Labelled & Optional Parameters

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Labeled Parameters

Labeled Arguments

- In the core language, most functions are specified with positional arguments.
- Labeled arguments are a convenient extension to the core language.
- Can be passed in different order than one of their definitions.
    - Increases flexibility.

~label:pattern

```
# let rec range ~first:a ~last:b =
    if a > b then []
    else a :: range ~first:(succ a) ~last:b;;
val range : first:int -> last:int -> int list = <fun>

# range 3 6;;
- : int = [3;4;5;6]

# range ~first:3 ~second:6;;
- : int = [3;4;5;6]

# range ~second:6 ~first:3;;
- : int = [3;4;5;6]
```

Label punning

~f:f

```
# let find l ~f =
    let rec loop = function
      | [] -> None
      | hd :: tl -> if f hd then Some hd else loop tl
    in
    loop l;;
val find : 'a list -> f:('a -> bool) -> 'a option = <fun>

# find ~f:(fun x -> x = 3) [1;2;3];;
- : int option = Some 3
```

```
# let ratio ~num ~denom = float num /. float denom;;
val ratio : num:int -> denom:int -> float = <fun>
# let num = 3 in
  let denom = 4 in
  ratio ~num ~denom;;
- : float = 0.75
```

- When defining a function
    - with lots of arguments
    - with multiple arguments of the same type that might get confused with each other

```
val substring: string -> int -> int -> string
```

    - with flexibility on the order which arguments are passed.

```
val substring: string -> pos:int -> len: int ->
string
```

Inference of labeled args

```
# let foobar ~x ~y ~f =
    let dx = (f ~x ~y) in
    let dy = (f ~x ~y) in
    (dx, dy)
;;
val foobar : x:'a -> y:'b ->
f:(x:'a -> y:'b -> 'c) -> 'c * 'c = <fun>
```

```
f:(y:'a -> x:'b -> 'c)
```

Inference of labeled args

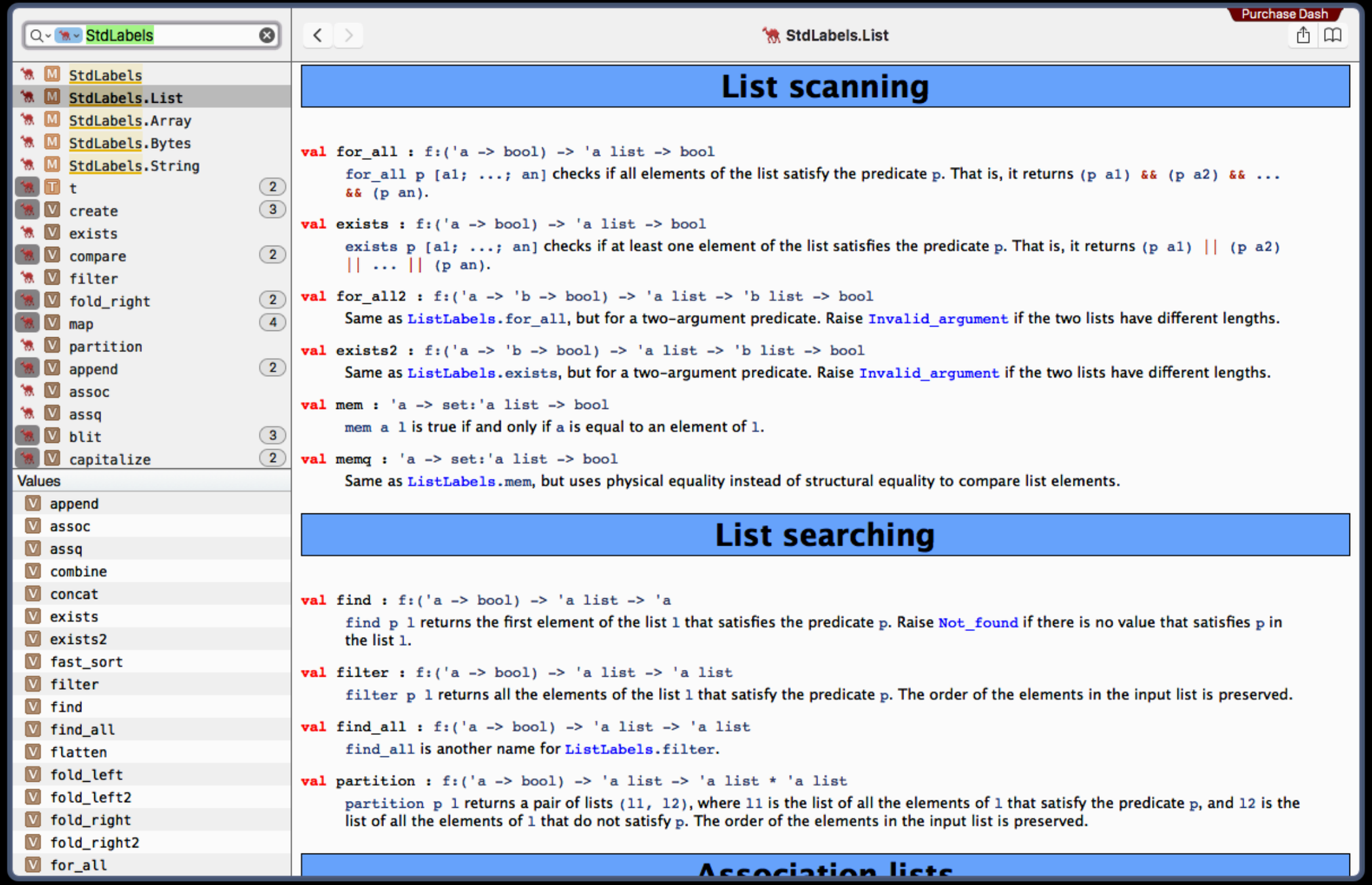
```
# let foobar ~x ~y ~f =
    let dx = (f ~x ~y) in
    let dy = (f ~y ~x) in
    (dx, dy)
;;
Error: This function is applied to arguments
in an order different from other calls.
This is only allowed when the real type is
known.
```

Inference of labeled args

```
# let foobar ~x ~y ~(f: x:'a -> y:'b -> 'c) =
    let dx = (f ~x ~y) in
    let dy = (f ~y ~x) in
    (dx, dy)
;;
val foobar : x:'a -> y:'b ->
f:(x:'a -> y:'b -> 'c) -> 'c * 'c = <fun>
```

Provide explicit type information

- By default, standard library functions are not labeled.
- The module `StdLabels` redefines some modules of the standard library with labeled versions of some functions.




```
# List.map ~f:((+) 3) [4;5;6];;

# List.fold_left ~f:(+) ~init:0 [1;2;3;4;5];;
```

Optional Parameters

Optional Parameters

- Like labelled arguments, can be provided in any order
- Specify an optional value with the syntax
- `?(label = expresion)`

```
# let rec range ?(step=1) a b =
    if a > b then []
    else a :: range ~step (a + step) b;;
val range : ?step:int -> int -> int list = <fun>


# range 1 10;;
- : int list = [1; 2; 3; 4; 5; 6; 7; 8; 9; 10]


# range 1 10 ~step:2;;
- : int list = [1; 3; 5; 7; 9]
```

- A function with option argument receives None when the caller doesn't provide the argument, and Some when it does.

```
# open Core.Std.String;;
# concat;;
- : ?sep:string -> string list -> string = <fun>

# concat [“foo”;”bar”];;
- : string = “foobar”

# concat ?sep:None [“foo”;”bar”];;
- : string = “foobar”

# let upper_concat ?sep a b = concat ?sep
(List.map (uppercase l));;
val upper_concat : ?sep:bytes -> bytes list -> bytes = <fun>
```

Optional arguments & partial application

```
# let foo ?(z = 0) x y = (x + y) > z;;
val foo : ?z:int -> int -> int -> bool = <fun>

# let bar = foo 3;;
val bar : int -> bool = <fun>

# bar 2;;
- : bool = true

# bar 2 ~z:7;;
Error: This function has type int -> bool
       It is applied to too many arguments;
       maybe you forgot a `;'.
```

```
# let foo x ?(z = 0)  y = (x + y) > z;;
val foo : int -> ?z:int -> int -> bool = <fun>

# let bar = foo 3;;
val bar : int -> bool = <fun>

# bar 2 ~z:7;;
- : bool = false
```

Reference

- Labels (https://ocaml.org/learn/tutorials/labels.html)

- Real World OCaml (Chapter 2: Functions)