COMPSCI 734 –Introduction to Part I

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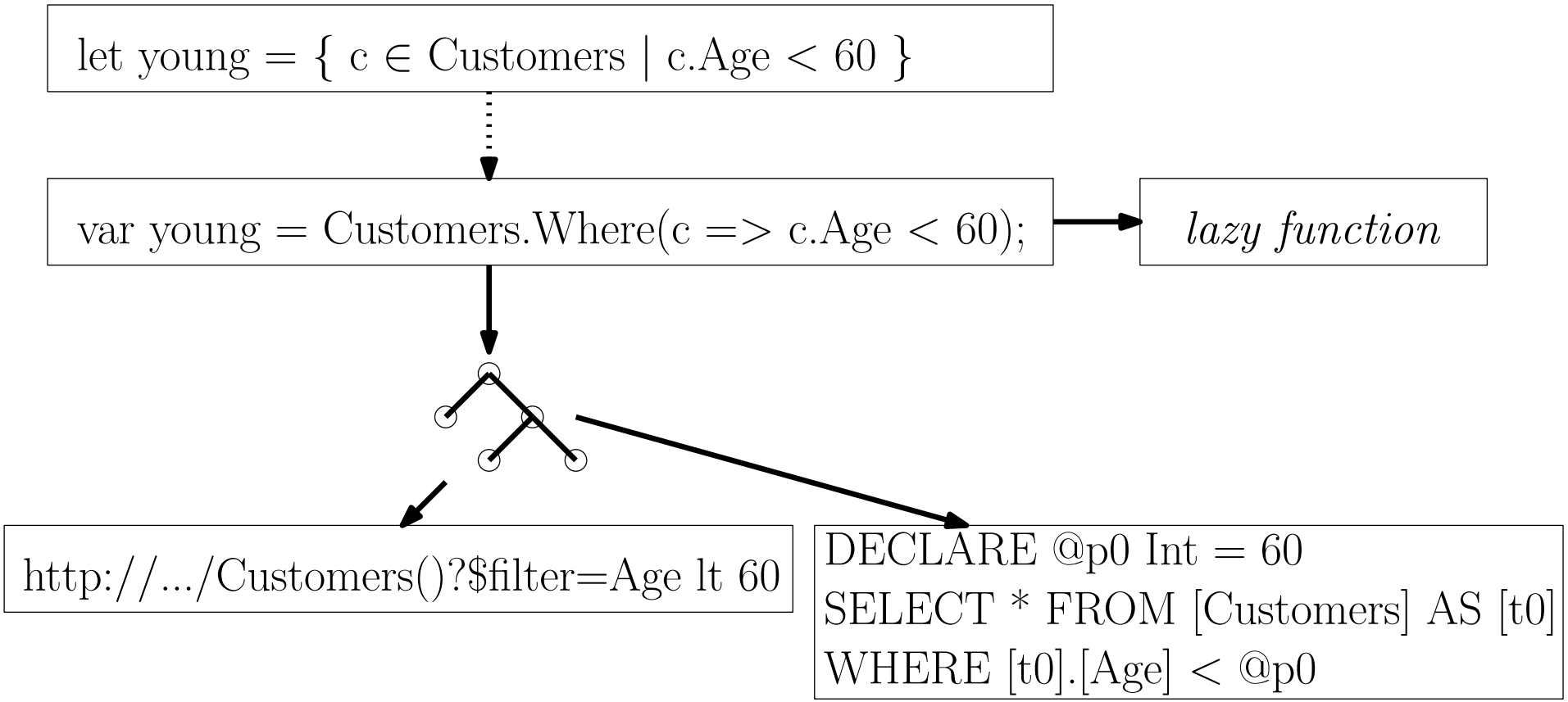
Recommended Preparation: COMPSCI 335 in a nutshell



- Tutorials? One or two?

What we may want more?

- All cores of your machine? Of a cluster? Available in the cloud?
- Automatic scaling, no explicit threads?
- Message-based communication?
- ...
- Nice models, to cover them all?
- Actor model: tasks with unbounded input queues, aka mailboxes
- CSP model: tasks with bounded input buffers, typically 0 size = rendezvous, channels

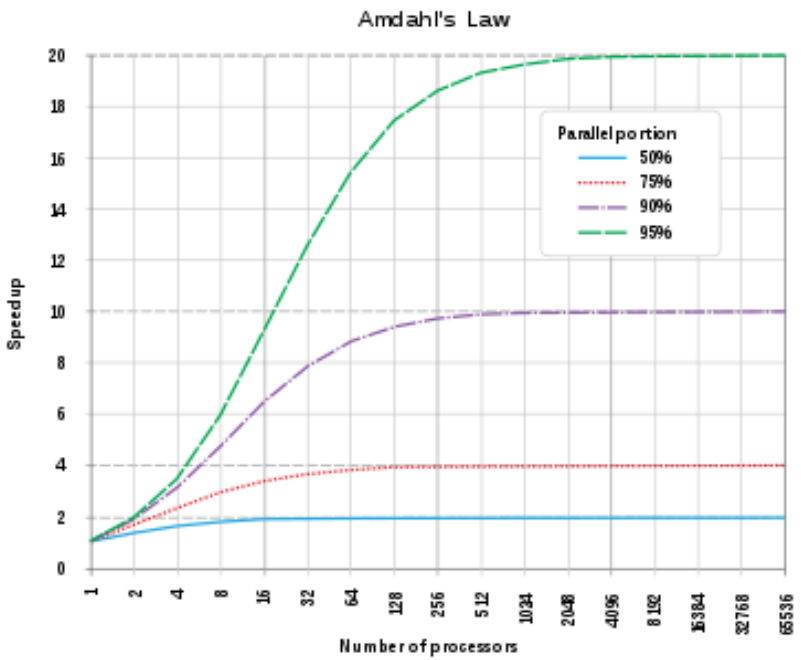
Parallel Computing

- Data Parallelism in FP

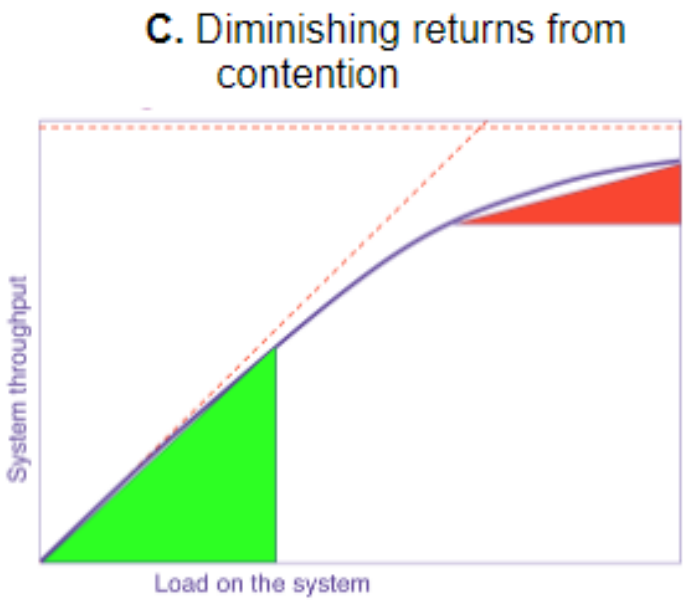
```
1 var young =
2   Customers.AsParallel().Where(c => c.Age < 60);
```

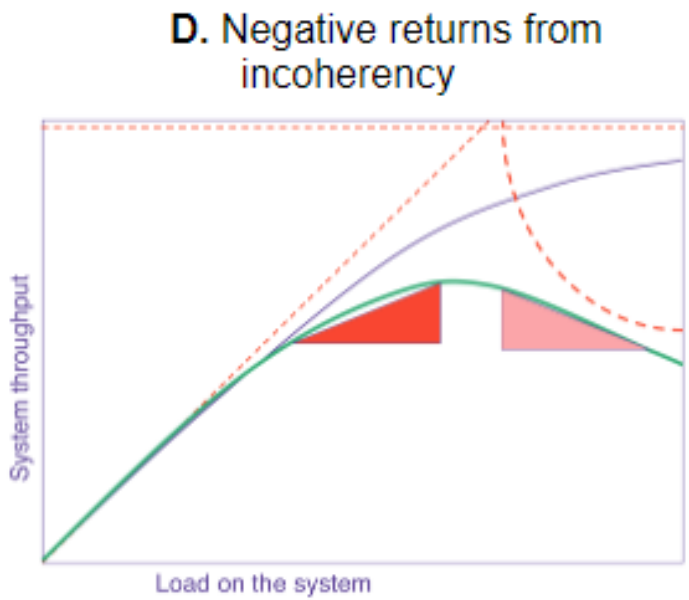
- Task Parallelism in FP
- Concurrency and communication in FP: Actors, CSP Channels
- Best Practices, Granularity / Partitioning, (False) Sharing

Parallel Limits – Amdahl



Parallel Limits – Gunther (Universal Scalability Law)





Monads – One ring to rule them all?

- Ubiquitous but hidden theoretical abstraction
- Covers: nullables, options, containers, arrays, lists, collections, virtual sequences, tasks, asyncs, actors, cloudlets, ...
- You Could Have Invented Monads!
  And Maybe You Already Have!

Basic discrete algebra – quiz

- How do you call these?

```
1  (x ⊕ y) ⊕ z = x ⊕ (y ⊕ z)   // ⊕ is associative
2  x ⊕ y = y ⊕ x               // ⊕ is commutative
3  x ⊕ e = e ⊕ x = x           // e is identity or neutral
4  x ⊕ x^-1 = x^-1 ⊕ x = e     // x^-1 is the inverse
```

Assignment #1

- Parallel experiments and evaluations based on the classical LCS (Longest Common Subsequence) algorithm
- Languages: F#, C#
- Feedback: too much, too less, ambiguities, deadlines?
- Weight: 15%
- Bonuses? JS, Python, Golang?

Miscellanea

- Software: F#, C#, extra libraries, command-line
- F# Links
  - F# for fun and profit
    `https://fsharpforfunandprofit.com/`
  - F# Foundation
    `https://fsharp.org/`
  - MSDN F# Guide
    `https://docs.microsoft.com/en-us/dotnet/fsharp/`
- Exam sample with model solution (part I)