Efficient Multicore Scheduling Of Dataflow Process Networks

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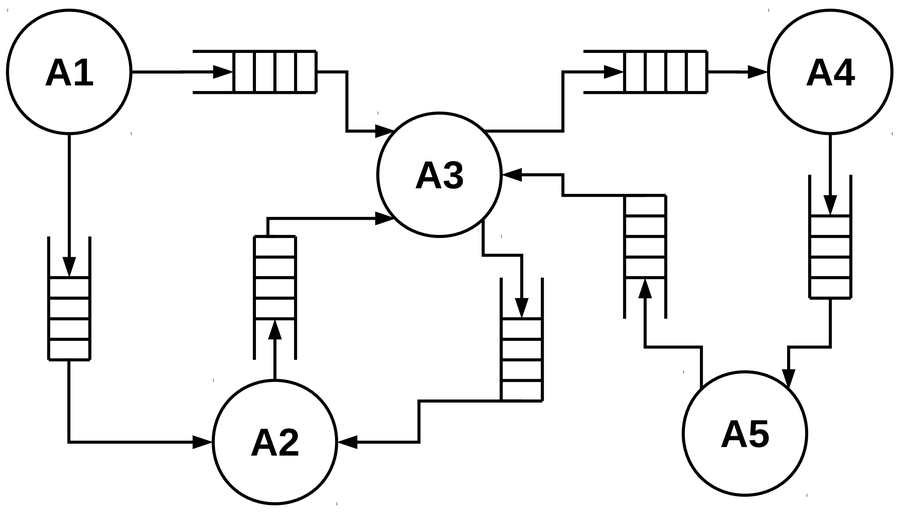
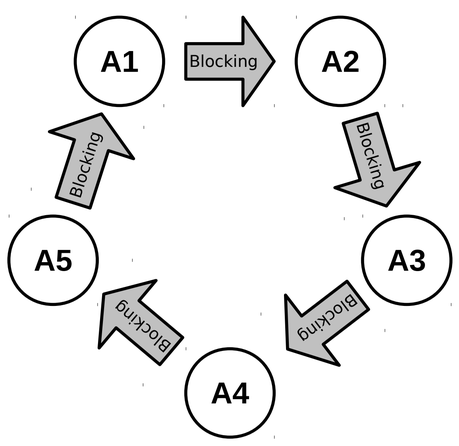
Dataflow Process Networks



Single-core scheduling strategies

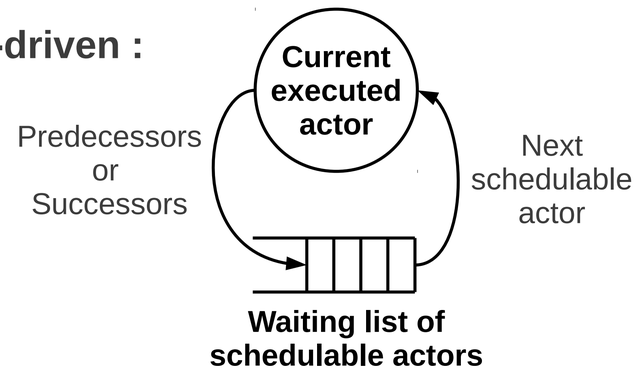
Round-robin :

- Simple strategie
- Equal chance of being executed
- No notion of time slice
- Static list of next schedulable actors



Data-driven / demand-driven :

- More advanced strategie
- Dynamic list of next schedulable actors

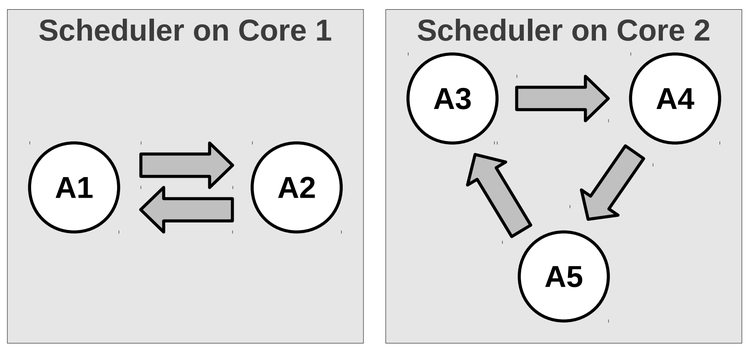


Multi-core scheduling strategies

Static mapping of the processes on the cores

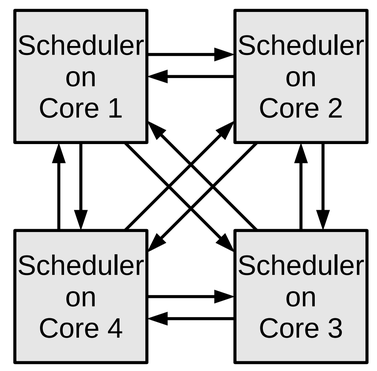
A1 and A2 on the first core
A3, A4 and A5 on the other one

Multi-core round-robin

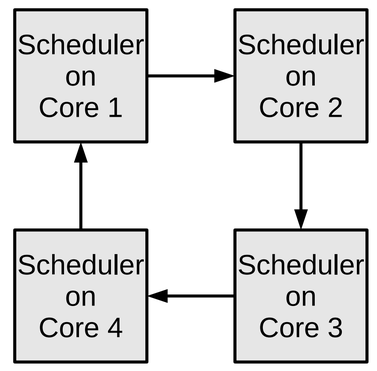


Topologies of communications

- Mesh



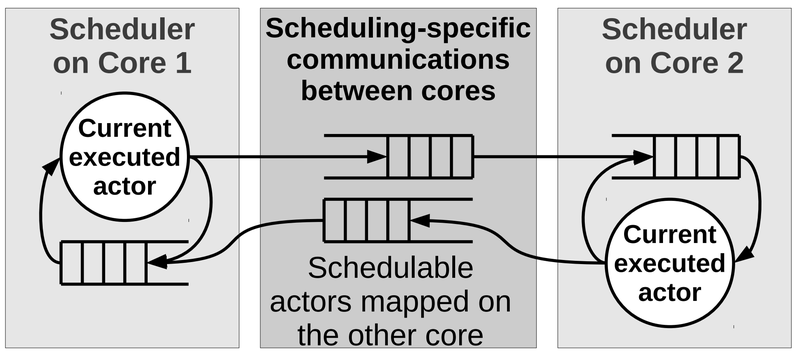
- Ring



Combined scheduling algorithm

```
CombinedScheduling()
    while true do
        if isEmpty(schedulable)
            then actor = getNext(RoundRobin);
            else actor = getNext(DataDemandDriven);
        fi;
        fire(actor);
        If not(RoundRobin) and ||firing|| > 0
            then
                if isEmpty(actor:inputs)
                    then addPredecessors(actor);
                    else addSuccessors(actor);
                fi;
        fi;
    od;
```

Communications



Results with two different video decoders (in frames per second)

MPEG-4 Simple Profile

Strategy		Core	CIF	720p	Speedup
Round-robin		1	144	15.6	1
		2	265	26.6	1.78
		4	494	51.4	3.36
Combined strategy		1	154	16.1	1
		2	288	27.3	1.75
	Ring	4	443	49.8	2.98
	Mesh	4	516	51.9	3.28

MPEG-4 Advanced Video Coding

Strategy		Core	QCIF	CIF	Speedup
Round-robin		1	28.4	7.1	1
		2	55.6	13.9	1.96
		4	90.8	21.2	3.05
Combined strategy		1	169	40.6	1
		2	294	71.4	1.74
	Ring	4	341	75.2	1.93
	Mesh	4	473	97.1	2.59

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