

COMPSCI 734 – Part I - Exam Preparation Outline

1. Actors and Channels

- a. Fundamental features of the Actor model
- b. Actor model vs CSP (CML, Channels) model
- c. F# Mailbox as an implementation of the Actor model on F# asyncs
- d. F# Hopac as an implementation of the CSP model on jobs
- e. C# Channels as an implementation of the CSP model on C# asyncs
- f. Backpressure in Actors and CSP
- g. Supervision in Actors – cf. Akka.NET
- h. Monitoring in Actors – cf. Akka.NET
- i. Unbounded non-determinism and Actors

2. Monads and Kleisli Compositions

- a. Fundamental functions: unit, flat, map, bind
- b. Fundamental functions in particular cases: lists, maybe, tasks
- c. Monad builder methods and fundamental functions
- d. Kleisli operators and fundamental functions
- e. Translate between equivalent expressions, using:
 - i. Fundamental functions
 - ii. Monad builder methods
 - iii. Sugared expressions
 - iv. Kleisli operators (where applicable)
- f. The three fundamental laws, using:
 - i. Fundamental functions
 - ii. Kleisli operators
- g. Diagrams and arrow chasing

3. Parallel Scalability Laws

- a. Fundamental theoretical laws: Amdahl, Gustafson, Guenther (Universal)
- b. Speedup limits for given number of PE (fixed)
- c. Speedup limits for increasing number of PE and graphical shapes
- d. Seeming contradiction between Amdahl and Gustafson
- e. Amdahl as special case of Guenther
- f. Superlinear speedup scenarios?
- g. Practical speedup estimations