAIDFXP) of \InterfacePage))
  (T (fetch (IFPAGE CurrentFXP) of \InterfacePage)))
  (TERPRI T])

```

(PRINTADDRS

```

[LAMBDA (BASE CNT) (* bvm%: "13-Feb-85 22:42")
(PRIN1 "words from ")
(PRINTVA BASE)
(PRIN1 " to ")
(PRINTVA (\ADDBASE BASE (SUB1 CNT)))
(TERPRI)
(SPACES 7)
(for I from 0 to 7 do (PRINTNUM .I7 I))
(PROG ((NB (\VAG2 (\HILOC BASE)
  (FLOOR (\LOLOC BASE)
  8)))
  (LB (\ADDBASE BASE CNT)))
  (do (COND
    ((EVENP (\LOLOC NB)
     8)
     (TAB 0 0)
     (PRINTNUM .I5 (\LOLOC NB))
     (PRIN1 ": ")))
    [COND
     ((PTRGTP BASE NB)
      (SPACES 7))
     (T (PRINTNUM .I7 (\GETBASE NB 0]
      (SETQ NB (\ADDBASE NB 1)) repeatwhile (PTRGTP LB NB))
      (TAB 0 0])

```

(PRINTVA

```

[LAMBDA (X) (* bvm%: "12-Feb-85 10:41")
(PRIN1 "{")
(PRINTNUM .I2 (HILOC X))
(PRIN1 ",")
(PRINTNUM .I2 (LOLOC X))
(PRIN1 "}"]

```

(READVA

```

[LAMBDA NIL (* Imm "21-AUG-81 12:55")
(VAG2 (READOCT)
  (READOCT])

```

(READATOM

```

[LAMBDA NIL ; Edited 16-Feb-87 15:44 by raf
(ALLOCAL (PROG1 (HANDLER-BIND [[XCL:MISSING-EXTERNAL-SYMBOL #'(LAMBDA (CONDITION)
  ;; MAKE AN INTERNAL SYMBOL INSTEAD
  (CL:INTERN (
    XCL:MISSING-EXTERNAL-SYMBOL-NAME
    CONDITION)
    (XCL:MISSING-EXTERNAL-SYMBOL-PACKAGE
    CONDITION)
  (XCL:MISSING-PACKAGE #'(LAMBDA (CONDITION)
    ;; FAKE A PACKAGE BY THIS NAME AND MAKE THE SYMBOL IN
    ;; IT
    (CL:INTERN (XCL:MISSING-PACKAGE-SYMBOL-NAME
    CONDITION)
    (CL:MAKE-PACKAGE (
    XCL:MISSING-PACKAGE-PACKAGE-NAME
    CONDITION)
    :USE NIL]
  (CL:READ T))
  (READC T])

```

(READOCT

```

[LAMBDA (PROMPT) (* bvm%: "28-Jan-85 11:51")
(DECLARE (USEDFREE RAIDIX))
(COND

```

```

((AND PROMPT (NOT (READP T)))
(printout T PROMPT))
(bind STR while (EQUAL (SETQ STR (RSTRING T T))
"")
do (READC T)
finally (RETURN (PROG1 (OR (FIXP (SELECTQ RAIDIX
(8 (MKATOM (CONCAT STR "Q"))))
(16 (bind (N _ 0)
CHAR while (SETQ CHAR (GNC STR))
do [SETQ N (IPLUS (ITIMES N 16)
(COND
((FIXP CHAR)
CHAR)
((AND (IGEQ (SETQ CHAR (CHCON1 CHAR))
(CHARCODE A))
(ILEQ CHAR (CHARCODE F)))
(IPLUS (IDIFFERENCE CHAR (CHARCODE
A))
10))
(T (ERROR CHAR '? T]
finally (RETURN N)))
(SHOULDNT)))
(PROGN (PRIN1 "?" T)
(ERROR!)))
(READC T])

```

(SHOWSTACKBLOCKS

```

[LAMBDA (SCANPTR WAITFLG) (* bvm%: "18-AUG-83 12:05")
; show stack
(PROG ((EASP (fetch EndOfStack of \InterfacePage))
SCAN
[SELECTC (fetch (STK FLAGS) of SCANPTR)
(\STK.FSB (SHOWSTACKBLOCK1 SCANPTR "free block" (fetch (FSB CHECKED) of SCANPTR))
(add SCANPTR (fetch (FSB SIZE) of SCANPTR)))
(\STK.GUARD (SHOWSTACKBLOCK1 SCANPTR "guard block" T)
(add SCANPTR (fetch (FSB SIZE) of SCANPTR)))
(\STK.FX ; frame extension
(SHOWSTACKBLOCK1 SCANPTR "Frame extn = " (fetch (FX CHECKED) of SCANPTR))
(PRIN2 (\UNCOPY (fetch (FX FRAMENAME) of SCANPTR))
(SETQ SCANPTR (fetch (FX NEXTBLOCK) of SCANPTR)))
(PROG ((ORIG SCANPTR)
IVAR) ; must be a basic frame
(while (EQ (fetch (STK FLAGS) of SCANPTR)
\STK.NOTFLAG)
do (add SCANPTR WORDSPERCELL))
(COND
((NOT (type? BF SCANPTR))
(SHOWSTACKBLOCK1 ORIG "Garbage" T))
(T (SETQ IVAR (fetch (BF IVAR) of SCANPTR))
[COND
((fetch (BF RESIDUAL) of SCANPTR)
(SHOWSTACKBLOCK1 SCANPTR "Residual BF" (EQ SCANPTR ORIG))
(PRIN1 " with IVar = ")
(PRINTNUM .I7 IVAR))
(T (SHOWSTACKBLOCK1 SCANPTR "Basic frame" (AND (EQ ORIG IVAR)
(fetch (BF CHECKED)
of SCANPTR]
(add SCANPTR WORDSPERCELL]
(TERPRI)
(COND
((IGREATERP SCANPTR EASP)
(RETURN)))
(AND WAITFLG (READC T))
(GO SCAN])

```

(SHOWSTACKBLOCK1

```

[LAMBDA (PTR STR GOODFLG) (* bvm%: " 6-AUG-83 23:59")
(PRINTNUM .I7 PTR)
(SPACES 1)
(OR GOODFLG (PRIN1 "[bad] "))
(PRIN1 STR])

```

(PRINCOPY

```

[LAMBDA (X) (* bvm%: "24-Jan-86 12:33")
(PRINT (\UNCOPY X (LOCAL (CAR VPRINTLEVEL))
(LOCAL (CDR VPRINTLEVEL)))
T T])

```

(NOSUCHATOM

```

[LAMBDA (ATM) ; Edited 9-Nov-92 15:24 by sybalsky:mv:envos
;; Called only under TeleRaid when VMKATOM fails to find atom ATM. JDS: And in MAKEINIT, ditto. For Makeinit (since Teleraid is essentially
;; dead), changed ERROR! to ERROR.

```

```
(printout T "No such atom: " ATM T)
(ERROR "No such atom: ")
```

)

(DEFINEQ

(BACKTRACE

```
[LAMBDA (IPOS EPOS FLAGS FILE PRINTFN) (* bvm%:"13-Feb-85 22:42")
(RESETFORM (OUTPUT FILE)
(\BACKTRACE (\STACKARGPTR (OR IPOS -1))
(\STACKARGPTR (OR EPOS T))
[EQ 0 (LOGAND 8 (OR FLAGS (SETQ FLAGS 0))
(NEQ 0 (LOGAND FLAGS 1))
(NEQ 0 (LOGAND FLAGS 4))
(NEQ 0 (LOGAND FLAGS 32))
(EQ 0 (LOGAND FLAGS 16))
(OR PRINTFN (FUNCTION PRINT))
NIL])
```

(\BACKTRACE

```
[LAMBDA (IPOS EPOS NAMES VARS LOCALS JUNK ALINKS PRINTFN CNT RADIX) (* Imm "2-Jul-86 13:00")
(OR RADIX (SETQ RADIX 8))
(PROG [NARGS NPVARS NAME ARGNAME BLINK (.I7 (NUMFORMATCODE (LIST 'FIX 7 RADIX))
(DECLARE (SPECVARS .I7))
POSLEP
(COND
(CNT (printout NIL .I3 CNT ": ")
(add CNT 1)))
(SETQ NAME (\STKNAME IPOS))
(COND
(JUNK (TERPRI)
(TERPRI)
(PRIN1 "Basic frame at ")
(PRINTNUM .I7 (SETQ BLINK (fetch (FX BLINK) of IPOS)))
(TERPRI)
(\PRINTBF BLINK (fetch (FX NAMETABLE) of IPOS)
PRINTFN)
(PROGN (TERPRI)
(PRIN1 "Frame xtn at ")
(PRINTNUM .I7 IPOS)
(PRIN1 ", frame name= "))
(APPLY* PRINTFN NAME)
(\PRINTFRAME IPOS PRINTFN))
[(OR VARS LOCALS)
(\PRINTBF (fetch (FX BLINK) of IPOS)
(fetch (FX NAMETABLE) of IPOS)
PRINTFN
(COND
(LOCALS 'LOCALS)
(T T)))
(COND
(NAMES (APPLY* PRINTFN NAME)
(TERPRI)))
(\PRINTFRAME IPOS PRINTFN (COND
(LOCALS 'LOCALS)
(T T])
(NAMES (APPLY* PRINTFN NAME)))
(COND
([AND (NEQ EPOS IPOS)
(NOT (fetch (FX INVALIDP) of (SETQ IPOS (COND
(ALINKS (fetch (FX ALINK) of IPOS))
(T (fetch (FX CLINK) of IPOS])
(GO POSLEP)))
(RETURN T])
```

(\SCANFORNTENTRY

```
[LAMBDA (NMT NTEXT) ; Edited 18-Feb-91 15:18 by jds
;; Scan thru the name table pointedto by NMT, looking for the name of the variable with offset entry NTEXT, which must be in the form
;; appropriate to the architecture (2- or 3-byte).
(bind NM for NT1 from (fetch (FNHEADER OVERHEADWORDS) of T) by (CONSTANT (WORDSPERNAMEENTRY)) as NT2
from (IPLUS (fetch (FNHEADER OVERHEADWORDS) of T)
(fetch (FNHEADER NTSIZE) of NMT))
by (CONSTANT (WORDSPERNTOFFSETENTRY)) do (COND
((NULL-NTENTRY (SETQ NM (GETSTKNAMEENTRY NMT NT1)))
(RETURN)))
(COND
((IEQP NTEXT (GETSTKNTOFFSETENTRY NMT NT2))
(RETURN (\INDEXATOMVAL NM])
```

(\PRINTSTK

```
[LAMBDA (I) (* Imm "23-MAY-82 22:09")
```

```
(PRINTNUM .I7 I)
(PRIN1 ": ")
(PRINTNUM .I7 (GETBASE \STACKSPACE I))
(PRINTNUM .I7 (GETBASE \STACKSPACE (ADD1 I)))
(SPACES 1])
```

(\PRINTFRAME

; Edited 30-Jan-91 01:48 by jds

```
[LAMBDA (FRAME PRINTFN VARONLY)
  (PROG ((NMT (fetch (FX NAMETABLE) of FRAME))
        (I 0)
        (FT (fetch (FX FIRSTTEMP) of FRAME))
        TMP NLOCALS)
    [COND
      ((NOT VARONLY)
       (\PRINTSTK FRAME)
       (PRIN1 "[")
       (PROGN (PSTKFLD FAST "F, " FAST)
              (PSTKFLD INCALL "C, " INCALL)
              (PSTKFLD VALIDNAMETABLE "V, " VALIDNAMETABLE)
              (PSTKFLD NOPUSH "N, " NOPUSH)
              (PSTKFLD USECNT "USE=" (NEQ USECNT 0)
                       NIL ", ")
              (PSTKFLD SLOWP "X, " SLOWP)
              (PSTKFLD ALINK "alink]" T))
       (TERPRI)
       (PSTK 2 (FNHEADER "[fn header]" T))
       (PSTK 4 (NEXTBLOCK "[next, pc]" T))
       (PSTK 6 (NAMETABLE "[nametable]" T))
       (PSTK 8 (BLINK "[blink, clink]" T)
       (SETQ NLOCALS (fetch (FNHEADER NLOCALS) of NMT))
       [for old I from (fetch (FX FIRSTPVAR) of FRAME) by WORDSPERCELL while (ILESSP I FT) as J from 0
         do (OR VARONLY (\PRINTSTK I))
           (COND
             [(ILESSP J NLOCALS)
              (COND
                ((OR (SETQ TMP (\SCANFORNTENTRY NMT (MAKE-NTENTRY PVARCODE J)))
                    (AND (NEQ VARONLY T)
                        (SETQ TMP "local"))))
                 (COND
                   ((fetch (PVARSLLOT BOUND) of (ADDSTACKBASE I))
                    (AND VARONLY (SPACES 3))
                    (PRIN2 TMP)
                    (SPACES 1)
                    (APPLY* PRINTFN (\GETBASEPTR (ADDSTACKBASE I)
                                                0)))
                   ((NOT VARONLY)
                    (printout NIL TMP " [unbound]" T)
                    ((NOT VARONLY)
                     (COND
                       ((SETQ TMP (\SCANFORNTENTRY NMT (MAKE-NTENTRY FVARCODE J)))
                        (printout NIL "[fvar " .P2 TMP " " (COND
                          ((fetch (FVARSLLOT LOOKEDUP) of (ADDSTACKBASE I))
                           (COND
                             ((EQ [SETQ TMP (\HILOC (fetch (FVARSLLOT
                                                                 BINDINGPTR
                                                                 )
                                                                 of (ADDSTACKBASE
                                                                 I]
                                                                 \STACKHI)
                                                                 " on stack]" )
                              ((NEQ (FLOOR TMP 2)
                                   (\HILOC \VALSPACE))
                               ; See comment in BOUNDP
                               " non-stack binding]" )
                              (T " top value]" )))
                              (T " not looked up]" )))
                         T))
                        (T (printout NIL "[padding]" T)
                       (COND
                         ((NOT VARONLY)
                          (SETQ FT (fetch (FX NEXTBLOCK) of FRAME))
                          (for old I by 2 while (ILESSP I FT) do
                            ; 2 = WORDSPERCELL but for doesn't translate correctly with
                            ; WORDSPERCELL
                            (\PRINTSTK I)
                            (COND
                              ((fetch (PVARSLLOT BOUND) of (ADDSTACKBASE I))
                               (APPLY* PRINTFN (\GETBASEPTR (ADDSTACKBASE I)
                                                           0)))
                              (T (TERPRI))
                            ))
                          ))
                        ))
                    ))
                ))
            ))
          ))
    ]
  )
)
```

(\PRINTBF

; Edited 30-Jan-91 01:49 by jds

```
[LAMBDA (BL NMT PRINTFN VARONLY)
  [bind NM for I from (fetch (BF IVAR) of BL) by 2 as J from 0 to (SUB1 (fetch (BF NARGS) of BL))
  do (OR VARONLY (\PRINTSTK I))
  [COND
```

```

      ([OR (SETQ NM (\SCANFORNTENTRY [OR NMT (RETURN (OR VARSONLY (TERPRI)
                                         (MAKE-NTENTRY IVARCODE J)))
      (AND (NEQ VARSONLY T)
            (SETQ NM '*local*]
      (AND VARSONLY (SPACES 3))
      (PRIN2 NM)
      (SPACES 1)
      (APPLY* PRINTFN (GETBASEPTR \STACKSPACE I]
  finally (OR VARSONLY (while (ILESSP I BL) do (\PRINTSTK I)
                                         (printout NIL "[padding]" T)
                                         (add I 2]

```

```

(COND
  ((NOT VARSONLY)
   (\PRINTSTK BL)
   (COND
     ((fetch (BF RESIDUAL) of BL)
      (PRIN1 "residual ")))
   (COND
     ((NEQ (fetch (BF USECNT) of BL)
            0)
      (printout NIL "usecnt= " (fetch (BF USECNT) of BL)
                  %)))
   (TERPRI])

```

)

(DECLARE%: EVAL@COMPILE DONTCOPY

(RPAQQ RAIDCOMS

```

  ((MACROS PSTKFLD PRINTSTKFIELDS PSTK PRINTVA)
   (ADDVARS (RDCOMS (FNS RAIDCOMMAND RAIDSHOWFRAME RAIDSTACKCMD RAIDROOTFRAME PRINTADDRS PRINTVA READVA
                     READOCT READATOM SHOWSTACKBLOCKS SHOWSTACKBLOCK1 PRINCOPY NOSUCHATOM)
             (FNS \BACKTRACE \STKNAME \PRINTBF \PRINTFRAME \SCANFORNTENTRY \PRINTSTK))
   (EXPANDMACROFNS PSTKFLD PRINTSTKFIELDS PSTK PRINTVA))
  (ADDVARS (DONTCOMPILEFNS RAIDCOMMAND RAIDSHOWFRAME RAIDSTACKCMD RAIDROOTFRAME PRINTADDRS PRINTVA READVA
            READATOM READOCT SHOWSTACKBLOCKS SHOWSTACKBLOCK1 PRINCOPY NOSUCHATOM)))

```

(DECLARE%: EVAL@COMPILE

```

(PUTPROPS PSTKFLD MACRO [(FLD STR TEST FMT STR2)
  (PROG ((FLD (fetch (FX FLD) of FRAME)))
        (DECLARE (LOCALVARS FLD))
        (COND
          (TEST (PRIN1 'STR)
                (SELECTQ (CONSTANT (NTHCHAR 'STR -1))
                        (= (printout NIL %, FLD STR2))
                        NIL)
                T])

```

```

(PUTPROPS PRINTSTKFIELDS MACRO [FIELDS (CONS 'PROGN (MAPCAR FIELDS (FUNCTION (LAMBDA (X)
                                                                              (CONS 'PSTKFLD X])

```

```

(PUTPROPS PSTK MACRO ((N . FIELDS)
  (\PRINTSTK (IPLUS FRAME N))
  (PRINTSTKFIELDS . FIELDS)
  (TERPRI))

```

```

(PUTPROPS PRINTVA MACRO [LAMBDA (X)
  (printout NIL "{" (HILOC X)
              ", "
              (LOLOC X)
              "}")

```

)

```

(ADDTOVAR RDCOMS (FNS RAIDCOMMAND RAIDSHOWFRAME RAIDSTACKCMD RAIDROOTFRAME PRINTADDRS PRINTVA READVA READOCT
                  READATOM SHOWSTACKBLOCKS SHOWSTACKBLOCK1 PRINCOPY NOSUCHATOM)
  (FNS \BACKTRACE \STKNAME \PRINTBF \PRINTFRAME \SCANFORNTENTRY \PRINTSTK))

```

```

(ADDTOVAR EXPANDMACROFNS PSTKFLD PRINTSTKFIELDS PSTK PRINTVA)

```

```

(ADDTOVAR DONTCOMPILEFNS RAIDCOMMAND RAIDSHOWFRAME RAIDSTACKCMD RAIDROOTFRAME PRINTADDRS PRINTVA READVA
            READATOM READOCT SHOWSTACKBLOCKS SHOWSTACKBLOCK1 PRINCOPY NOSUCHATOM)

```

)

(DEFINEQ

(CCODEP

```

  [LAMBDA (FN)
    (COND
      [(LITATOM FN)
       (COND
         ((fetch (LITATOM CCODEP) of FN)
          (NOT (fetch (LITATOM PSEUDOCODEP) of FN)))
         (T (TYPEP (fetch (LITATOM DEFPOINTER) of FN)
                    'COMPILED-CLOSURE]
          (T (CL:COMPILED-FUNCTION-P FN])

```

; Edited 30-Jan-87 13:36 by Pavel

(EXPRP

```

[LAMBDA (FN)
  (PROG ((DEF FN))
    [COND
      ((LITATOM DEF)
        [COND
          ((fetch (LITATOM CCODEP) of DEF)
            (RETURN (fetch (LITATOM PSEUDOCODEP) of DEF)]
          (SETQ DEF (fetch (LITATOM DEFPONTER) of DEF)
            (RETURN (COND
              ((LISTP DEF)
                T]))
          ))
    ]))
  ]))

```

(* Imm "17-FEB-82 23:50")

(SUBRP

```

[LAMBDA (FN)
  NIL])

```

(* Imm "17-AUG-81 21:57")

(FNTYP

```

[LAMBDA (FN)
  (PROG ((DEF FN))
    [COND
      ((LITATOM DEF)
        (SETQ DEF (fetch (LITATOM DEFINITIONCELL) of DEF))
        (COND
          ((fetch (DEFINITIONCELL PSEUDOCODEP) of DEF)
            (SETQ DEF (\PSEUDOCODE.REALDEF DEF)))
          ((PROG1 (fetch (DEFINITIONCELL CCODEP) of DEF)
            (SETQ DEF (fetch (DEFINITIONCELL DEFPONTER) of DEF))))
          (RETURN (\CCODEFNTYP DEF)
            (RETURN (COND
              ((LISTP DEF)
                (SELECTQ (CAR DEF)
                  (CL:LAMBDA 'EXPR*
                    ([LAMBDA OPENLAMBDA]
                      (COND
                        ((AND (NLISTP (SETQ DEF (CADR DEF)))
                          DEF)
                          'EXPR*)
                        (T 'EXPR)))
                    (NLAMBDA (COND
                      ((AND (NLISTP (SETQ DEF (CADR DEF)))
                        DEF)
                      'FEXPR*)
                    (T 'FEXPR)))
                  (FUNARG 'EXPR)
                  NIL))
              ((TYPEP DEF 'COMPILED-CLOSURE)
                (\CCODEFNTYP (fetch (COMPILED-CLOSURE FNHEADER) of DEF]))
            ))
          ))
    ]))

```

(* bvm%: "7-Jul-86 16:43")

(ARGTYPE

```

[LAMBDA (FN)
  (LET ((DEF FN)
    (CL:TYPECASE DEF
      (CL:SYMBOL (COND
        ((PROG1 (fetch (LITATOM CCODEP) of DEF)
          (SETQ DEF (fetch (LITATOM DEFPONTER) of DEF)))
          (\CCODEARGTYPE DEF))
          (DEF (ARGTYPE DEF))))
        (CONS (SELECTQ (CAR DEF)
          (CL:LAMBDA 2)
          ([LAMBDA OPENLAMBDA]
            (COND
              ((AND (NLISTP (SETQ DEF (CADR DEF)))
                DEF)
                2)
              (T 0)))
            (NLAMBDA (COND
              ((AND (NLISTP (SETQ DEF (CADR DEF)))
                DEF)
                3)
              (T 1)))
            (FUNARG (ARGTYPE (CADR DEF)))
            (SELECTQ (FNTYP DEF)
              (EXPR 0)
              (FEXPR 1)
              (EXPR* 2)
              (FEXPR* 3)
              NIL)))
          (CLOSURE 2)
          (COMPILED-CLOSURE (\CCODEARGTYPE (fetch (COMPILED-CLOSURE FNHEADER) of DEF))))))
    ))

```

(* bvm%: "16-Jul-86 22:47")

(NARGS

```
[LAMBDA (FN) ; (* bvm%: " 7-Jul-86 17:07")
  (LET ((DEF FN))
    (COND
      ((AND (LITATOM DEF)
            (PROG1 (fetch (LITATOM CCODEP) of DEF)
                  (SETQ DEF (fetch (LITATOM DEFPOINTER) of DEF))))
        (\CCODENARGS DEF))
      ((LISTP DEF)
        (SELECTQ (CAR DEF)
          (CL:LAMBDA 1)
          ([LAMBDA NLAMBDA OPENLAMBDA]
            (COND
              ((NULL (SETQ DEF (CADR DEF)))
                0)
              ((NLISTP DEF)
                1)
              (T (in DEF sum 1))))
            (FUNARG (NARGS (CADR DEF)))
            NIL))
          ((TYPEP DEF 'COMPILED-CLOSURE)
            (\CCODENARGS (fetch (COMPILED-CLOSURE FNHEADER) of DEF))
```

(ARGLIST

; Edited 15-Jan-88 15:10 by bvm:

```
[LAMBDA (FN SMARTP)
  (PROG ((DEF FN)
        TEMP)
    (COND
      ((LITATOM DEF)
        (COND
          ((PROG1 (fetch (LITATOM CCODEP) of DEF)
                (SETQ DEF (fetch (LITATOM DEFPOINTER) of DEF)))
            (RETURN (\CCODEARGLIST DEF SMARTP)))
          ((NULL DEF)
            (SETQ DEF (GETPROP FN 'EXPR))
            (RETURN (COND
              ((LISTP DEF)
                (SELECTQ (CAR DEF)
                  (CL:LAMBDA 'U)
                  ([LAMBDA NLAMBDA OPENLAMBDA]
                    (CADR DEF))
                  (FUNARG (ARGLIST (CADR DEF)))
                  (GO UNDEF))))
              ((TYPEP DEF 'COMPILED-CLOSURE)
                (\CCODEARGLIST (fetch (COMPILED-CLOSURE FNHEADER) of DEF)
                  SMARTP))
              (T (GO UNDEF))
            ))
          UNDEF
            (COND
              ((AND (SETQ DEF (FNCHECK FN T))
                    (NEQ DEF FN))
                (RETURN (ARGLIST DEF)))
              (T (ERROR "Args not available:" FN]))
```

(\CCODEARGLIST

; Edited 10-May-88 12:18 by MASINTER

:: Computes the arglist for raw code object FNHD. If SMARTP is true, we're allowed to return a Common Lisp arg list if we find one; otherwise, we have to comply with Interlisp arglist semantics.

```
(PROG ((N (fetch (FNHEADER NA) of FNHD))
      (IVARS SIZE LOCALSIZE ENDT))
  (COND
    ((EQ N 0) ; No args
      (RETURN NIL))
    ((AND (< N 0)
          (NOT SMARTP)) ; LAMBDA*
      (RETURN 'U])
    (SETQ SIZE (fetch (FNHEADER NTSIZE) of FNHD))
    (COND
      ((EQ [SETQ LOCALSIZE (- (FOLDLO (if (fetch (FNHEADER NATIVE) of FNHD)
                                           then (- (fetch (FNHEADER STARTPC) of FNHD)
                                           4)
                                           else (fetch (FNHEADER STARTPC) of FNHD))
                                           BYTESPERWORD)
              (SETQ ENDT (+ (fetch (FNHEADER OVERHEADWORDS) of T)
                            (COND
                              ((EQ SIZE 0)
                                ; No nametable, but there's a quad of zeros there anyway
                                WORDSPERQUAD)
                              (T (UNFOLD SIZE 2]
                                ; Nothing extra here
                                0)
                            ))
              )
      (> LOCALSIZE WORDSPERCELL) ; There is a second nametable between the first and the code.
      (SETQ IVARS (\CCODEIVARSCAN FNHD ENDT (FOLDLO LOCALSIZE 2]
        ((AND (LISTP (SETQ ENDT (\GETBASEPTR FNHD ENDT)))
```

```

      (LISTP (CAR ENDT))) ; It's exactly a pointer to debugging info, car of which is a stylized
                          ; arglist
    (SETQ ENDT (if (AND (EQ (CAAR ENDT)
                          '&OPTIONAL)
                      (LISTGET (CDR ENDT)
                              :INTERLISP))
                  then
                  (CDAR ENDT)
                  else (CAR ENDT)))
    (RETURN (COND
            (SMARTP ENDT)
            (T
             (for X in ENDT unless (EQ X '&OPTIONAL) collect (COND
                                ((STRINGP X)
                                 ; Callers of ARGLIST are expecting to get something that would
                                 ; actually function as one
                                 (MKATOM X))
                                (T X)
                                ; Waited until now to see if there was a stored arglist, but we
                                ; didn't find one--give up
                                ))
            ((< N 0)
             (RETURN 'U])
            ((NEQ SIZE 0)
             (SETQ IVARS (\CCODEIVARSCAN FNHD (fetch (FNHEADER OVERHEADWORDS) of T)
                ; Scan specials name table
                SIZE IVARS]
             (SETQ IVARS (for I from 0 to (SUB1 N) collect (OR (CDR (ASSOC I IVARS))
                (PACK* '*ARG* I])
             (RETURN (SELECTQ (fetch (FNHEADER ARGTYPE) of FNHD)
                (3 (CAR IVARS))
                IVARS])

```

(\CCODEIVARSCAN

```

[LAMBDA (FNHD START SIZE IVARS) ; Edited 30-Jan-91 02:00 by jds
;; Search nametable starting at offset START in FNHD for all ivars. Return list of dotted pairs (index . name) consed onto front of IVARS. NTSIZE
;; is size of nt in words
(bind NM CODE for NTOFFSET FROM (UNFOLD START BYTESPERWORD) by (CONSTANT (BYTESPERNAMEENTRY))
 while (SETQ NM (\INDEXATOMVAL (GETNAMEENTRY FNHD NTOFFSET)))
 do ; Note that entry = 0 => NM = NIL terminates the loop
 [COND
 ((EQ [NTSLOT-VARTYPE (SETQ CODE (GETNTOFFSETENTRY FNHD (IPLUS NTOFFSET (UNFOLD SIZE BYTESPERWORD)
 IVARCODE)
 (push IVARS (CONS (NTSLOT-OFFSET CODE)
 NM]
 finally (RETURN IVARS])
)

```

:: Translation machinery for new LAMBDA words

```

(PUTPROPS LAMBDATRANFNS VARTYPE ALIST)
(ADDTOVAR LAMBDATRANFNS )
(DECLARE%: DONTCOPY
(DECLARE%: EVAL@COMPILE
(PUTPROPS \CCODENARGS MACRO ((FNH)
 ([LAMBDA (N)
 (COND
 ((ILESSP N 0)
 1)
 (T N]
 (fetch (FNHEADER NA) of FNH))))
(PUTPROPS \CCODEFNTYP MACRO ((FNH)
 (SELECTQ (\CCODEARGTYPE FNH)
 (0 'CEXP)
 (1 'CFEXP)
 (2 'CFEXP*)
 'CFEXP*))
(PUTPROPS \CCODEARGTYPE MACRO ((FNH)
 (fetch (FNHEADER ARGTYPE) of FNH)))
)
)

```

:: CONSTANTS mechanism

```
(DEFINEQ
```


(CONSTANTS

```

[NLAMBDA VARS
  (OR COMPVARMACROHASH (SETQ COMPVARMACROHASH (HASHARRAY 100)))
  [for X in VARS do (COND
    ((LISTP X)
     (PUTHASH (CAR X)
              (LIST 'CONSTANT (CADR X)
                   COMPVARMACROHASH))
     (T (PUTHASH X (LIST 'CONSTANT X)
                  COMPVARMACROHASH)
        VARS])

```

(CONSTANTEXPRESSIONP

; Edited 21-Jan-91 23:45 by jds

```

[LAMBDA (FORM)
  (COND
    [(LITATOM FORM)
     (COND
       ((OR (NULL FORM)
            (EQ FORM T))
        (LIST FORM))
       ((AND COMPVARMACROHASH (SETQ FORM (GETHASH FORM COMPVARMACROHASH)))
        (CONSTANTEXPRESSIONP FORM])
      [(LISTP FORM)
       (SELECTQ (CAR FORM)
                (QUOTE (CDR FORM))
                (FUNCTION (AND (LITATOM (CADR FORM))
                              (NULL (CDDR FORM))
                              (CDR FORM)))
                (CONSTANT [LET (VALUE)
                            [SETQ VALUE (NLSETQ (EVAL (CADR FORM)
                                                  (COND
                                                    (VALUE (LIST (CAR VALUE)))
                                                    (T (SETQ FORM (COMPILER:OPTIMIZE-AND-MACROEXPAND (CADR FORM)
                                                                 *BC-MACRO-ENVIRONMENT*
                                                                 (COMPILER:MAKE-CONTEXT :VALUES-USED 1 :PREDICATE-P NIL)))
                                                  (LIST (EVAL FORM]))
                            (COND
                              [(FMEMB (CAR FORM)
                                       CONSTANTFOLDFNS)
                               (for X in (CDR FORM) collect (CAR (OR (CONSTANTEXPRESSIONP X)
                                                                    (RETURN))))
                               finally (RETURN (LIST (APPLY (CAR FORM)
                                                            $$VAL]
                                                         (NOT (GETD (CAR FORM))))
                               (PROG ((MAC (GETMACROPROP (CAR FORM)
                                                         COMPILERMACROPROPS)))
                                   (RETURN (AND MAC [NOT (EQUAL FORM (SETQ FORM (MACROEXPANSION FORM MAC])
                                                                    (CONSTANTEXPRESSIONP FORM])
                                                         (NUMBERP FORM)
                                                         (LIST FORM])

```

(RPAQ? COMPVARMACROHASH (HASHARRAY 100))

:: We need this initialized for the INIT, so don't put it off. (It used to start out NIL and get set later)

(ADDTOVAR CONSTANTFOLDFNS PLUS IPLUS TIMES ITIMES DIFFERENCE IDIFFERENCE QUOTIENT IQOTIENT IMIN IMAX IABS LLSH LRSH LOGOR LOGXOR LOGAND OR AND)

(DECLARE%: DOEVAL@COMPILE DONTCOPY

(GLOBALVARS COMPVARMACROHASH CONSTANTFOLDFNS)

(DECLARE%: EVAL@COMPILE DONTCOPY DONTEVAL@LOAD

(DECLARE%: DOEVAL@COMPILE DONTCOPY

(LOCALVARS . T)

(DECLARE%: DOEVAL@COMPILE DONTCOPY

(SPECVARS *TAIL* *FN* *FORM* *ARGVAL*)

(DECLARE%: EVAL@COMPILE DONTCOPY

(ADDTOVAR LAMS FAULTEVAL FAULTAPPLY)

(DECLARE%: DONTEVAL@LOAD DOEVAL@COMPILE DONTCOPY COMPILERVARS

{MEDLEY}<CLTL2>LLINTERP.;1

(ADDTOVAR **NLAMA** CONSTANTS PROG1 COND PROGN OR AND QUOTE LET* LET GO PROG SETQ)

(ADDTOVAR **NLAML** FUNCTION RETURN)

(ADDTOVAR **LAMA** BOUNDF APPLY* \INTERPRETER)
)

(PUTPROPS **LLINTERP COPYRIGHT** ("Venue & Xerox Corporation" T 1981 1982 1983 1984 1985 1986 1987 1988 1990 1991
1992 1993))

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