File created: 15-Jun-90 18:38:14 **{DSK}<usr>local>lde>lispcore>internal>library>MESATYPES.;2**

changes to: (VARS MESATYPESCOMS)

previous date: 5-Oct-84 12:16:00 {DSK}<usr>local>lde>lispcore>internal>library>MESATYPES.;1

Read Table: INTERLISP

Package: INTERLISP

Format: XCCS

;;
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```
(RPAQQ MESATYPESCOMS
       ((* Defines three new record types%: MESATYPE, MESARECORD, and MESAARAY. Also provides a number of macros
           to manipulate objects of these record types. None of this package need be present in the compiled
           version of a client package.)
        (* Public stuff)
        (MACROS MESASIZE MESASETQ MESAEQUAL FMESAELT MESAELT MESASETA)
        (PROP ARGNAMES MESASIZE MESASETQ MESAEQUAL FMESAELT MESAELT MESASETA)
        (* Private stuff)
        (INITVARS (\MESATYPES (HASHARRAY 20)))
        (P (pushnew CLISPRECORDTYPES 'MESATYPE)
           (pushnew CLISPRECORDTYPES 'MESARECORD)
           (pushnew CLISPRECORDTYPES 'MESAARRAY)
           (MOVD 'RECORD 'MESATYPE)
           (MOVD 'RECORD 'MESARECORD)
           (MOVD 'RECORD 'MESAARRAY))
        (PROP USERRECORDTYPE MESATYPE MESARECORD MESAARRAY)
        (FNS MESATYPEFN MESARECORDFN MesaRecordFields MesaRecordSubblock MesaRecordCreateMethod MESAARRAYFN
             MesaArrayOffsets MesaArrayFindOffset RemoveLast)))
```

(* * Defines three new record types%: MESATYPE, MESARECORD, and MESAARAY.
Also provides a number of macros to manipulate objects of these record types.
None of this package need be present in the compiled version of a client package.)

(* * Public stuff)

```
(DECLARE%: EVAL@COMPILE

(PUTPROPS MESASIZE MACRO [args (PROG ((recordName (CAR args))) (* Returns the size of record recordName)
                                     (RETURN (EVAL `(INDEXF (fetch (%, recordName THISISTHELASTFIELD)
                                                                of T])

(PUTPROPS MESASETQ MACRO [args (PROG ((a (CAR args))
                                      (b (CADR args))
                                      (type (CADDR args)))

(* Copies the contents of "b" into "a" Returns a. Should be used to translate statement of the form "a _ b;" when a and b are
neither numbers nor pointers. A safer (ie, more correct) way to do this would be to say "(foreach field f in type st f has both a
fetch and a replace method do (replace (type f) of a with (fetch (type f) of b)))")

                                     (RETURN `(\BLT %, a %, b (MESASIZE %, type])

(PUTPROPS MESAEQUAL MACRO [args (PROG ((a (CAR args))
                                       (b (CADR args))
                                       (type (CADDR args)))

(* Compares a and b for equality, where a and b are instances of record type.
a and b can be multiple words long.)

                                      (RETURN `(for word from 0 to (SUB1 (MESASIZE %, type))
                                                  always (EQ (\GETBASE %, a word)
                                                             (\GETBASE %, b word])

(PUTPROPS FMESAELT MACRO
          [args (PROG ((array (CAR args))
                       (arrayType (CADR args))
                       (indexes (CDDR args))
                       indexRangeList indexOffsetList)

(* Returns a pointer to the indicated element of array. Unsafe, because it returns a pointer to the middle of the structure,
which would confuse the garbage collector if you held onto the element pointer longer than the array pointer.)

                     [SETQ indexRangeList (EVAL `(fetch (%, arrayType INDEXLIST) of T]
                     [SETQ indexOffsetList (EVAL `(fetch (%, arrayType OFFSETLIST) of T]
                     (RETURN (LIST '\ADDBASE array
                                   (CONS 'IPLUS
                                         (for index in indexes as indexRange in indexRangeList as offset
                                            in indexOffsetList
                                            collect `([OPENLAMBDA (index)
                                                        (OR (AND (ILEQ %, (CAR indexRange)
                                                                         index)
```

```
                                                              (ILEQ index %, (CDR indexRange)))
                                                          (ERROR 'indexOutOfRange))
                                                    (ITIMES %, offset (IDIFFERENCE index %, (CAR indexRange]
                                                  %, index])

(PUTPROPS MESAELT MACRO [args (PROG ((arrayType (CADR args))
                                     elementType)
```

(* Returns the selected element of the array. Copies it into a freshly allocated box to avoid returning a pointer to the middle of the structure, which might confuse the garbage collector.)

```
                                    [SETQ elementType (EVAL `(fetch (%, arrayType ELEMENTTYPE) of T]
                                    (RETURN `(MESASETQ (create %, elementType)
                                                       %,
                                                       (CONS 'FMESAELT args)
                                                       %, elementType])

(PUTPROPS MESASETA MACRO [args (PROG ((eltArgs (RemoveLast args))
                                      (arrayType (CADR args))
                                      (newValue (CAR (LAST args)))
                                      elementType)
```

(* Replaces the index'th element of array, provided that array is a contiguous run of objects of type elementType)

```
                                     [SETQ elementType (EVAL `(fetch (%, arrayType ELEMENTTYPE) of T]
                                     (RETURN `(MESASETQ %, (CONS 'FMESAELT eltArgs)
                                                      %, newValue %, elementType])
)

(PUTPROPS MESASIZE ARGNAMES (recordName))

(PUTPROPS MESASETQ ARGNAMES (a b type))

(PUTPROPS MESAEQUAL ARGNAMES (a b type))

(PUTPROPS FMESAELT ARGNAMES (array arrayType index1 |...| indexn))

(PUTPROPS MESAELT ARGNAMES (array arrayType index1 |...| indexn))

(PUTPROPS MESASETA ARGNAMES (array arrayType index1 |...| indexn newValue))
```

(* * Private stuff)

```
(RPAQ? \MESATYPES (HASHARRAY 20))

(pushnew CLISPRECORDTYPES 'MESATYPE)

(pushnew CLISPRECORDTYPES 'MESARECORD)

(pushnew CLISPRECORDTYPES 'MESAARRAY)

(MOVD 'RECORD 'MESATYPE)

(MOVD 'RECORD 'MESARECORD)

(MOVD 'RECORD 'MESAARRAY)

(PUTPROPS MESATYPE USERRECORDTYPE MESATYPEFN)

(PUTPROPS MESARECORD USERRECORDTYPE MESARECORDFN)

(PUTPROPS MESAARRAY USERRECORDTYPE MESAARRAYFN)

(DEFINEQ
```

(MESATYPEFN

```
  [LAMBDA (typeDecl)                                        (* hts%: "24-Mar-84 19:46")
    (PROG ((typeName (CADR typeDecl))
           (isType (CADDR typeDecl))
           (rest (CDDDR typeDecl)))
          (RETURN (NCONC (LIST 'MESARECORD typeName (LIST (CONS 'DATA isType)))
                         rest])
```

(MESARECORDFN

```
  [LAMBDA (recordDecl)                                      (* edited%: "31-Mar-84 16:34")
                                                            (* Translates a MESARECORD declaration into a
                                                            BLOCKRECORD.)
```

(* For each multi-word (gt 2) field, creates a special fetch method that returns a pointer to the beginning of the field, and a replace method that uses \BLT to copy over the entire field. This is done by replacing the fieldname with fieldnameSTARTOFTHISFIELD and making the fetch method for fieldname be a LOCF on fieldnameSTARTOFTHISFIELD)

(* Note that a field can be declared to be a multi-word field by saying either
(fieldname N WORD) or (fieldname mumble)%, where mumble is a previously defined MESARECORD.)

```
        (* Also includes a CREATE method for the type. if the user has not already done so.
        (Uses \ALLOCBLOCK. The messy-looking arithmetic is because MESASIZE returns the size of a record in words, and
        \ALLOCBLOCK's arg specifies the %# of pointer cells (2 words each) to allocate))

    (PROG ((recordName (CADR recordDecl))
           (fieldDeclarations (CADDR recordDecl))
           (subblocks (CONS))
           (rest (CDDDR recordDecl)))
          (RETURN (PROG1 (NCONC [LIST 'BLOCKRECORD recordName (NCONC (MesaRecordFields fieldDeclarations)
                                                                     (LIST '(THISISTHELASTFIELD WORD]
                                 (CAR subblocks)
                                 (MesaRecordCreateMethod recordName rest)
                                 rest)
                         (PUTHASH recordName T \MESATYPES)          (* Record that recordName is a new MESARECORD)
                         )])
```

(MesaRecordFields

```
  [LAMBDA (fieldDeclarations)                                       (* hts%: "29-Mar-84 18:04")
    (for field in fieldDeclarations collect (if [AND (CAR field)
                                                     (OR (GETHASH (CADR field)
                                                                  \MESATYPES)
                                                         (AND (EQ (CADDR field)
                                                                  'WORD)
                                                              (FIXP (CADR field))
                                                              (IGREATERP (CADR field)
                                                                         2]
                                                then (TCONC subblocks (MesaRecordSubblock recordName field))
                                                     (LIST (PACK* (CAR field)
                                                                  'STARTOFTHISFIELD)
                                                           [OR (FIXP (CADR field))
                                                               (EVAL `(MESASIZE %, (CADR field]
                                                           'WORD)
                                                else field])
```

(MesaRecordSubblock

```
  [LAMBDA (recordName fieldDeclaration)                             (* hts%: "29-Mar-84 18:05")
                                                                    (* Returns the appropriate accessfn declaration to make
                                                                    fieldDeclaration a multi-word subblock.)

    (PROG ((fieldName (CAR fieldDeclaration))
           (fieldSize (CADR fieldDeclaration)))
          [OR (FIXP fieldSize)
              (SETQ fieldSize (EVAL `(MESASIZE %, fieldSize]
          (RETURN (LIST 'ACCESSFNS (LIST fieldName (LIST 'LOCF (LIST 'fetch (LIST recordName (PACK* fieldName
                                                                                                   ,
                                                                                                STARTOFTHISFIELD
                                                                                                   ))
                                                                                'of
                                                                                'DATUM))
                                                   (LIST 'PROGN (LIST '\BLT (LIST 'fetch (LIST recordName fieldName)
                                                                                  'of
                                                                                  'DATUM)
                                                                      'NEWVALUE fieldSize)
                                                         'NEWVALUE])
```

(MesaRecordCreateMethod

```
  [LAMBDA (recordName rest)                                         (* edited%: "31-Mar-84 16:31")

        (* Returns a create method for the type, if the user has not already done so.)

    (if (for thing in rest thereis (EQ 'CREATE (CAR thing)))
        then NIL
      else (LIST `(CREATE (\ALLOCBLOCK (LRSH (ADD1 (MESASIZE %, recordName))
                                             1])
```

(MESAARRAYFN

```
  [LAMBDA (arrayDecl)                                               (* hts%: "18-Apr-84 14:21")
    (PROG ((arrayName (CADR arrayDecl))
           (indexDeclarations (CADDR arrayDecl))
           (elementType (CADDDR arrayDecl))
           (rest (CDDDDR arrayDecl))
           arrayOffsets)
          [SETQ indexDeclarations (for indexDecl in indexDeclarations collect (CONS (EVAL (CAR indexDecl))
                                                                                    (EVAL (CADR indexDecl]
                                                                    (* Evaluate arraybounds so that they can be expressions rather
     than integers.)
          (SETQ arrayOffsets (MesaArrayOffsets indexDeclarations elementType))
          (RETURN (APPEND `[MESARECORD %, arrayName ((DATA %, (MesaArrayFindOffset indexDeclarations arrayOffsets
                                                                                   elementType)
                                                              WORD))
                                                    (ACCESSFNS ((INDEXLIST (QUOTE %, indexDeclarations))
                                                                (OFFSETLIST (QUOTE %, arrayOffsets))
                                                                (ELEMENTTYPE (QUOTE %, elementType]
```

```
                          rest])
```

(MesaArrayOffsets

```
  [LAMBDA (indexDeclarations elementType)                    (* hts%: "24-Mar-84 20:15")
    (if (NULL indexDeclarations)
        then NIL
      else (PROG ((restOfOffsets (MesaArrayOffsets (CDR indexDeclarations)
                                                   elementType)))
                 (RETURN (CONS (MesaArrayFindOffset (CDR indexDeclarations)
                                                    restOfOffsets elementType)
                               restOfOffsets])
```

(MesaArrayFindOffset

```
  [LAMBDA (indexDeclarations arrayOffsets elementType)       (* hts%: "18-Apr-84 14:29")
    (if indexDeclarations
        then (ITIMES (ADD1 (IDIFFERENCE (CDAR indexDeclarations)
                                        (CAAR indexDeclarations)))
                     (CAR arrayOffsets))
      else (EVAL `(MESASIZE %, elementType])
```

(RemoveLast

```
  [LAMBDA (list)                                             (* hts%: "26-Mar-84 00:04")
    (PROG ((newList (COPY list))
           length)
          (SETQ length (LENGTH newList))
          (if (ILEQ length 1)
              then (RETURN NIL)
            else (RPLACD (FNTH newList (SUB1 length)))
                 (RETURN newList])

)

(PUTPROPS MESATYPES COPYRIGHT ("Venue & Xerox Corporation" 1984 1990))
```

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