Reconfigurable Broadcast Networks and Asynchronous Shared-Memory Systems are Equivalent

Chana Weil-Kennedy

joint work with A. R. Balasubramanian, *Technical University of Munich*
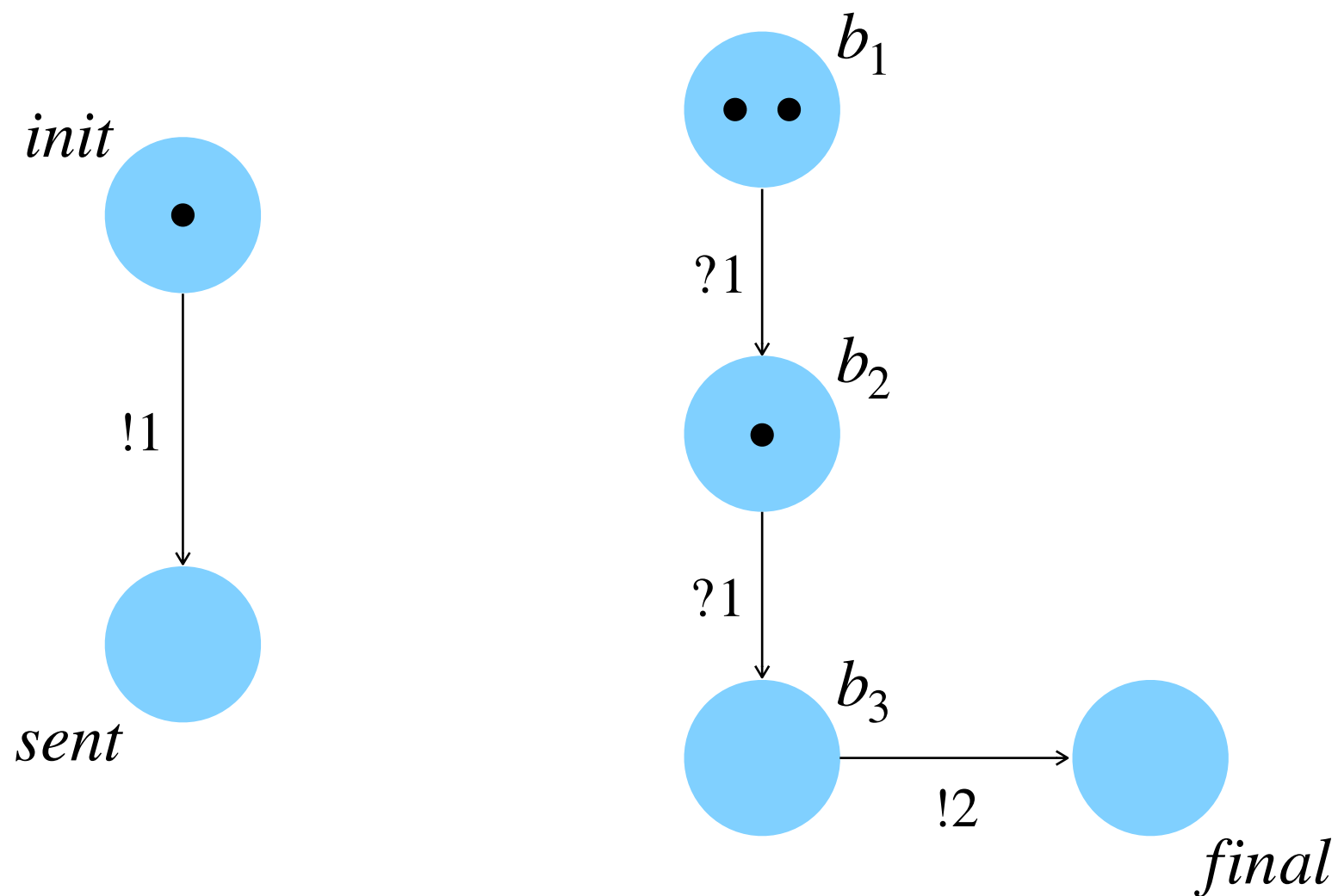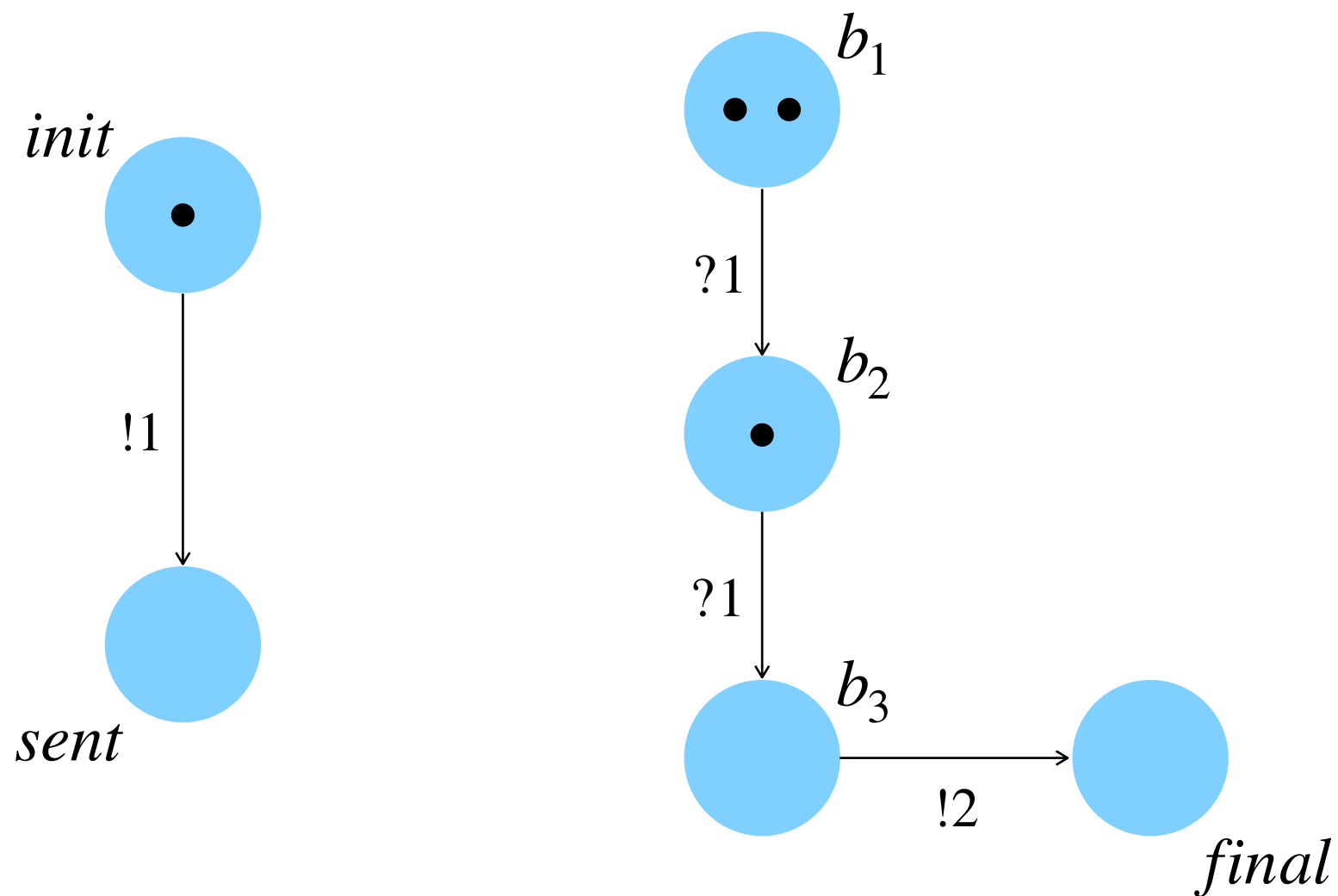
Reconfigurable Broadcast Network

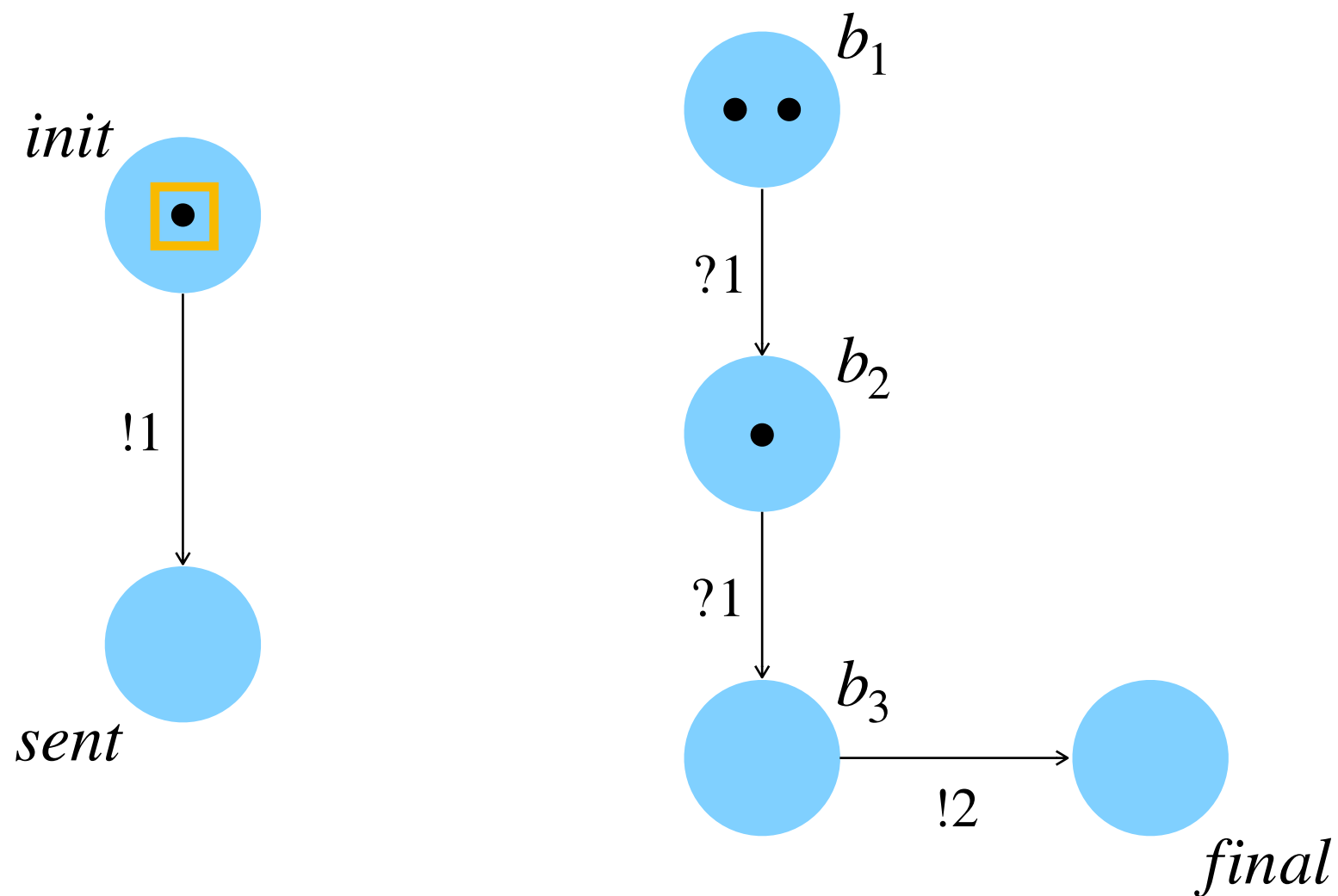introduced in [Delzanno, Sangnier & Zavattaro, CONCUR '10]

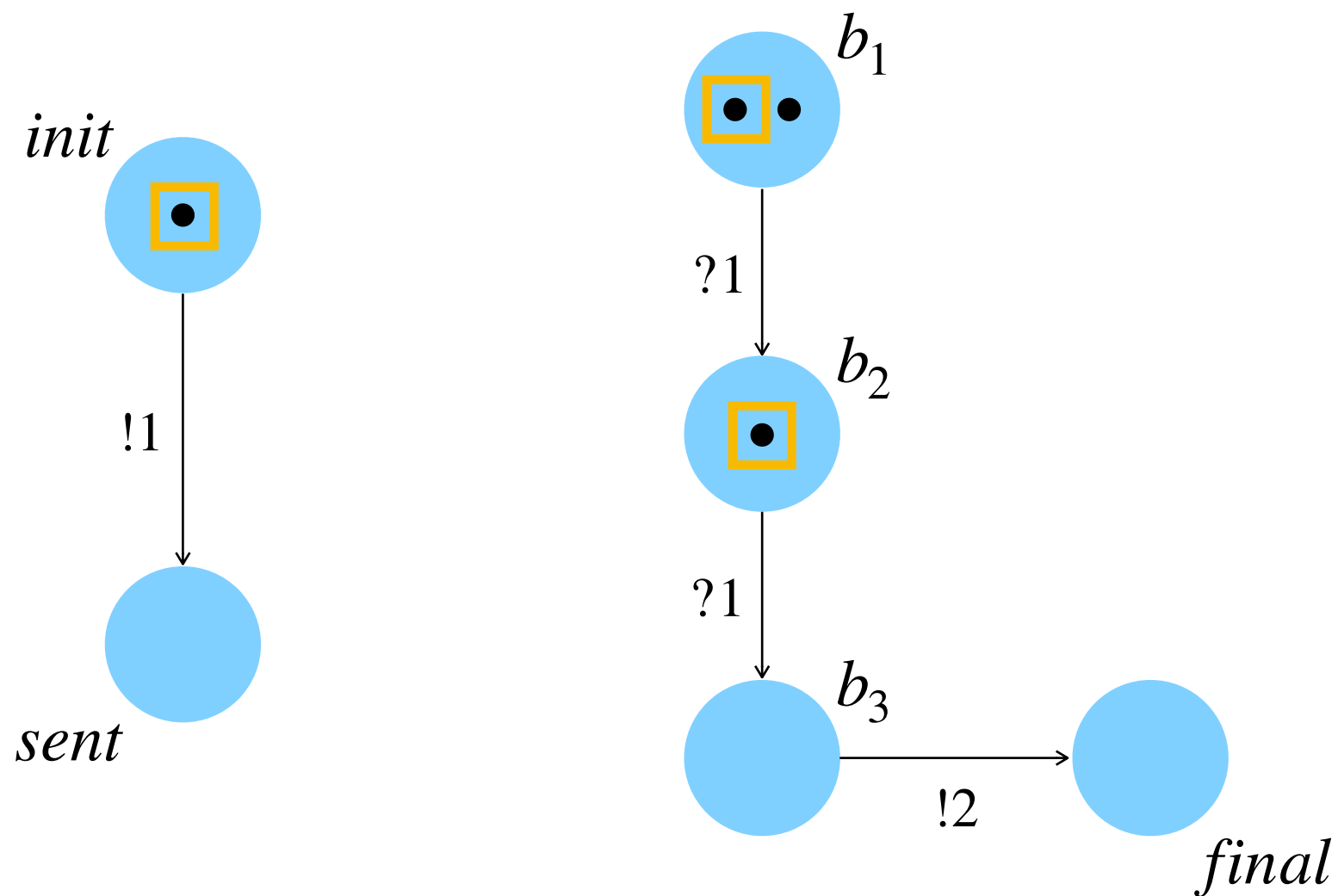# Reconfigurable Broadcast Network

Goal: put a process in *final*

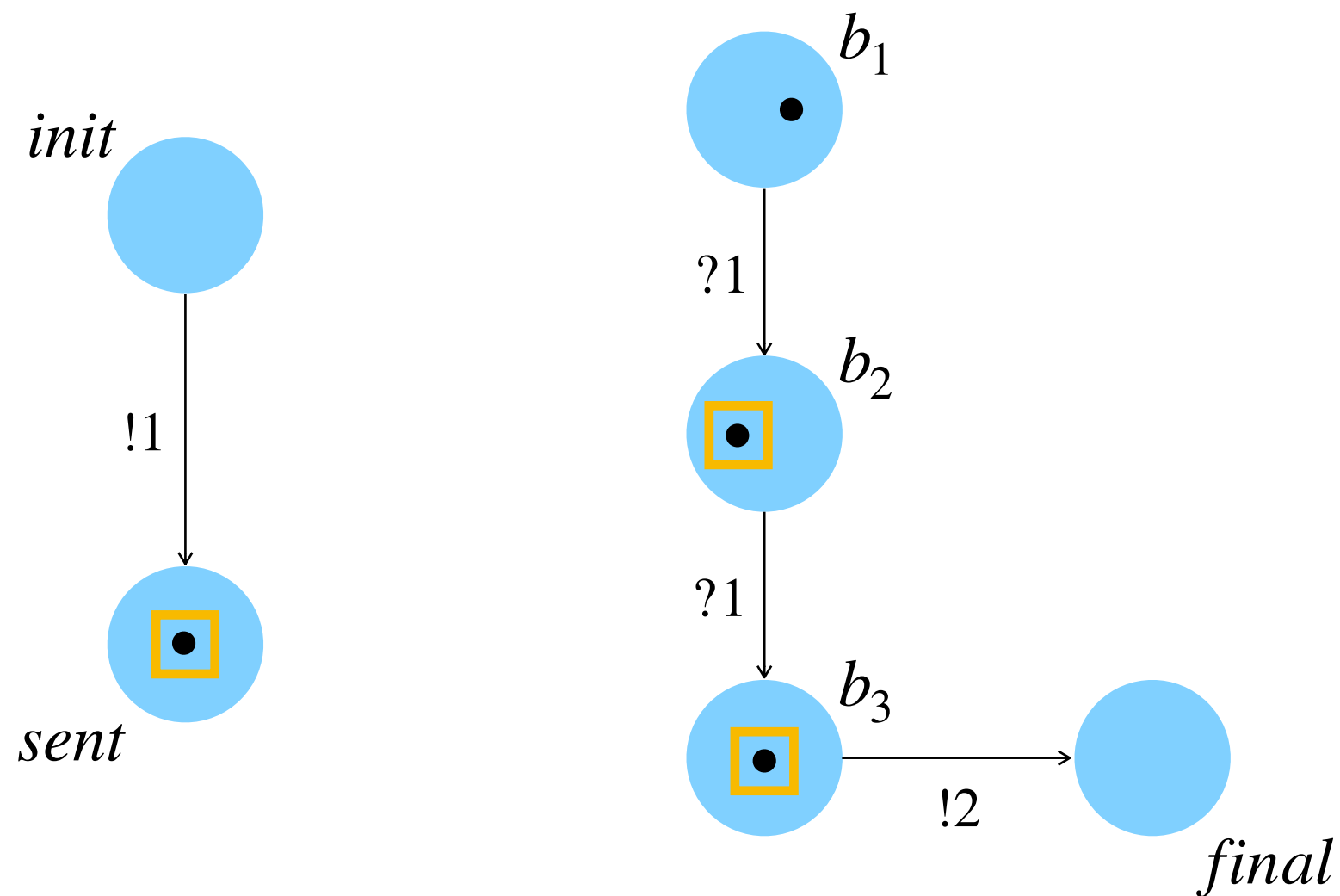# Reconfigurable Broadcast Network

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Reconfigurable Broadcast Network

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Reconfigurable Broadcast Network

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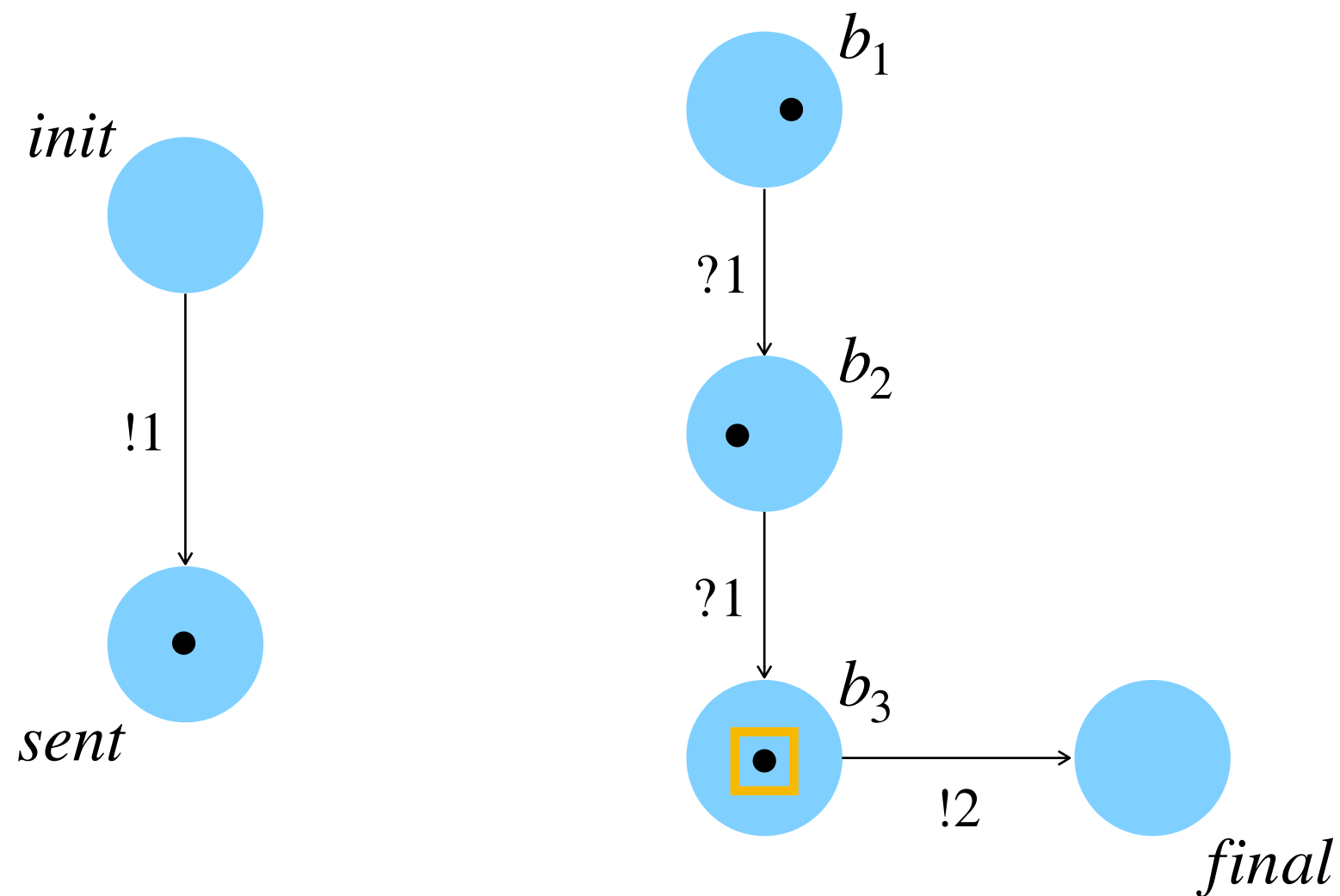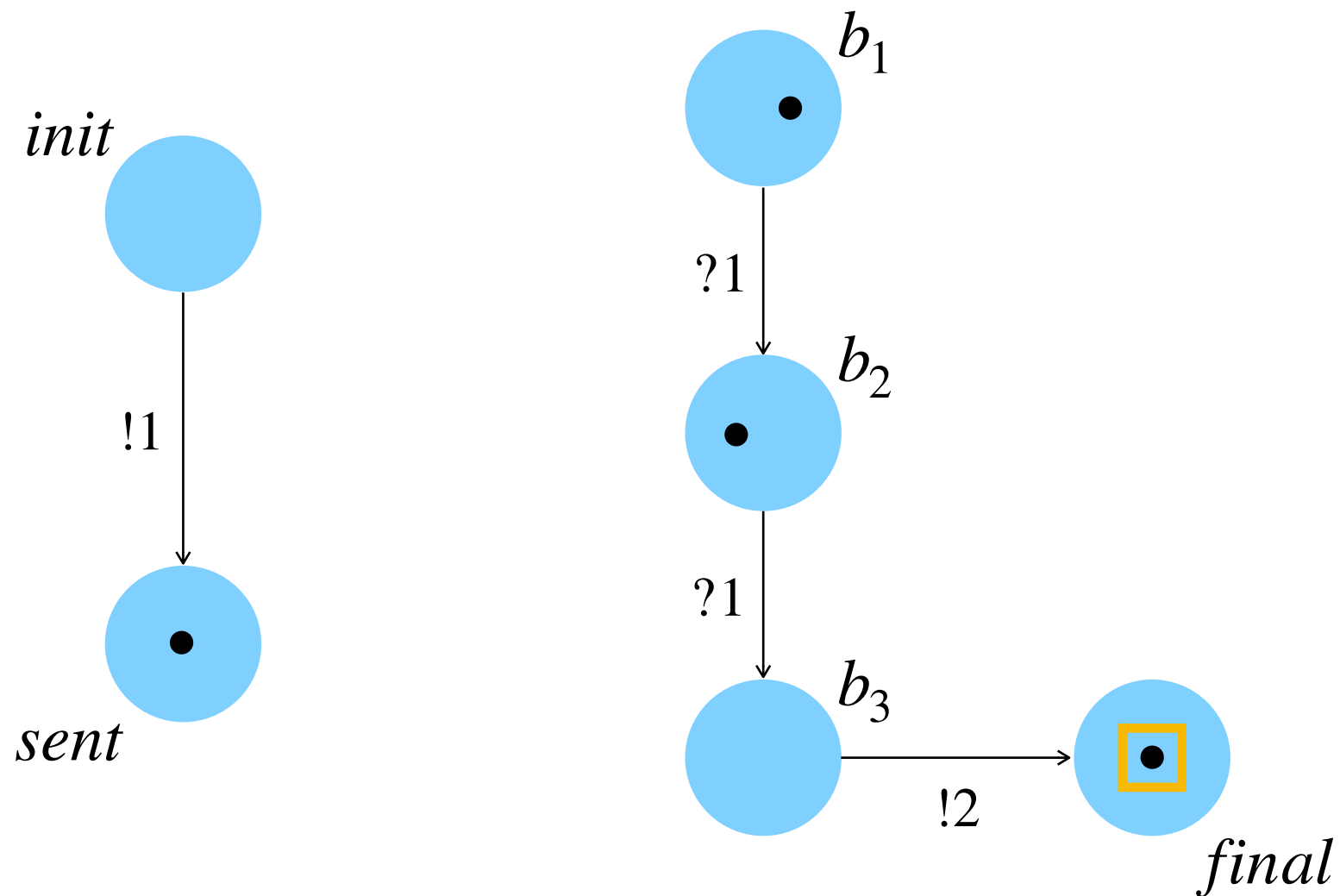*RBN and ASMS are Equivalent, C. Weil-Kennedy*

Reconfigurable Broadcast Network

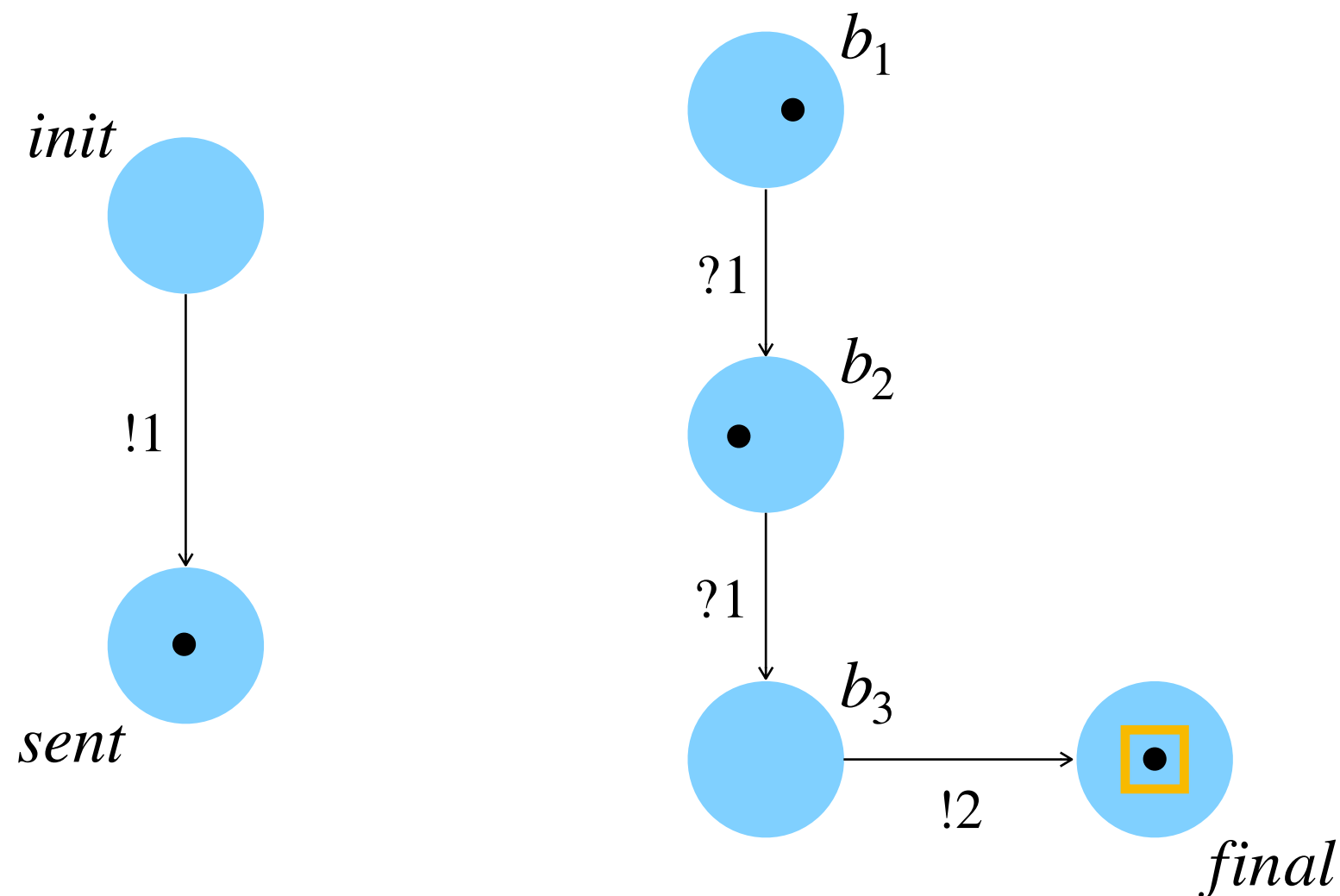**Goal: put a process in** *final*

Reconfigurable Broadcast Network

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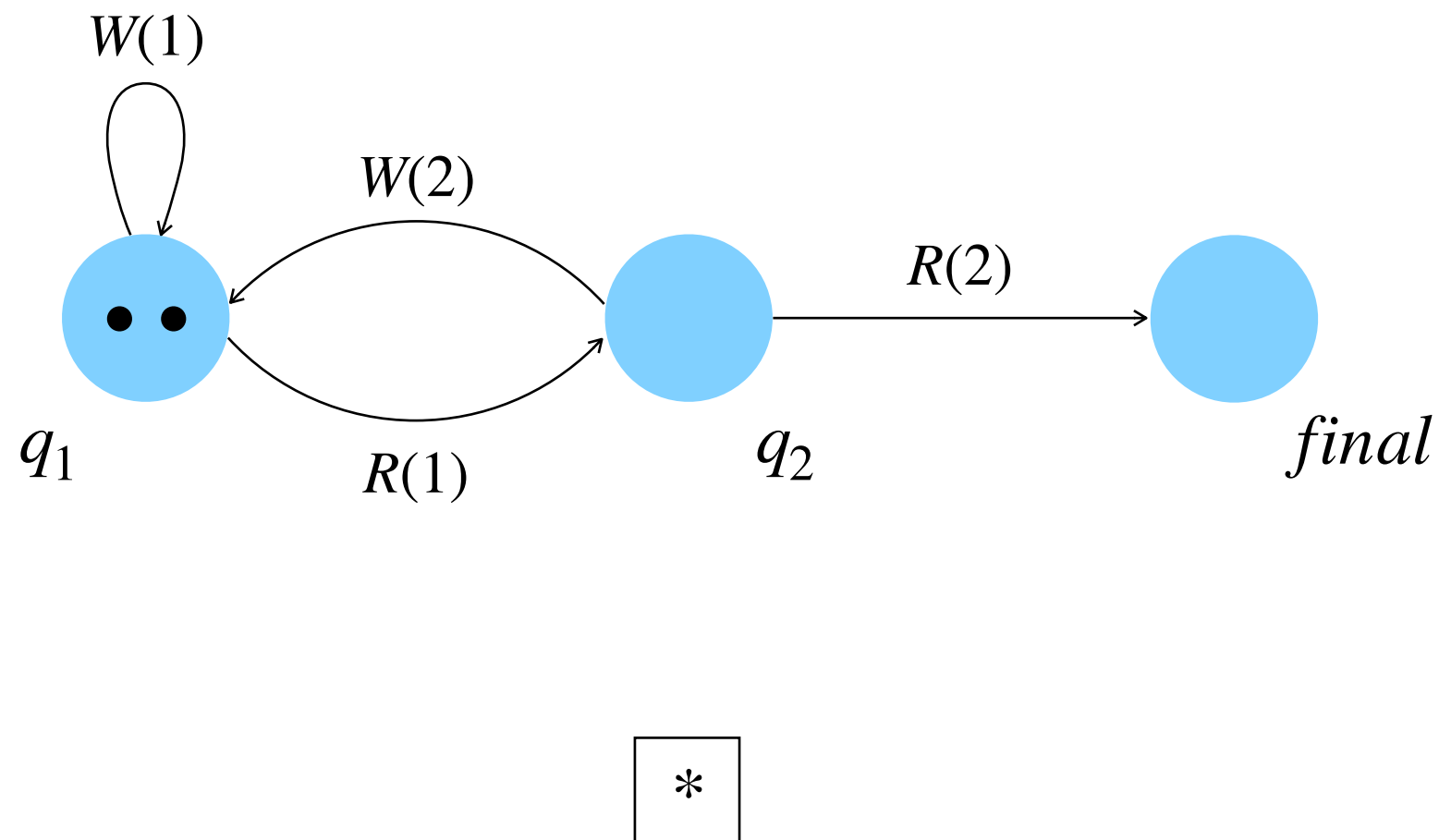
Reconfigurable Broadcast Network

Goal: put a process in *final*

- processes communicate by selective broadcast

- broadcast and receives happen at the same time
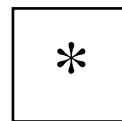
- multiple receives can happen simultaneously
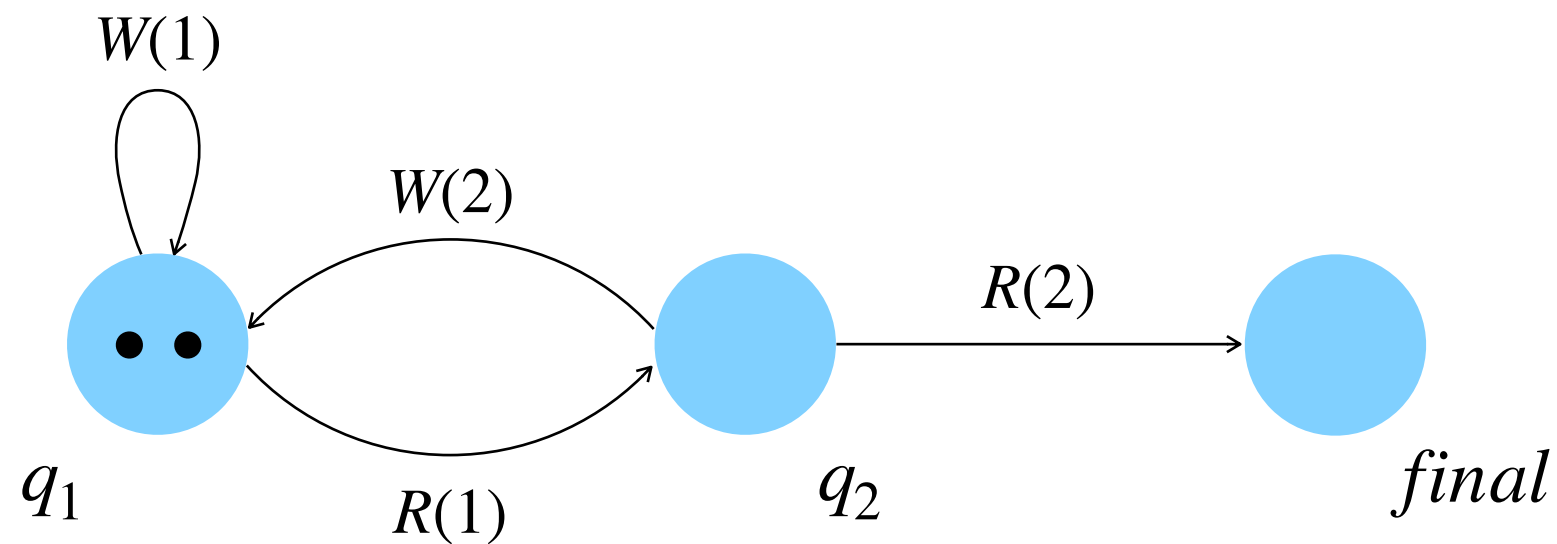
RBN and ASMS are Equivalent, C. Weil-Kennedy

Asynchronous Shared Memory System

introduced in [Esparza, Ganty & Majumdar, CAV '13]

Asynchronous Shared Memory System

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Asynchronous Shared Memory System
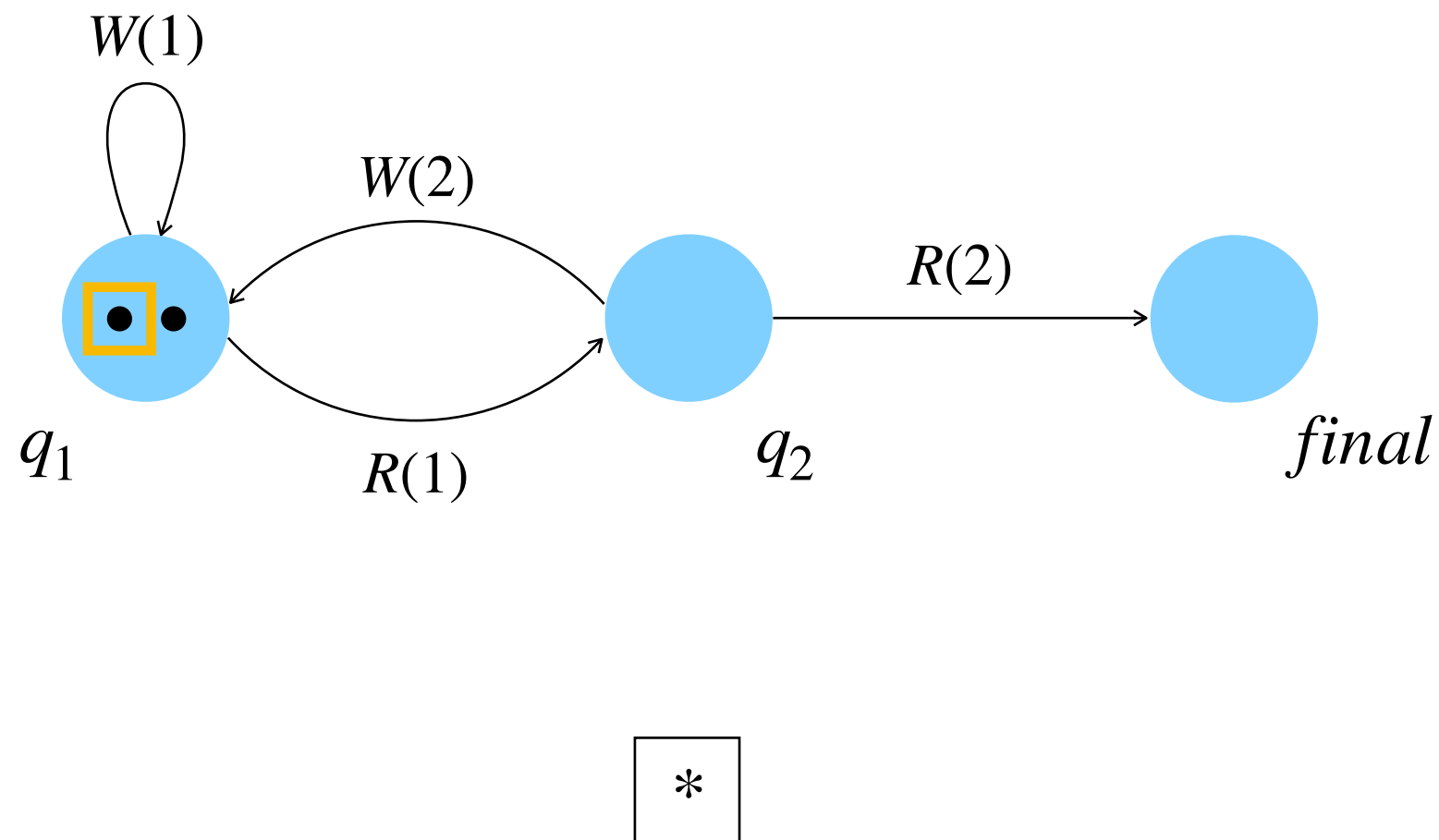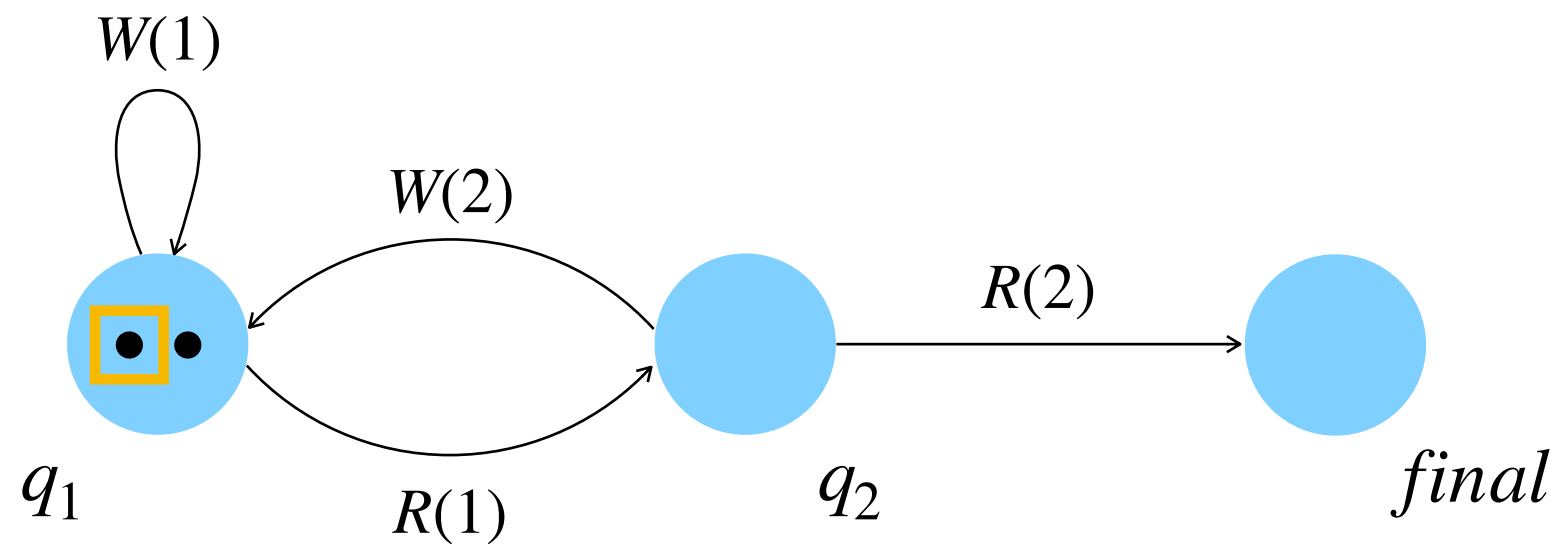
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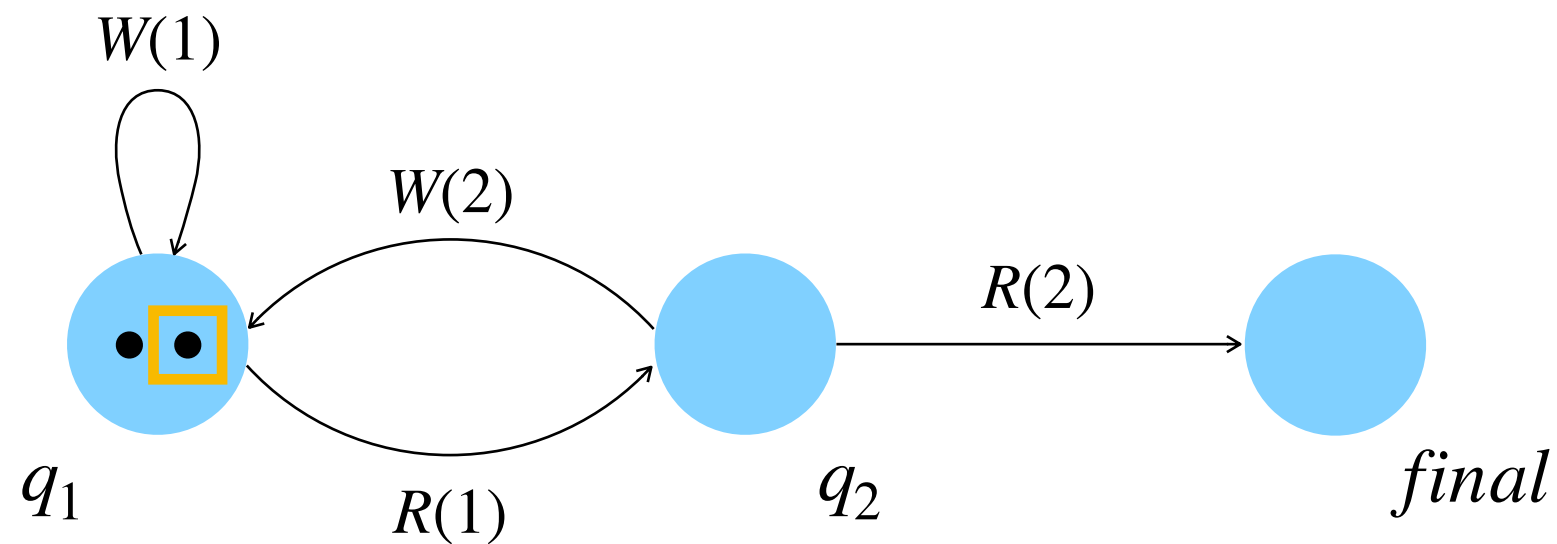# Asynchronous Shared Memory System
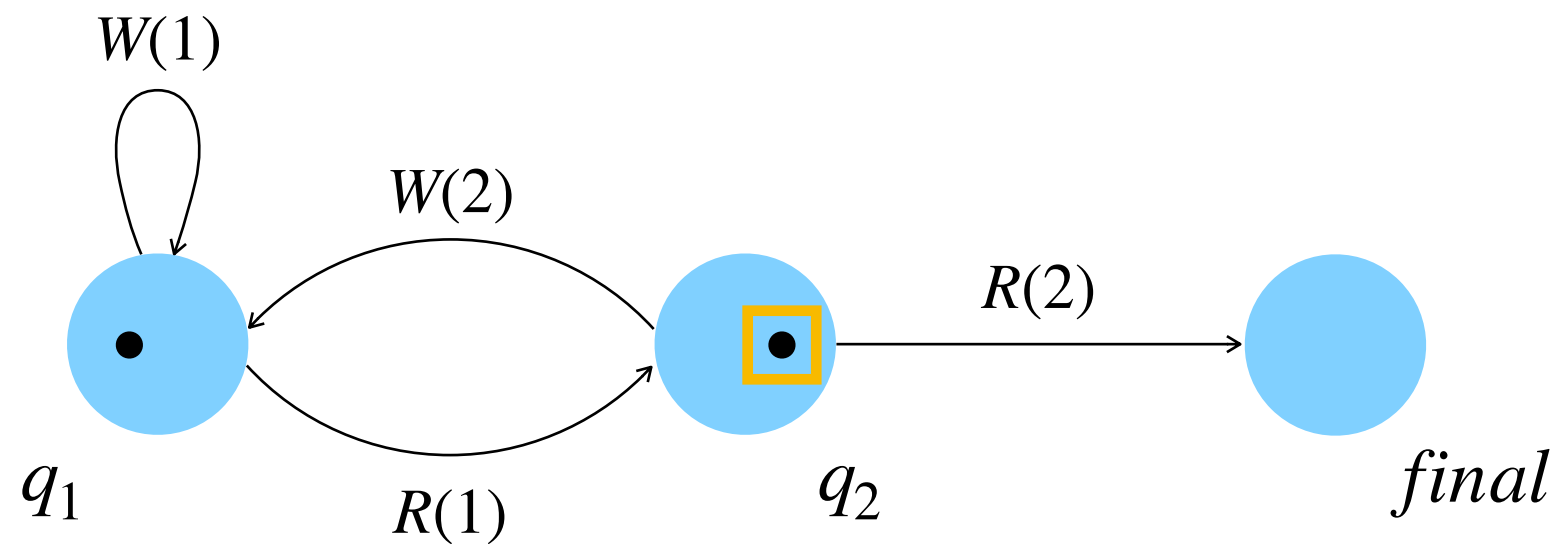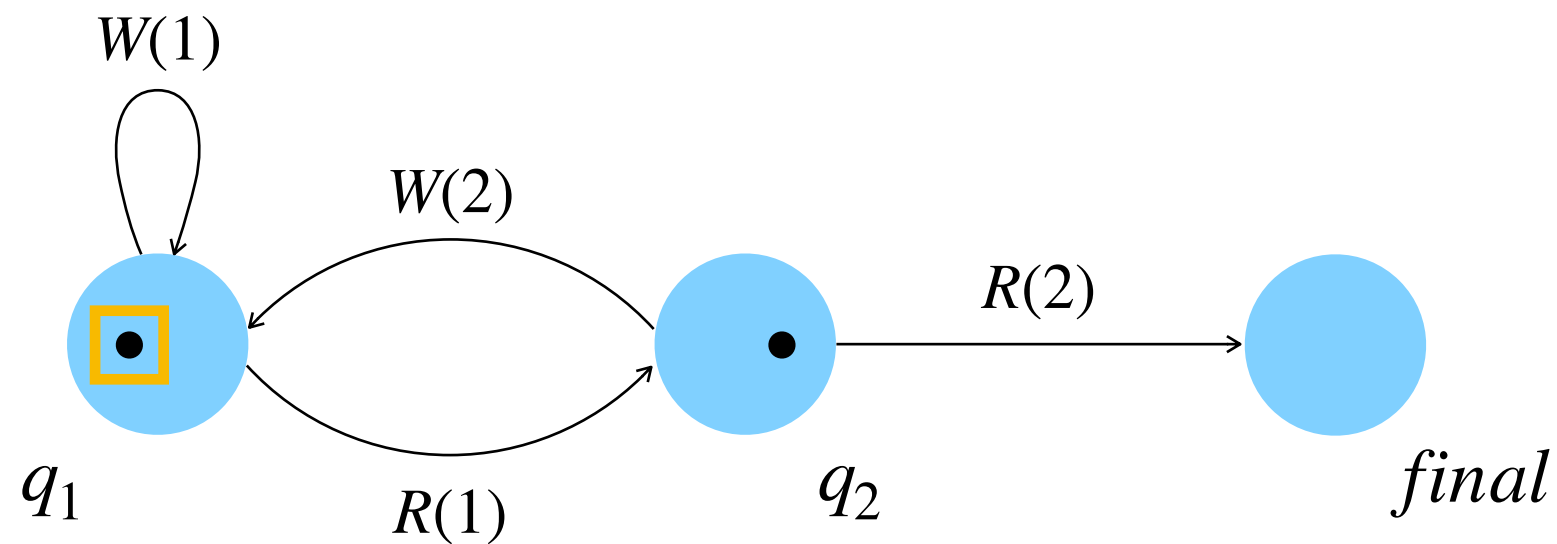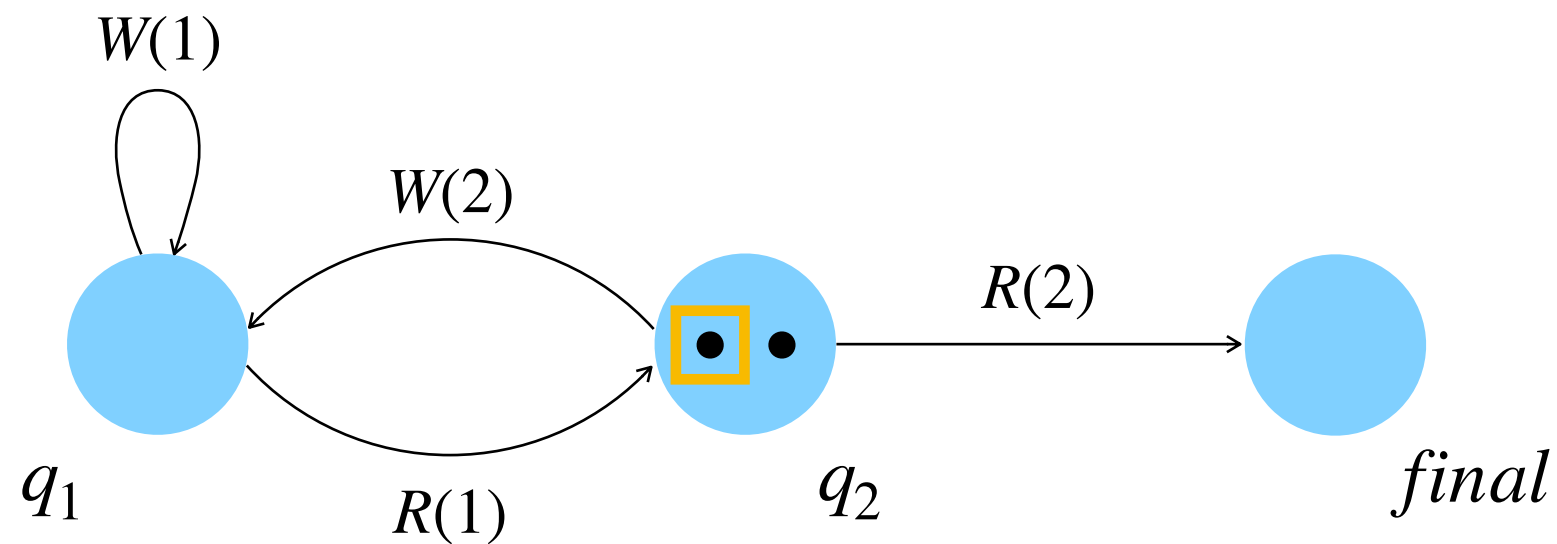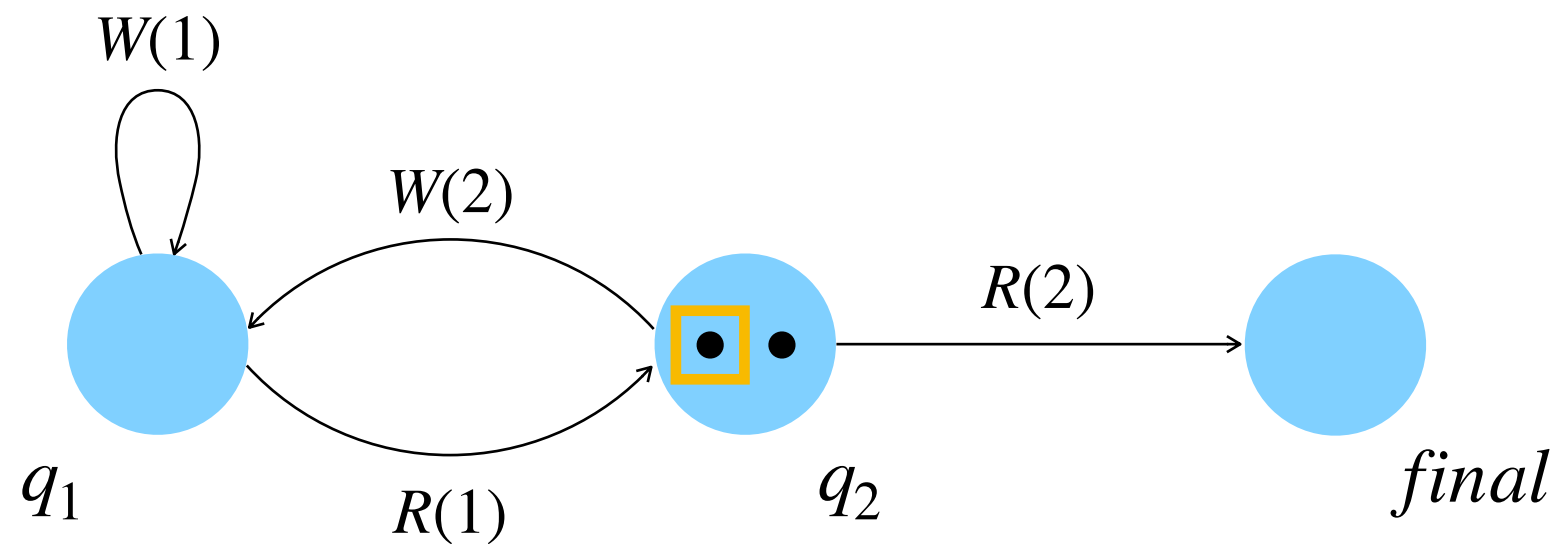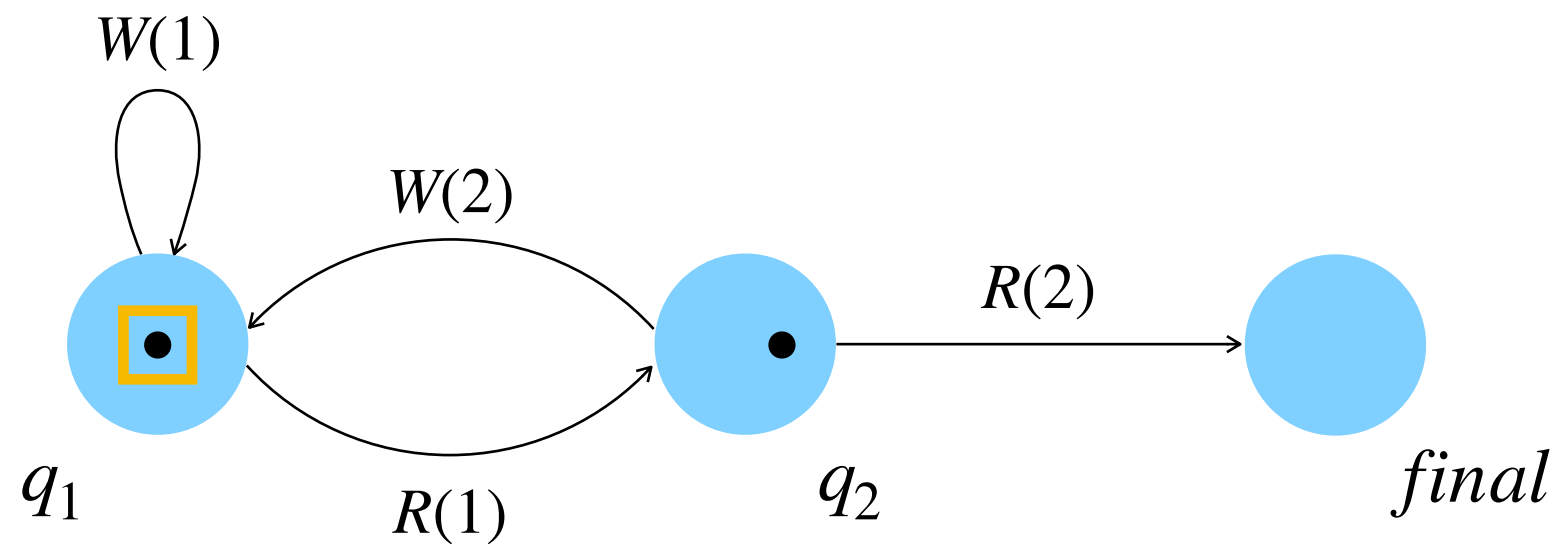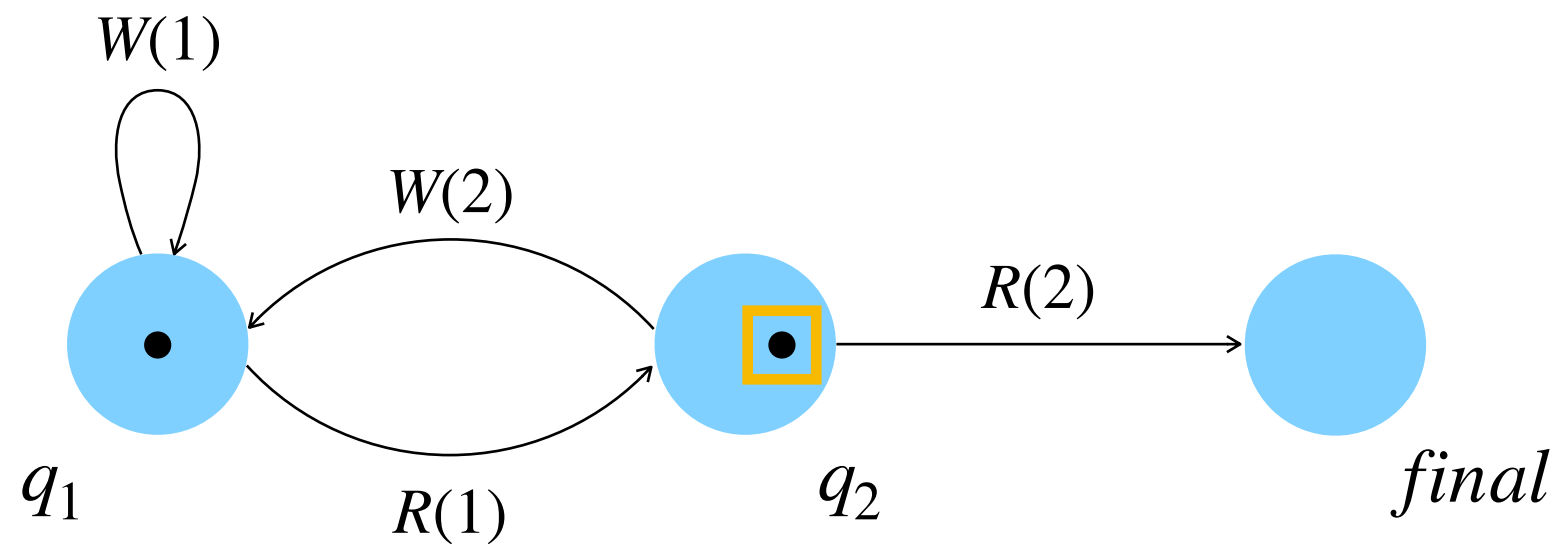
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Asynchronous Shared Memory System

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Asynchronous Shared Memory System

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Asynchronous Shared Memory System

- processes communicate by writing to a shared register
- writes and reads are asynchronous events
- only one process reads at a time

Equivalence

A **cube** is a boolean combination of constraints $\quad a \leq \#q \leq b$

$\in \mathbb{N} \qquad\qquad \in \mathbb{N} \cup \infty$

$$M \cdots\cdots\cdots\cdots\cdots\rightarrow M'$$

$\mathscr{C}$ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad \mathscr{C}'$

Equivalence

A **cube** is a boolean combination of constraints $a \leq \#q \leq b$

number of processes in q

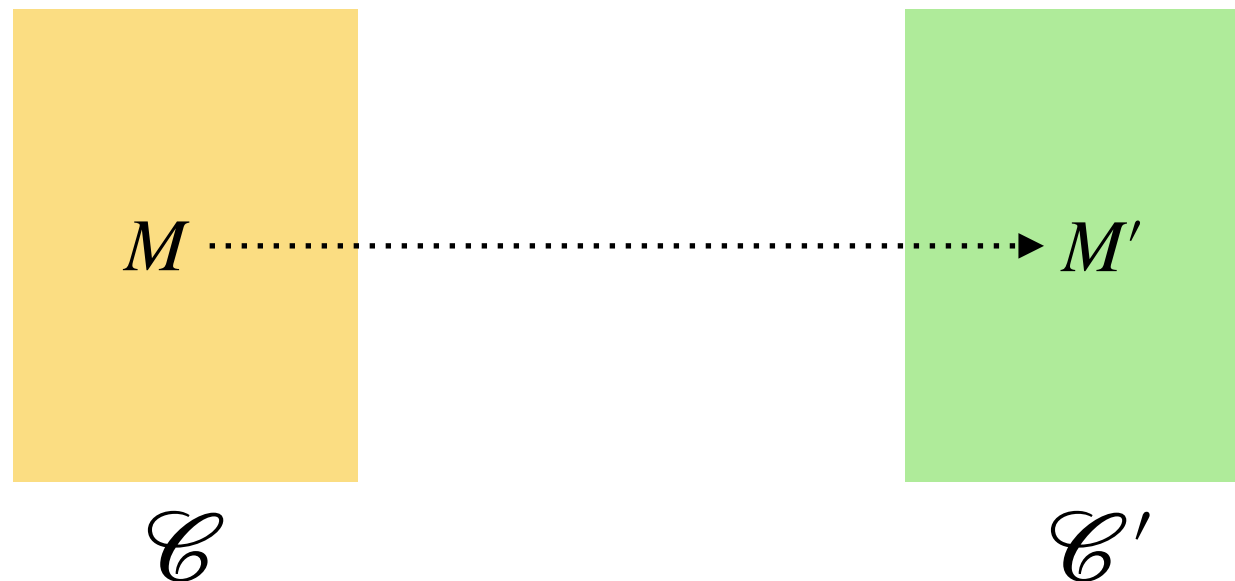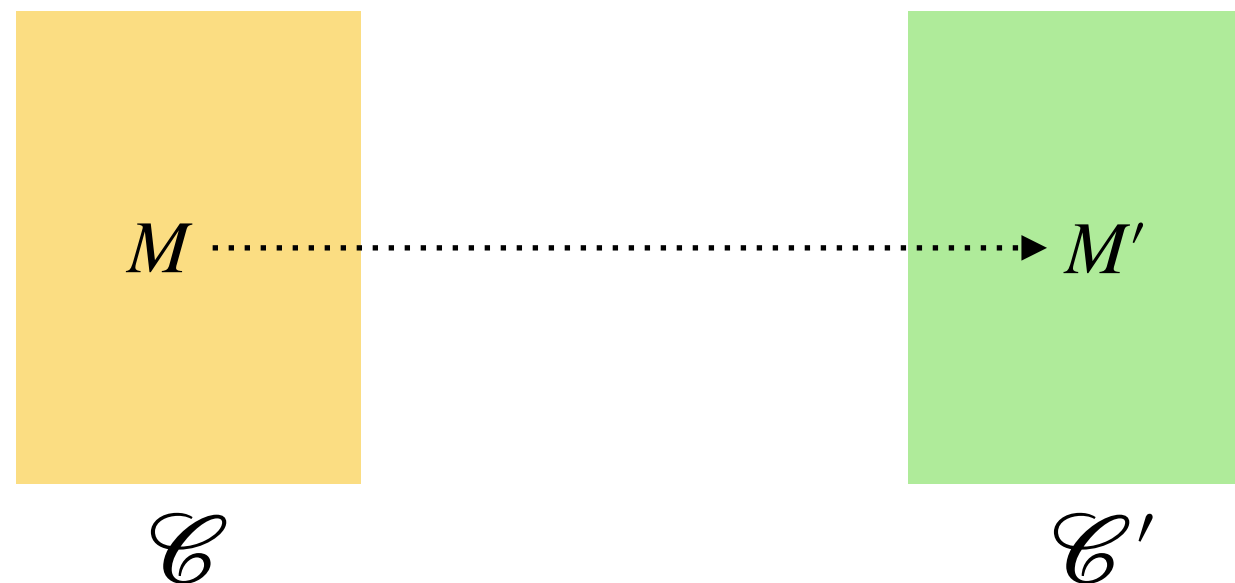$\in \mathbb{N}$ $\in \mathbb{N} \cup \infty$

$M \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\rightarrow M'$

$\mathscr{C}$ $\mathscr{C}'$

cube-reachability: given cubes $\mathscr{C}$ and $\mathscr{C}'$, does there exist $M \in \mathscr{C}$ and $M' \in \mathscr{C}'$ such that M reaches M' ?

Equivalence

RBN and ASMS are polynomial-time equivalent w.r.t. to cube-reachability

M ·······························► M'

$\mathscr{C}$ $\mathscr{C}'$
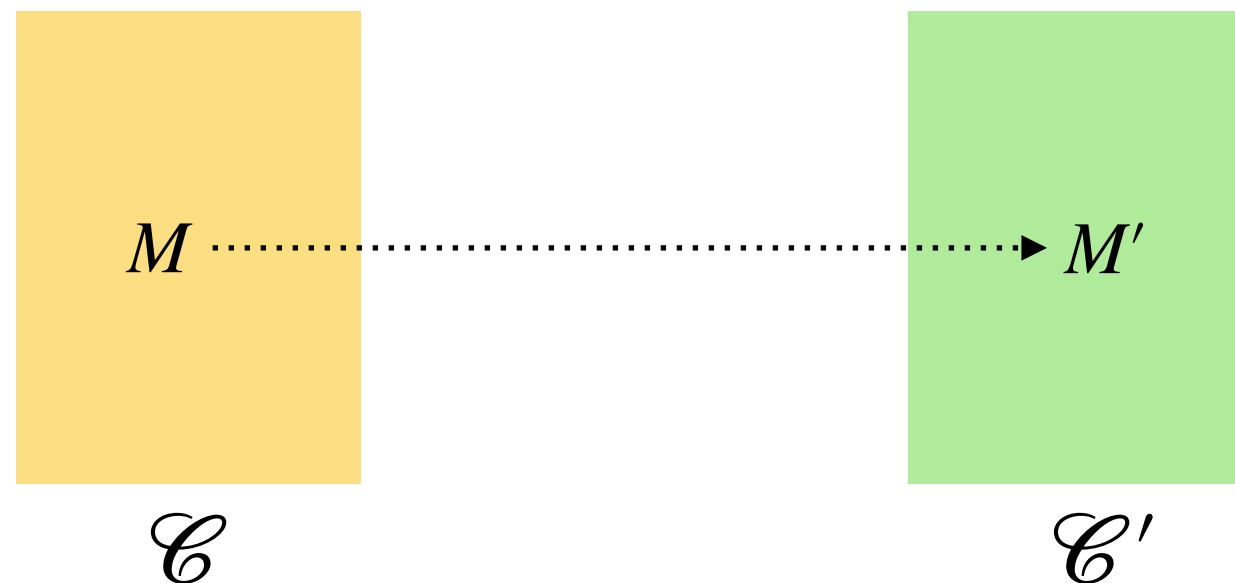
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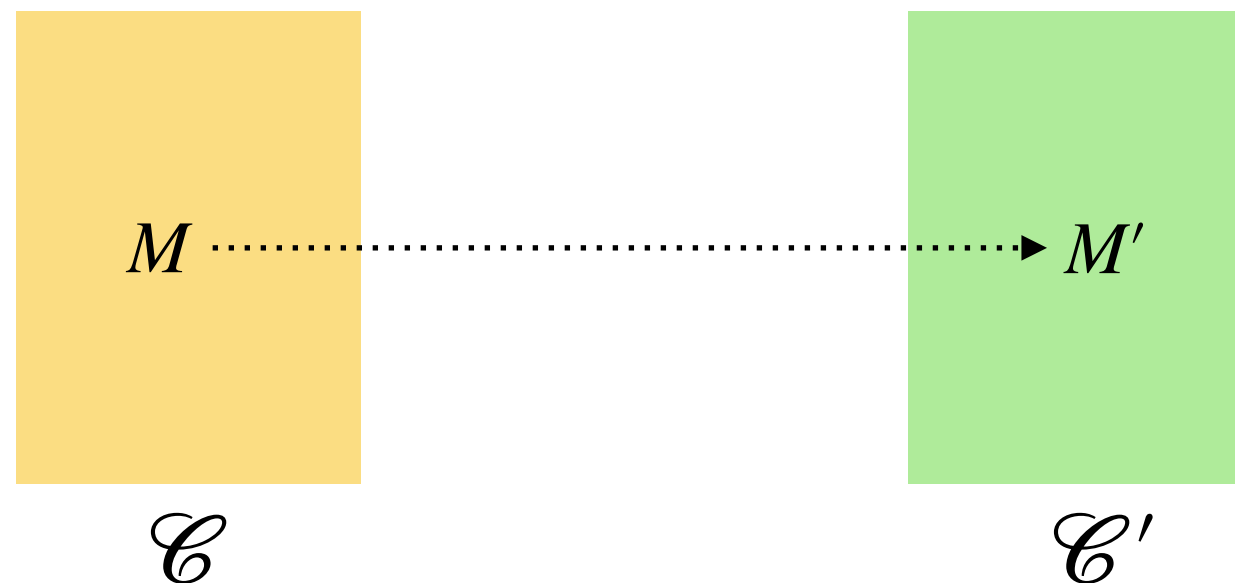
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Thank you!