Mu Reference *e*

version *0.2.8*

type keywords and aliases *s*

supertype	*T*	
bool	`()`, `:nil` are false, otherwise true	
condition	*keyword,* see ***Exception***	
list	`:cons` or `()`, `:nil`	
`:null`	`()`, `:nil`	
`: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
`:ns`	*namespace, ns*	namespace
`:stream`	*stream*	file or string type
`:struct`	*struct*	typed vector
`:symbol`	*symbol, sym*	LISP-1 symbol
`:vector`	*vector, string, str*	

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

Features *l*

```
[dependencies]
default = [ "env", "mu", "std", "nix", "sysinfo" ]
```

%mu	**core**	*list*	core state
	delay	*fixnum*	microseconds
	process-mem-virt	*fixnum*	virtual memory
	process-mem-res	*fixnum*	reserve
	process-time	*fixnum*	microseconds
	time-units-per-sec	*fixnum*	
%env	**heap-room**	*vector*	allocations
	`#(:t :type size total free …)`		
	heap-info	*list*	heap info
	`(type page-size npages)`		
	heap-size *keyword*	*fixnum*	type size
	heap-free	*fixnum*	bytes free
	env	*list*	env state
%**nix**	**uname**		
%**std**	**command**, **exit**		
%**sysinfo**	**sysinfo** (disabled on macOS)		
%**prof**	**prof-control**		toggle enable

configuration API *z*

```
config string format:

"npages:N, gc-mode:GCMODE, page-size:N, heap-type:HEAPTYPE"

  N: unsigned integer
  GCMODE: none | auto | demand
  HEAPTYPE: semispace | bump    // needs semispace feature
```

Special Forms *s*

:lambda *list . list'*	*function*	anonymous *function*
:quote *form*	*list*	quoted form
:if *T T' T"*	*T*	conditional

Reader/Printer *s*

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

Core *s*

null/	*ns*	null namespace
apply *fn list*	*T*	apply *fn* to *list*
eval *form*	*T*	evaluate *form*
eq *T T'*	*bool*	*T* and *T'* identical?
type-of *T*	*key*	type keyword
compile *form*	*T*	*mu* form compiler
view *form*	*vector*	vector of object
%if *fn fn' fn"*	*bool*	**:if** implementation
repr *T*	*vector*	tag representation
unrepr *vector*	*T*	tag representation

vector is an 8 element `:byte` vector of little-endian argument tag bits.

fix *fn T*	*T*	fixpoint of *fn*
gc	*bool*	garbage collection

Frames *e*

%frame-stack	*list*	active *frame*s
%frame-pop *fn*	*fn*	pop *function's* top frame binding
%frame-push *frame*	*cons*	push frame
%frame-ref *fn fix*	*T*	*function*, offset

Symbols *l*

boundp *symbol*	*bool*	is *symbol* bound?
make-symbol *string*	*symbol*	uninterned *symbol*
symbol-name *symbol*	*string*	name binding
symbol-value *symbol*	*T*	value binding

Fixnums *m*

mul *fix fix'*	*fixnum*	product
add *fix fix'*	*fixnum*	sum
sub *fix fix'*	*fixnum*	difference
less-than *fix fix'*	*bool*	*fix < fix'?*
div *fix fix'*	*fixnum*	quotient
ash *fix fix'*	*fixnum*	arithmetic shift
logand *fix fix'*	*fixnum*	bitwise and
logor *fix fix'*	*fixnum*	bitwise or
lognot *fix*	*fixnum*	bitwise complement

Floats *t*

fmul *fl fl'*	*float*	product
fadd *fl fl'*	*float*	sum
fsub *fl fl'*	*float*	difference
fless-than *fl fl'*	*bool*	*fl < fl'?*
fdiv *fl fl'*	*float*	quotient

Conses/Lists *s*

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

Vectors *s*

make-vector *key list*	*vector*	specialized vector from list
vector-length *vector*	*fixnum*	length of *vector*
vector-type *vector*	*key*	type of *vector*
svref *vector fix*	*T*	*n*th element

Streams *n*

standard-input *stream* std input *stream*
standard-output *stream* std output *stream*
error-output *stream* std error *stream*

open `type dir` *string bool*
stream open *stream,* raise error if *bool*

type	`:file`	`:string`	
dir	`:input`	`:output`	`:bidir`

close *stream* *bool* close *stream*
openp *stream* *bool* is *stream* open?

flush *stream* *bool* flush output *steam*
get-string *stream* *string* from *string stream*

read-byte *stream bool T*
byte read *byte* from *stream,* error on eof, *T:* eof-value

read-char *stream bool T*
char read *char* from *stream,* error on `eof`, *T:* `eof`-value

unread-char *char stream*
char push *char* onto *stream*

write-byte *byte stream byte* write *byte* to *stream*
write-char *char stream*
char write *byte* to *stream*

Namespaces *.*

make-namespace *str* *ns* make *namespace*
namespace-map *list* list of mapped *namespaces*
namespace-name *ns* *string* *namespace* name
intern *ns str value* *symbol* intern bound symbol
find-namespace *str* *ns* map *string* to *namespace*
find *ns string* *symbol* map *string* to *symbol*
namespace-symbols *ns list* *namespace symbols*

Exceptions *n*

with-exception *fn fn' T* catch exception

fn - `(:lambda (obj cond src) . body)`
fn' - `(:lambda () . body)`

raise *T keyword* raise exception on *T* with

condition:

`:arity`	`:div0`	`:eof`	`:error`	`:except`
`:future`	`:ns`	`:open`	`:over`	`:quasi`
`:range`	`:read`	`:exit`	`:signal`	`:stream`
`:syntax`	`:syscall`	`:type`	`:unbound`	`:under`
`:write`	`:storage`			

Structs *t*

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

mu library API *I*

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

use mu::{ Condition, Config, Env, Exception, Core, Mu, Result,
Tag };

impl Mu {
  const VERSION: &str

  fn config(_: Option<String>) → Option<Config>
  fn make_env(_: &Config) → Env
  fn apply(_: &Env, _: Tag, _: Tag) → Result<Tag>
  fn compile(_: &Env, _: Tag) → Result<Tag>
  fn eq(_: Tag, _: Tag) → bool;
  fn exception_string(_: &Env, _: Exception) → String
  fn eval(_: &Env, _: Tag) → Result<Tag>
  fn eval_str(_: &Env, _: &str) → Result<Tag>
  fn load(_: &Env, _: &str) → Result<bool>
  fn read(_: &Env, _: Tag, _: bool, _: Tag) → Result<Tag>
  fn read_str(_: &Env, _: &str) → Result<Tag>
  fn core() → &Core
  fn err_out() → Tag
  fn std_in() → Tag
  fn std_out() → Tag
  fn write(_: &Env, _: Tag, _: bool, _: Tag) → Result<()>
  fn write_str(_: &Env, _: &str, _: Tag) → Result<()>
  fn write_to_string(_: &Env, _: Tag, _: bool) → String
}
```

Reader Syntax *x*

`;`	comment to end of line
`#|...|#`	block comment
‘*form*	quoted form
`*form*	backquoted form
`` `(…) ``	backquoted list (proper lists)
,*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
#*…	bit vector
#x…	hexadecimal *fixnum*
#.	read-time eval
#\.	*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	

mu-sys *.*

mu-sys: 0.0.2: [celq] [file…]

c: name:value,…	runtime configuration
e: form	eval and print result
l: path	load from path
q: form	eval quietly