Week-1: Introduction to model checking

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Chennai Mathematical Institute

NPTEL-course

July - November 2015

Module 3:

Modeling data-dependent programs

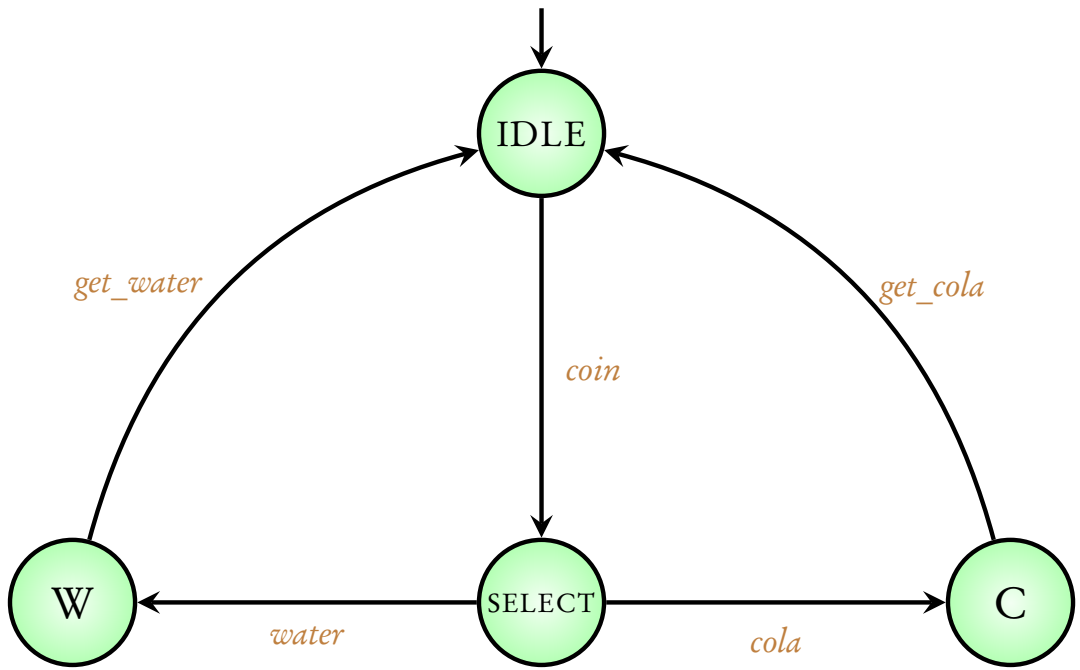
Data-dependent programs:

Variables + Conditional branching + Assignments

Data-dependent programs:

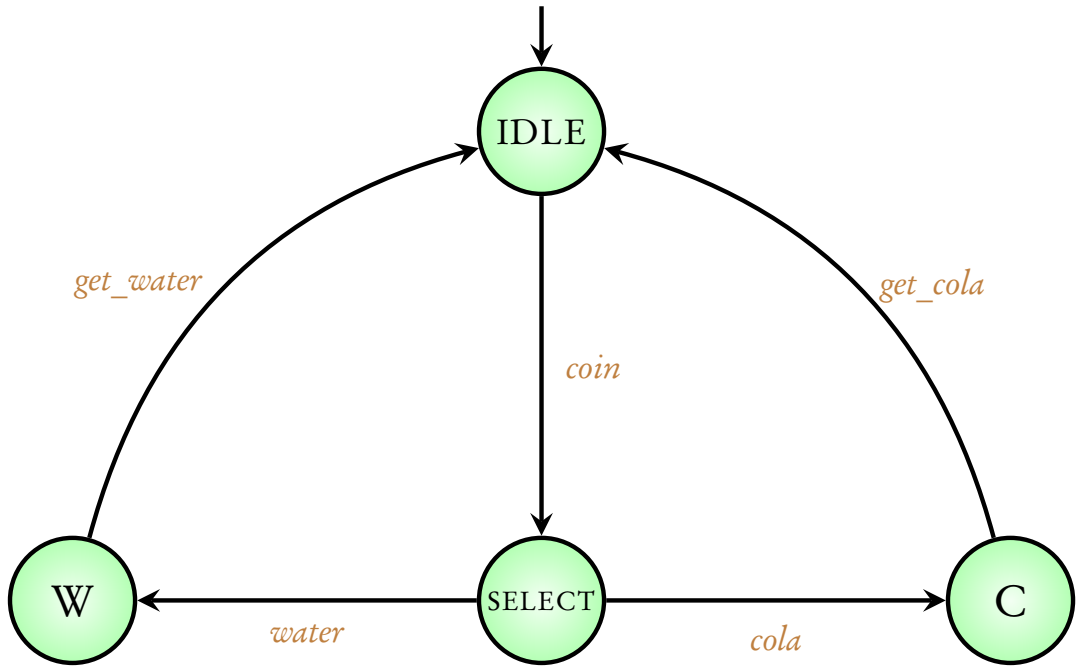
Variables + Conditional branching + Assignments

Coming next: vending machine revisited


IDLE
get_water
coin
get_cola
W
SELECT
C
water
cola

Variables:

`nwater, ncola, max`



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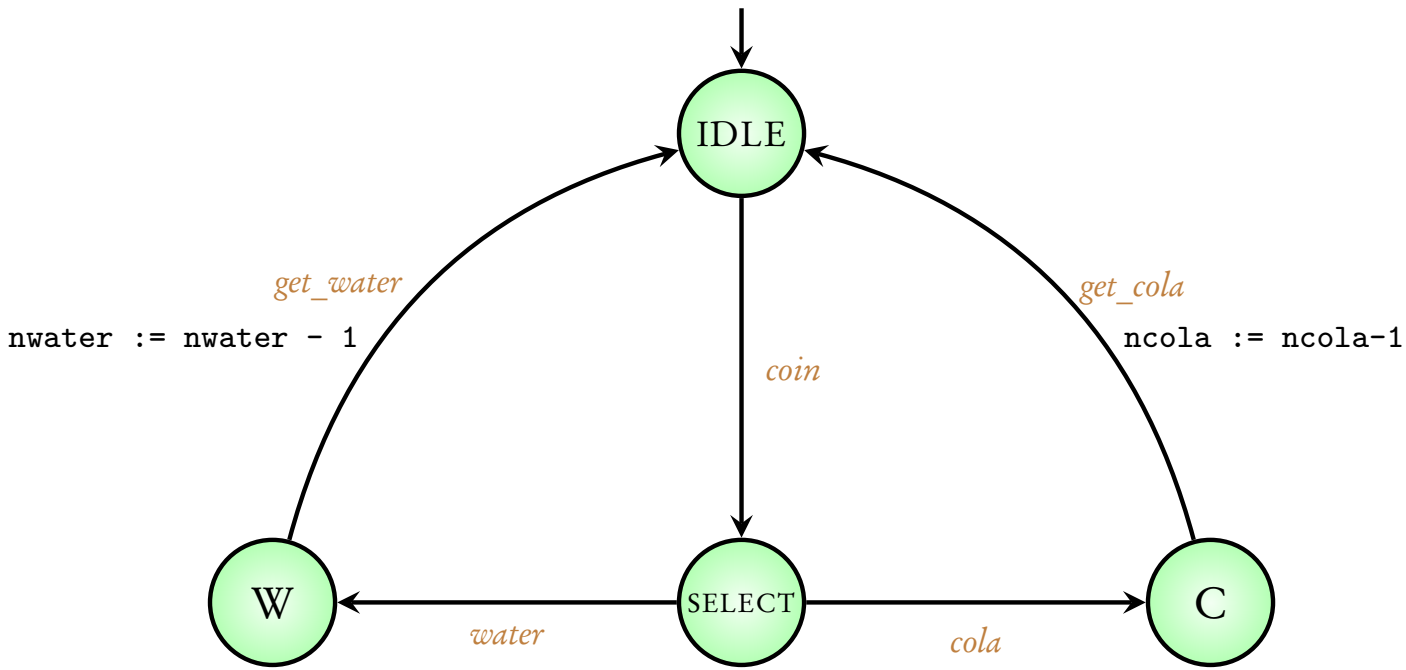

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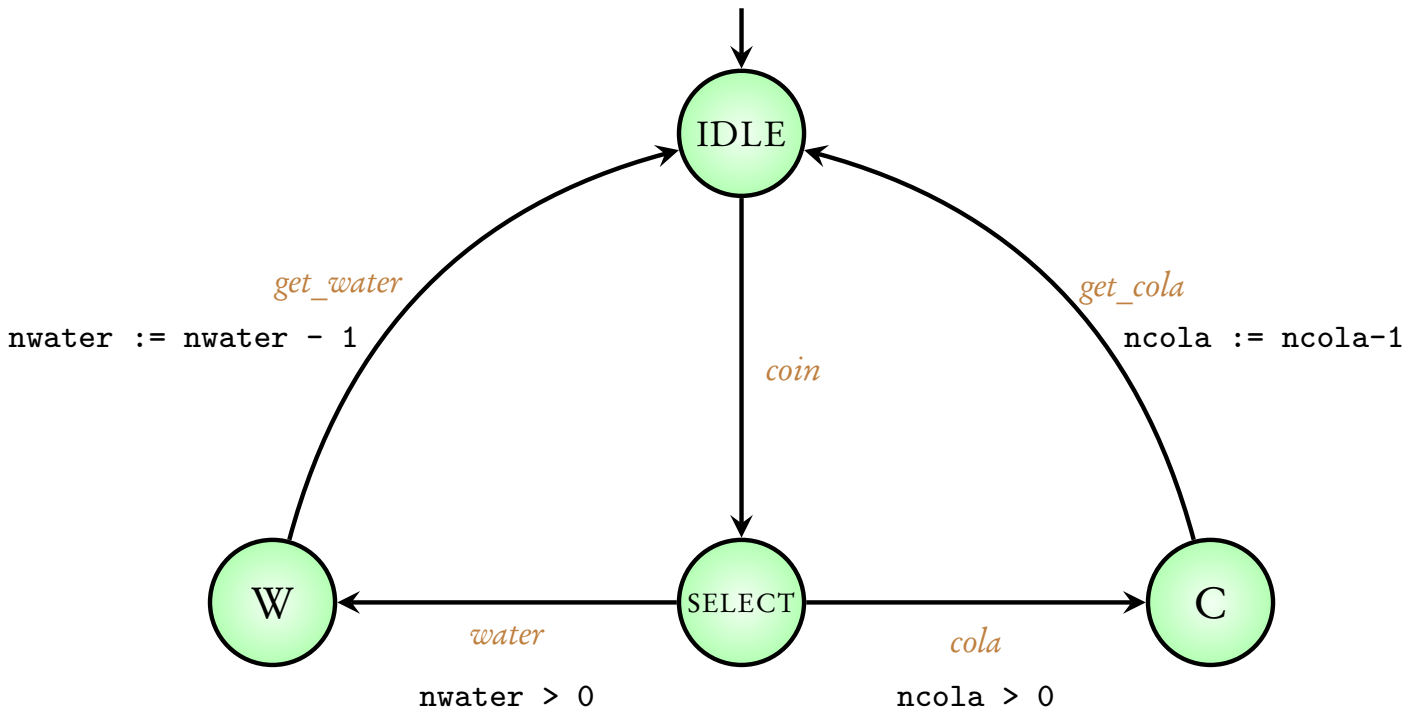

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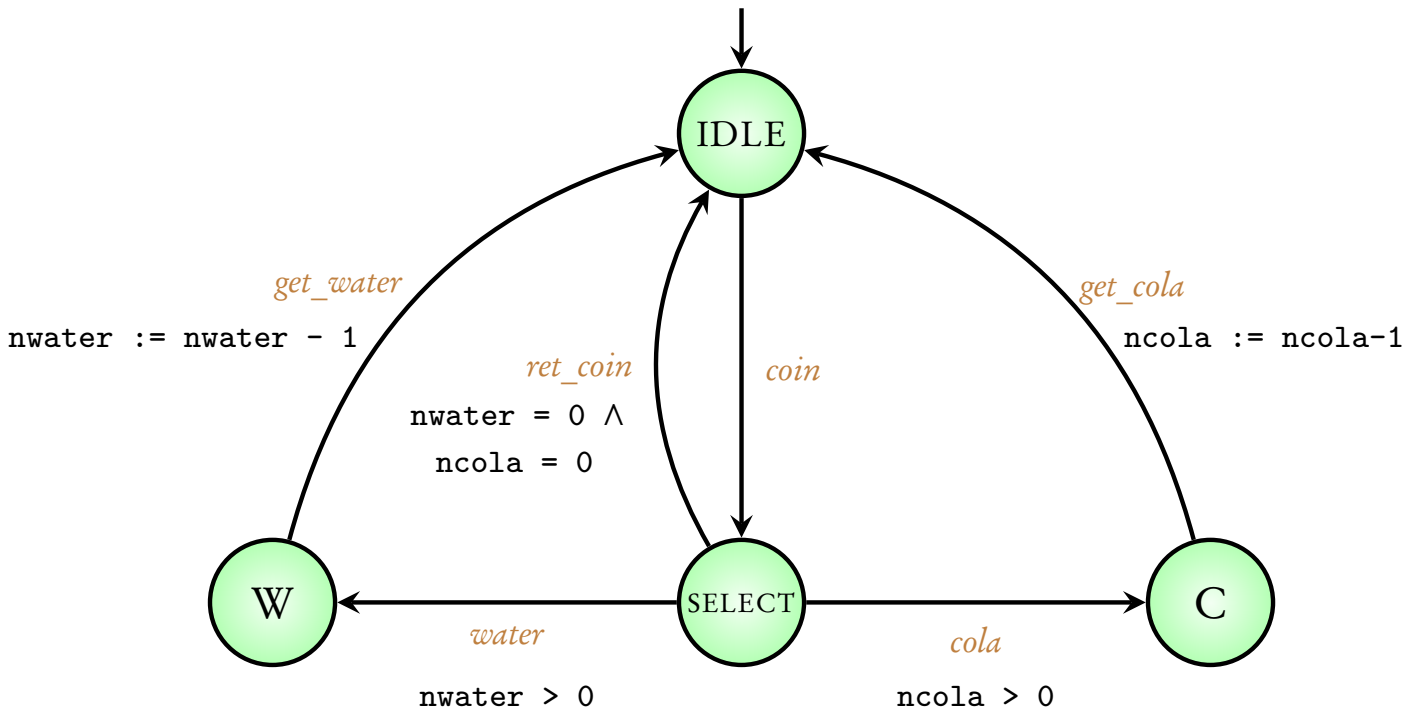

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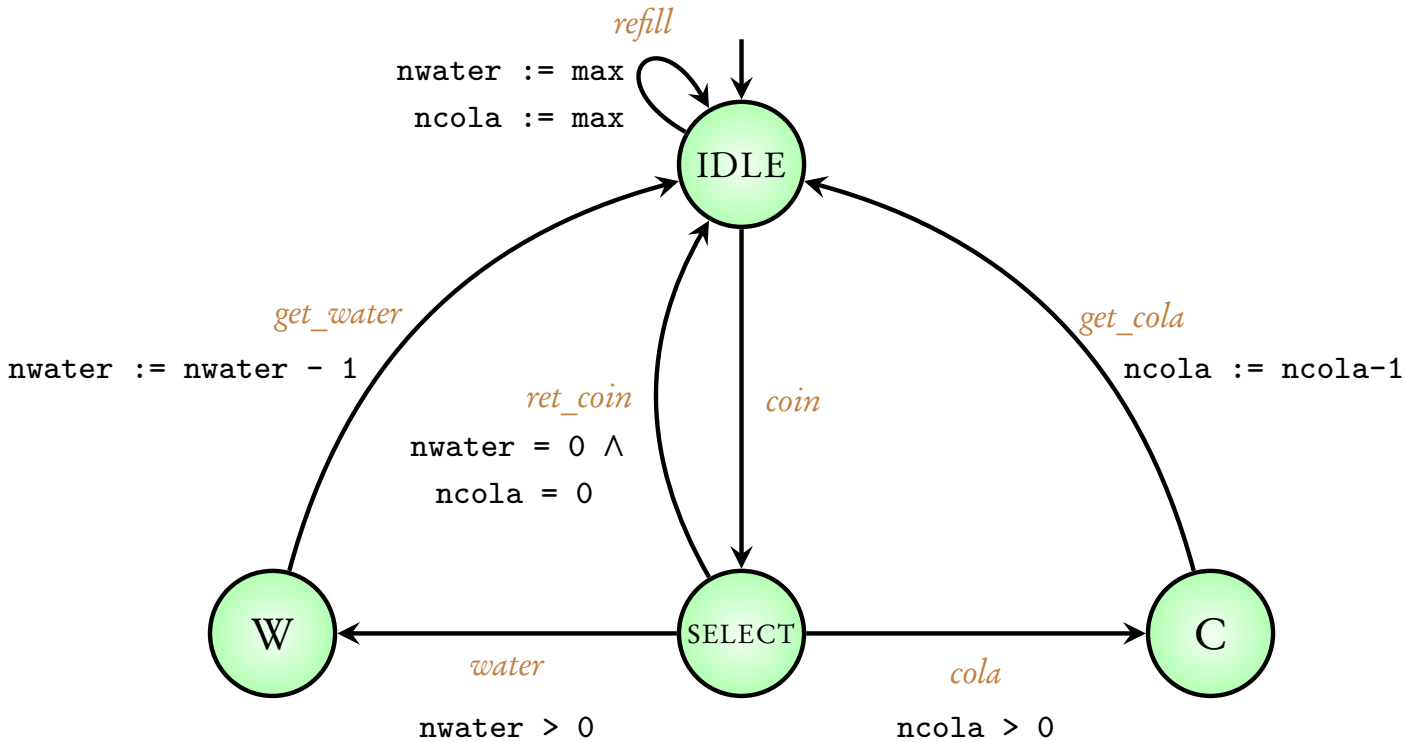
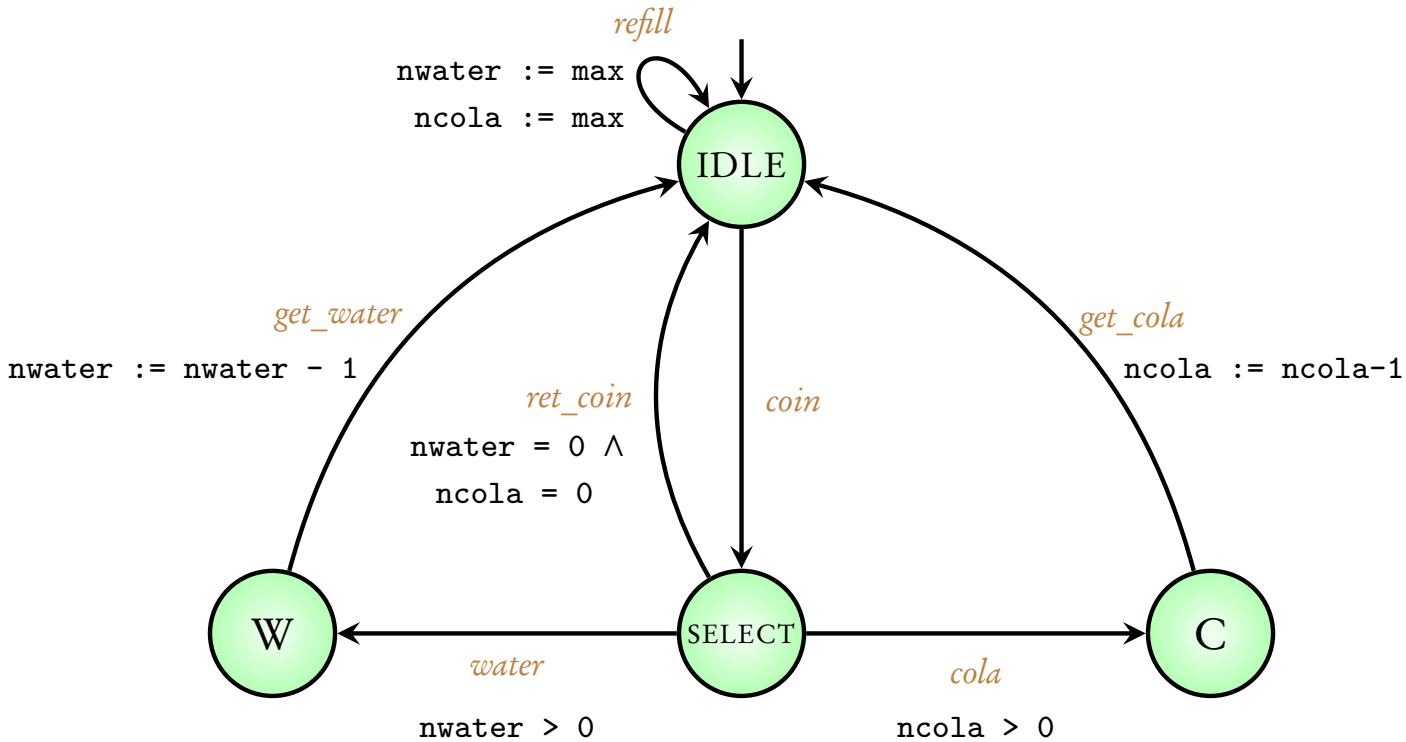


Initial condition:

`nwater = max, ncola = max`

Variables:

`nwater, ncola, max`



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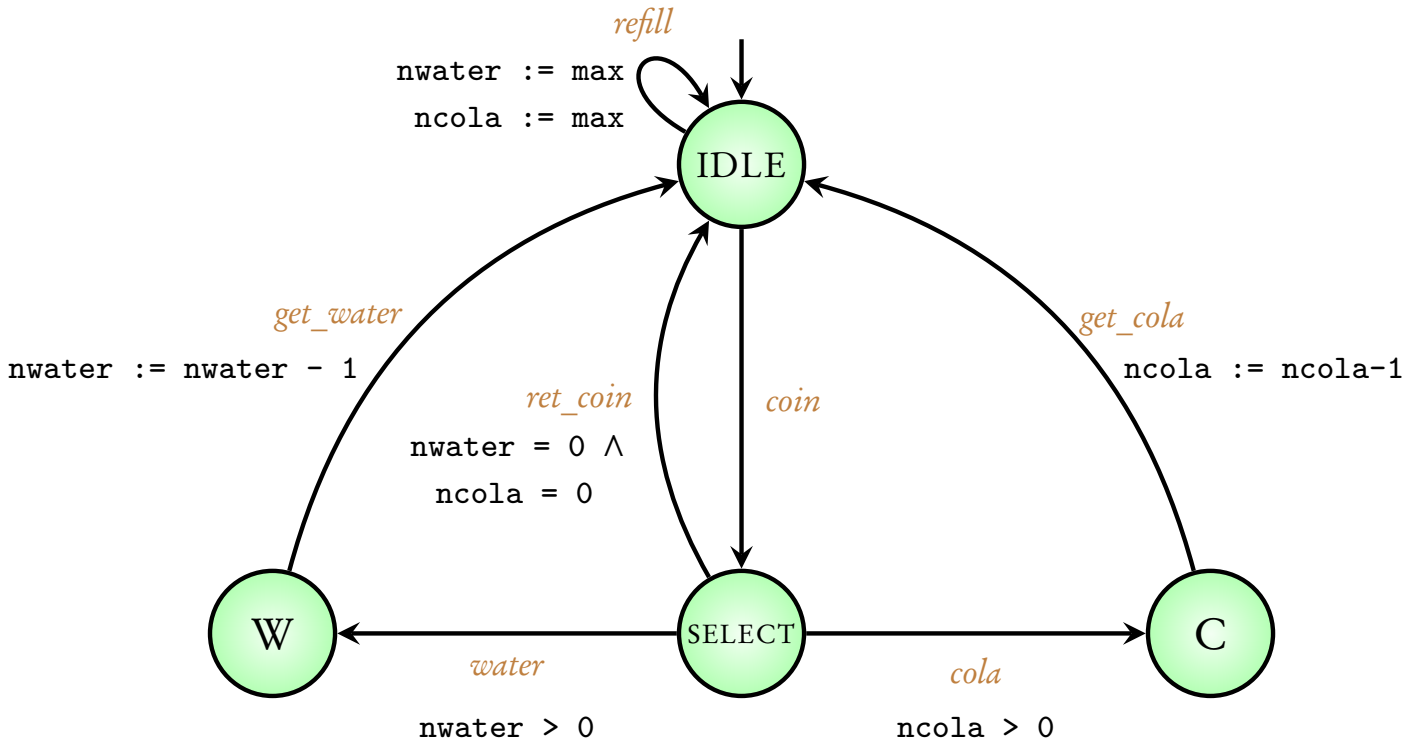
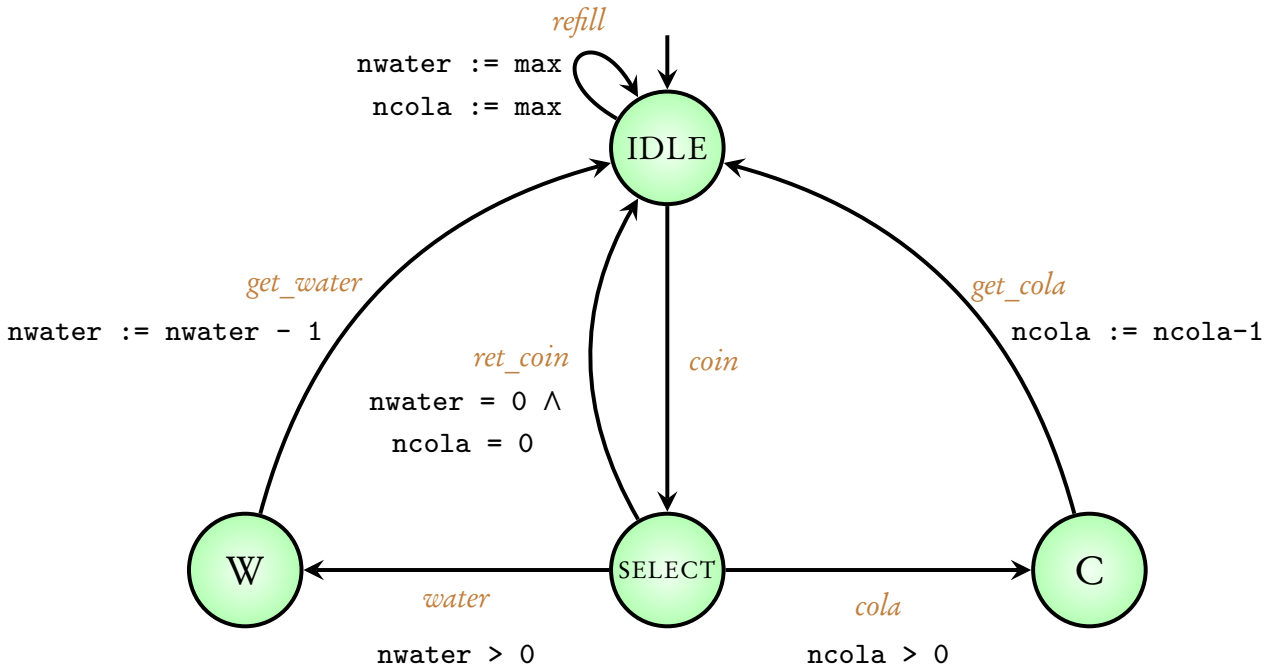
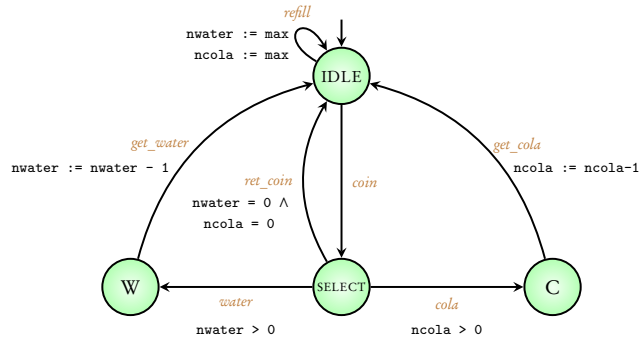


Program graph

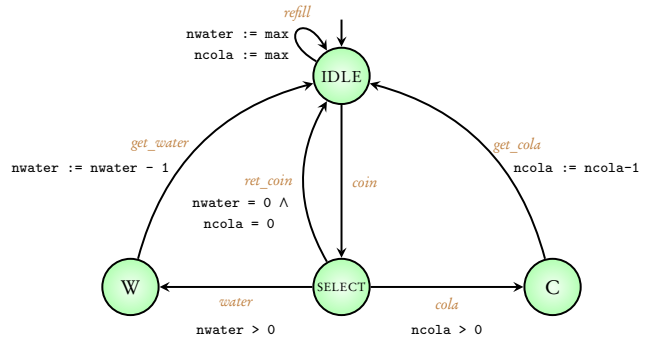


Coming next: Transition system corresponding to `max` = 1

$\texttt{max} = 1$


refill
nwater := max
ncola := max
IDLE
get_water
nwater := nwater - 1
ret_coin
nwater = 0 ∧
ncola = 0
coin
get_cola
ncola := ncola-1
W
SELECT
C
water
nwater > 0
cola
ncola > 0

$\texttt{max} = 1$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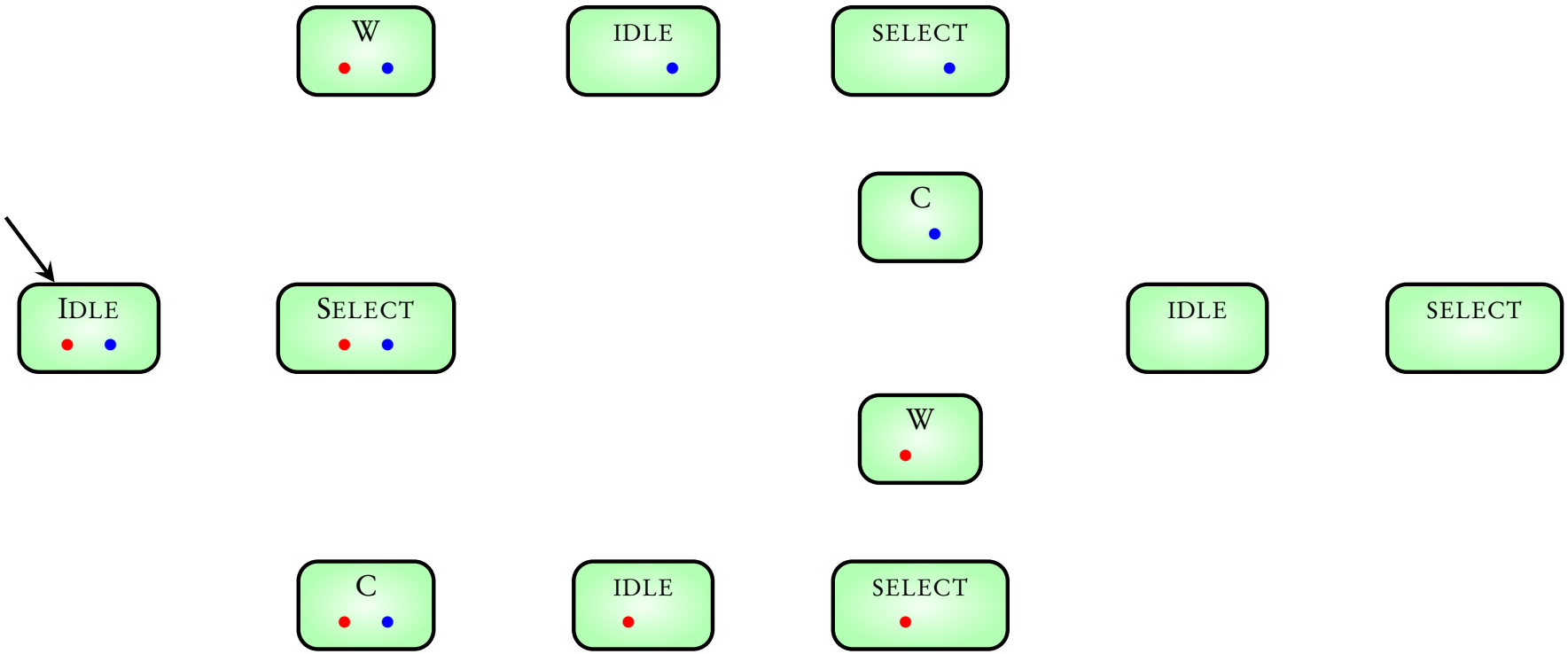
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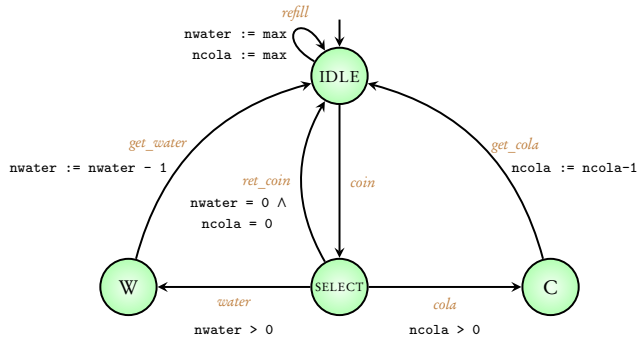
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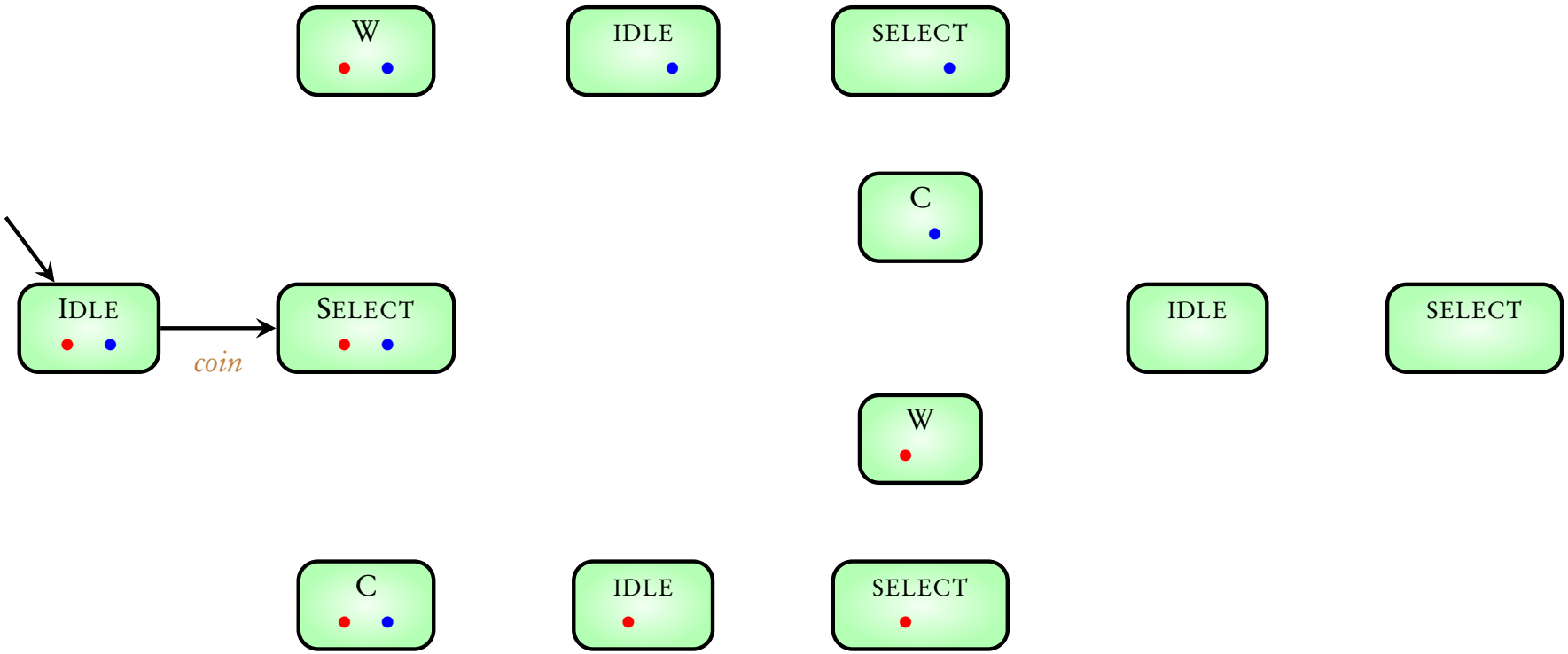
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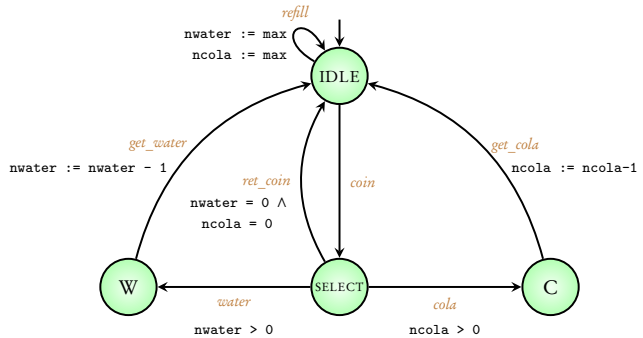
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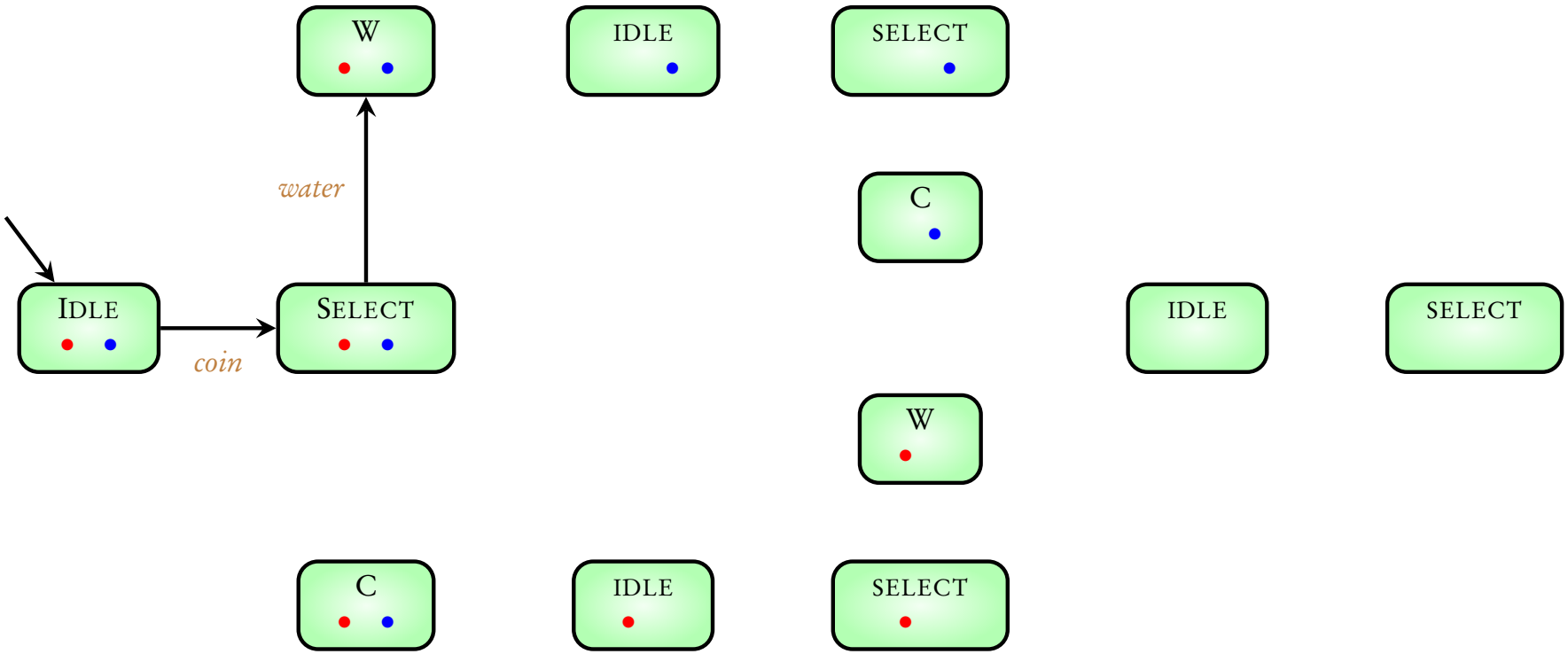
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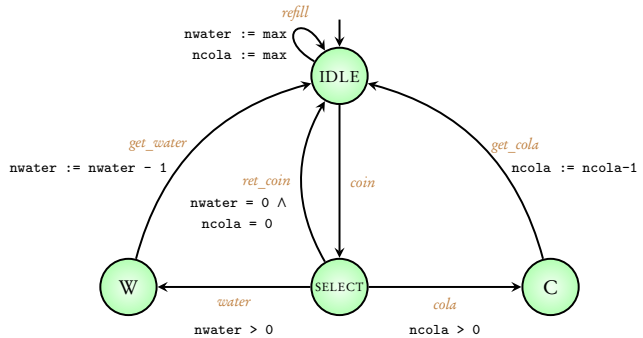
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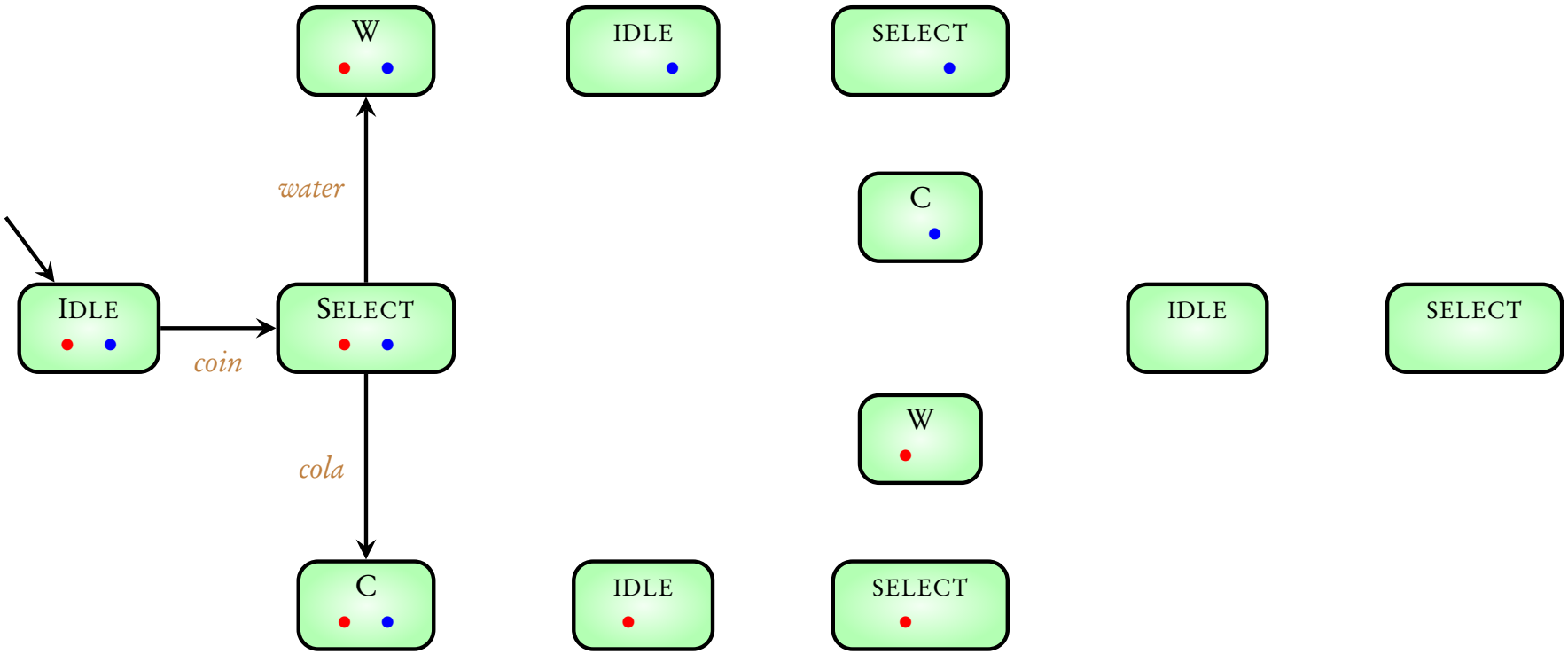
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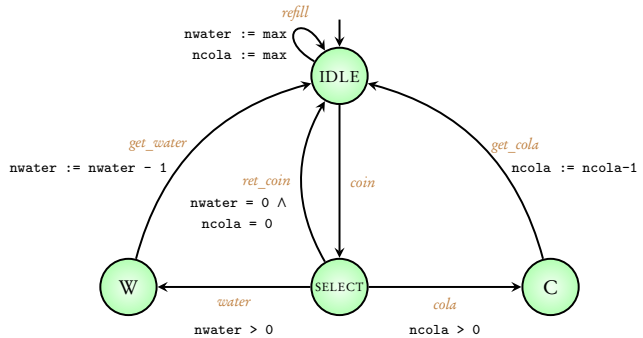
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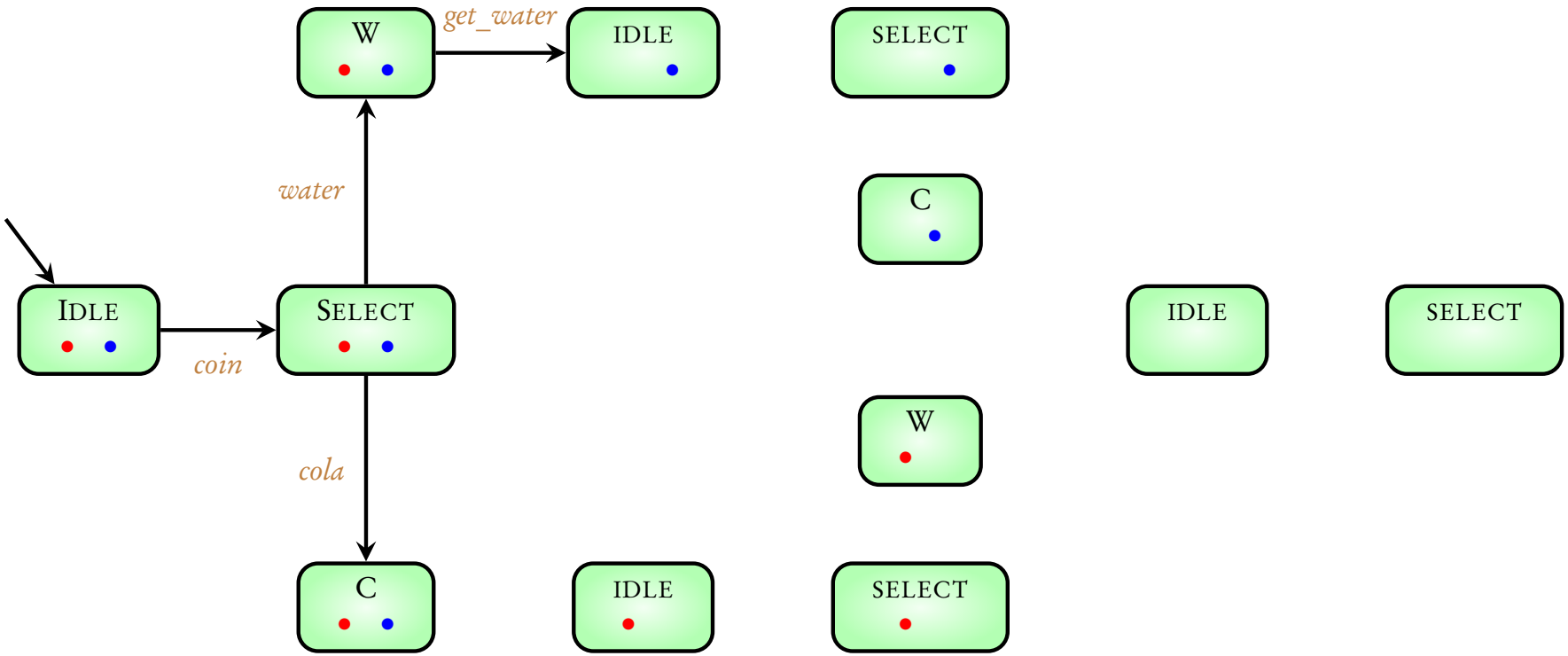
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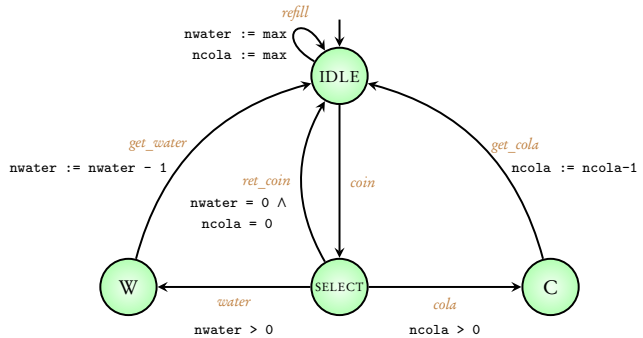
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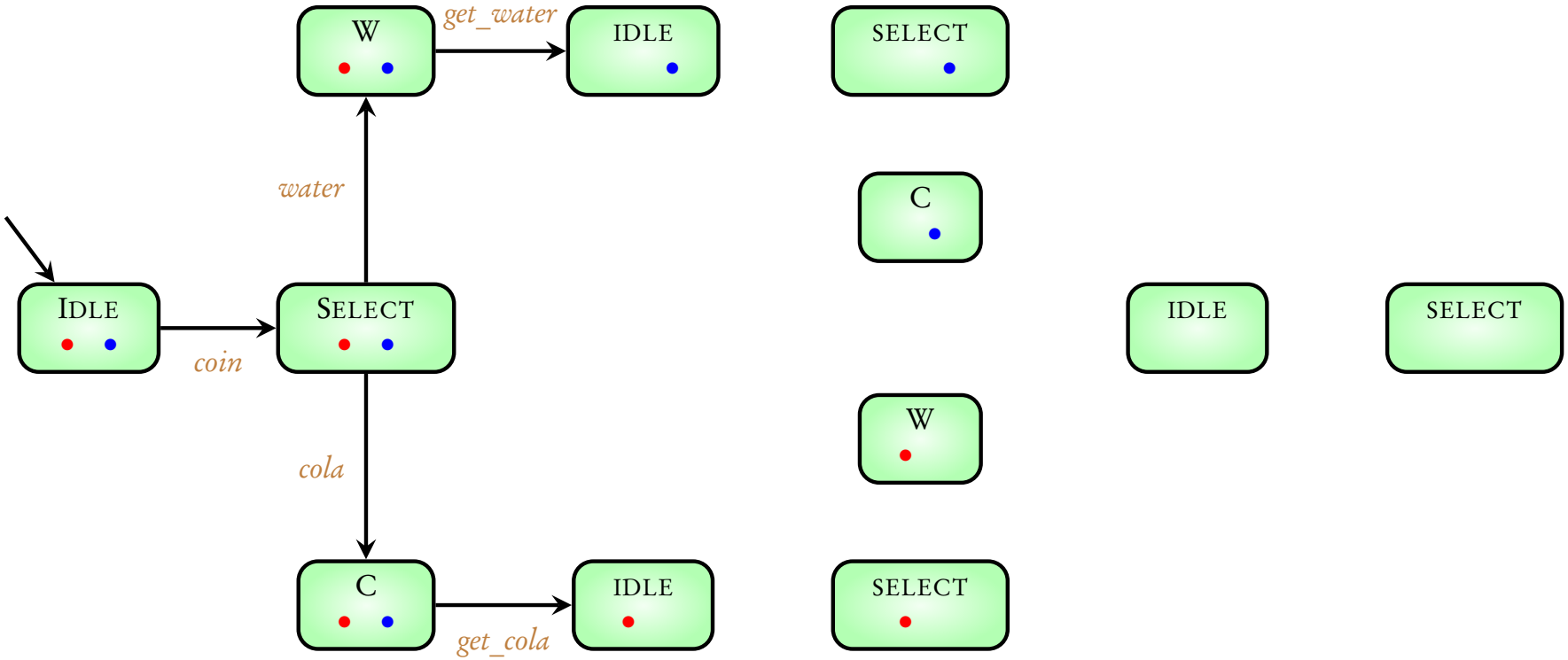
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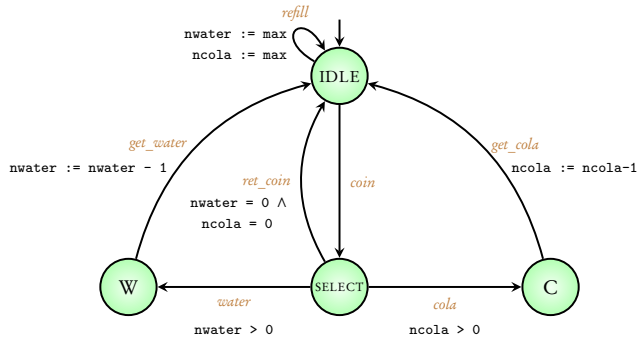
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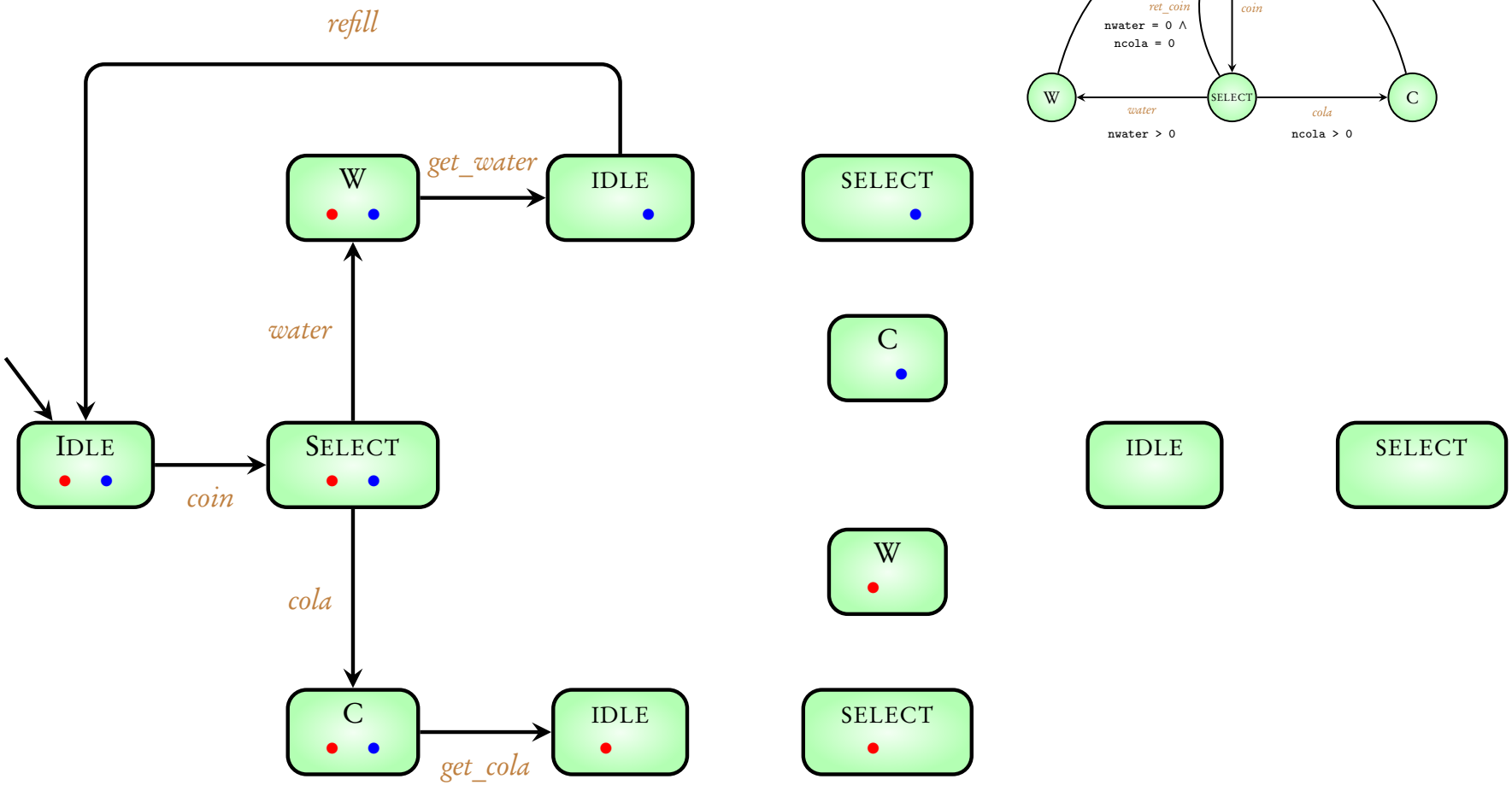
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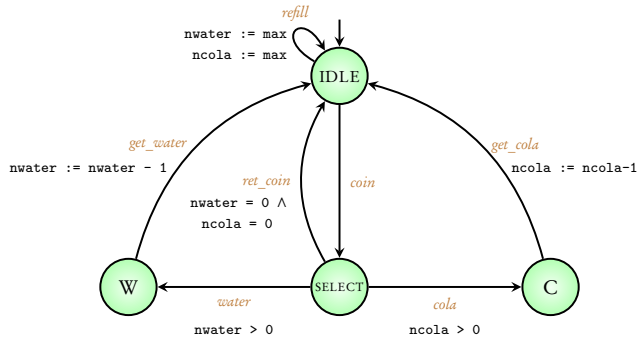
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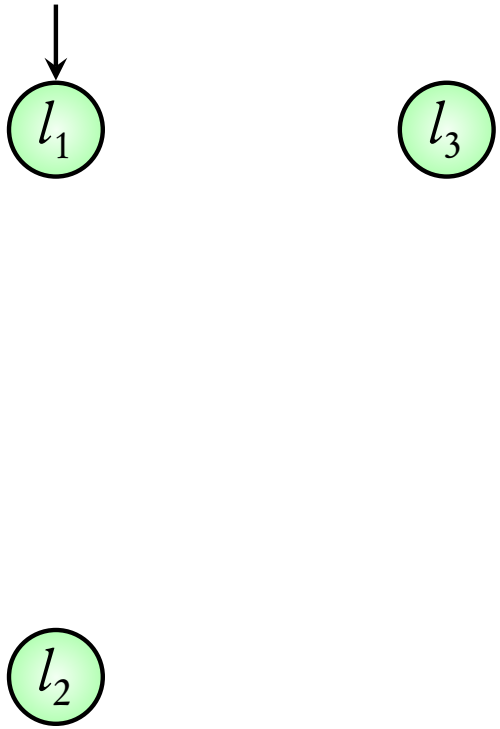
```
    ...
while (x > 0)
    if (x mod 2 = 0)
        x := x - 2
    else  x:= x - 1
    ...
```

```
...
l1: while (x > 0)
    if (x mod 2 = 0)
l2:     x := x - 2
    else x:= x - 1
...
l3:
```



...

l_1: **while** (x > 0)

l_2:

```
if (x mod 2 = 0)
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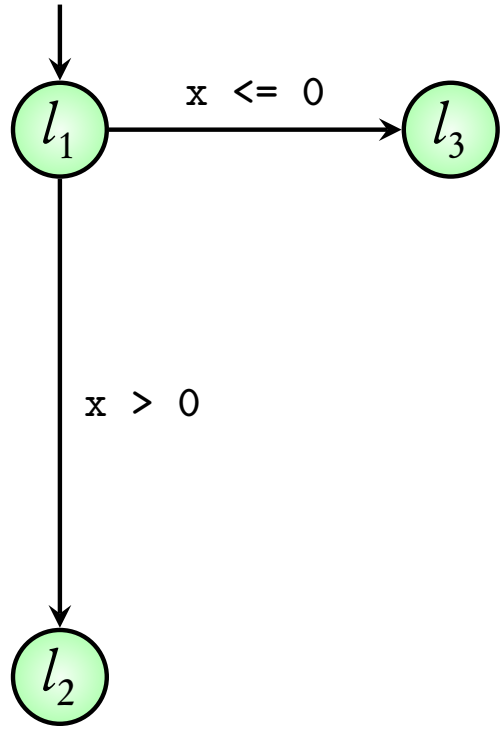
...

l_3:



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l_1: **while** (x > 0)

if (x mod 2 = 0)

l_2: x := x - 2

else x:= x - 1

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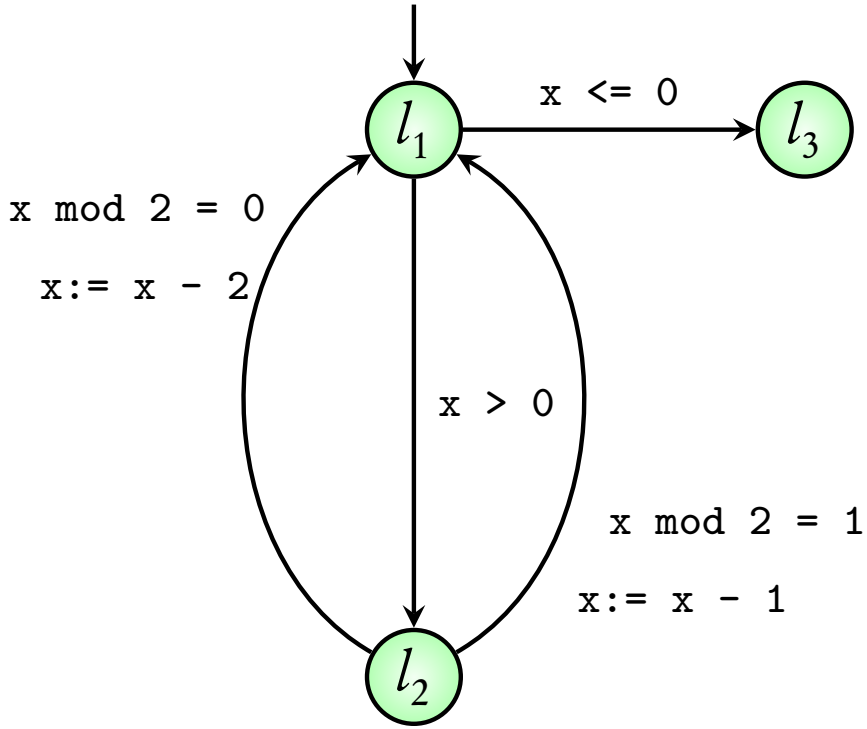
l_3:



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if (x mod 2 = 0)

l_2: x := x - 2

else x:= x - 1

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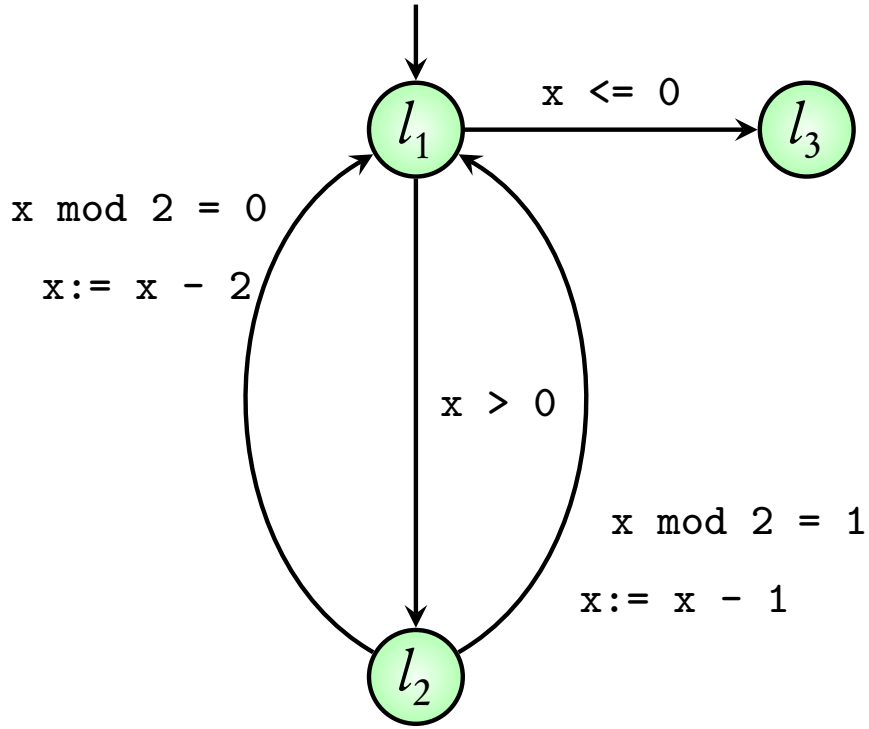
l_3:



Program graph

```
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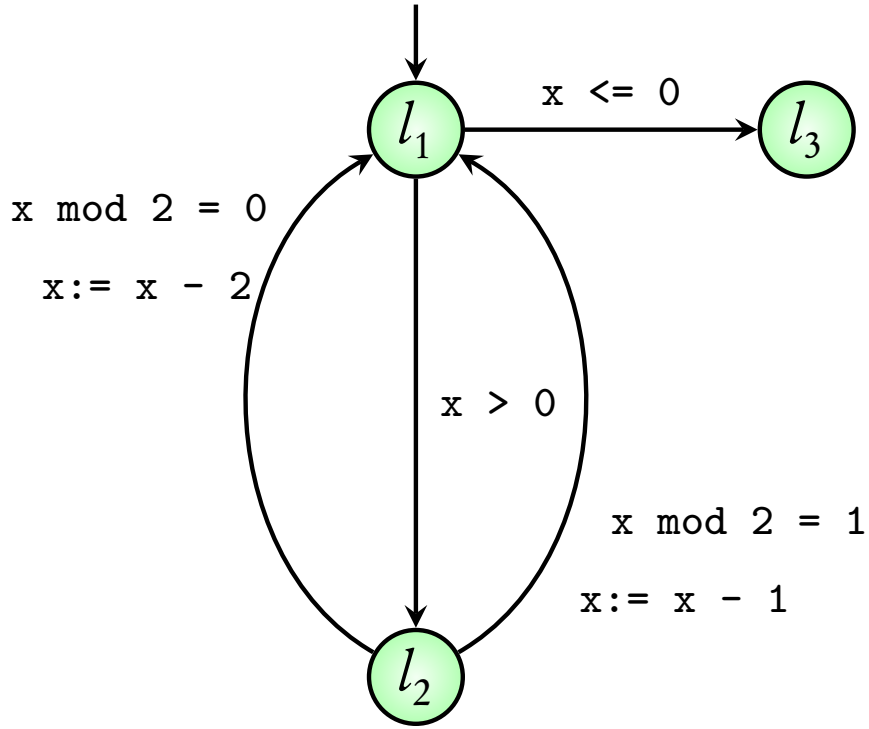
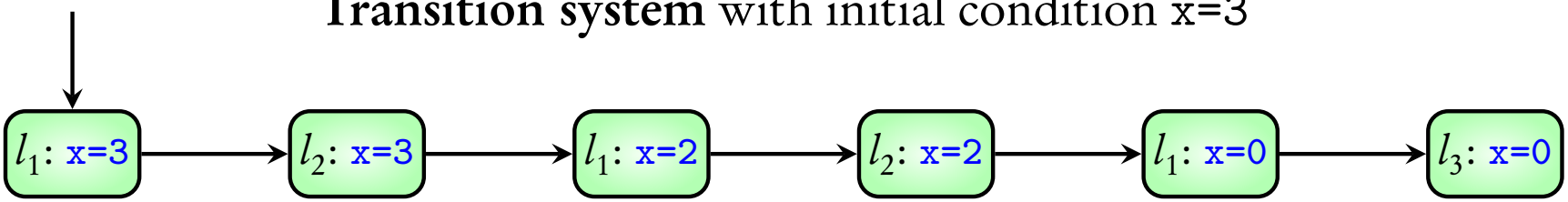
l2:         x := x - 2
        else x:= x - 1
...
l3:
```



Program graph

Transition system with initial condition x=3



Summary

Data-dependent programs

Program graphs

Transition systems of program graphs

Reference: Principles of Model Checking, *Baier and Katoen*, MIT Press (2008)

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