Mu Reference

mu version *0.0.26*

Type keywords and aliases

supertype	*T*	
bool	`()`, `:nil` are false, otherwise true	
condition	*keyword,* see ***Exception***	
list	*cons* or `()`, `:nil`	
frame	*cons*, see ***Frame***	
`:null`	`()`, `:nil`	
`:asyncid`	*async*	async future id
`:char`	*char*	
`:cons`	*cons*	
`:fixnum`	*fixnum, fix*	56 bit signed integer
`:float`	*float, fl*	32 bit IEEE float
`:func`	*function, fn*	function
`:keyword`	*keyword, key*	*symbol*
`:map`	*map*	*key/value* hash
`:stream`	*stream*	file or string type
`:struct`	*struct*	typed vector
`:symbol`	*symbol, sym*	LISP-1 symbol
`:vector`	*vector, string, str*	

`:char :t :byte :fixnum :float`

Heap *p*

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 *e*

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 *t*

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

Symbol *l*

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

Special Form *s*

:async *fn . list*	*async*	create *future* context
:lambda *list . list'*		
	function	anonymous function
:quote *form*	*list*	quoted form
:if *form T T'*	*T*	conditional

Core *e*

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*	*mu* form compiler
view *form*	*vector*	vector of object
repr *bool T*	*T*	tag representation conversion: if *bool* is (), return 8 byte *fixnum* vector of argument tag bits, otherwise convert argument byte vector to tag
fix *fn form*	*T*	fixpoint of *function* on *form*
gc *bool*	*bool*	garbage collection, verbose
exit *fix*		exit process with return code

Fixnum *m*

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
ash *fix fix'*	*fixnum*	arithmetic shift
logand *fix fix'*	*fixnum*	bitwise and
logor *fix fix'*	*fixnum*	bitwise or

Float *t*

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/Lists *s*

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

Vector *r*

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

Map *p*

make-mp *list* *map* *map* from assoc *list*

mp-ref *map T* *T* reference *map*
mp-has *map T* *bool* is key resident?
mp-size *map* *fixnum* size of *map*
mp-list *map* *list* *map* contents

Exception *n*

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*, error on eof, *T:* eof value

rd-char *stream bool T*
char — read *char* from *stream*, 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 *m*

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

Namespace

make-ns *key* *key* — make namespace
ns-map *list* — list of mapped namespaces
untern *key string*
symbol — intern unbound symbol
intern *key string value*
symbol — intern bound symbol
ns-find *key string*
symbol — map *string* to *symbol*
ns-syms `type` *key*
T — namespace's *symbols*
`type - :list :vector`

Reader/Printer *r*

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

Mu library API *l*

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

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
```