A Classification of Weak Asynchronous Models of Distributed Computing

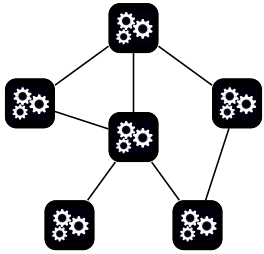
Javier Esparza[1] Fabian Reiter[2]

[1]Technische Universität München

[2]Université Gustave Eiffel

1 September 2020 @ CONCUR'20, Online

The framework



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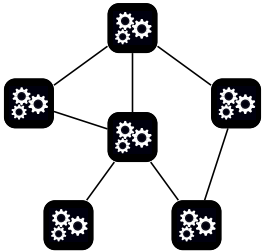

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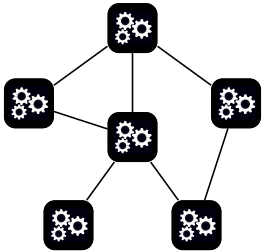

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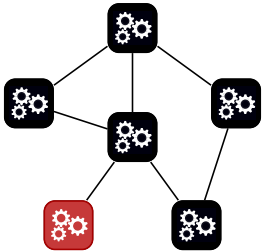

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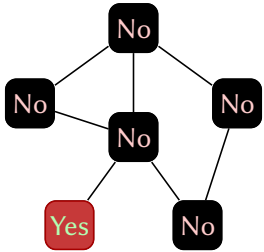

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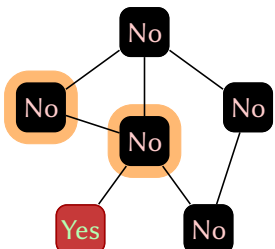

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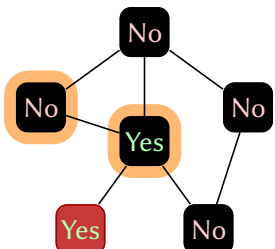

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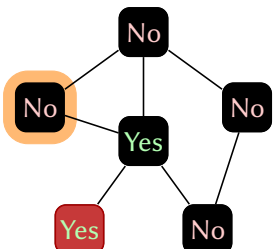

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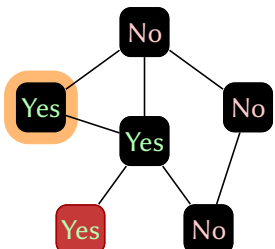

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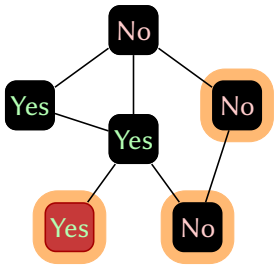

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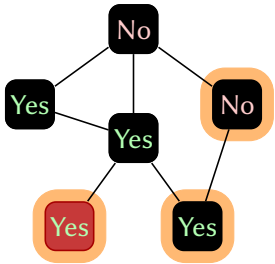

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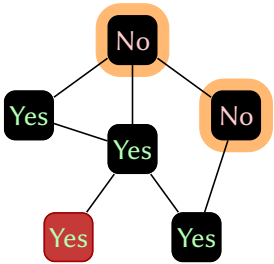

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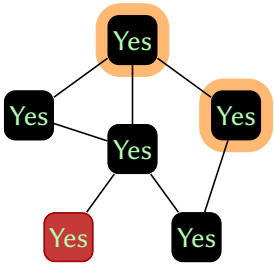

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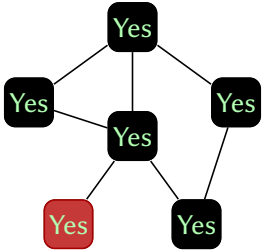

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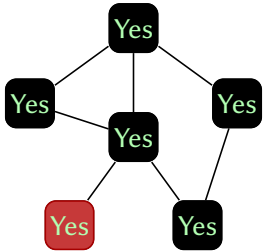

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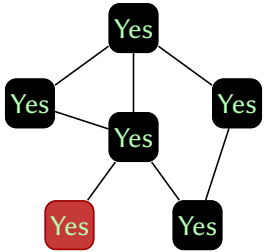

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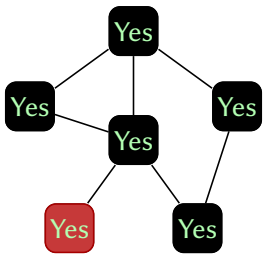

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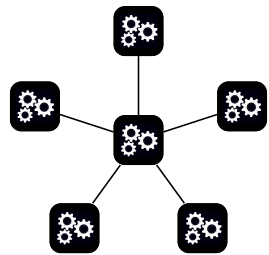

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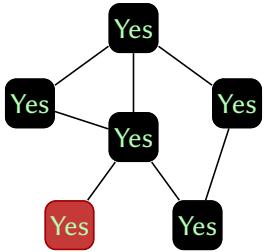

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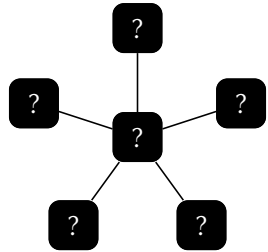

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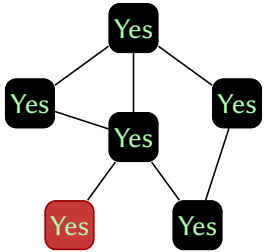

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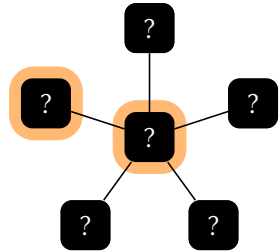

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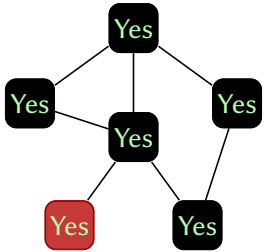

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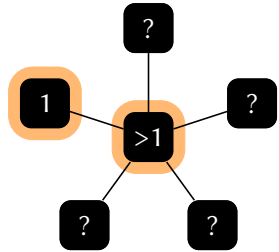

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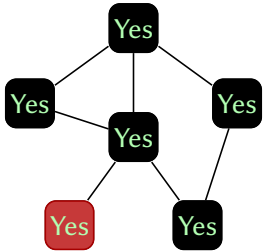

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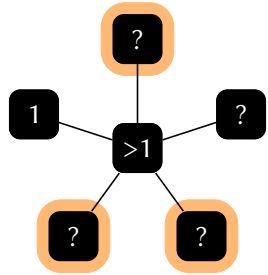

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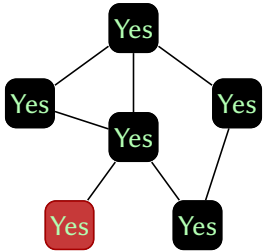

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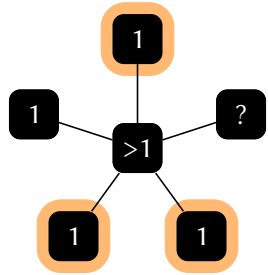

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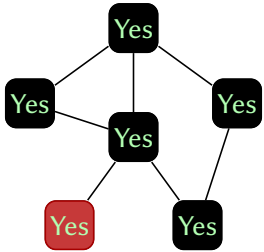

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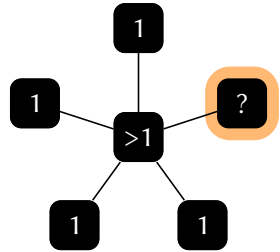

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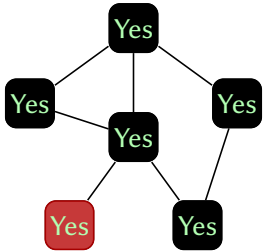

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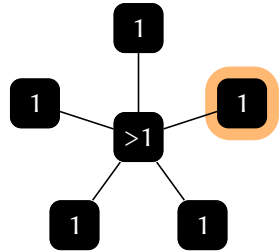

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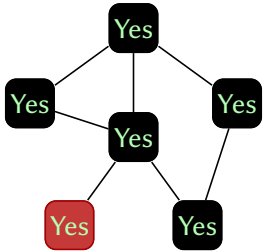

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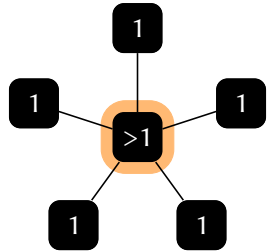

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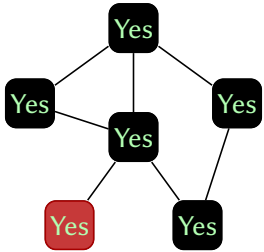

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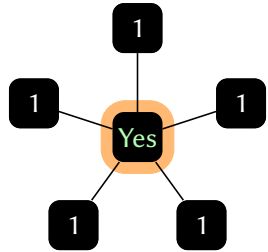

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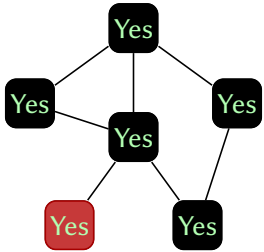

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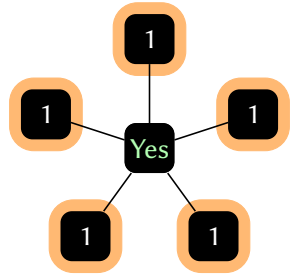

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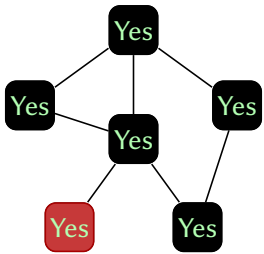

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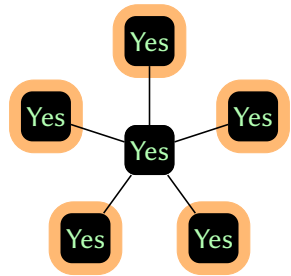

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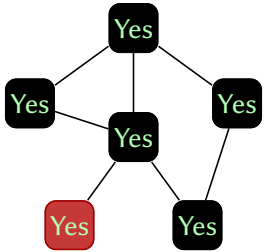

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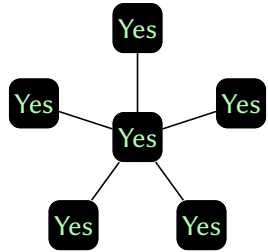

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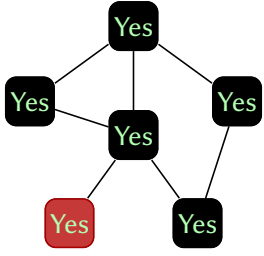

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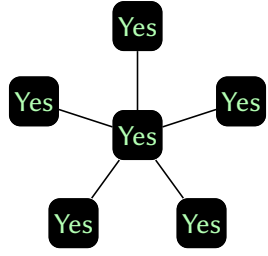

Easy if nodes can count their neighbors.

Four parameters

Detection | Acceptance | Selection | Fairness

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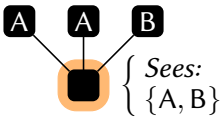

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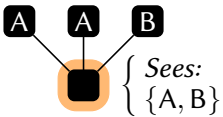

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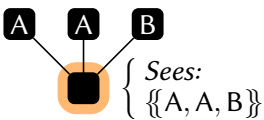

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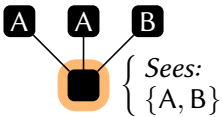
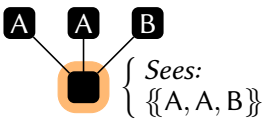


D: counting



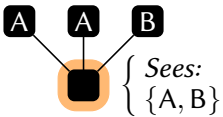
a: halting

Answers are final.

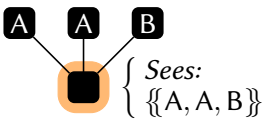
Four parameters

Detection | Acceptance | Selection | Fairness

d: non-counting



D: counting



a: halting

Answers are final.

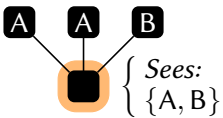
A: stabilizing

Answers can change.

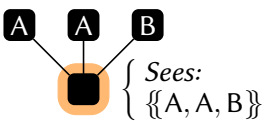
Four parameters

Detection	Acceptance	Selection	Fairness

d: non-counting



D: counting



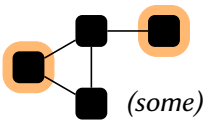
a: halting

Answers are final.

A: stabilizing

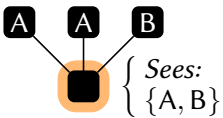
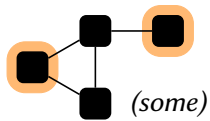
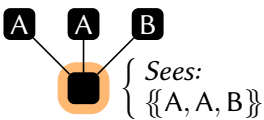
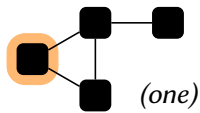
Answers can change.

s: liberal



(some)

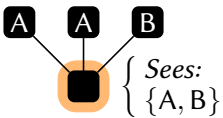
Four parameters

Detection	Acceptance	Selection	Fairness
d: non-counting	**a**: halting	**s**: liberal	
	 *Answers are final.*		
D: counting	**A**: stabilizing	**S**: exclusive	
	 *Answers can change.*		

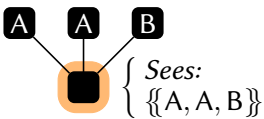
Four parameters

Detection	Acceptance	Selection	Fairness

d: non-counting



D: counting



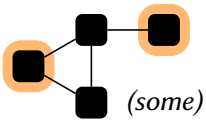
a: halting

Answers are final.

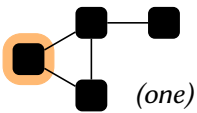
A: stabilizing

Answers can change.

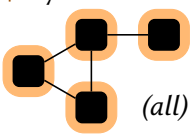
s: liberal



S: exclusive



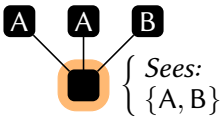
$: synchronous



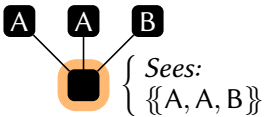
Four parameters

Detection

d: non-counting



D: counting



Acceptance

a: halting

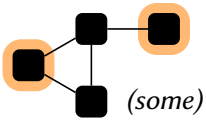
Answers are final.

A: stabilizing

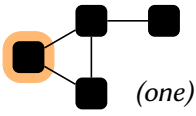
Answers can change.

Selection

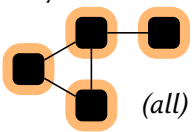
s: liberal



S: exclusive



$: synchronous



Fairness

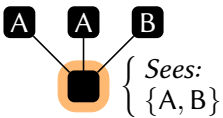
f: starvation-free

Every node selected infinitely often.

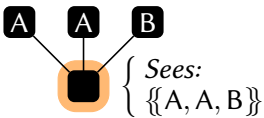
Four parameters

Detection

d: non-counting



D: counting



Acceptance

a: halting

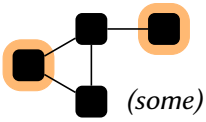
Answers are final.

A: stabilizing

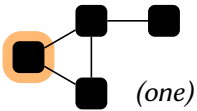
Answers can change.

Selection

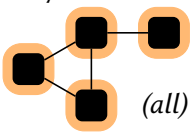
s: liberal



S: exclusive



$: synchronous



Fairness

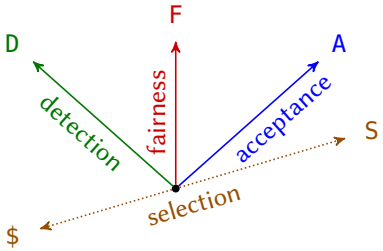
f: starvation-free

Every node selected infinitely often.

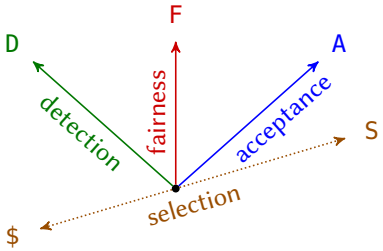
F: stochastic-like

Every sequence of selections occurs infinitely often.

Main result

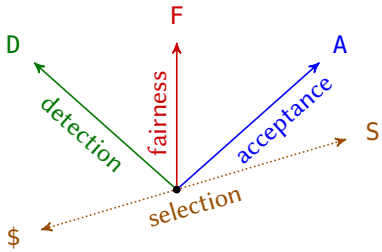


Main result



dasf

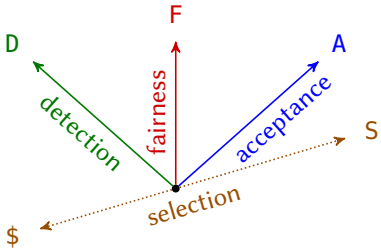
Main result



Dasf

dasf

Main result


F
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fairness
acceptance
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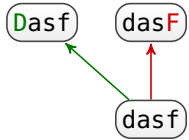
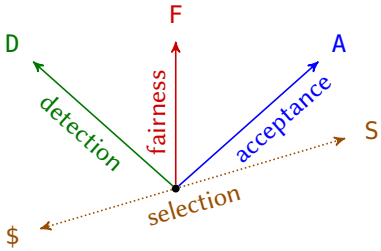
selection


Dasf
dasF
dasf

Main result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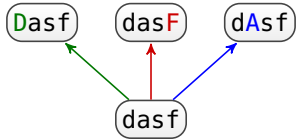
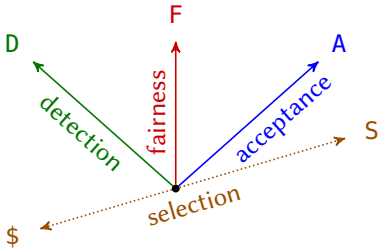

Dasf
dasF
dAsf
dasf

Main result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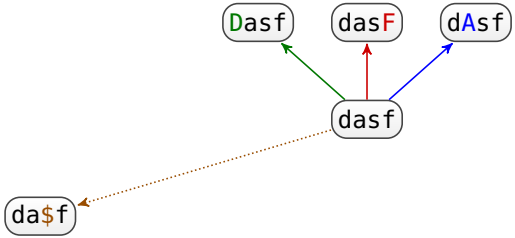
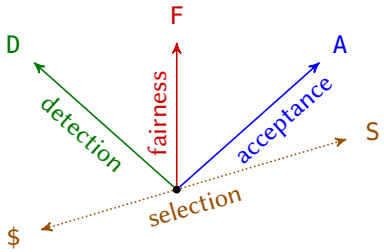

Dasf
dasF
dAsf
dasf
da$f

Main result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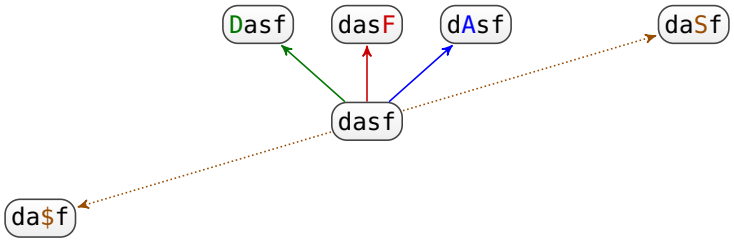
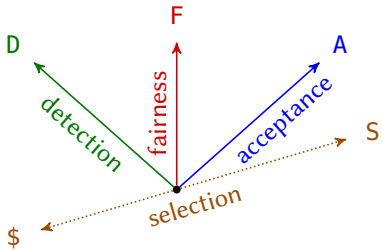

Dasf
dasF
dAsf
daSf
dasf
da$f

Main result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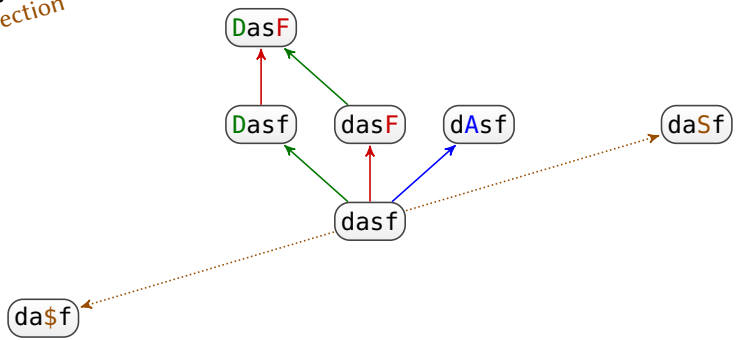
DasF
Dasf
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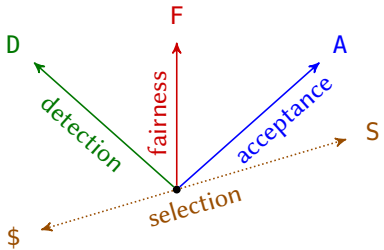
dAsf
daSf
dasf
da$f

Main result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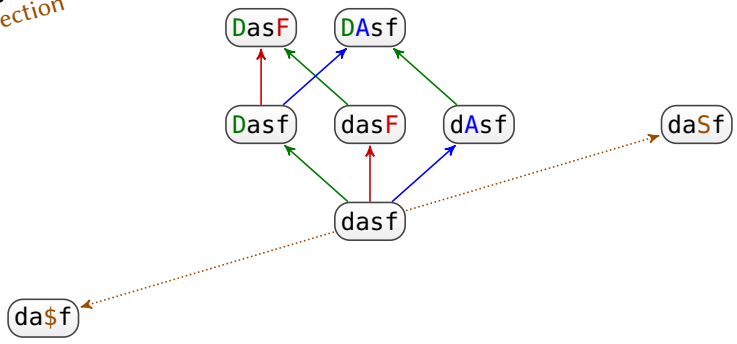
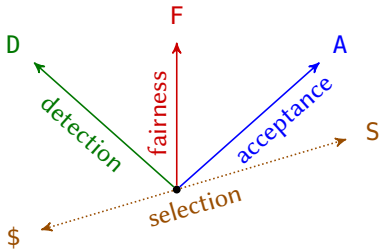

DasF
DAsf
Dasf
dasF
dAsf
daSf
dasf
da$f

Main result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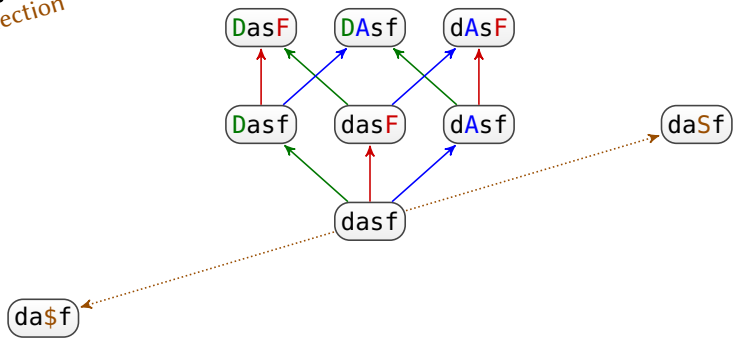
DasF
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dAsF
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daSf
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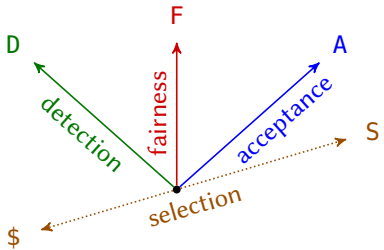
Main result


F
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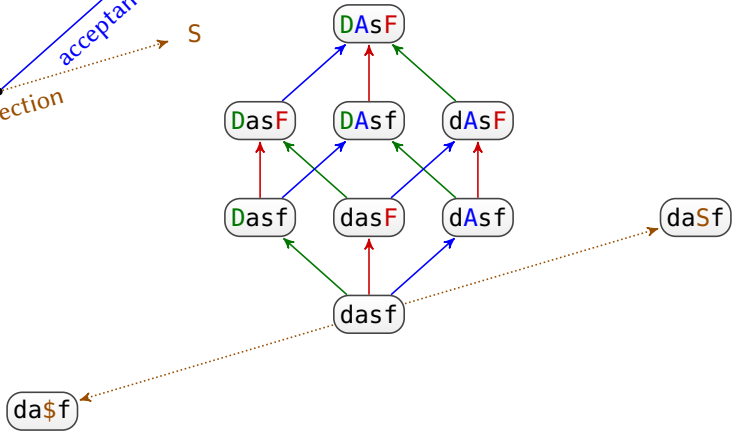
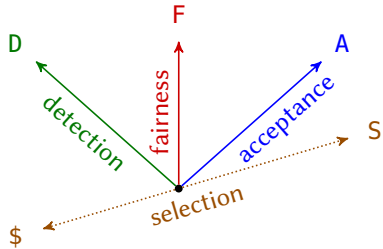

DAsF
DasF
DAsf
dAsF
Dasf
dasF
dAsf
daSf
dasf
da$f

Main result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DaSf
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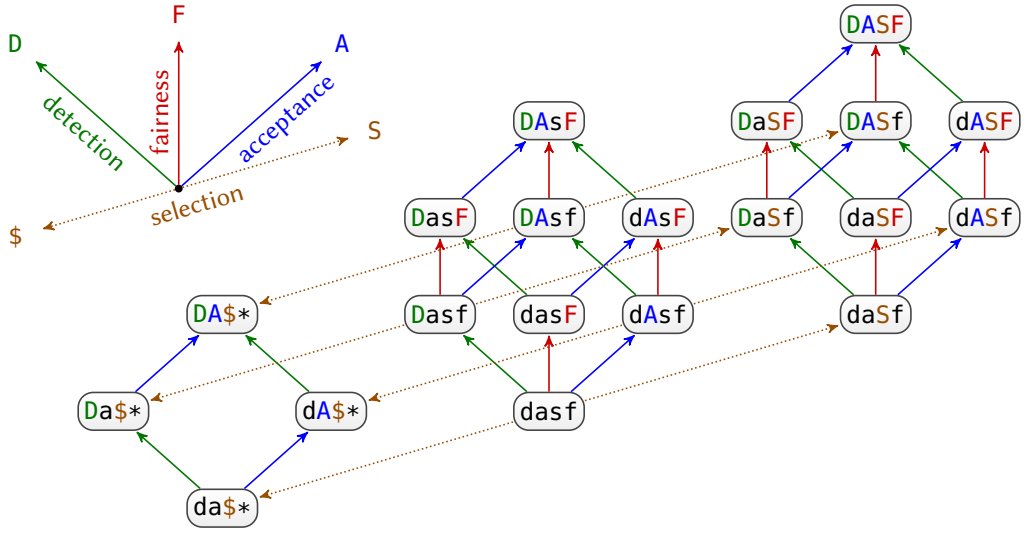
daSf
dasf
da$f

Main result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DaSF
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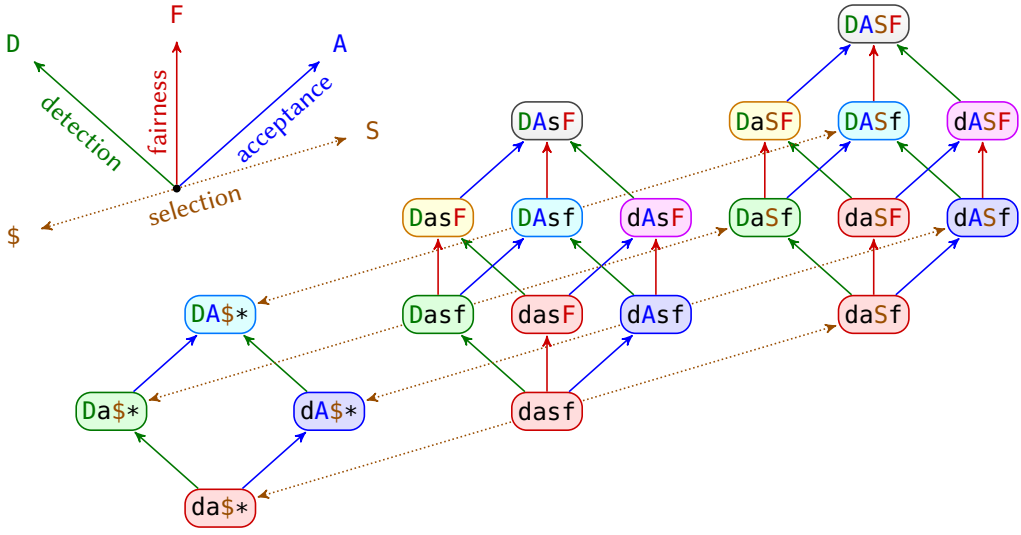
daSF
dASf
daSf

Main result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Da$*
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daSF
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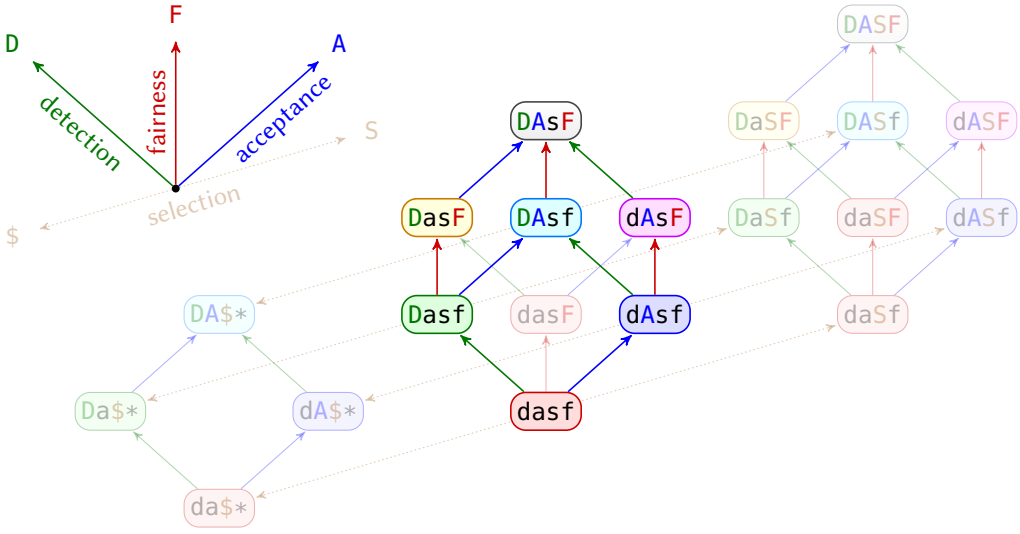
daSf

Main result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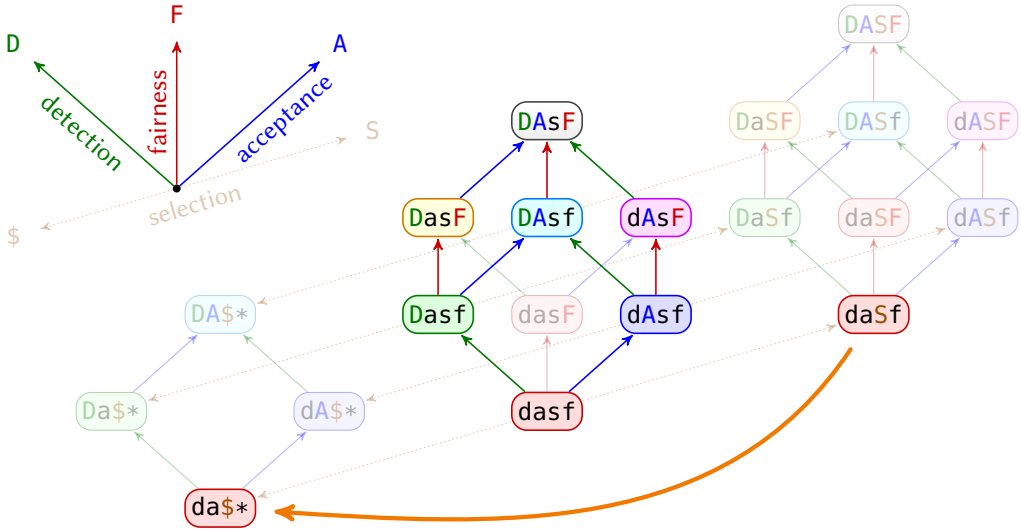
Main result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DA$*
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DaSF
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dASF
DaSf
daSF
dASf
daSf

Exclusivity does not increase expressiveness

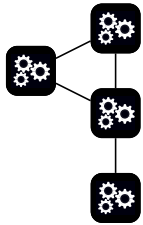
Synchronous selection `da$*`  Exclusive selection `daSf`

Exclusivity does not increase expressiveness

Synchronous selection `**$*`  Exclusive selection `**Sf`

Exclusivity does not increase expressiveness

Synchronous selection `**$*` ← Exclusive selection `**Sf`



Exclusivity does not increase expressiveness

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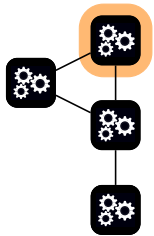

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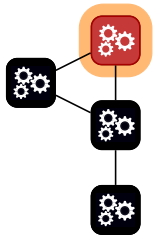

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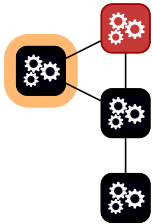

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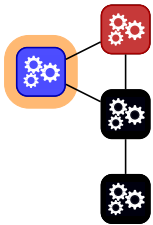

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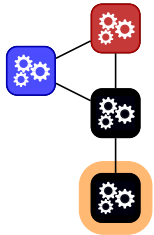

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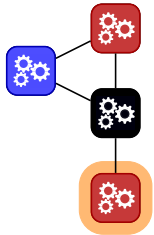

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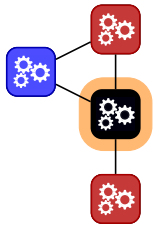

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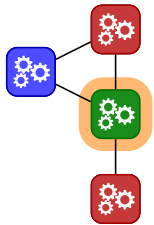

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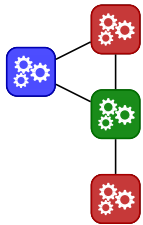

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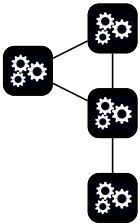

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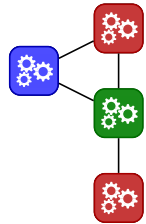

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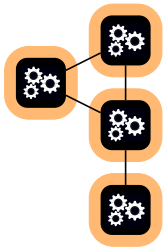

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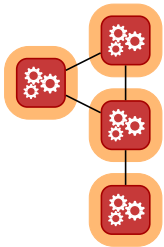

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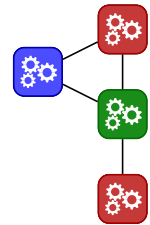

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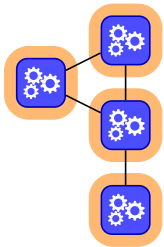

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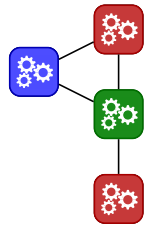

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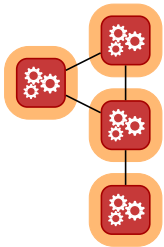

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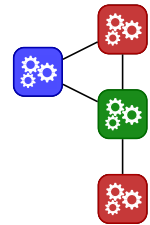

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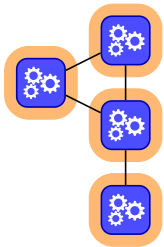

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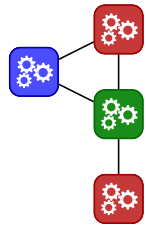

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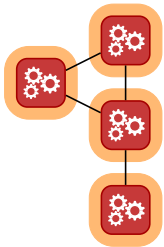

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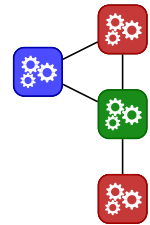

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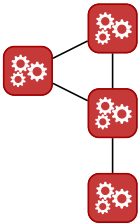

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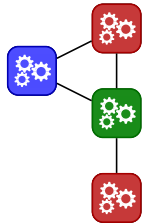

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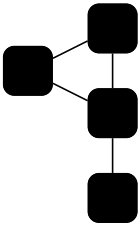

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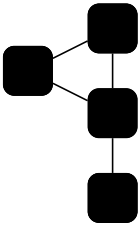

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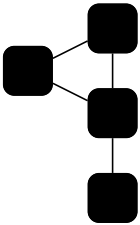

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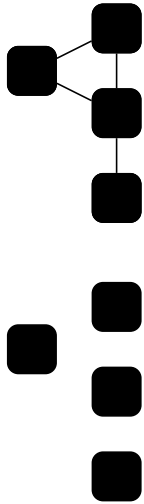

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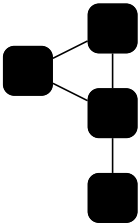

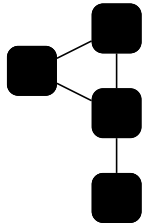

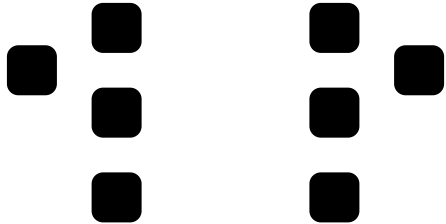

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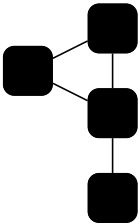

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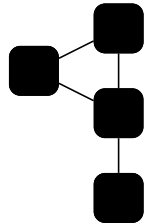

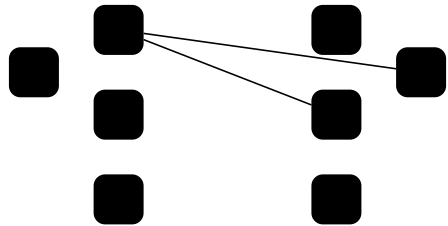

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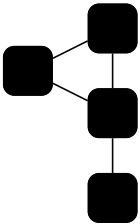

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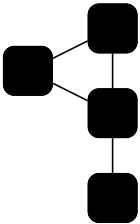

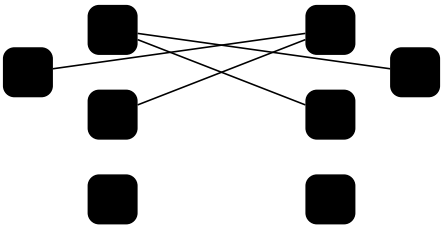

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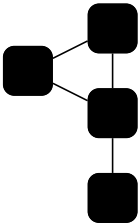

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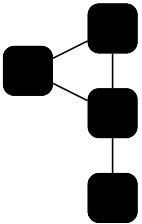

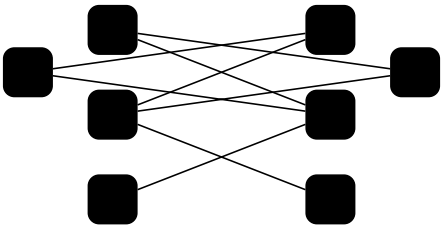

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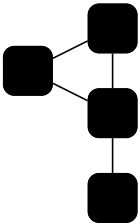

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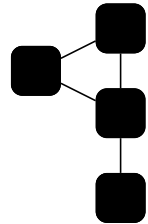
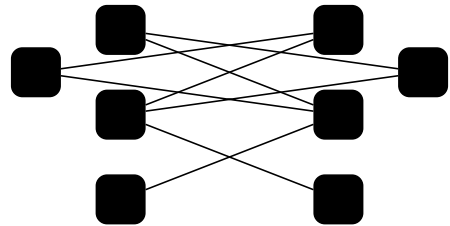


Kronecker cover



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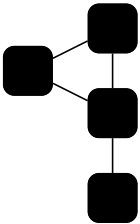

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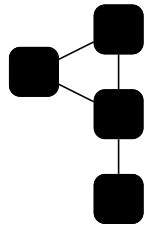

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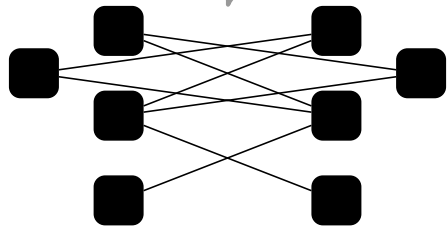
Kronecker cover



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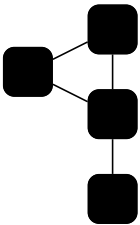

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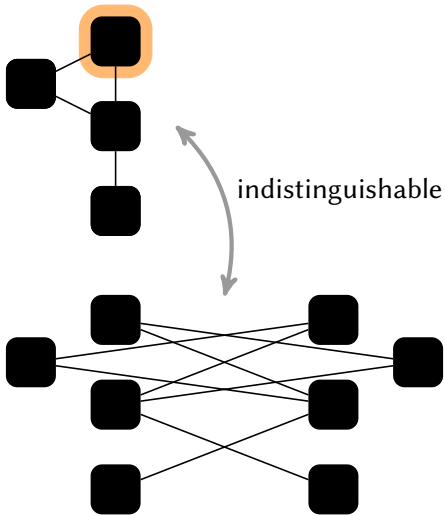

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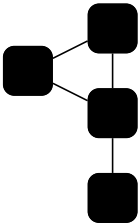

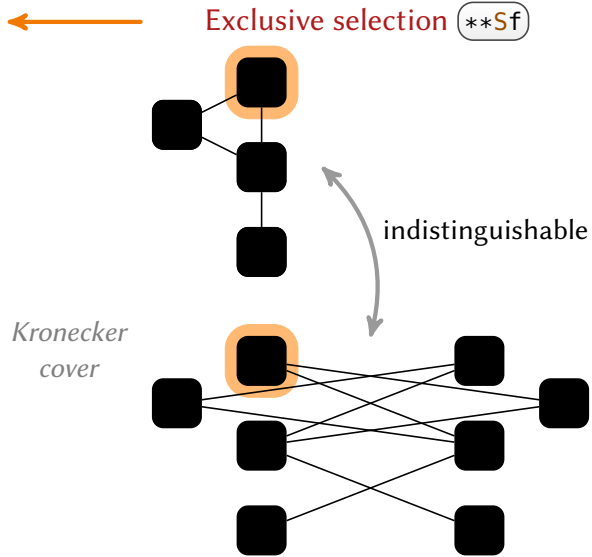

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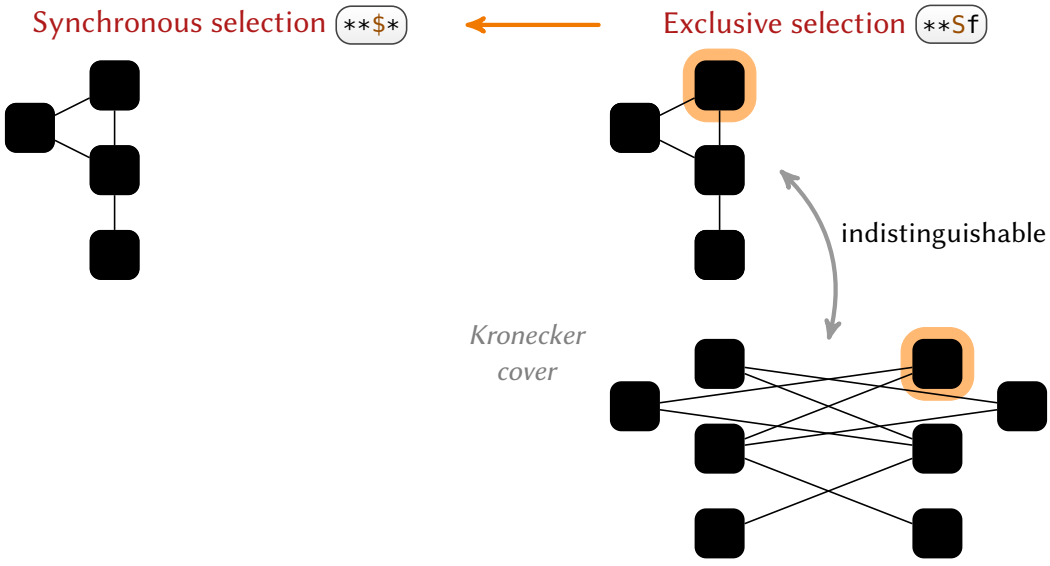

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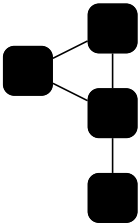

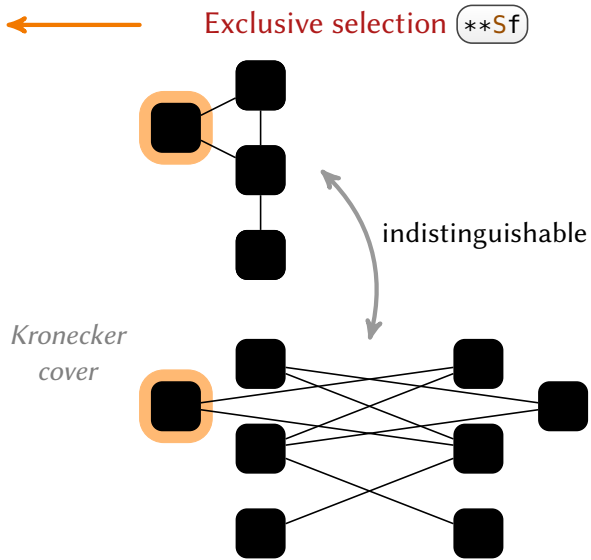

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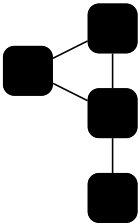

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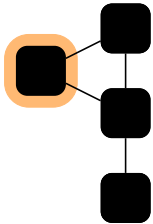

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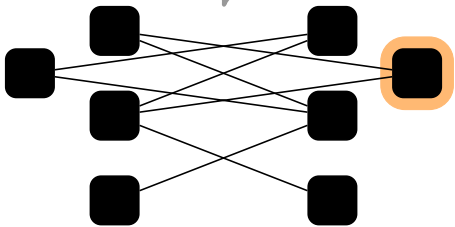
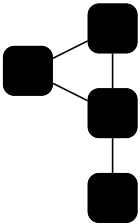


Exclusivity does not increase expressiveness

Synchronous selection **$*



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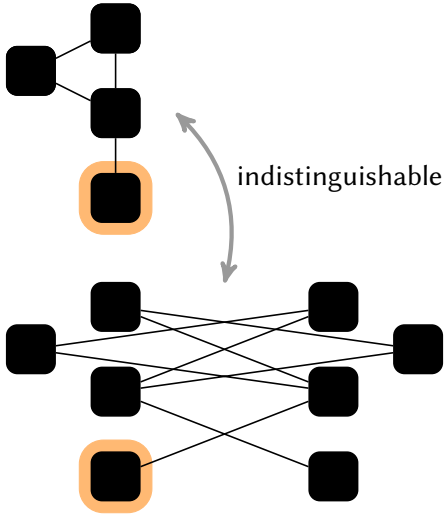

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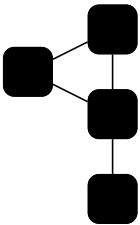

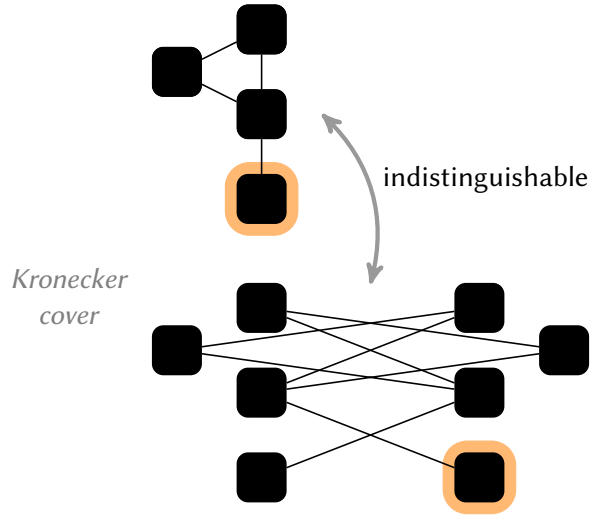

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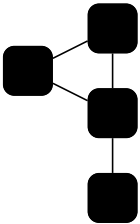

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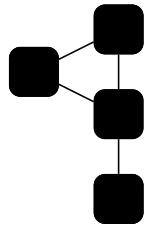

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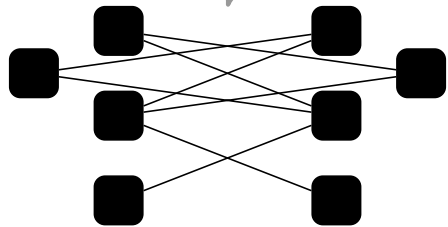

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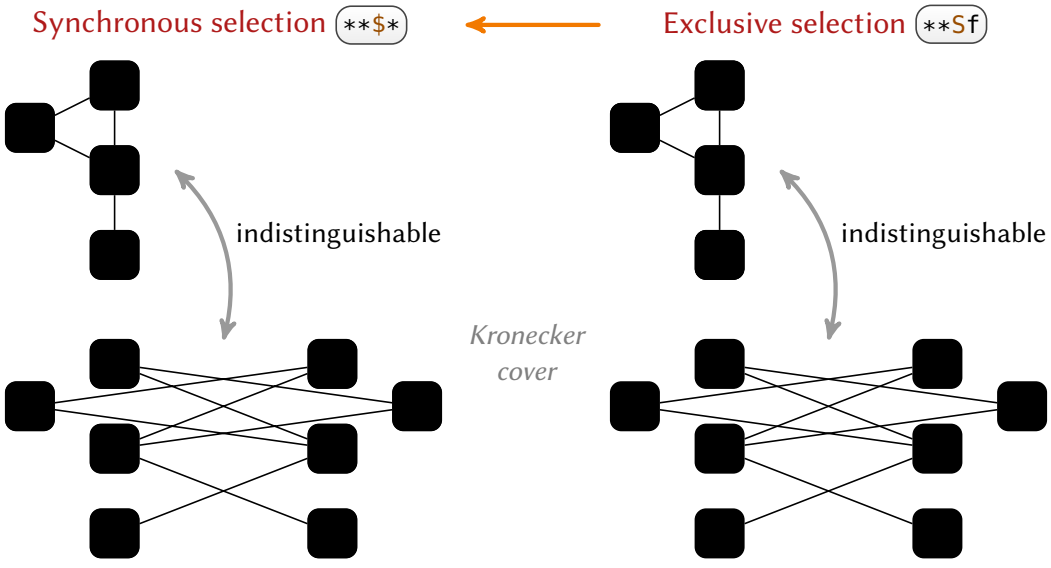

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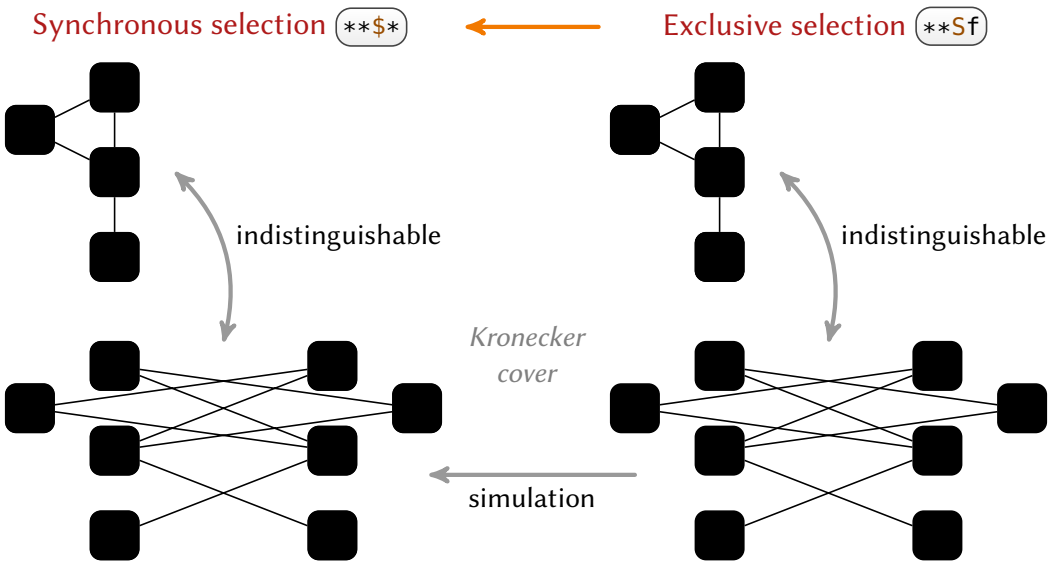

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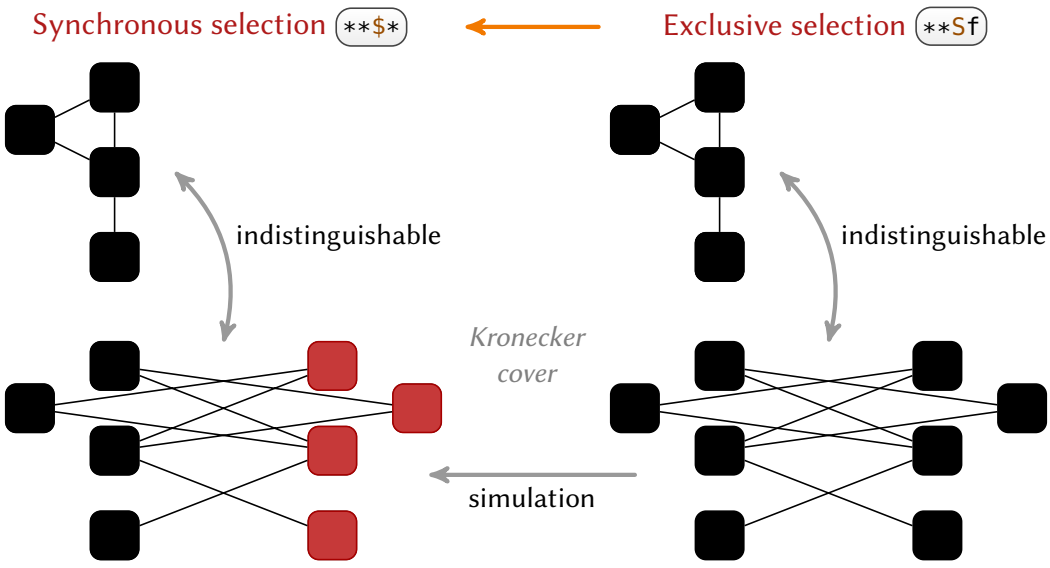

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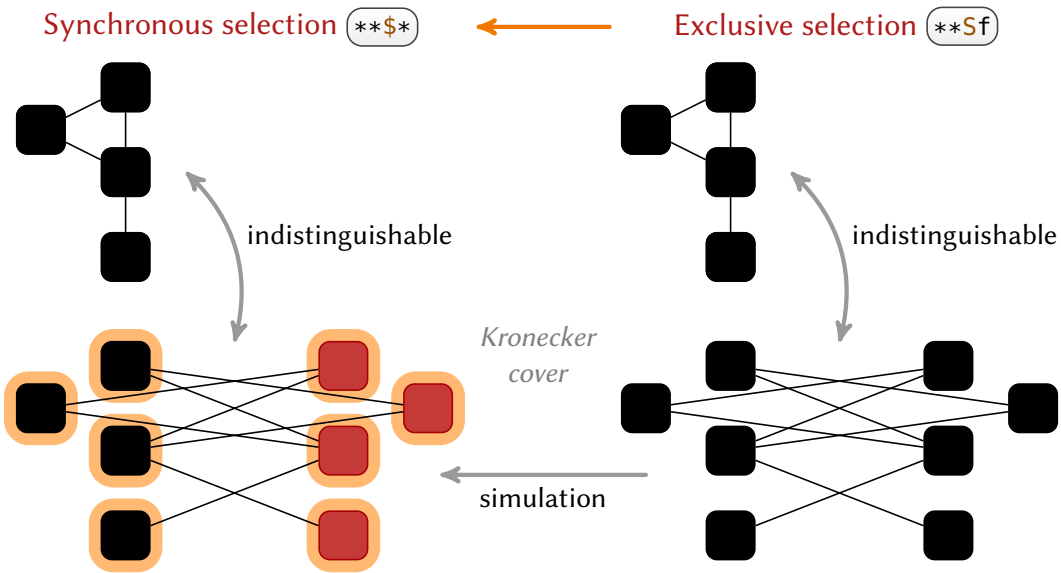

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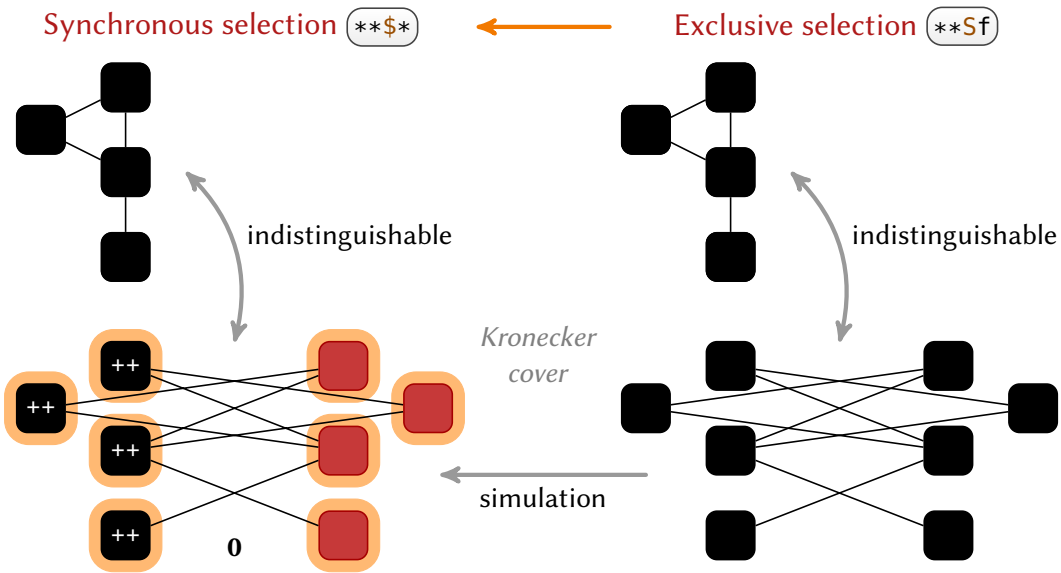

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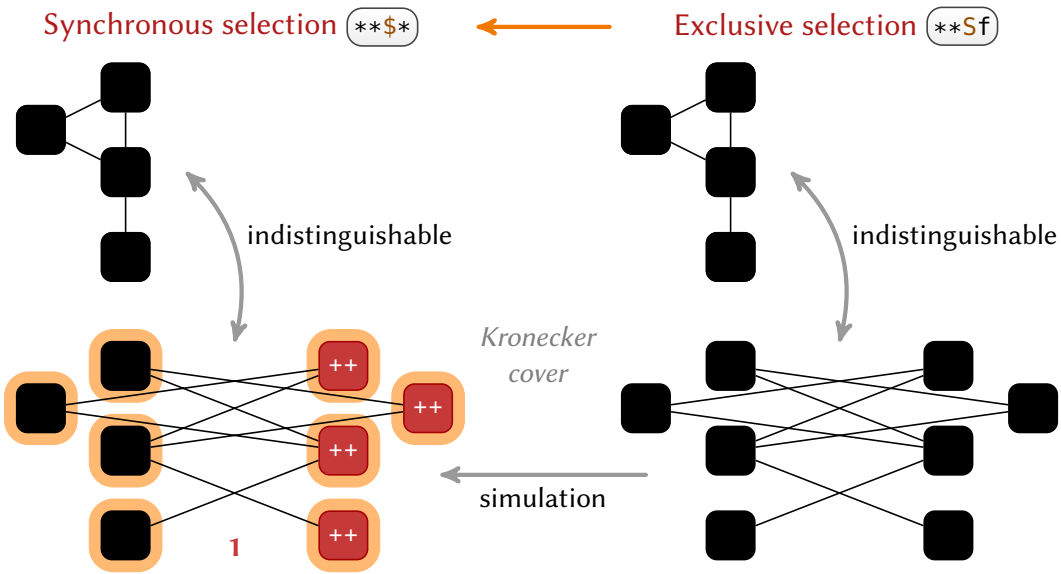

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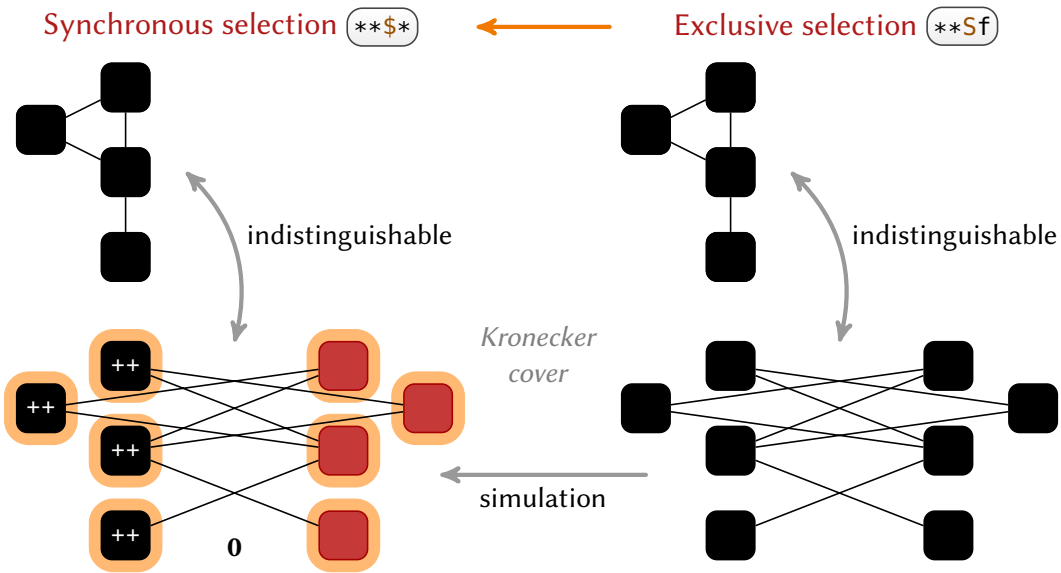

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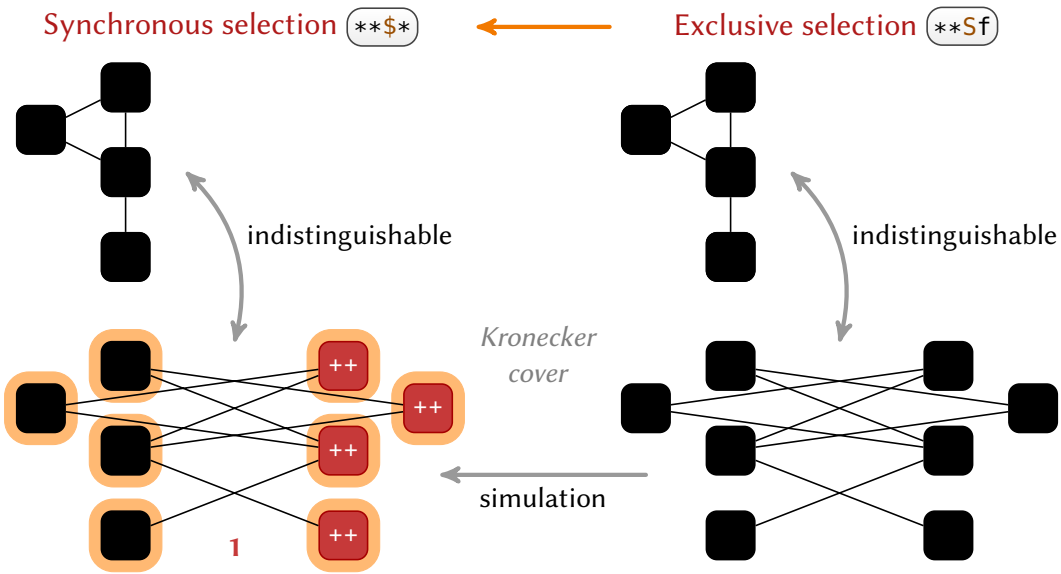

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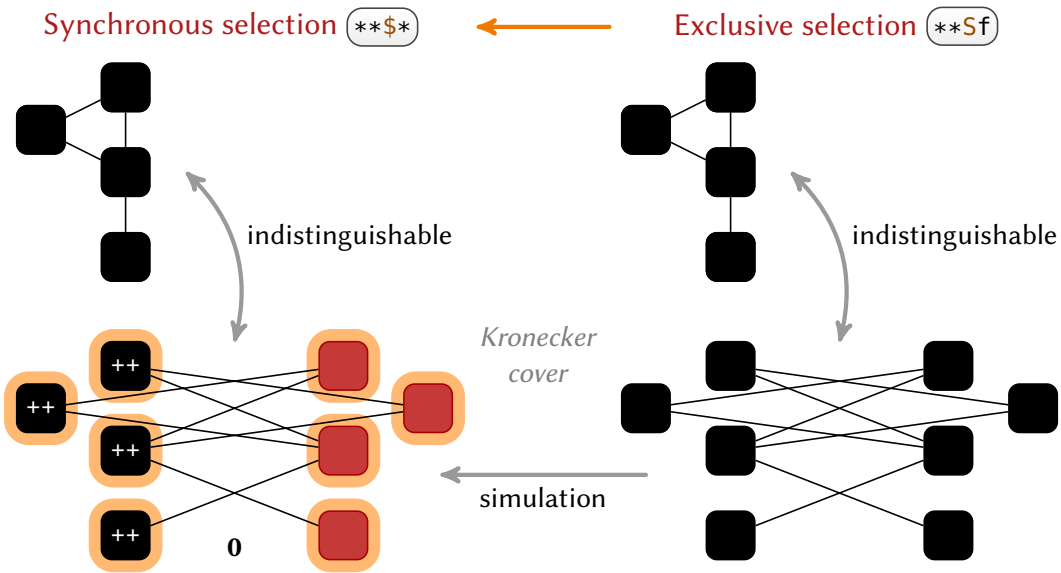

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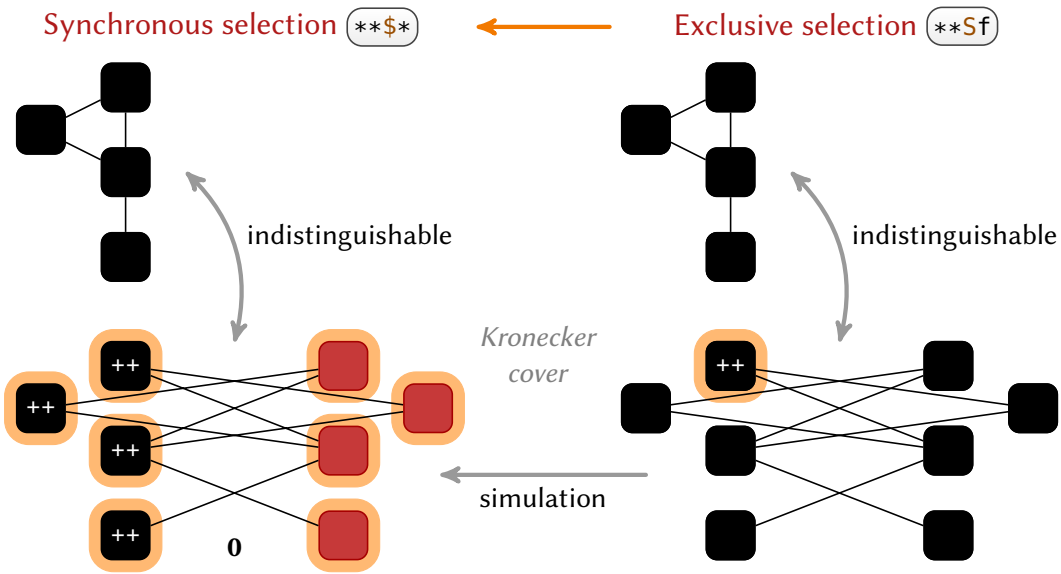

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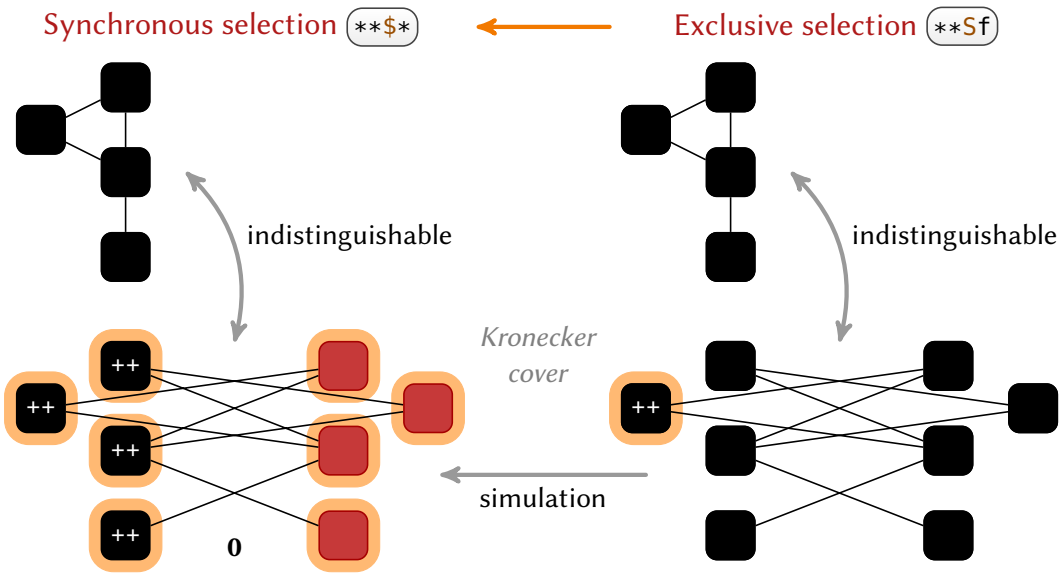

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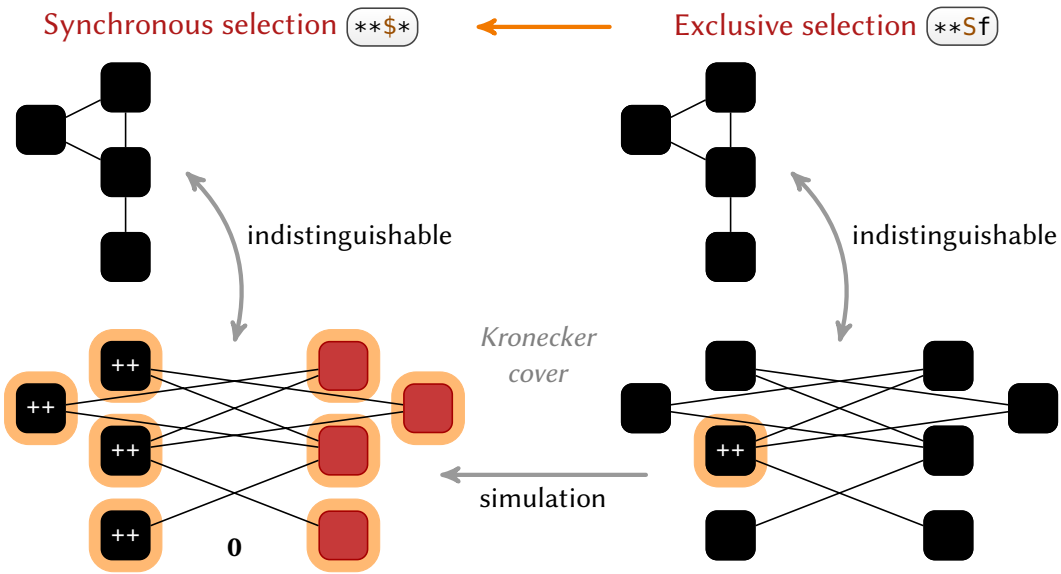

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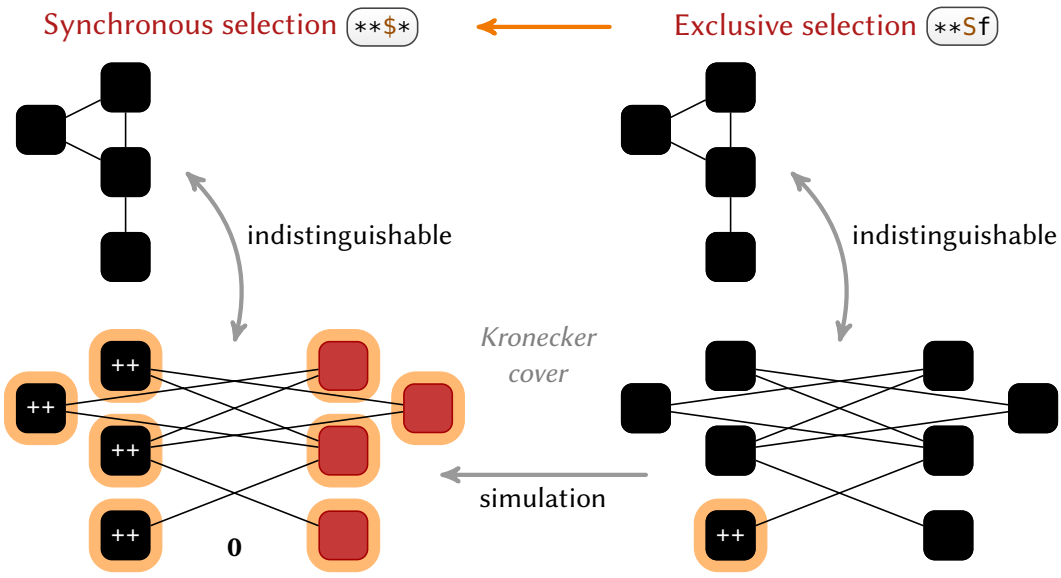

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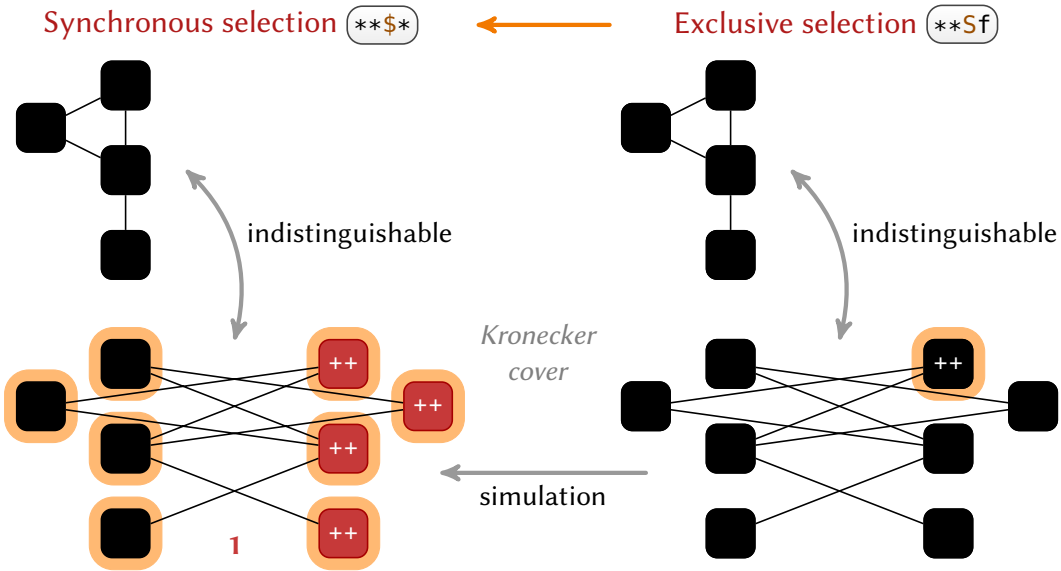

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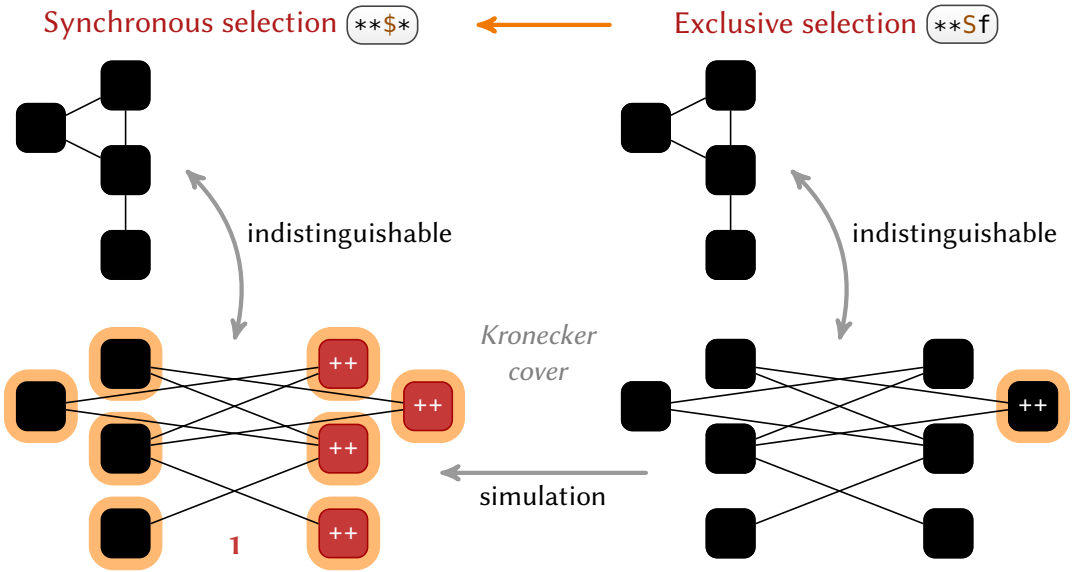

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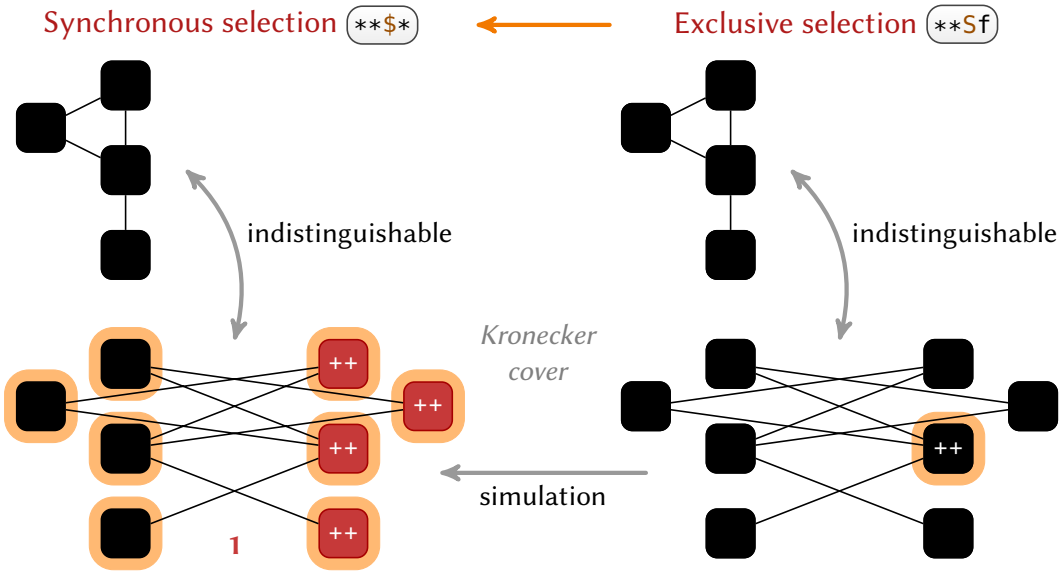

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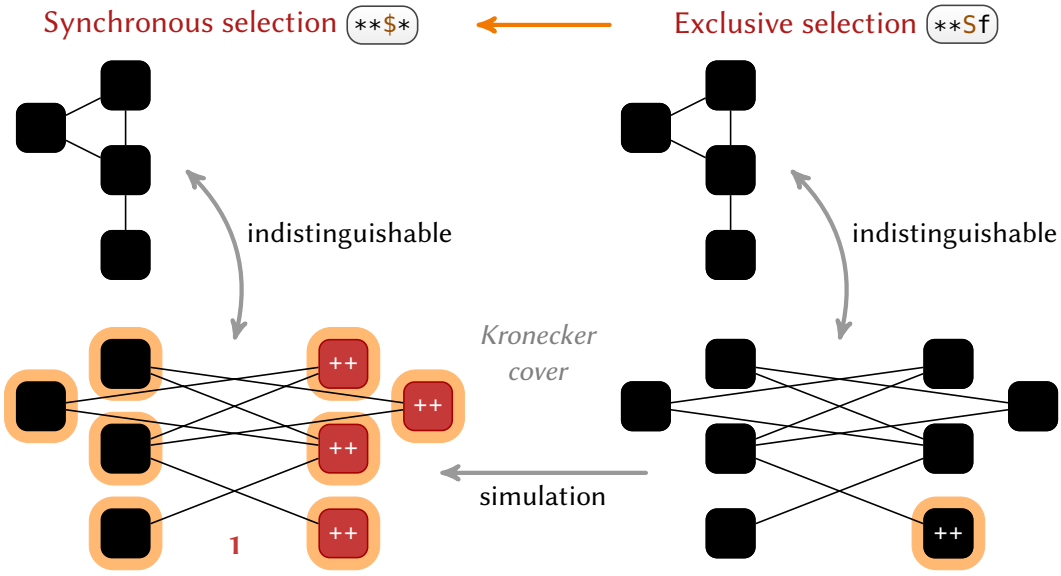

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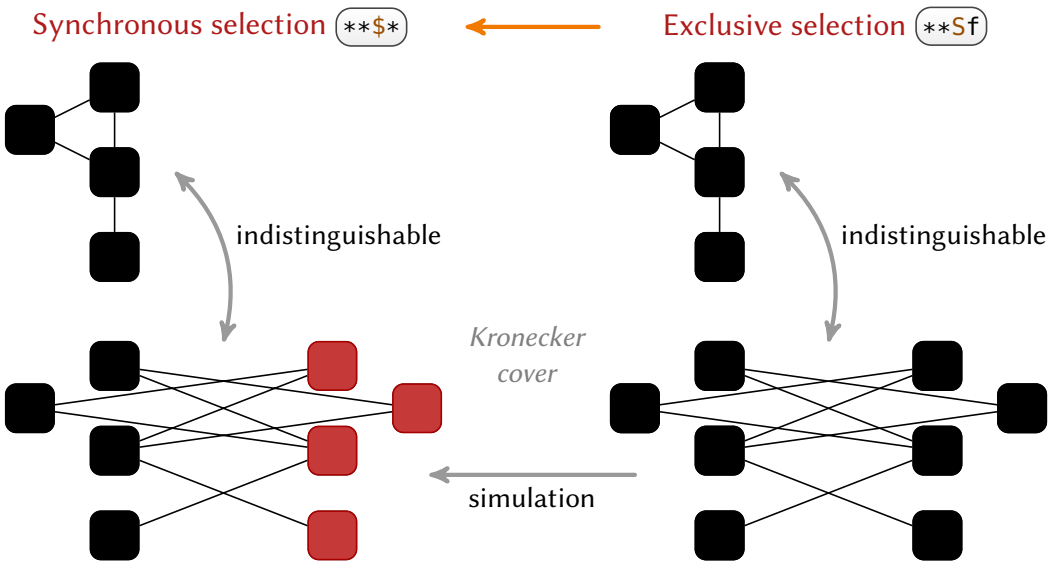

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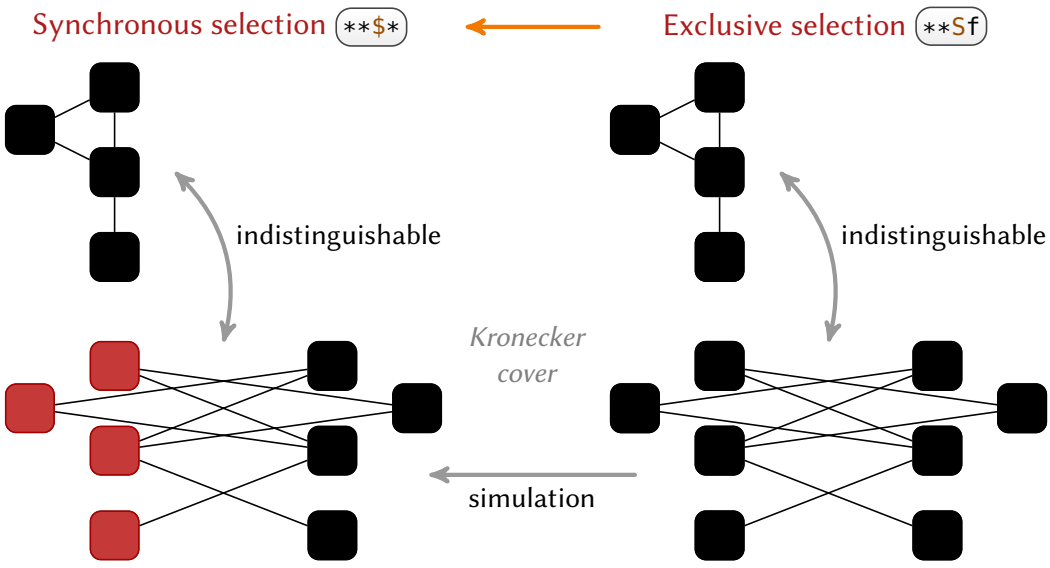

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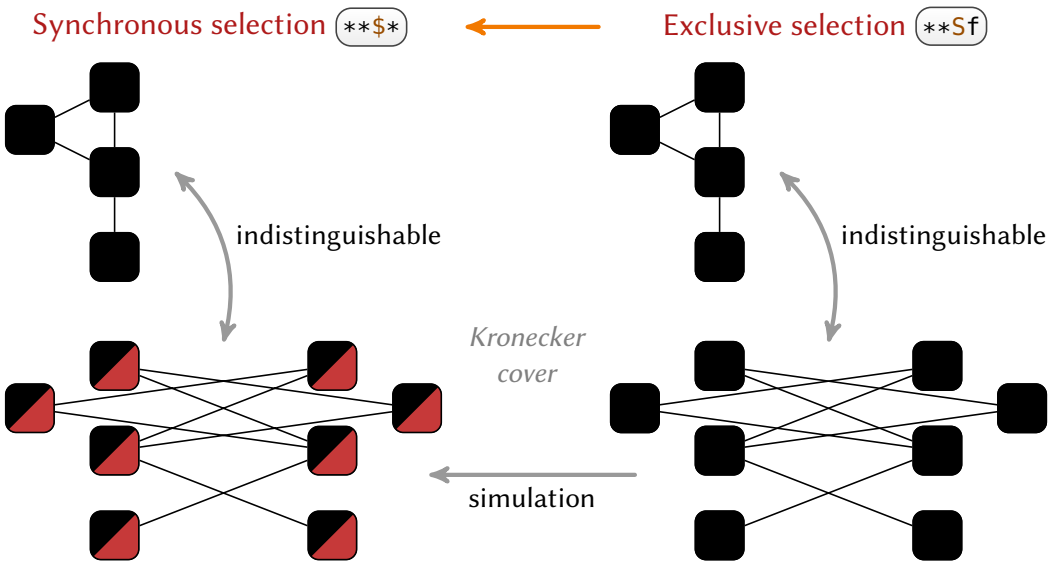

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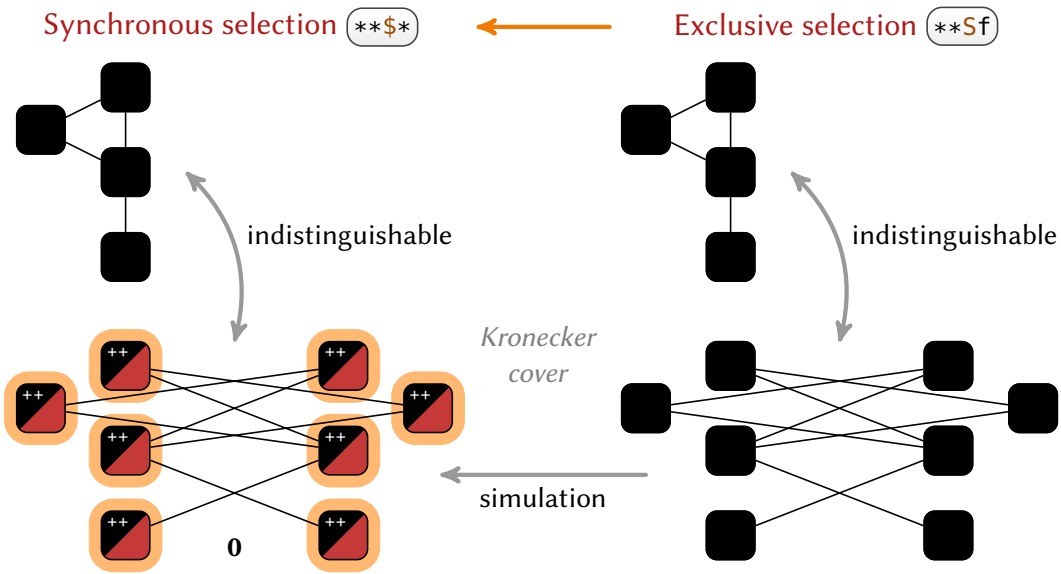

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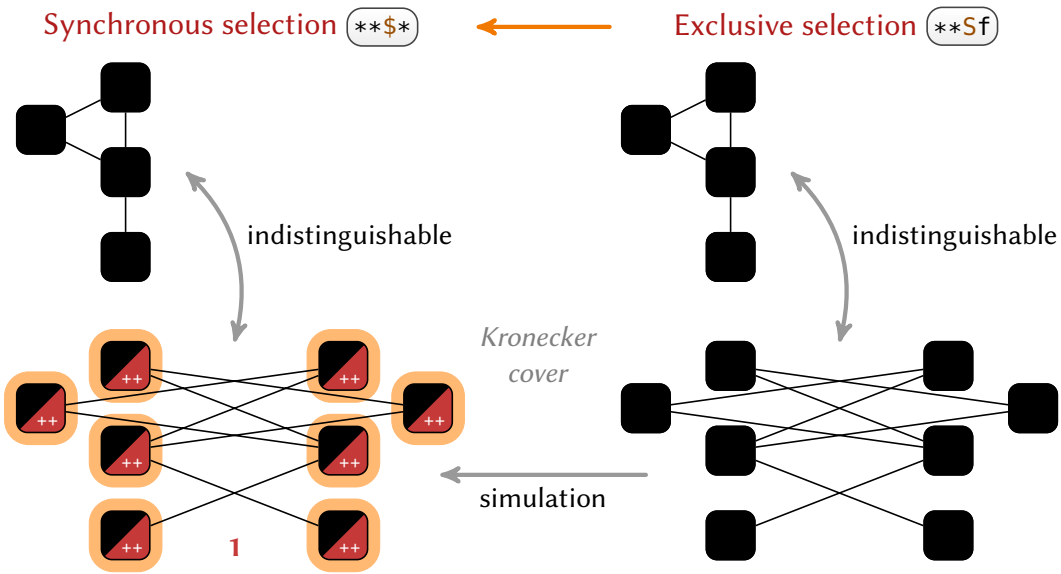

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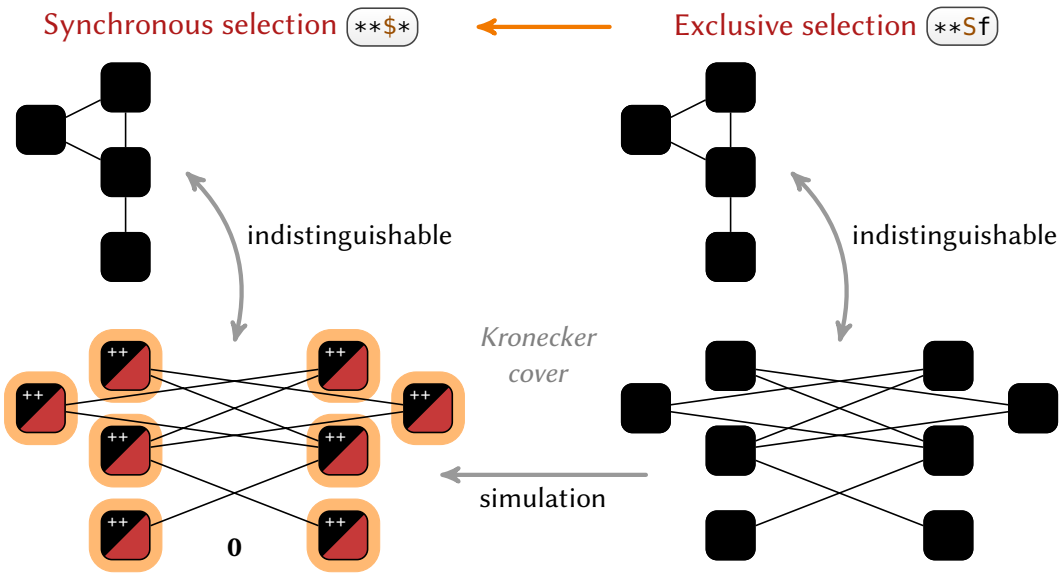

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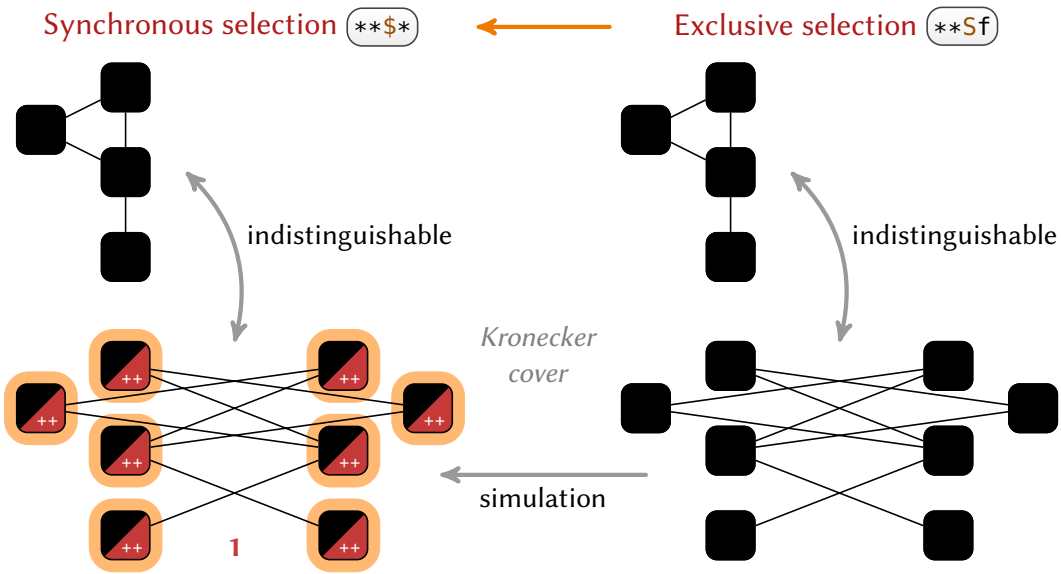

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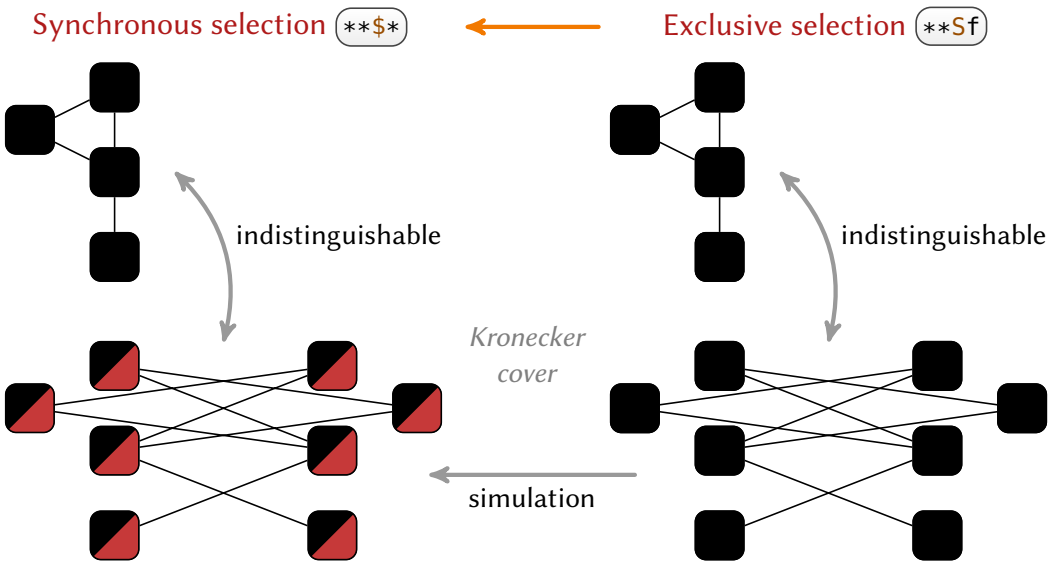

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