03 · SystemVerilog Data Types & Procedural Code

TutorialHub cheat sheet

Basic types

Type	States	Bits	Signed
`logic`	4	1	no
`bit`	2	1	no
`byte`	2	8	yes
`shortint / int / longint`	2	16/32/64	yes
`integer`	4	32	yes
`string`, `real`, `time`	—	—	—

Sample DUT outputs into `logic`; `$isunknown(x)` before converting to `bit`. Messages: `$sformatf("%0d %h %s %0t", …)`, `$error`, `$fatal(1, …)`.

enum / struct

```
typedef enum logic [1:0] {RD, WR, IDLE}
op_e;
op.name()  op.next()  op.first()  op.num()
typedef struct packed { logic [3:0] id;
logic [7:0] a; } req_t;
req_t r = '{id: 1, a: 8'h10};
```

Containers

Kind	Declare	Size
Fixed	`int a[8];`	compile time
Dynamic	`int d[]; d = new[n];`	`d.size()`
Queue	`int q[$];`	grows
Assoc.	`int m[string];`	sparse

Queue methods

`push_back(x)` · `push_front(x)` · `pop_front()` · `pop_back()` · `insert(i,x)` · `delete(i)` · `delete()` · `size()` · `q[$]` last · `q = {}`

Associative methods

`exists(k)` · `delete(k)` · `num()` · `first(k)` · `next(k)` · `foreach (m[k])`

Array methods

Method	Result
`sum() product()`	value
`min() max() unique()`	queue
`find with (item > 3)`	queue
`find_index with (…)`	queue of index
`sort() rsort() reverse() shuffle()`	in place

Functions and tasks

	function	task
Time	no	yes
Return	value / void	outputs

Always `automatic`. `ref` = by reference · `const ref` = read-only reference · defaults `int n = 1` · named call `f(.n(3))`.

fork

Form	Parent continues
`join`	all done
`join_any`	first done
`join_none`	at once

`disable fork;` kills children · `wait fork;` waits for all. Capture loop vars: `automatic int k = i;`.

Watchdog

```
fork
  wait (done);
  begin #1ms; $fatal(1, "timeout"); end
join_any
disable fork;
```

Thread communication

Primitive	Calls
`event e`	`-> e` · `@e` · `wait(e.triggered)`
`semaphore s = new(1)`	`get(n)` · `put(n)` · `try_get(n)`
`mailbox #(T) m = new()`	`put` · `get` · `try_get` · `peek` · `num`

Remember it like this

Idea	Picture
`bit` vs `logic`	a camera that blacks out blurry photos vs one that keeps them
enum	named dial positions
struct	a form with fields
Queue	a shop line (push_back, pop_front)
Associative array	a phone book: only filled pages use space
Function / task	a calculator / an errand
`ref`	sharing a link instead of a copy
automatic	everyone gets their own notepad
join / join_any / join_none	wait for all friends / the first / nobody
Event · semaphore · mailbox	doorbell · room key · postbox