Mu Reference

mu version *0.0.24*

Type keywords and aliases

supertype	*T*, *object*
bool	`()`, `:nil` is false, otherwise true
condition	*keyword*, see ***Exceptions***
list	*cons* or `()`, `:nil`
frame	see ***Frames***
string	*char vector*
`:null`	`()`, `:nil`
`:asyncid`	async future id
`:char`	*char*
`:cons`	*cons*
`:fixnum`	*fix*, *fixnum*, 56 bit signed integer
`:float`	*float*, *fl*, 32 bit IEEE float
`:func`	*fn*, a function
`:keyword`	*keyword symbol*
`:map`	*map* object
`:stream`	*stream*, file or string type
`:struct`	*struct*
`:symbol`	*sym*, *symbol*
`:vector`	simple *vector*, *string* (`:char`) `:t :byte :fixnum :float`

Heap

hp-info *vector*, heap static information
`#(:t type pages pagesize)`

hp-stat *vector*, heap allocations
`#(:t :type size total free ...)`

hp-size *T* *fixnum*, heap occupancy in bytes

Frame

frame binding: `(fn . #(:t …))`

frames *list*, active *frame binding* list
fr-pop *fn* *fn*, pop *function's* top frame binding
fr-push *frame* *cons*, push frame binding
fr-ref *fix fix* *T*, frame id, offset

Struct

make-st *keyword list*
struct, *of* type *keyword* from list
st-type *struct* *keyword*, struct type keyword
st-vec *struct* *vector*, of struct members

Symbol

boundp *sym* *bool*, is *symbol* bound?
keyword *string*
keyword from *string*
make-sy *string* *sym*, uninterned *symbol*
sy-ns *sym* *ns*, symbol namespace
sy-name *sym* *string*, symbol name binding
sy-val *sym* *T*, value binding

Special Forms

:async *fn . List* `:asyncid`, create future context
:lambda *list . list'*
function, anonymous
:quote *form* *list*, quoted form
:if *form fn' fn"* *T*, conditional

Core

apply *fn list* *T*, apply *function* to *list*
eval *form* *T*, evaluate *form*
eq *T T'* *bool*, *are T* and *T'* identical?
type-of *T* *keyword*

***await**`:async` *T*, return value of async future
***abort**`:async` *T*, abort future

compile *form* *T*, library form compiler
view *form* *vector*, vector of object

repr *bool T* *T*, tag representation conversion: if *bool* is (), return 8 byte vector of argument tag bits, otherwise convert argument byte vector to tag

fix *fn form* *T*, fixpoint of *function* on *form*
gc *bool*, garbage collection
exit *fix* *exit process with return code*

Fixnum

fx-mul *fix fix'* *fixnum*, product
fx-add *fix fix'* *fixnum*, sum
fx-sub *fix fix'* *fixnum*, difference
fx-lt *fix fix'* *bool*, *fix < fix'*
fx-div *fix fix'* *fixnum*, quotient
logand *fix fix'* *fixnum*, bitwise *and*
logor *fix fix'* *fixnum*, bitwise *or*

Float

fl-mul *fl fl'* *float*, product
fl-add *fl fl'* *float*, sum
fl-sub *fl fl'* *float*, difference
fl-lt *fl fl'* *bool*, *fl < fl'*
fl-div *fl fl'* *float*, quotient

Conses and Lists

%append *list T* *list*, append
car *list* *list*, head of *list*
cdr *list* *T*, tail of *list*
cons *form form'* *cons*, (*form . form'*)
length *list* *fixnum*, length of *list*
nth *fix list* *T*, nth *car* of *list*
nthcdr *fix list* *T*, nth *cdr* of *list*

Vector

make-sv *keyword list*
vector, typed vector of list
sv-len *vector* *fixnum*, length of *vector*
sv-ref *vector fix* *T*, *n*th element
sv-type *vector* *keyword*, type of *vector*

Map

make-mp *map*, make a new map

mp-add *map T T'*
map, add pair to map
mp-get *map T* *T*, reference map
mp-has *map T* *bool*, is key resident?
mp-size *map* *fixnum*, size of map
mp-list *map* *cons*, map contents

Exception

with-ex *fn fn'* *T*, catch exception
fn - `(:lambda (obj cond src) . body)`
fn' - `(:lambda () . body)`

raise *T keyword*
raise exception with *condition*:

```
:arity  :eof    :open   :read
:write  :error  :syntax :type
:div0   :stream :range  :except
:ns     :over   :under  :unbound
```

Stream

std-in *symbol,* standard input *stream*
std-out *symbol,* standard output *stream*
err-out *symbol,* standard error *stream*

open `type direction` *string*
stream, open *stream*
`type      - :file  :string`
`direction - :input :output`

close *stream* *bool,* close *stream*
openp *stream* *bool,* is *stream* open?
eof *stream* *bool,* is *stream* at end of file?
flush *stream* *bool,* flush output steam
get-str *stream* *string,* from *string stream*

rd-byte *stream bool T*
byte, read *byte* from *stream,*
bool: error on eof, *T:* eof value
rd-char *stream bool T*
char, read *char* from *stream,*
bool: error on `eof`, *T:* `eof` value
un-char *char stream*
char, push *char* onto *stream*

wr-byte *byte stream*
byte, write *byte* to *stream*
wr-char *char stream*
char, write *char* to *stream*

System

real-tm *T* *fixnum*, system clock secs
run-us *T* *fixnum*, process time *µs*

namespaces

make-ns *keyword*
keyword, make namespace
untern *keyword string*
symbol, intern unbound symbol
intern *keyword string value*
symbol, intern bound symbol
ns-find *keyword string*
symbol, map *string* to *symbol*
ns-syms *keyword*
list, namespace's symbols

Reader/Printer

read *stream bool T*
T, read stream object
write *T bool stream*
T, write escaped object

mu library API

```
[dependencies]
mu = { git =
"https://github.com/Software-Knife-and-Tool/thorn.git",
branch=main }

use mu::{Condition, Config, Exception,
         Mu, Result, System, Tag}

config string format: "npages:N,gcmode:GCMODE"
GCMODE - { none, auto, demand }

const Mu::VERSION: &str
Mu::new(config: &Config)-> Mu
Mu::config(config: String) -> Option<Config>
Mu::apply(&self, func: Tag, args: Tag)-> Result
Mu::eq(&self, func: Tag, args: Tag) -> Result
Mu::eval(&self, expr: Tag) -> Result
Mu::compile(&self, form: Tag) -> Result
Mu::read(&self, stream: Tag, eofp: bool, value: Tag) -> Result
Mu::write(&self, form: Tag, esc: bool, stream: Tag) -> Result
Mu::get_string(&self, stream: Tag) -> Result
Mu::write_string(&self, str: String, stream: Tag) -> Result
Mu::from_u64(&self, tag: u64) -> Tag
Mu::as_u64(&self, tag: Tag) -> u64
Mu::std_in(&self) -> Tag
Mu::std_out(&self) -> Tag
Mu::err_out(&self) -> Tag

System::new(config: &Config)-> System
System::config(config: String) -> Option<Config>
System::mu(&self)-> &Mu
System::eval(&self, expr: &String) -> Result
System::error(&self, ex: Exception) -> String
System::read(&self, string: String) -> Result
System::write(&self, expr: Tag, escape: bool) -> String
System::load(&self, file_path: &String) -> Result
```

Reader Syntax

`;`	comment to end of line
`#|...|#`	block comment
`'`*form*	quoted form
`` `form ``	backquoted form
`` `(...) ``	backquoted list (proper lists only)
`,form`	eval backquoted form
`,@form`	eval-splice backquoted form
`(...)`	constant *list*
`()`	empty *list*, prints as `:nil`
`(... . .)`	dotted *list*
`"..."`	*string, char vector*
`\`	single escape in strings
`#x`	hexadecimal *fixnum*
`#\c`	*char*
`#(:type ...)`	*vector*
`#s(:type ...)`	*struct*
`#:symbol`	uninterned *symbol*
`"`` ,; `	terminating macro char
`#`	non-terminating macro char

`!$%&*+-.`
 `<>=?@[]|`
 `:^_{}~/`
 `A..Za..z`
 `0..9`
	symbol constituents

`0x09 #\tab`
 `0x0a #\linefeed`
 `0x0c #\page`
 `0x0d #\return`
 `0x20 #\space`
	whitespace

Runtime

```
mu-local: x.y.z: [-h?pvcelq] [file…]

?: usage message
h: usage message
c: [name:value,…]
e: eval [form] and print result
l: load [path]
p: pipe mode (no repl)
q: eval [form] quietly
v: print version and exit
```