



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Data-Parallel Operations I

Parallel Programming in Scala

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Parallel Collections

In Scala, most collection operations can become data-parallel.

The `.par` call converts a sequential collection to a parallel collection.

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(1 until 1000).par  
  .filter(n => n % 3 == 0)  
  .count(n => n.toString == n.toString.reverse)
```

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```

However, some operations are not parallelizable.

Non-Parallelizable Operations

Task: implement the method `sum` using the `foldLeft` method.

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def sum(xs: Array[Int]): Int
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Non-Parallelizable Operations

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  xs.par.foldLeft(0)(_ + _)  
}
```

Does this implementation execute in parallel?

Non-Parallelizable Operations

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def sum(xs: Array[Int]): Int = {  
  xs.par.foldLeft(0)(_ + _)  
}
```

Does this implementation execute in parallel?

Why not?

Non-Parallelizable Operations

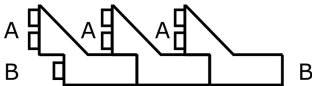
Let's examine the foldLeft signature:

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def foldLeft[B](z: B)(f: (B, A) => B): B
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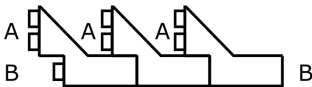
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Operations foldRight, reduceLeft, reduceRight, scanLeft and scanRight similarly must process the elements sequentially.

The fold Operation

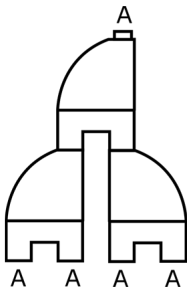
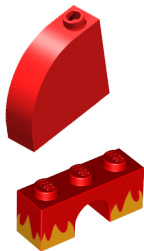
Next, let's examine the fold signature:

```
def fold(z: A)(f: (A, A) => A): A
```

The fold Operation

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```
def fold(z: A)(f: (A, A) => A): A
```



The fold operation can process the elements in a reduction tree, so it can execute in parallel.