TLDR

The Language Described in this Report

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Agenda

Introduction

Concurrency

- The Actor Model
- Message Passing

Konkret Sprog Design

- Grammatik
- Semantik

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Introduction

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Introduction

1. Simulations
   - 1.1 Created by natural and social scientists
   - 1.2 Run on HPC systems
2. Real World Systems
   - 2.1 Massive scale
   - 2.2 Inherently concurrent
3. Languages
   - 3.1 C
   - 3.2 Fortran

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Concurrency

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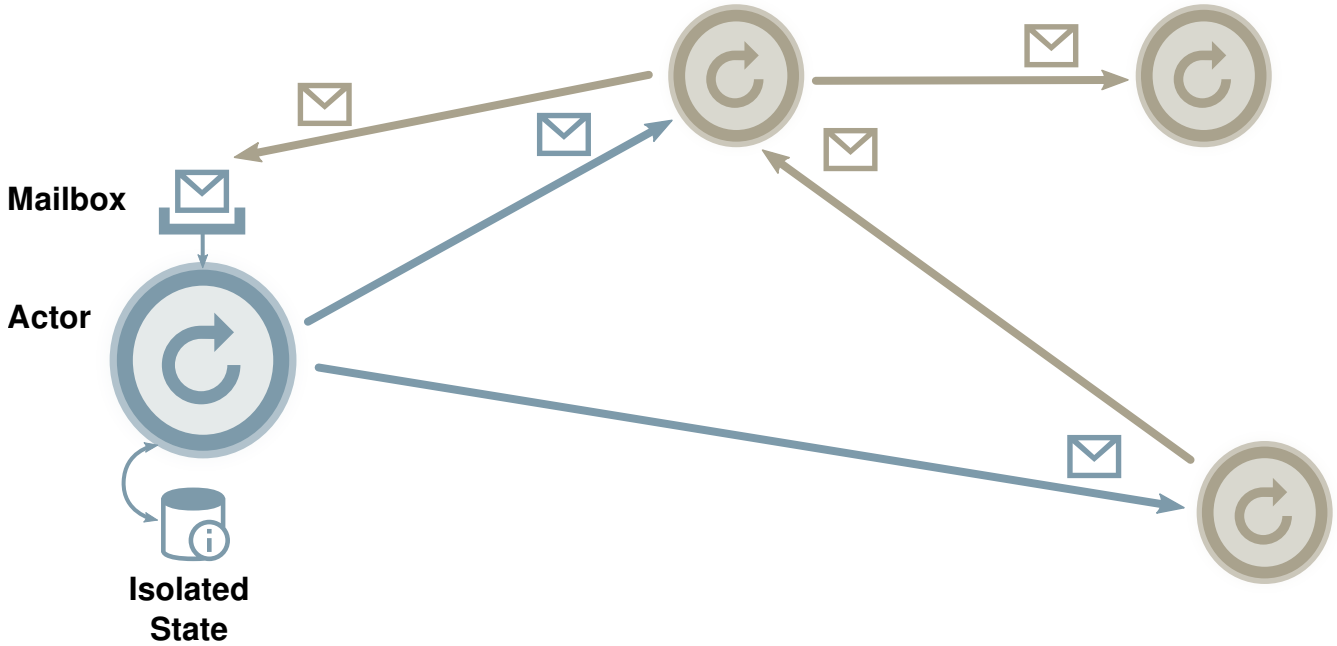
The Actor Model

1. Inherently concurrent
2. State
   - 2.1 Isolated
3. Communication
   - 3.1 Message passing
   - 3.2 Asynchronous
   - 3.3 Reactive



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Message Passing

1. Sending
   1.1 Blocking
   1.2 Non-blocking
2. Receiving
3. MPI

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Konkret Sprog Design

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Grammatik - Expressions

. . .

⟨*OP2*⟩ ::= <OP2> <Poneoperator> <OP1>
| <OP1>

⟨*OP1*⟩ ::= <Pzerooperator> <OP1>
| <OP0>

⟨*OP0*⟩ ::= <Operand>
| ’(’ <Expression> ’)’

. . .

⟨*PTWOOPERATOR*⟩ ::= ’*’ | ’/’ | ’%’

⟨*PTHREEOPERATOR*⟩ ::= ’+’ | ’-’

⟨*PFOUROPERATOR*⟩ ::= ’=’ | ’!=’ | ’<’ | ’<=’ | ’>’ | ’>=’

. . .

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Grammatik - Expressions

⟨*Operand*⟩ ::= <Block>
| <Integer>
| <Real>
| <Boolean>
| <Literals>
| <Invocation>

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Semantik - Transitions System

$$at = \text{ActorTypes} \rightharpoonup \text{Stm}$$
$$aEnv = \text{Anames} \cup next \rightharpoonup sEnv$$
$$sEnv = \text{Symbols} \rightharpoonup \text{Stm} \times \text{Symbols}$$

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Semantik - Eksempel

$$\text{INVOKE}_{A1}\ \frac{}{\langle x, sEnv\rangle \Rightarrow_A v}\ , sEnv(x) = \langle n, \epsilon\rangle\ , \mathcal{N}(n) = v$$

$$\text{INVOKE}_{A1}\ \frac{}{\langle x, sEnv\rangle \Rightarrow_A \top}\ , sEnv(x) = \langle true, \epsilon\rangle$$

$$\text{INVOKE}_{A1}\ \frac{}{\langle x, sEnv\rangle \Rightarrow_A \bot}\ , sEnv(x) = \langle false, \epsilon\rangle$$

$$\text{INVOKE}_{A1}\ \frac{}{\langle x, sEnv\rangle \Rightarrow_A \langle \{S\}, \epsilon\rangle}\ , sEnv(x) = \langle \{S\}, \epsilon\rangle$$

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Semantik - Eksempel

$$\text{INVOKE}_{A1}\ \frac{}{\langle x(y), sEnv\rangle \Rightarrow_A \langle S_1, sEnv[z \mapsto \langle S_2, s\rangle]\rangle}$$
$$, sEnv(x) = \langle \{S_1\}, z\rangle \, , sEnv(y) = \langle S_2, s\rangle$$

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