Understanding the Gain of Reconfigurable Communication

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YR-CONCUR Workshop 2023

Motivation

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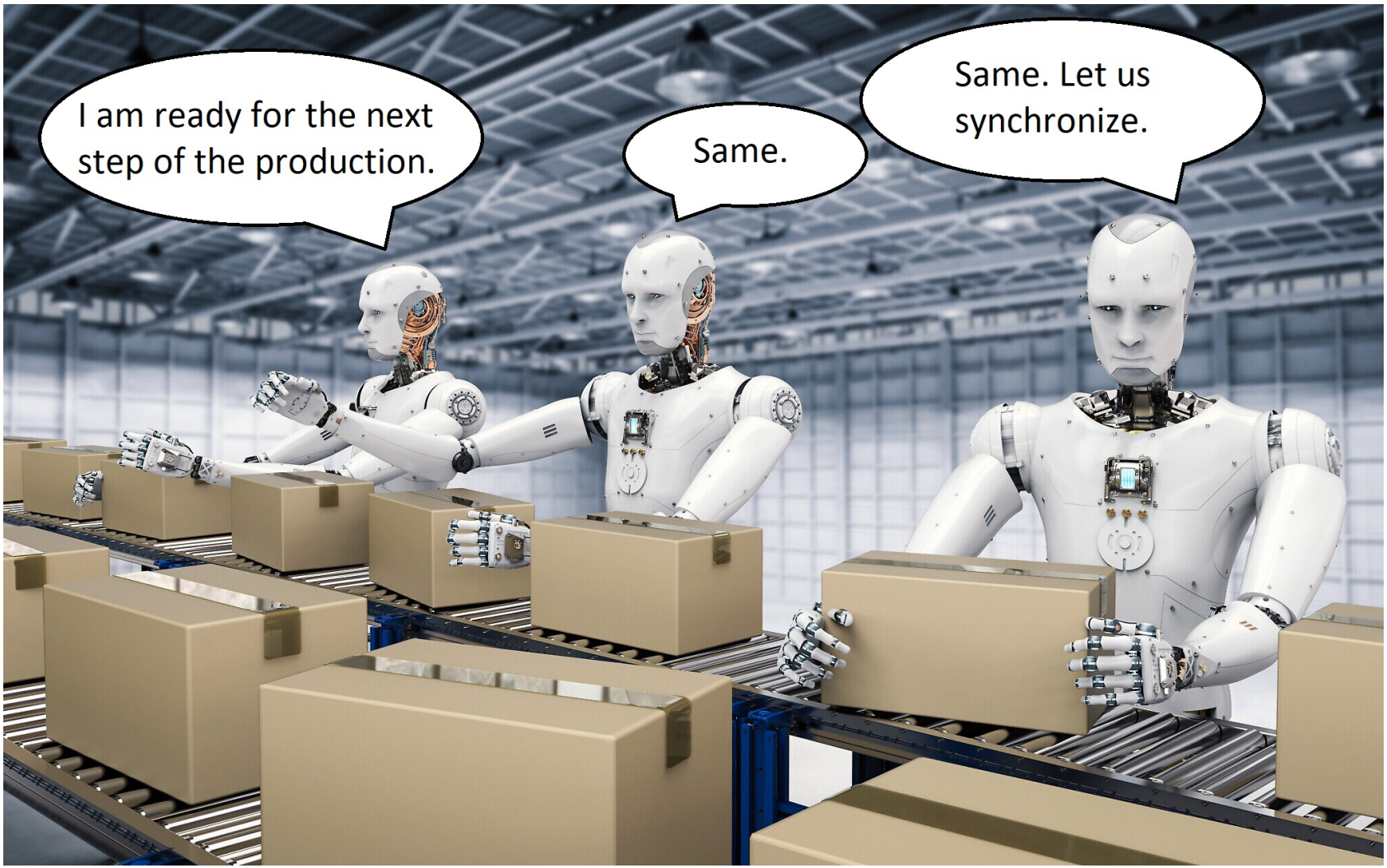
I am ready for the next step of the production.
Same.
Same. Let us synchronize.

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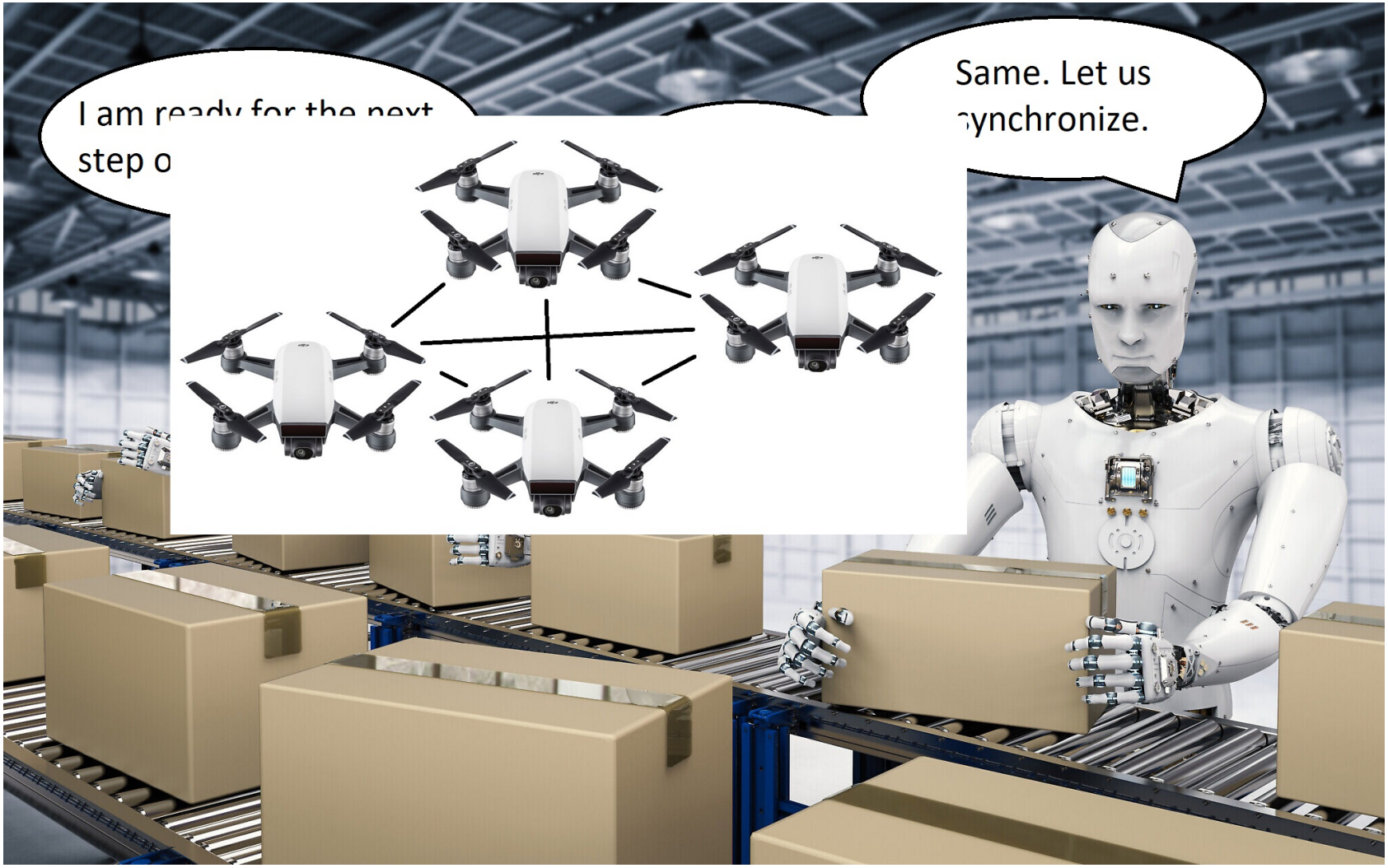

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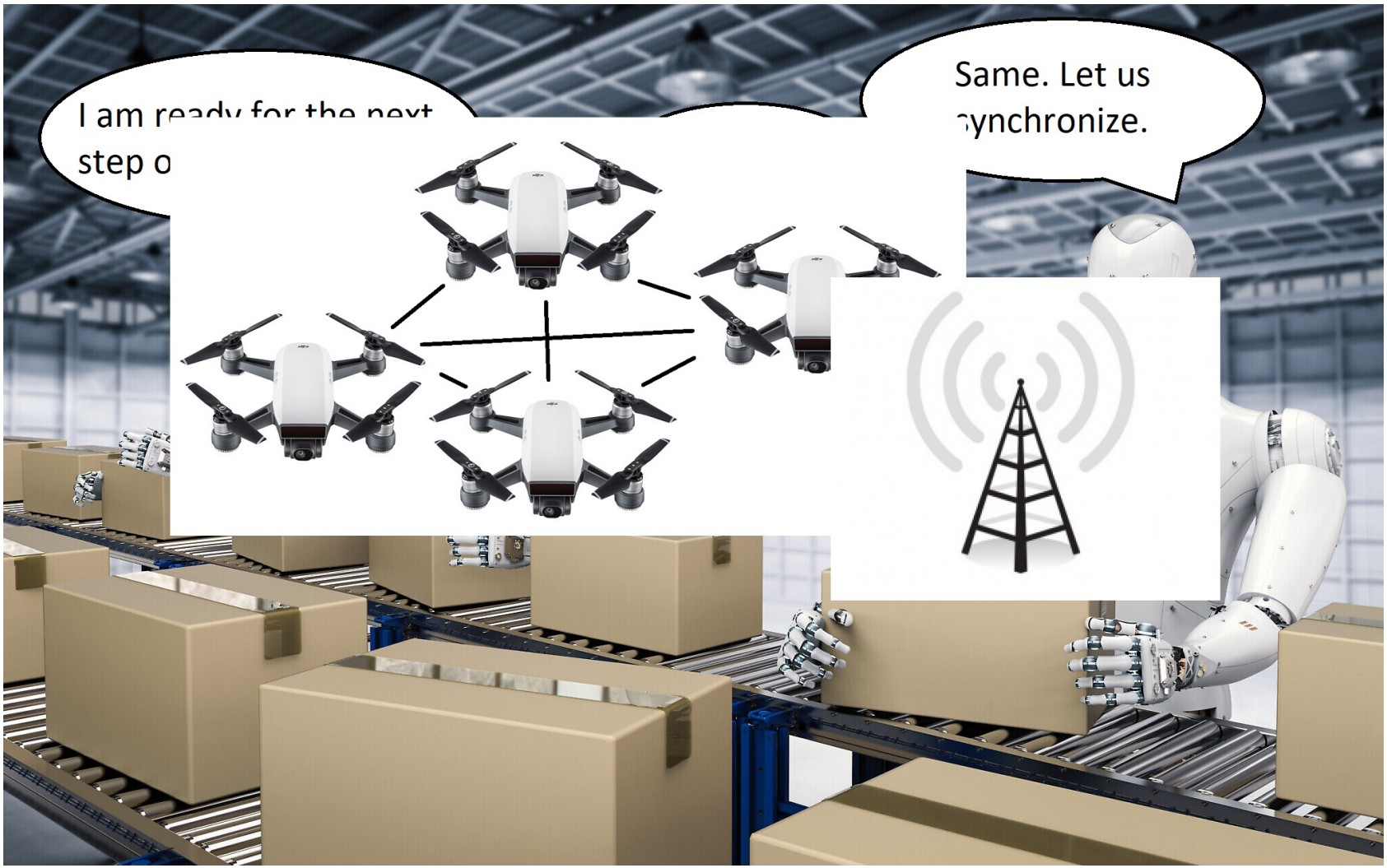

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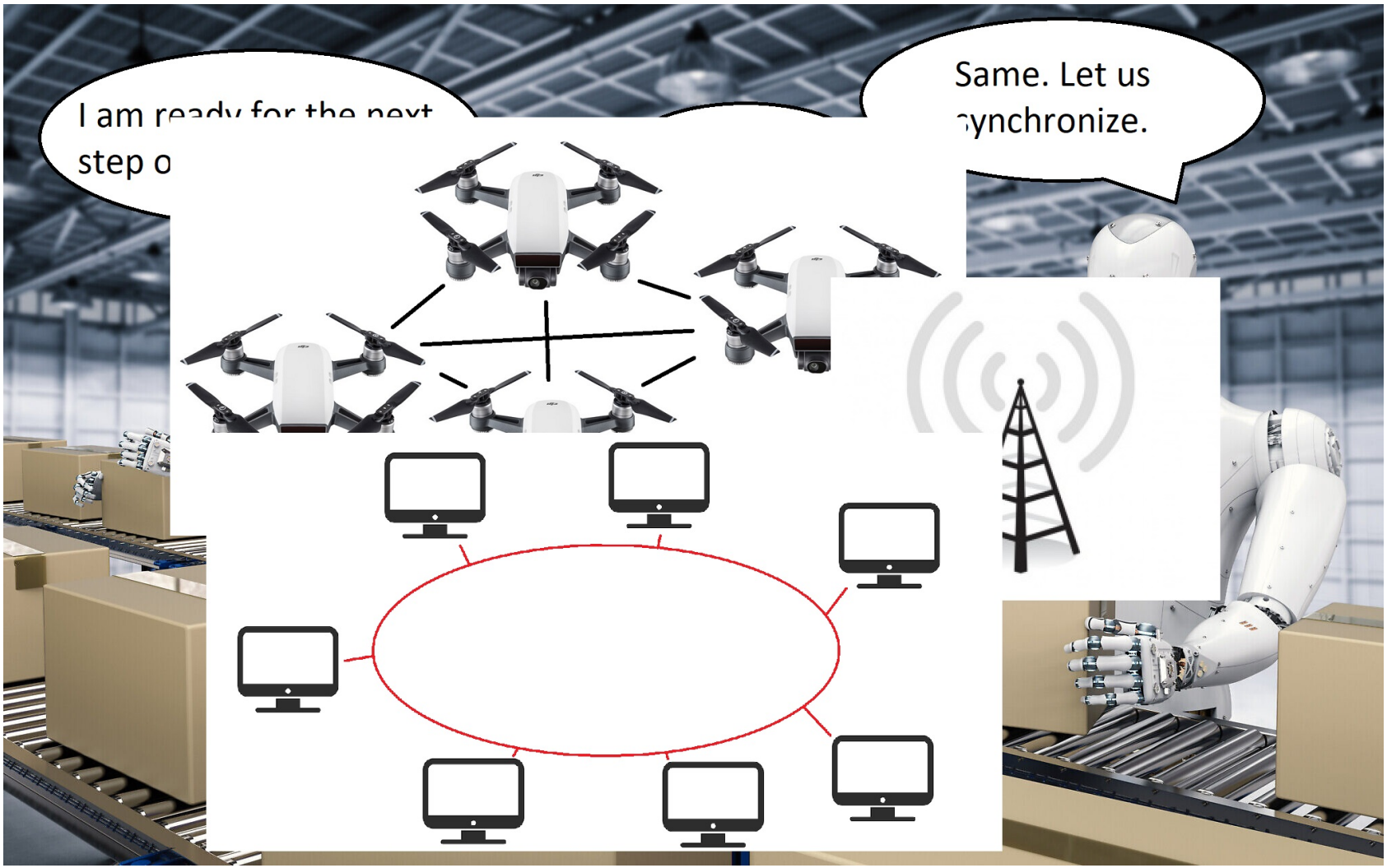
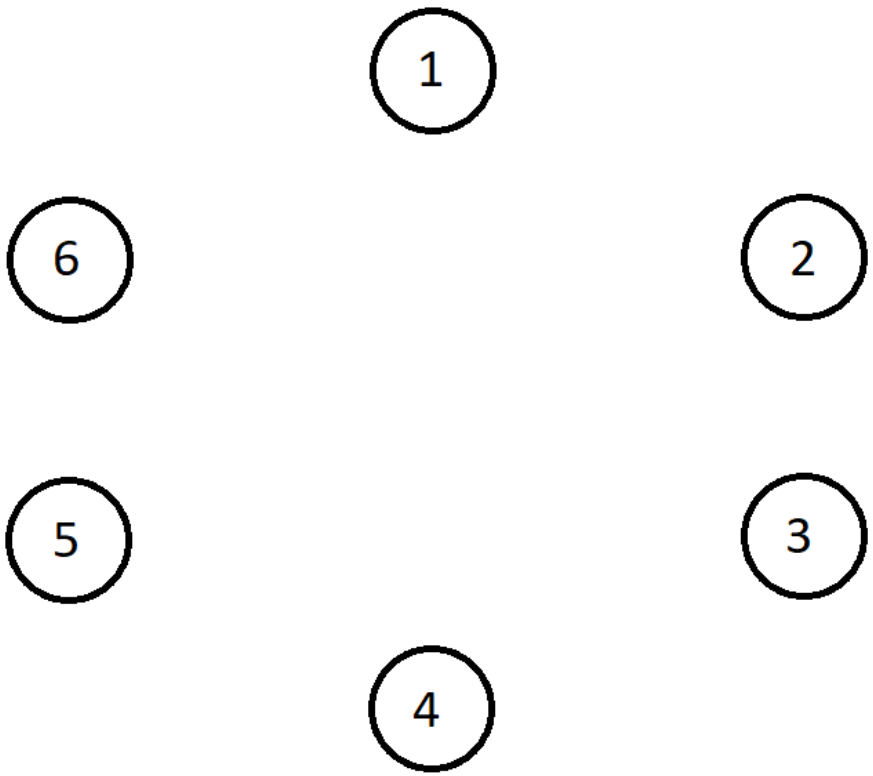


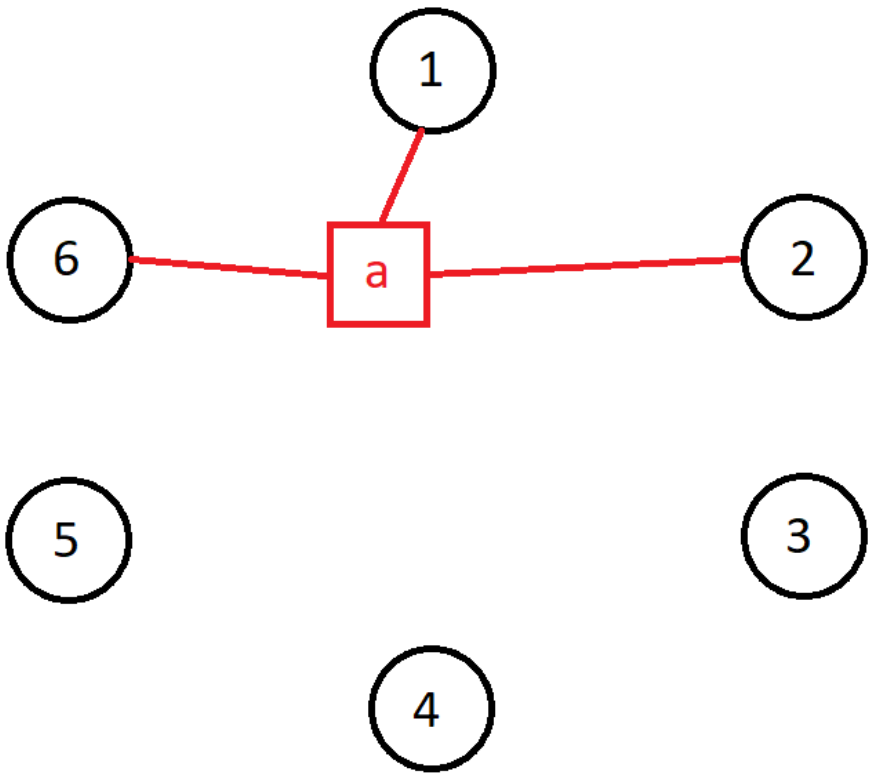
Distributed setting

Independent processes



Distributed setting

Independent processes communicating over channels



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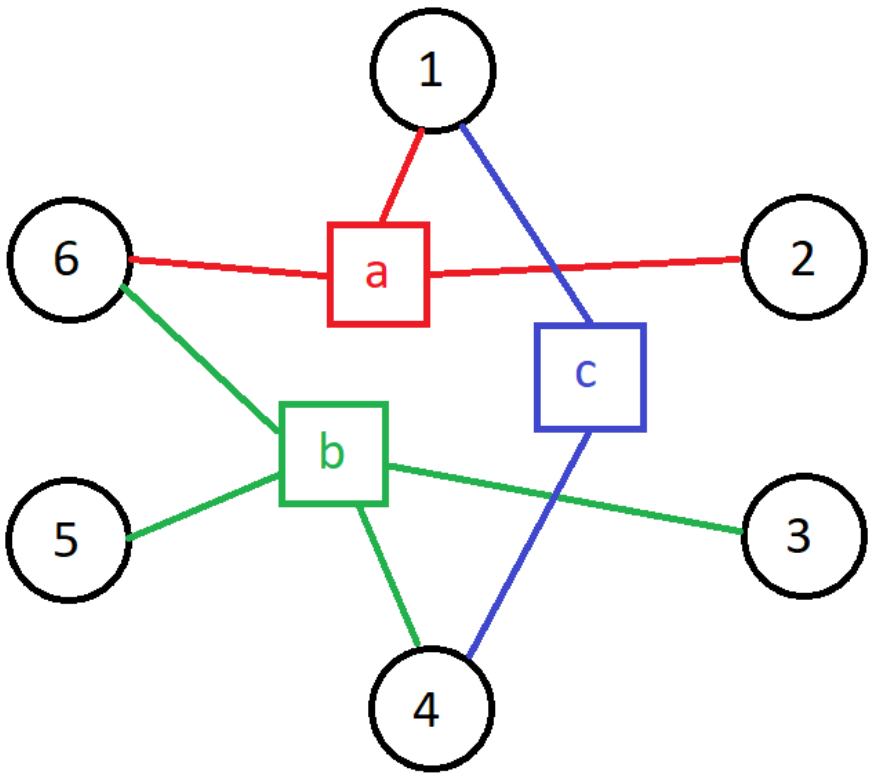

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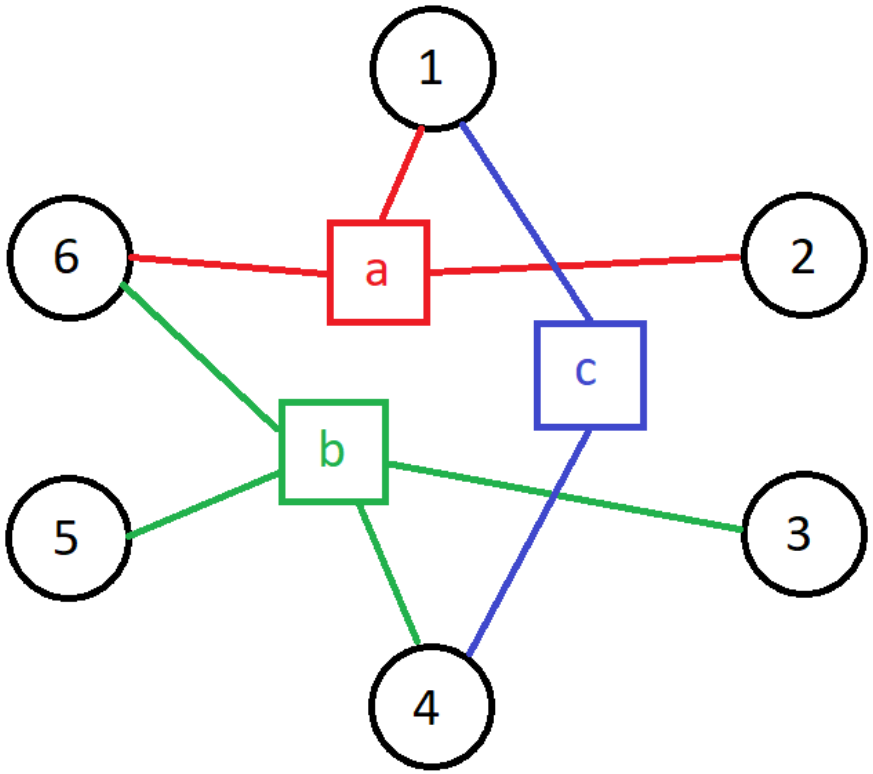
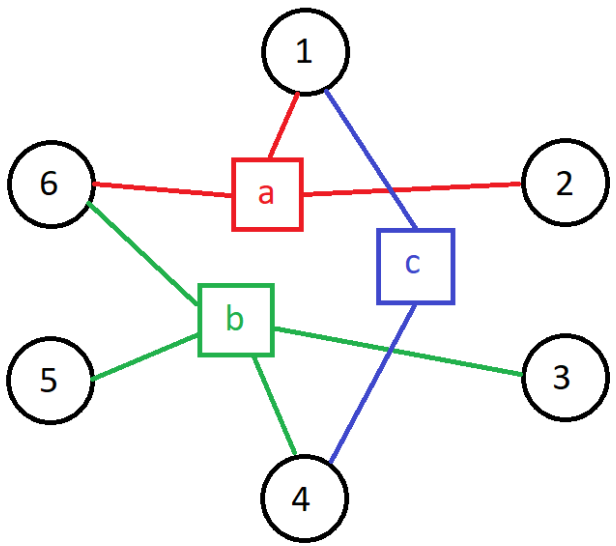


Some assumptions

- Asynchronous system
- Rendez-vous communication
- No sender/receiver distinction

Fixed or reconfigurable communications

Fixed:



$1 : a, c \quad 2 : a \quad 3 : b$
$4 : b, c \quad 5 : b \quad 6 : a, b$

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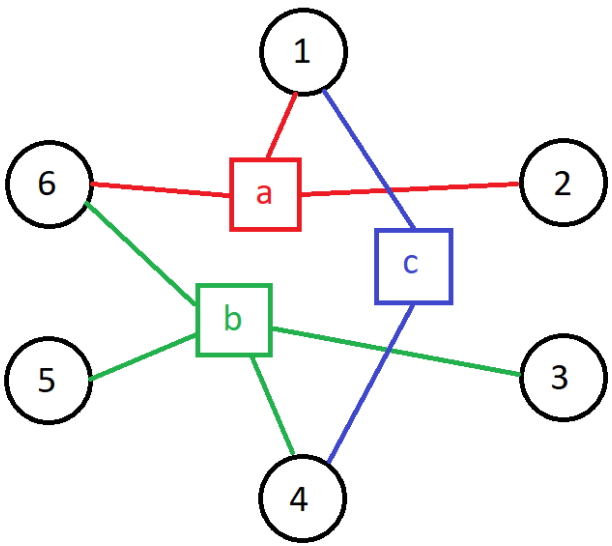

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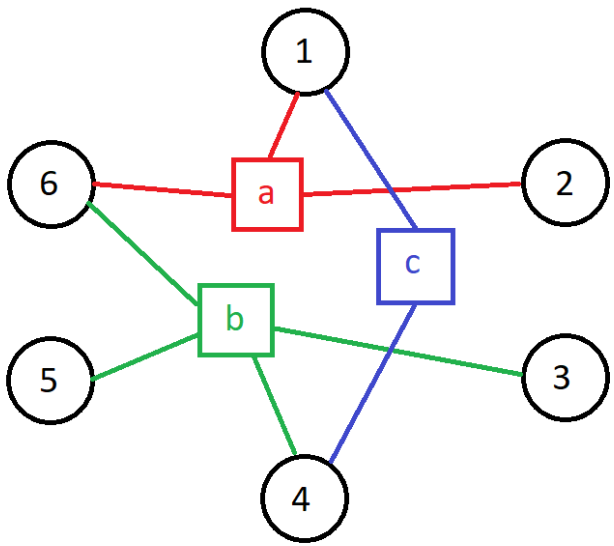

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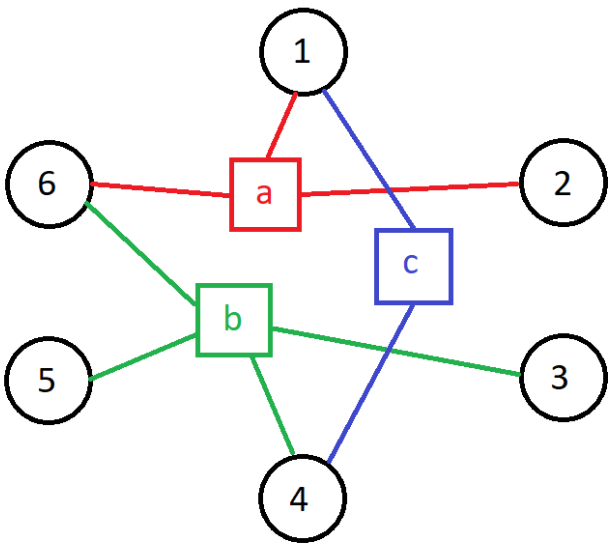

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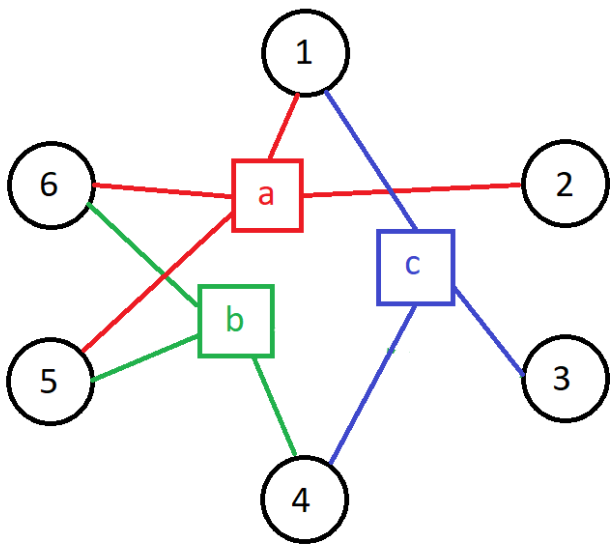

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Fixed communication model

Zielonka's Asynchronous Automata (AA)

Fix set of processes, channels, and communication structure

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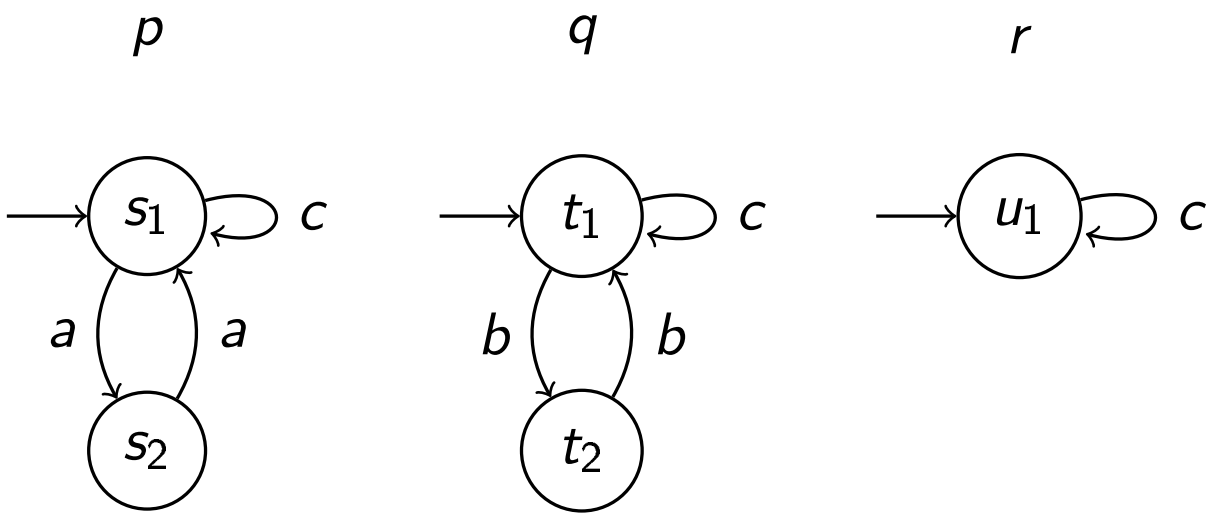

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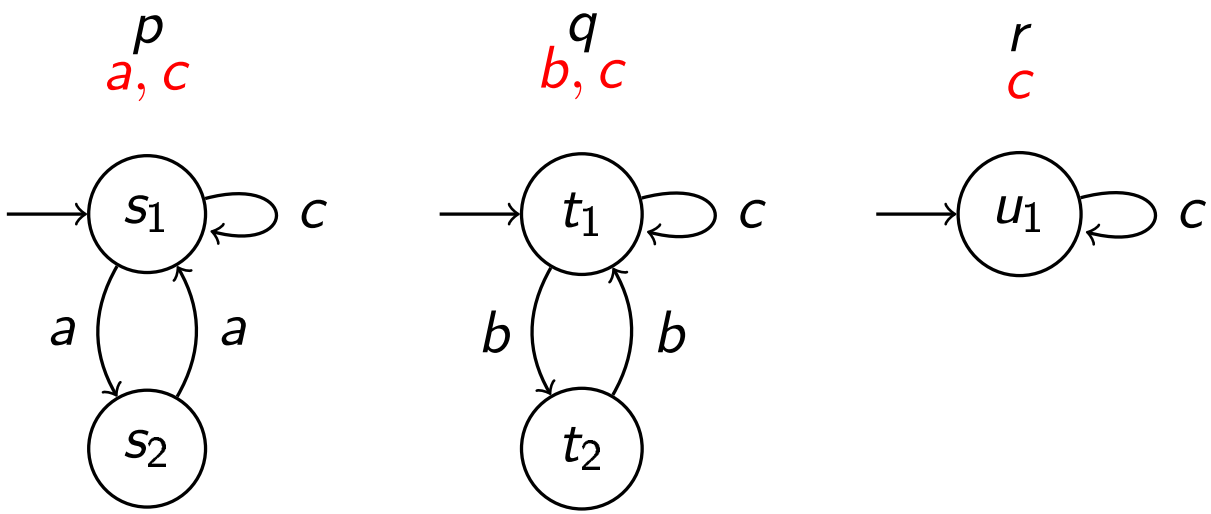

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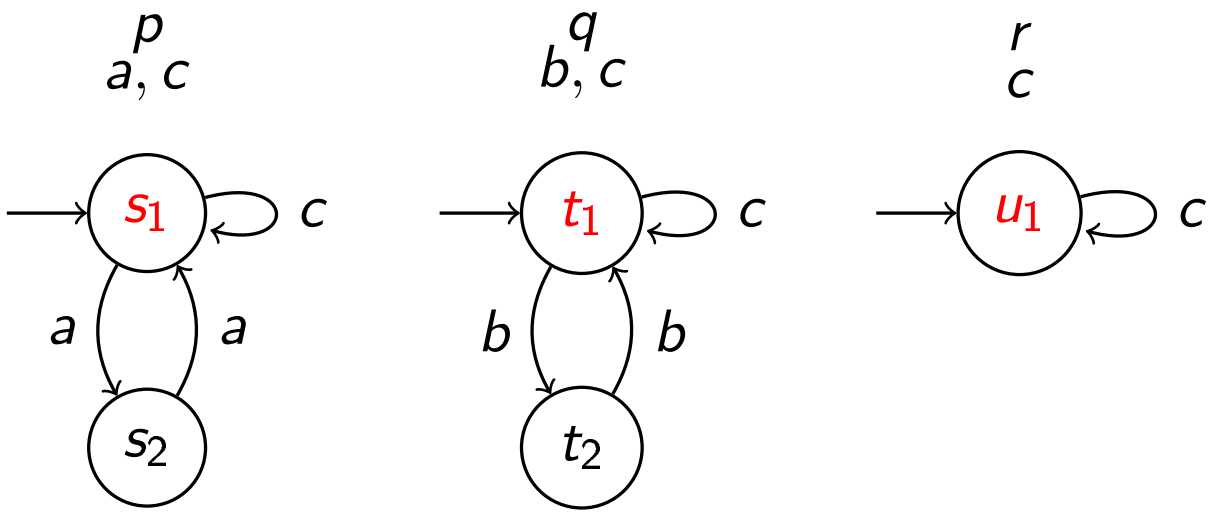

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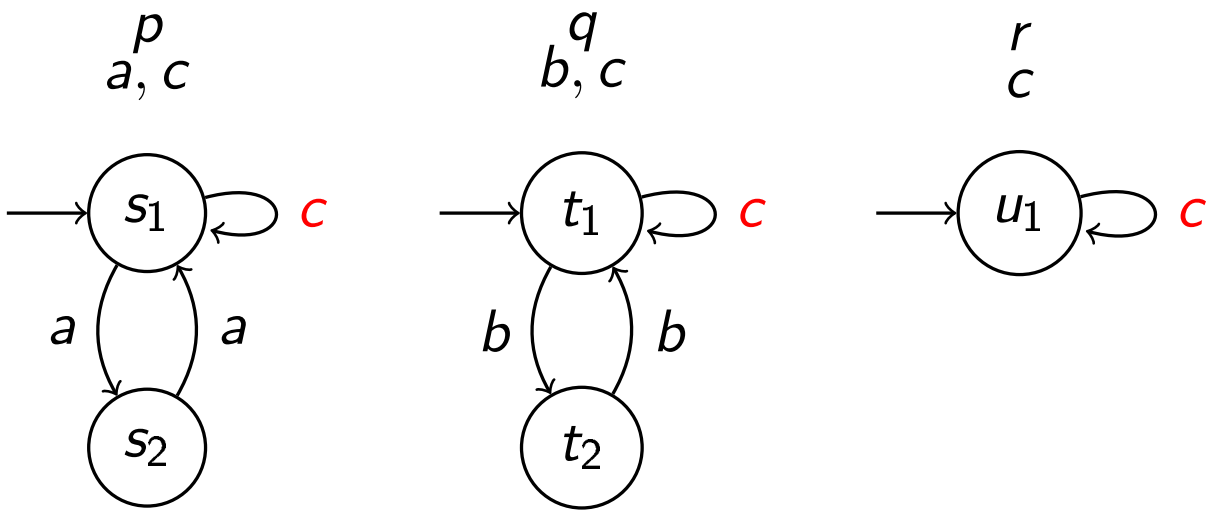

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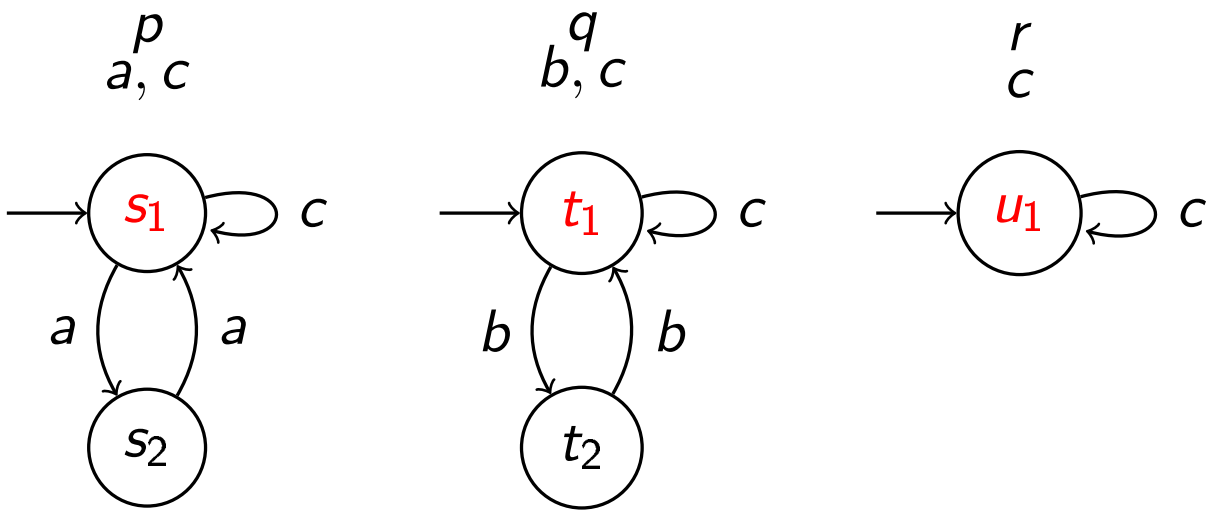

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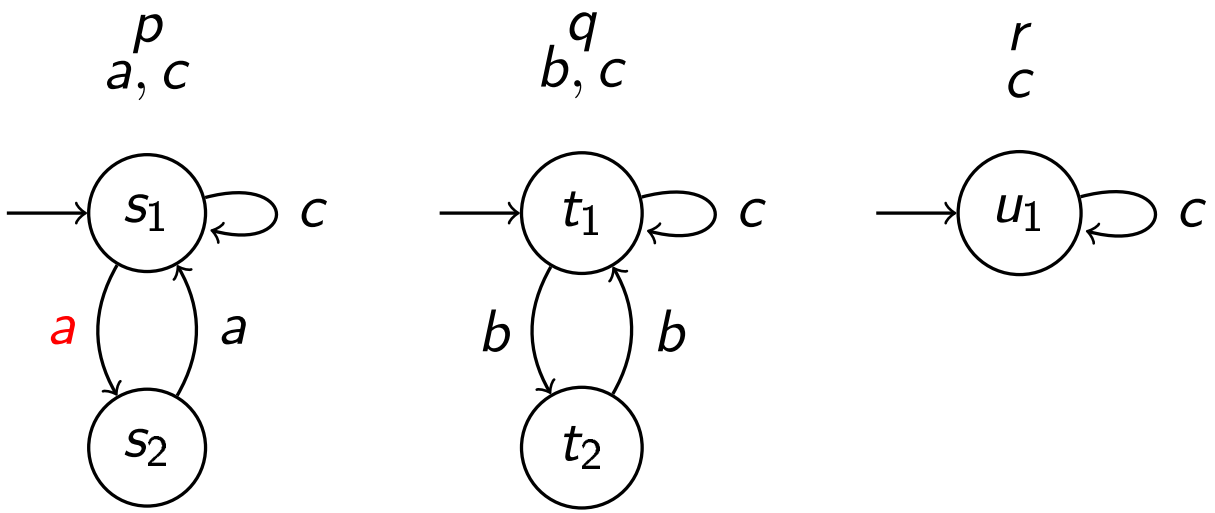

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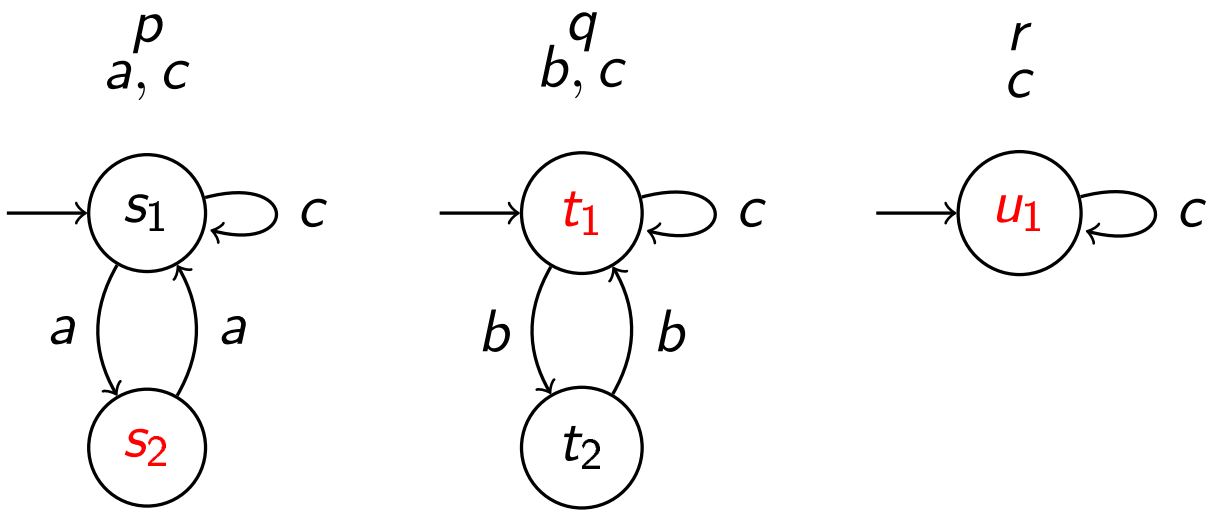

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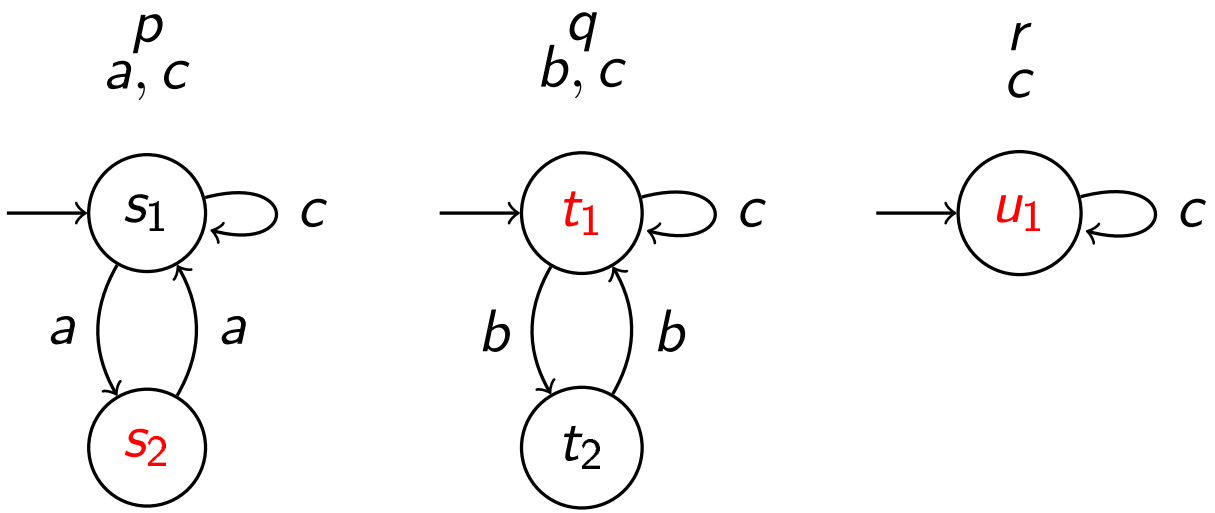

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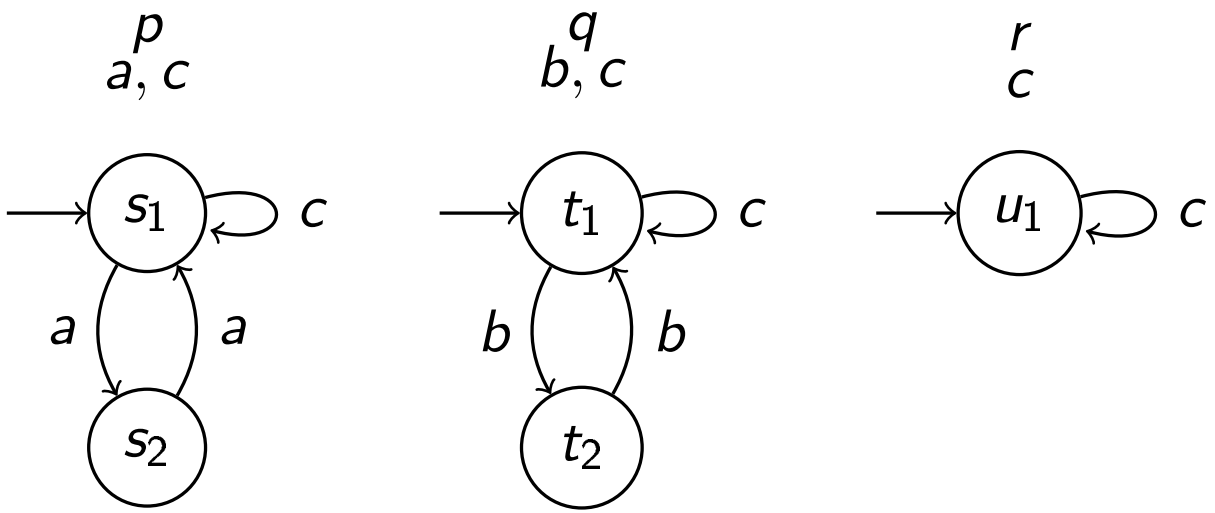

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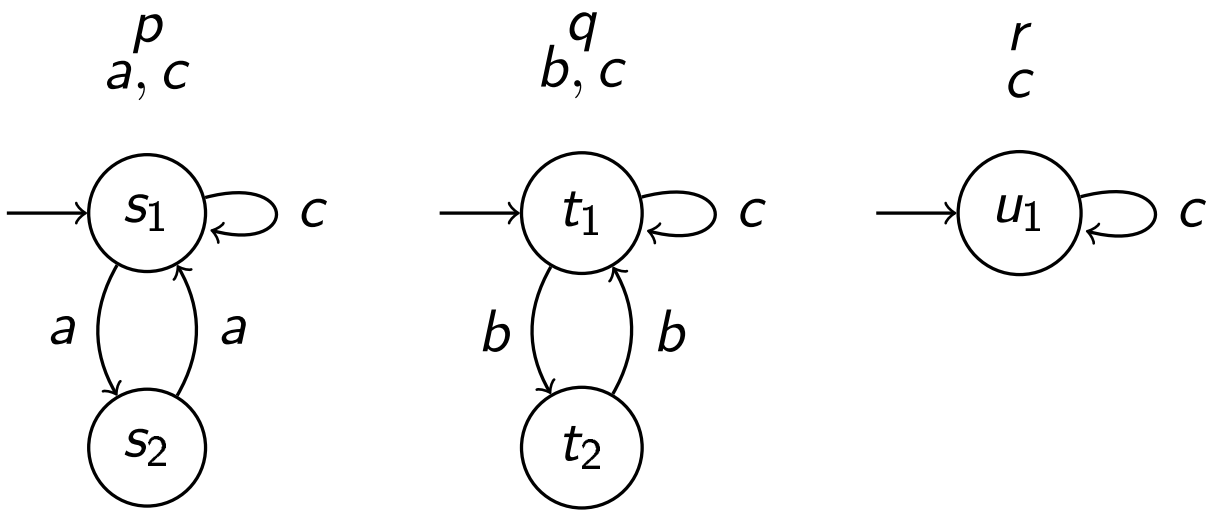

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$w = cab\ldots$ Language: all c preceded by even number of a & b

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Channeled Transition Systems (CTS)

Fix set of processes, channels, and ~~communication structure~~

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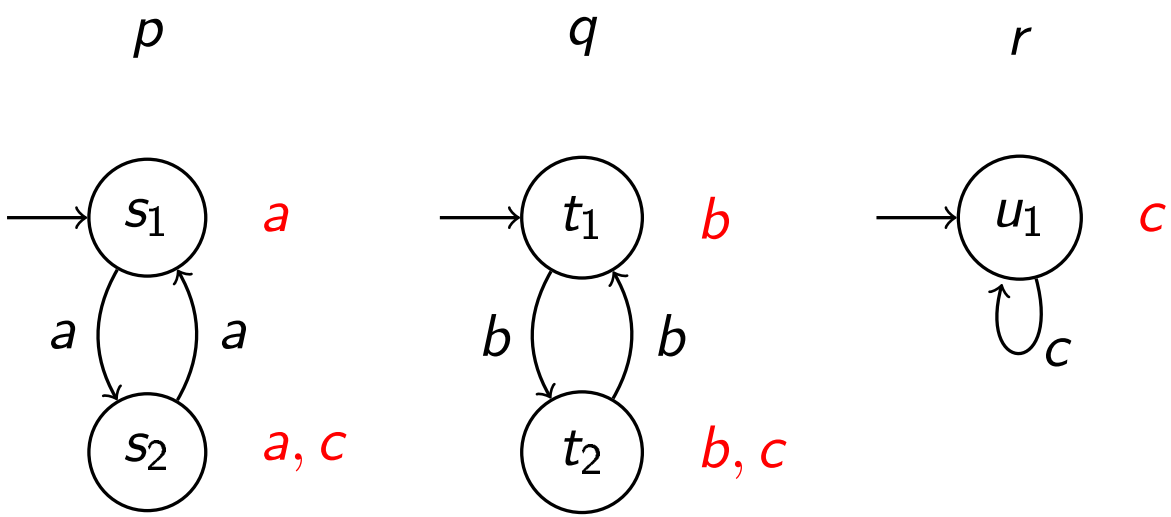

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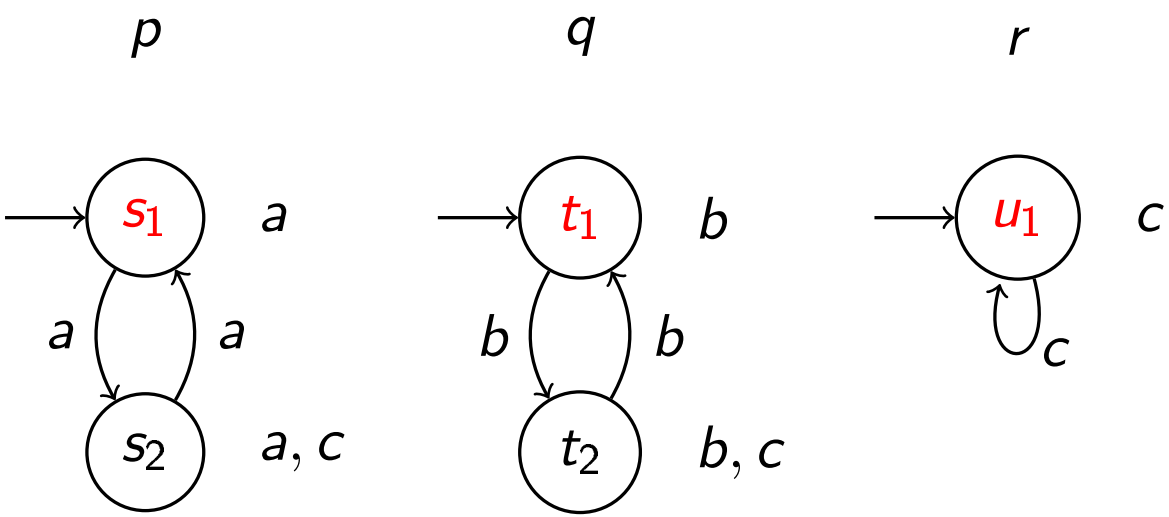

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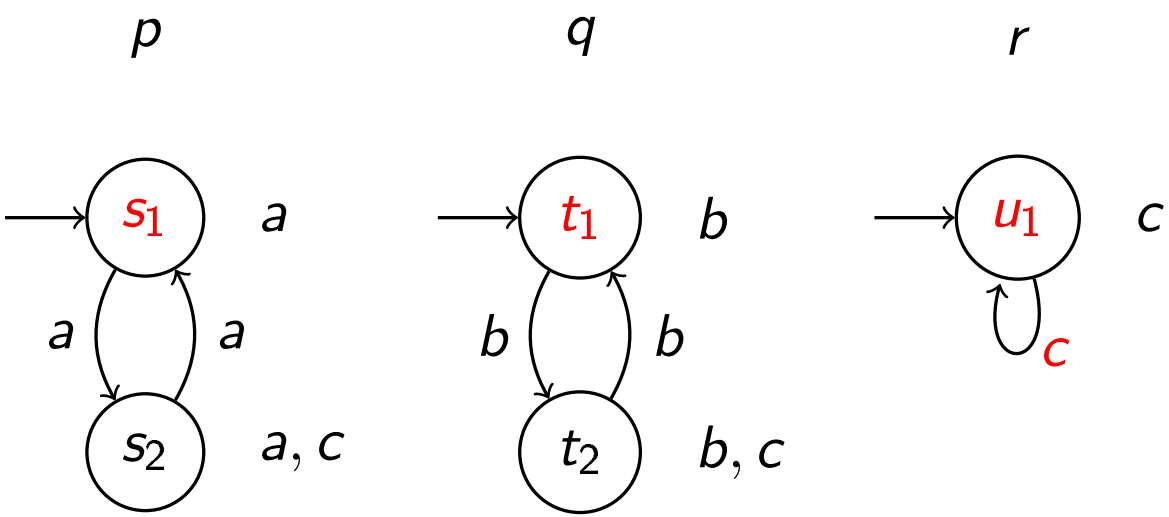

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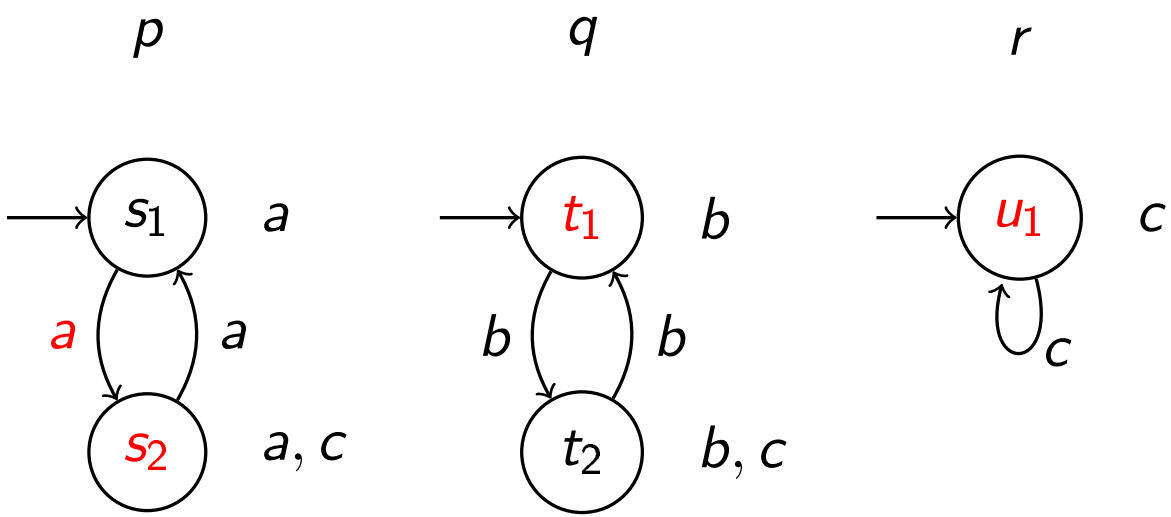

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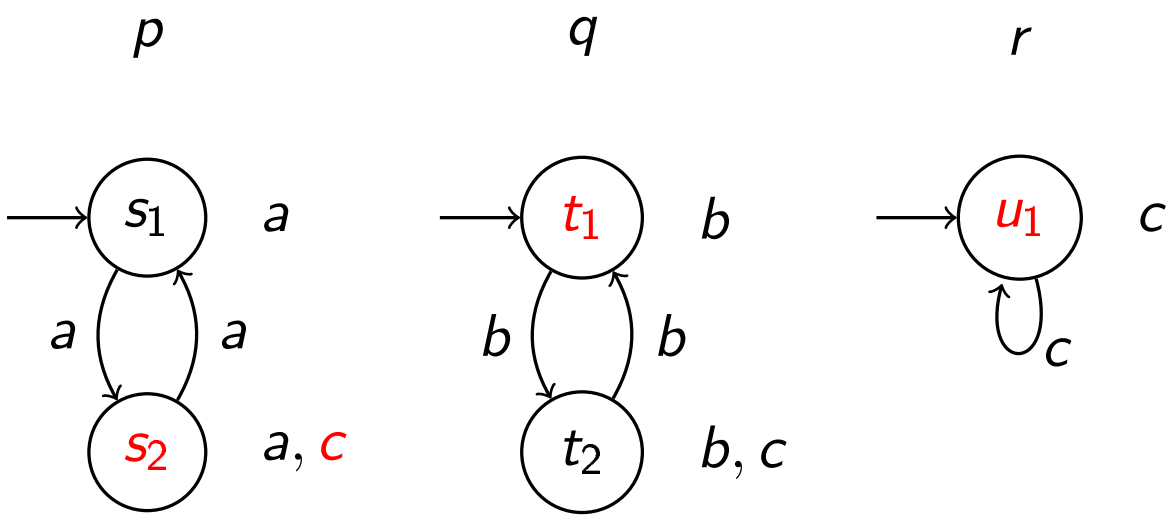

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Result 1: Fixed → Reconfigurable

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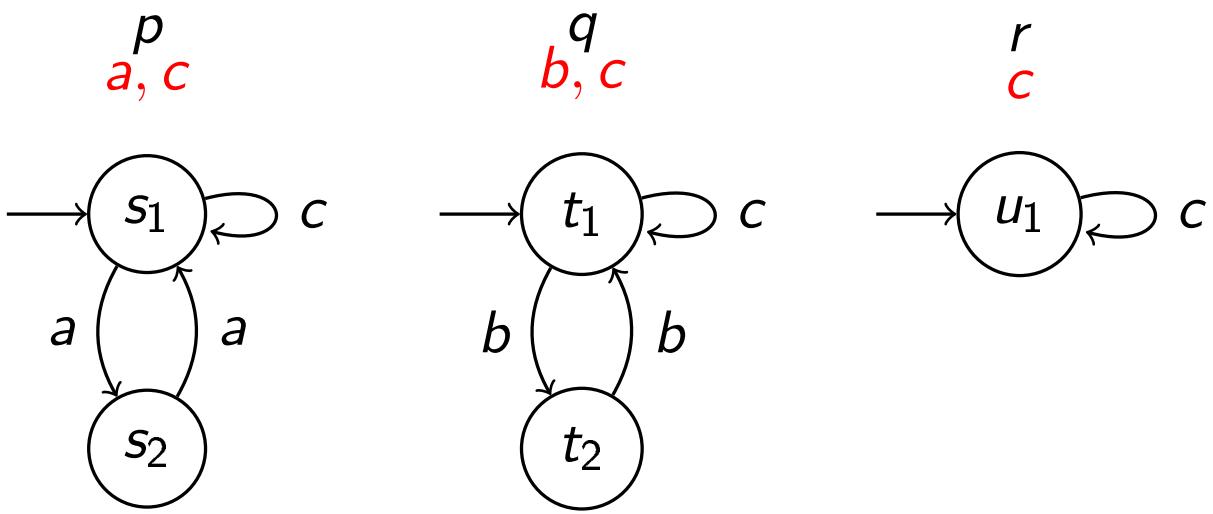

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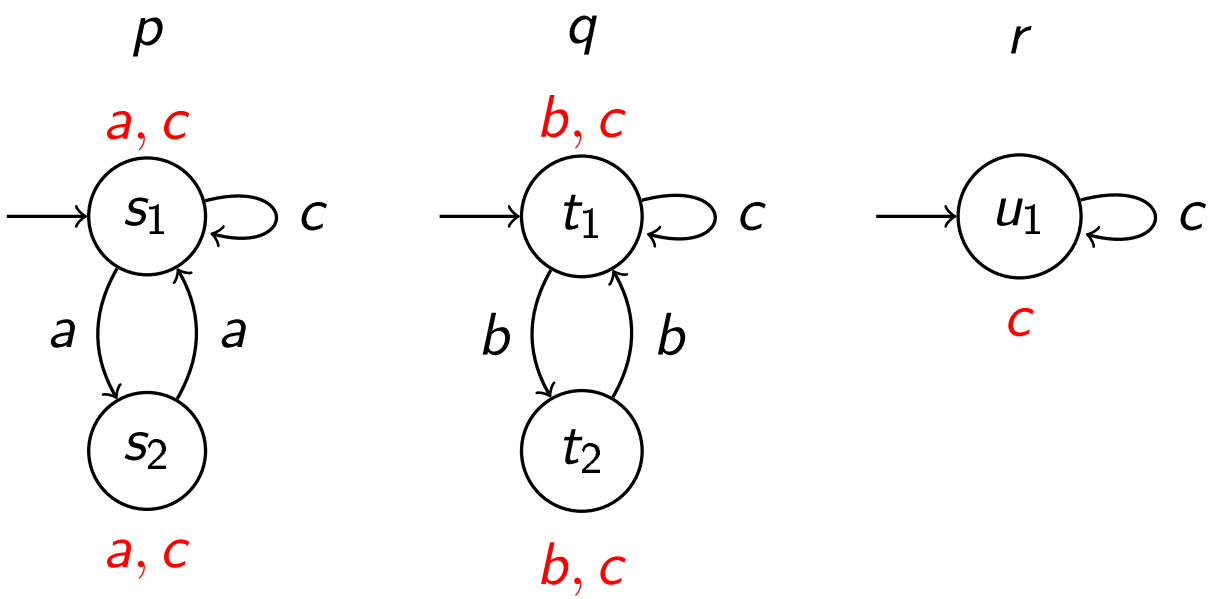

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Same with other direction!

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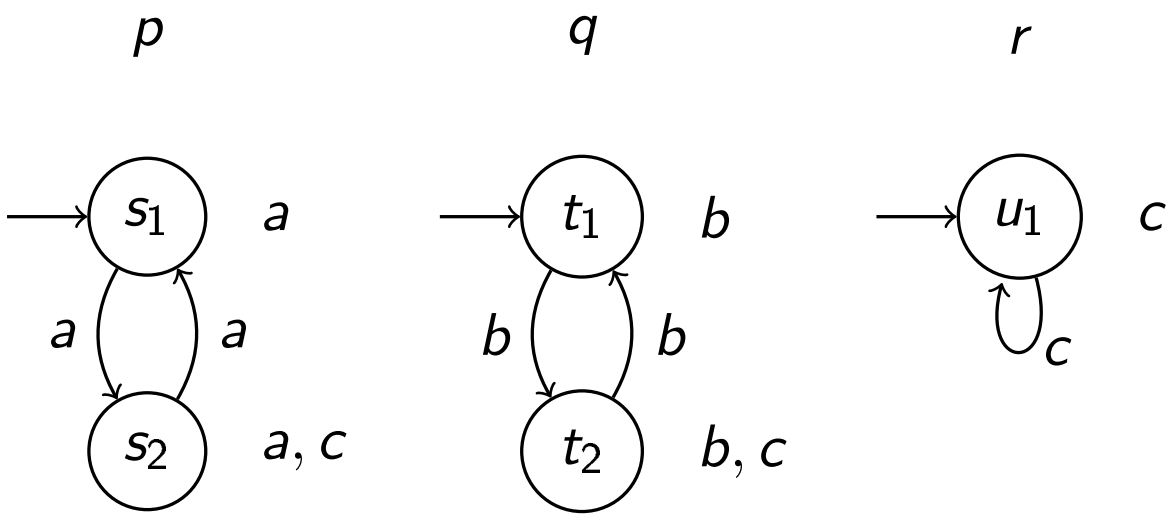

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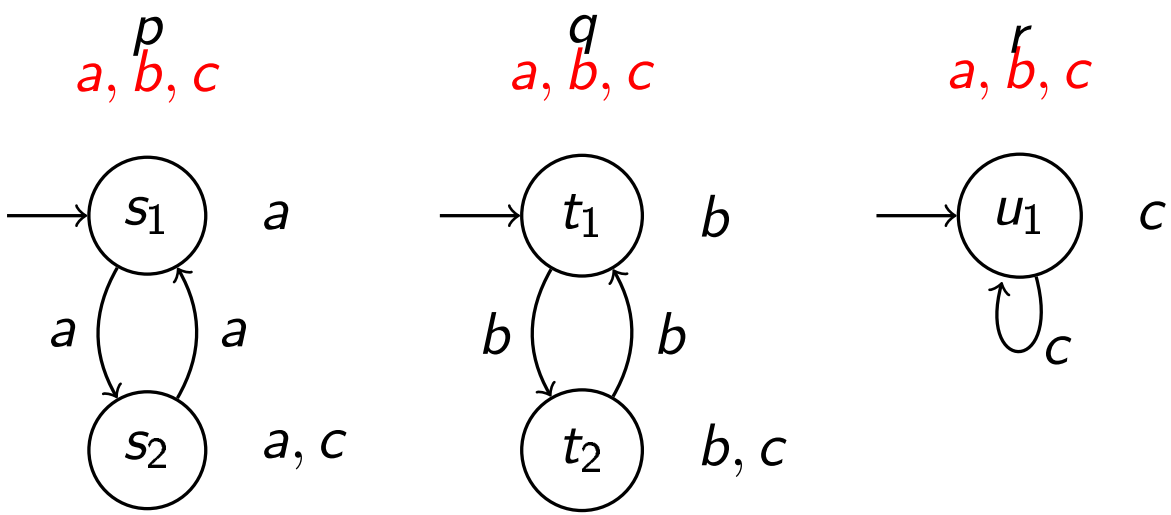

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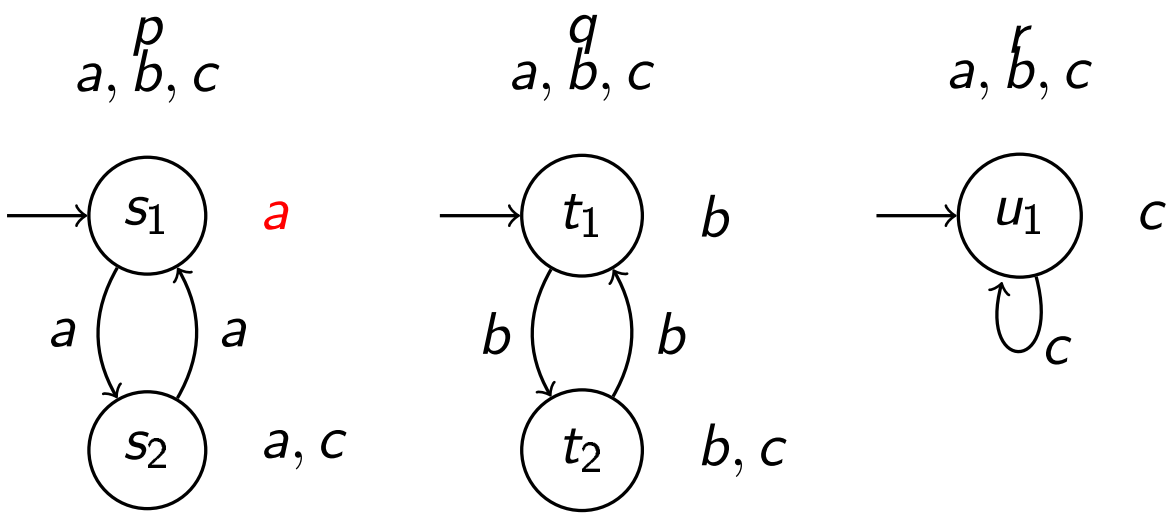

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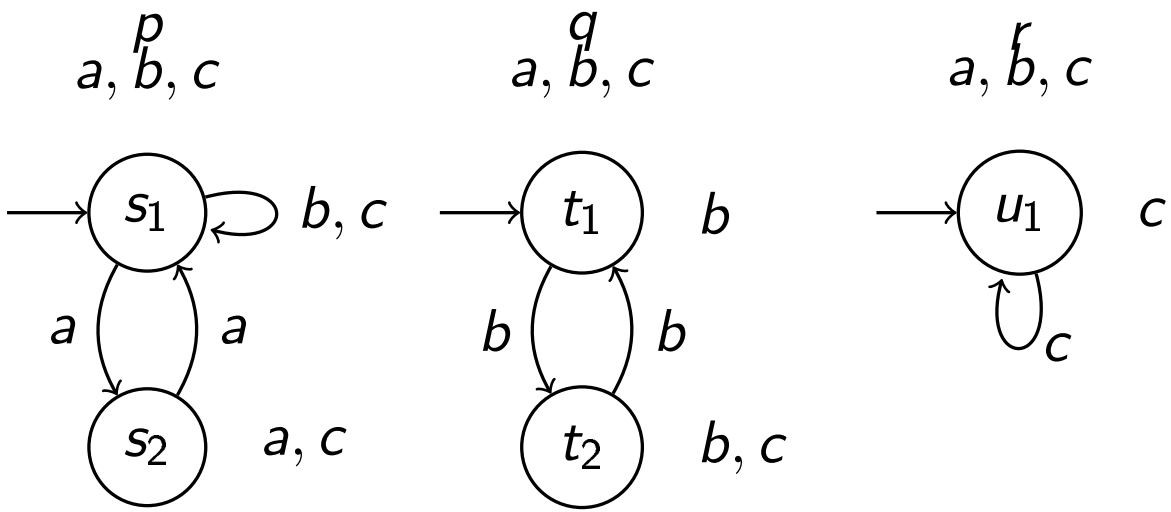

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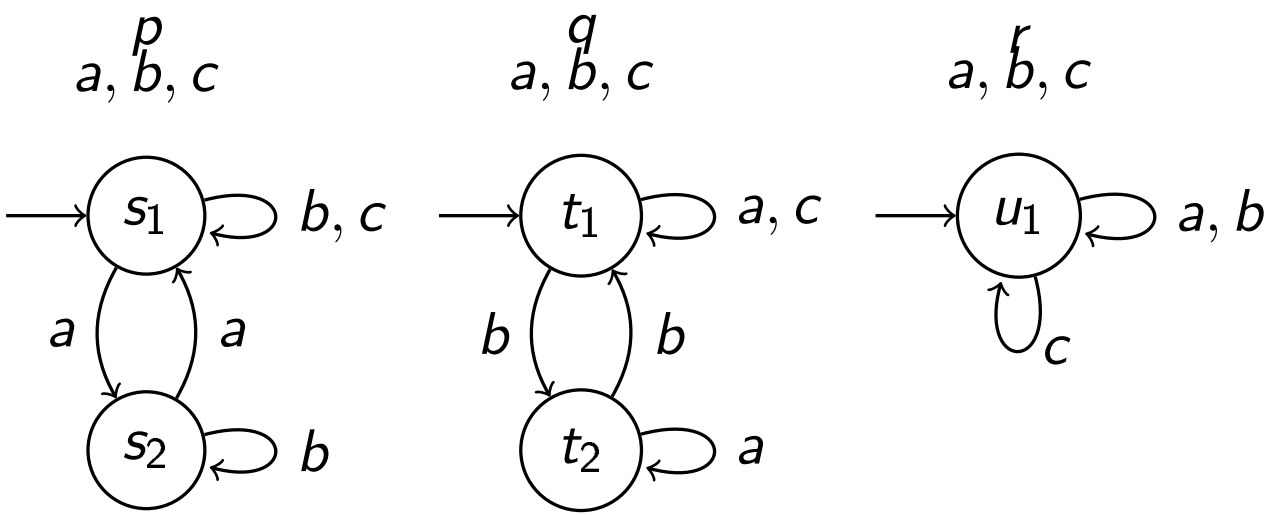

Now what?

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Can we do better?

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All processes listen to all channels

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Result 3: No better general construction

There is a CTS with no "nice" equivalent AA

Summary and future works

Takeaway message

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Thank you for your attention!