

**FOUNDATION**



List

# Linked list



# Linked list



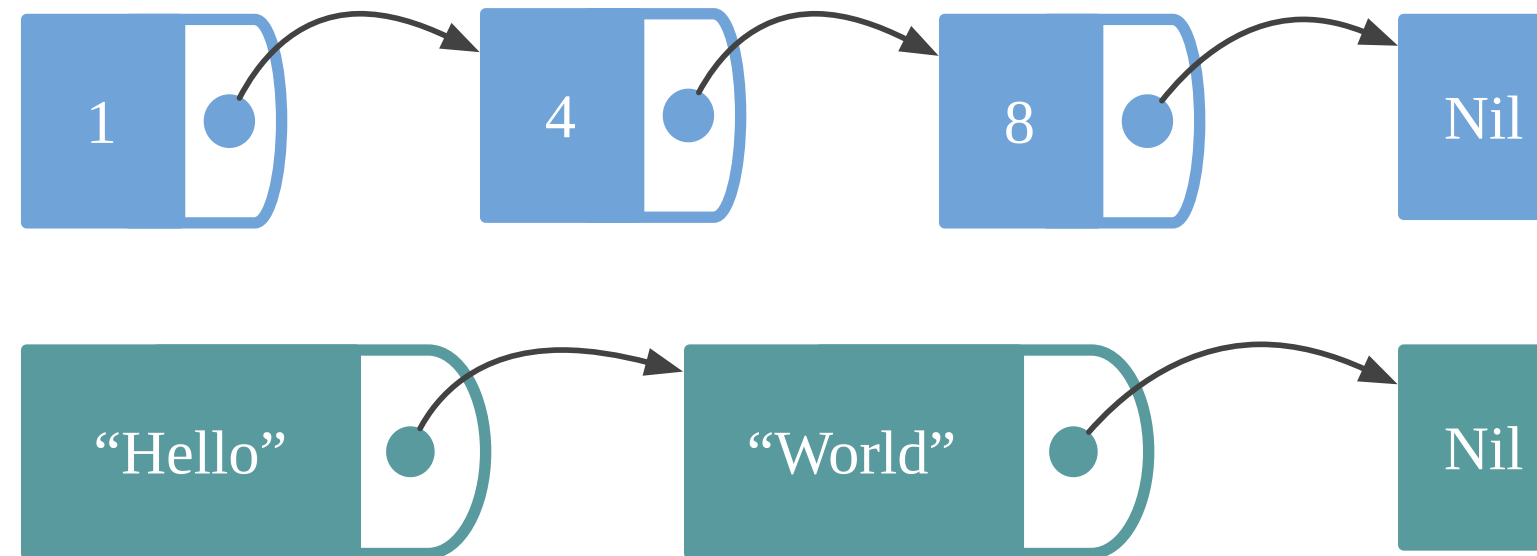
```
val words = List("Hello", "World", "!")
```

# Linked list



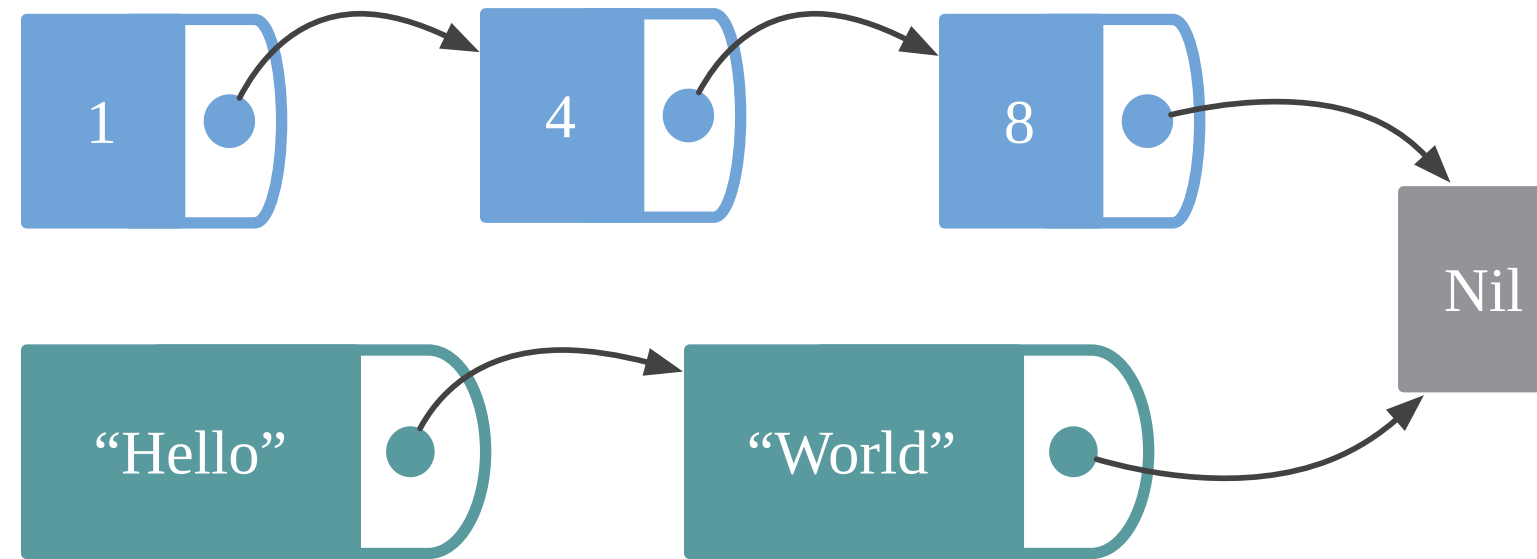
```
val words = "Hello" :: "World" :: "!" :: Nil
```

# List is a parametric type



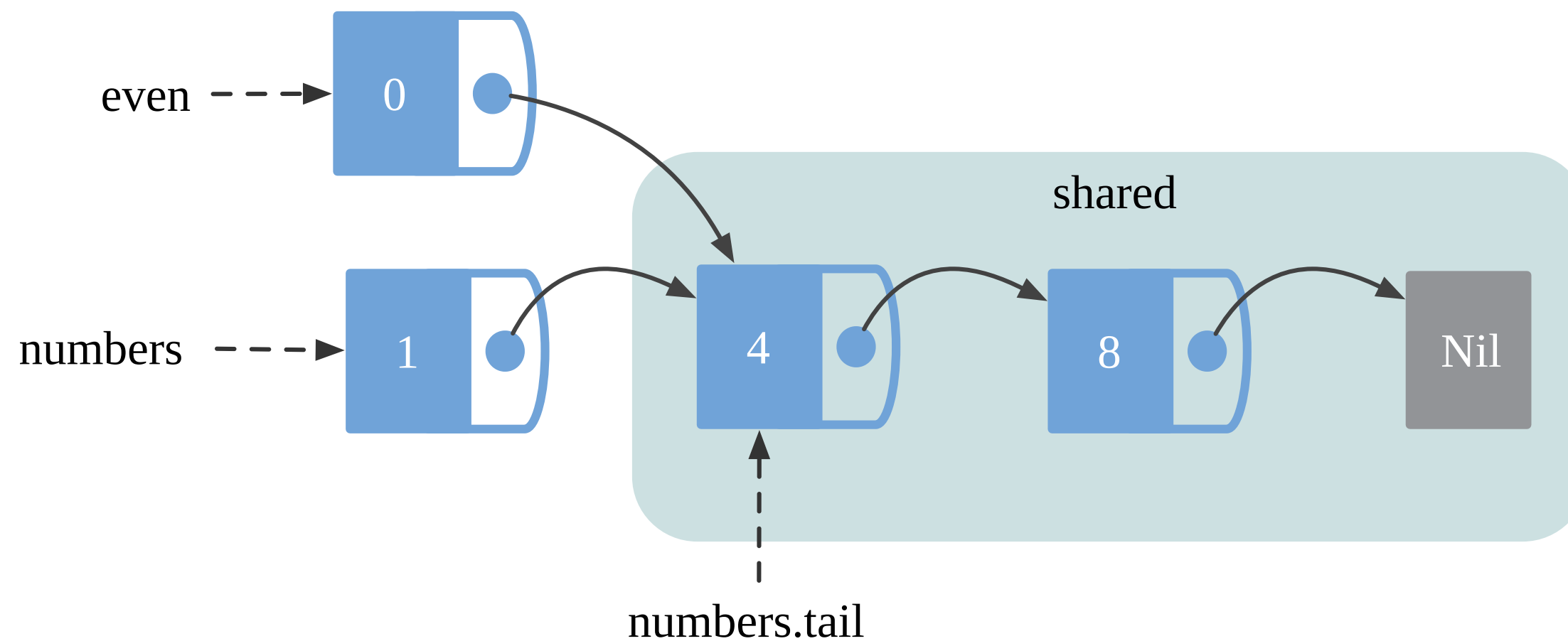
```
val numbers: List[Int]    = List(1, 4, 8)
val words   : List[String] = List("Hello", "World")
```

# Nil is a list of all types



```
val nil = Nil  
  
val numbers: List[Int]    = 1 :: 4 :: 8 :: nil  
  
val words  : List[String] = "Hello" :: "World" :: nil
```

# List is immutable

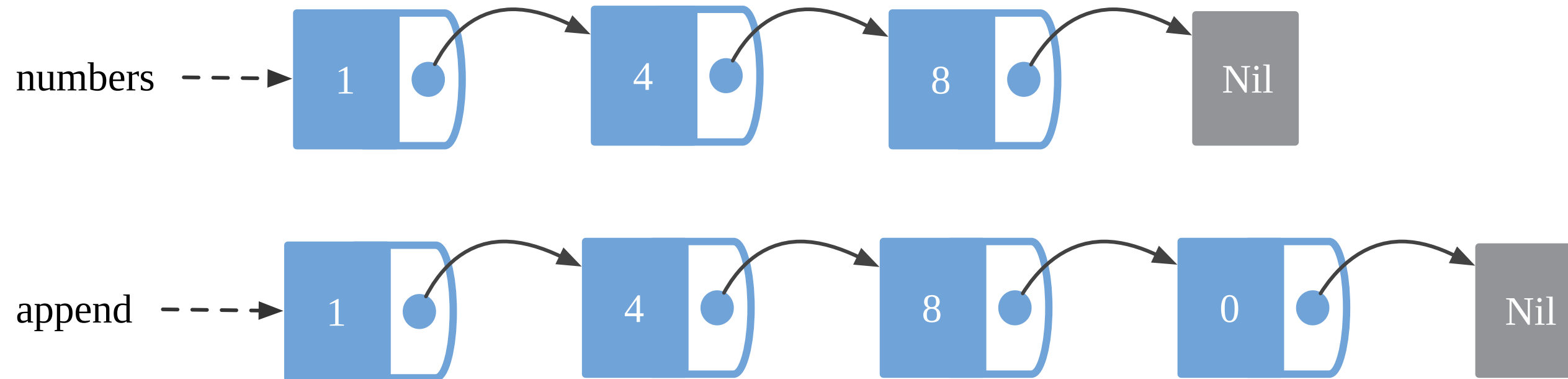


```
val numbers = 1 :: 4 :: 8 :: Nil  
// numbers: List[Int] = List(1, 4, 8)
```

```
val even = 0 :: numbers.tail  
// even: List[Int] = List(0, 4, 8)
```



# List is immutable



```
val numbers = 1 :: 4 :: 8 :: Nil  
// numbers: List[Int] = List(1, 4, 8)
```

```
val append = numbers :+ 0  
// append: List[Int] = List(1, 4, 8, 0)
```

# Persistent data structure

```
case class User(name: String, age: Int)

val users = List(User("John", 17), User("Alice", 54), User("Bob", 23))

val adults = users.filter(_.age >= 18)
```

# Persistent data structure

```
case class User(name: String, age: Int)  
  
val users = List(User("John", 17), User("Alice", 54), User("Bob", 23))  
  
val adults = users.filter(_.age >= 18)
```

```
users.length  
// res5: Int = 3
```

```
adults.length  
// res6: Int = 2
```

```
users.length != adults.length  
// res7: Boolean = true
```

Easier to test

# Concurrency

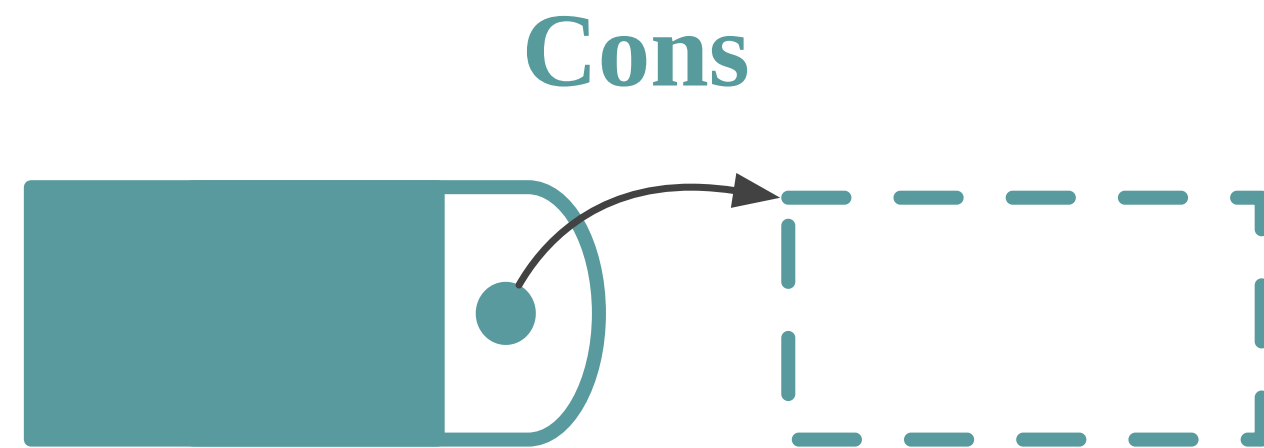


Corecursive podcast

Rust and bitter C++ developers with Jim Blandy

Why List is so popular?

# List is an enumeration

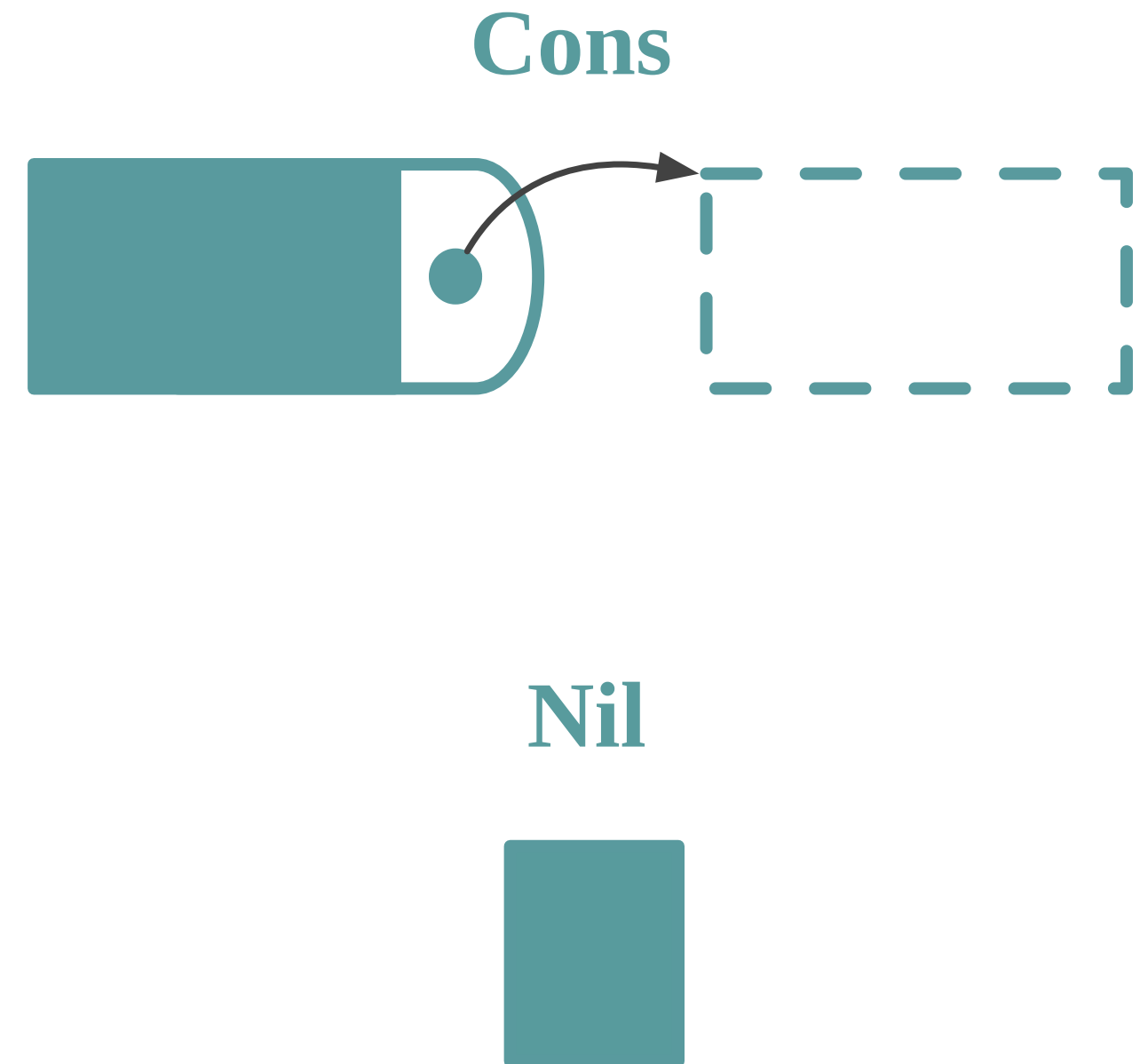


Nil



# List is an enumeration

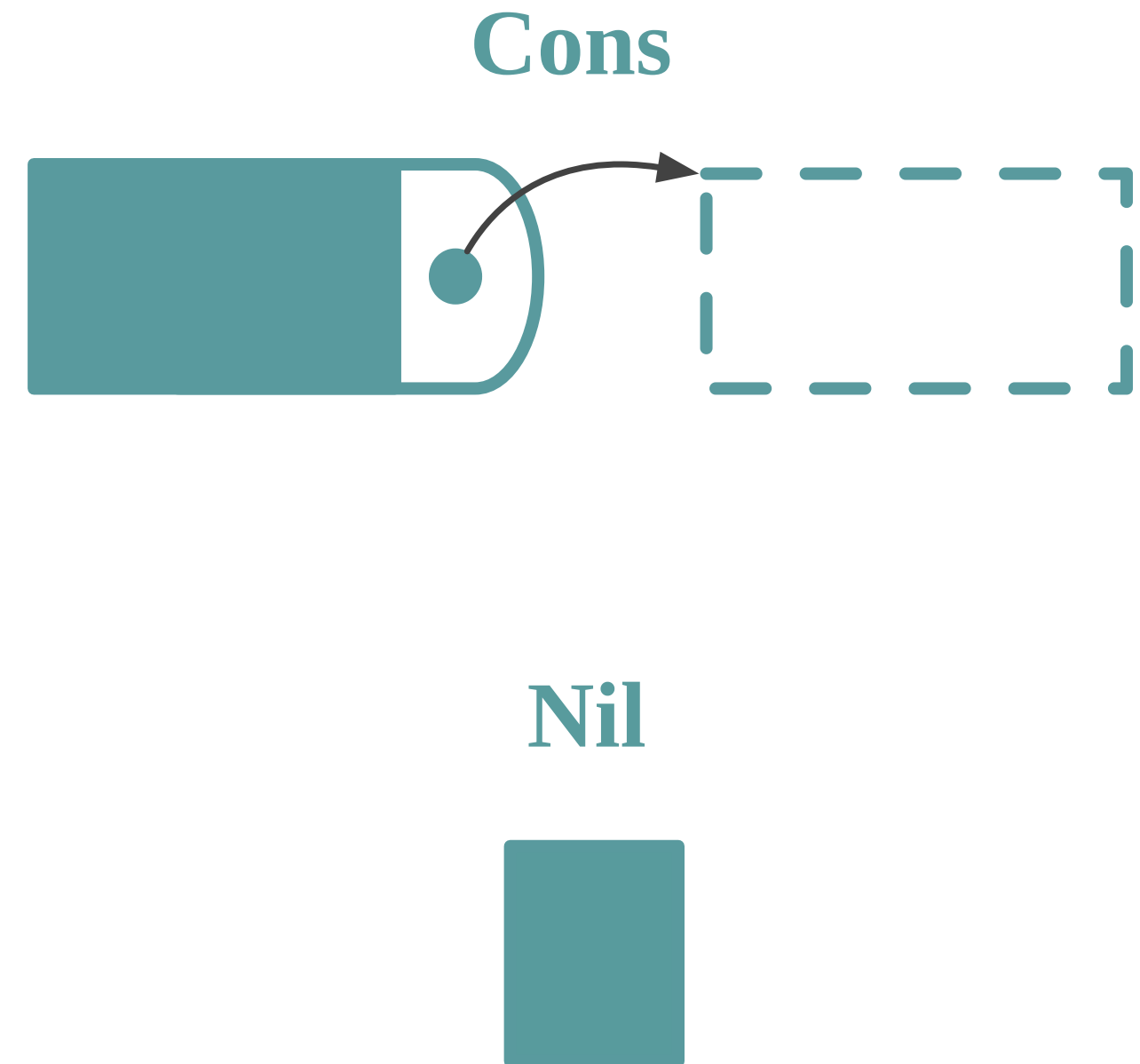
```
sealed trait List[+A]  
  
case class Cons[+A](head: A, tail: List[A])  
  extends List[A]  
  
case object Nil extends List[Nothing]
```



# List is an enumeration

```
enum List[+A] {  
  case class Cons(head: A, tail: List[A])  
  case object Nil  
}
```

In Dotty/Scala 3





# Pattern matching

```
list match {  
  case Cons(head, tail) => println("list is not empty")  
  case Nil              => println("list is empty")  
}
```

# Pattern matching

```
list match {  
  case Cons(head, tail) =>  
    tail match {  
      case Cons(second, rest) => println("list is has at least 2 elements")  
      case Nil                => println("list is has 1 element")  
    }  
  case Nil                => println("list is empty")  
}
```



# Pattern matching with infix Cons

```
list match {  
  case head :: second :: tail => println("list is has at least 2 elements")  
  case head :: tail           => println("list is has 1 element")  
  case Nil                    => println("list is empty")  
}
```

```
"Hello" :: "World" :: Nil
```

# Summary

- Extremely simple data structure
- Easy to test and safe to share
- Good for pattern matching, prepending elements, iterating
- Bad for appending elements, random access, size