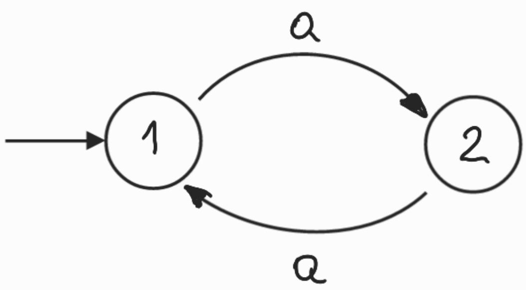
# Basic examples of event timing dynamics

1)

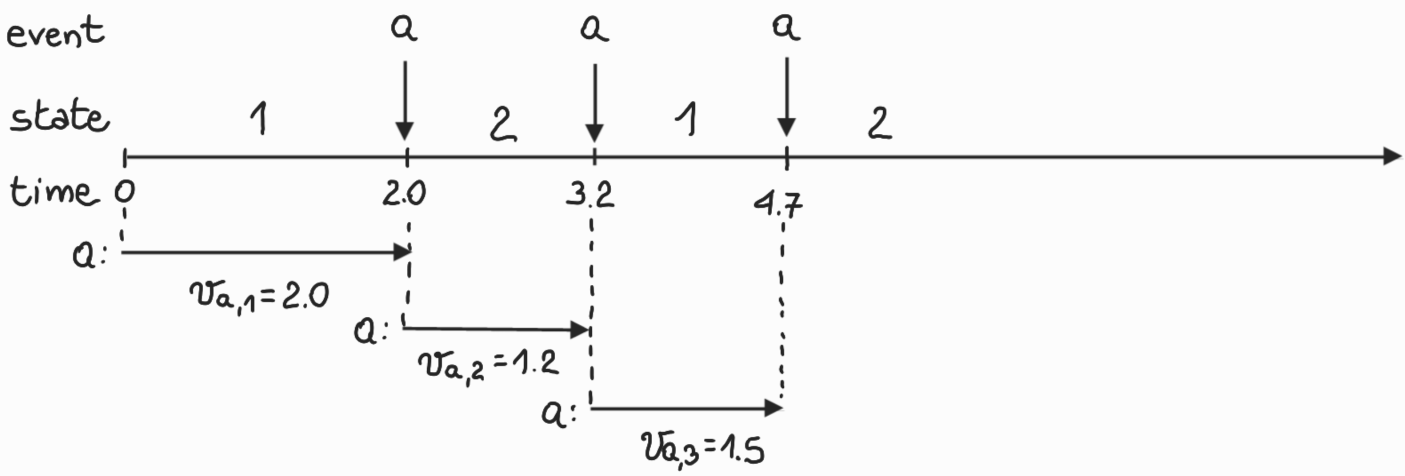



$\mathcal{E} = \{a\}$ ↪ single event, always possible

$V = \{V_a\}$, where $V_a = \{\underbrace{2.0}_{v_{a,1}}, \underbrace{1.2}_{v_{a,2}}, \underbrace{1.5}_{v_{a,3}}, \dots\}$

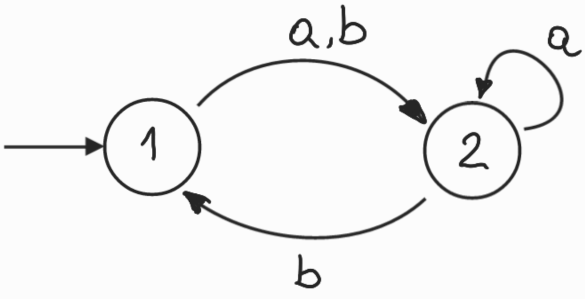
clock structure

clock sequence of event a




- Event a is activated at times $t = 0, 2, 3.2$
- Event a occurs at times $t = 2, 3.2, 4.7$

2)



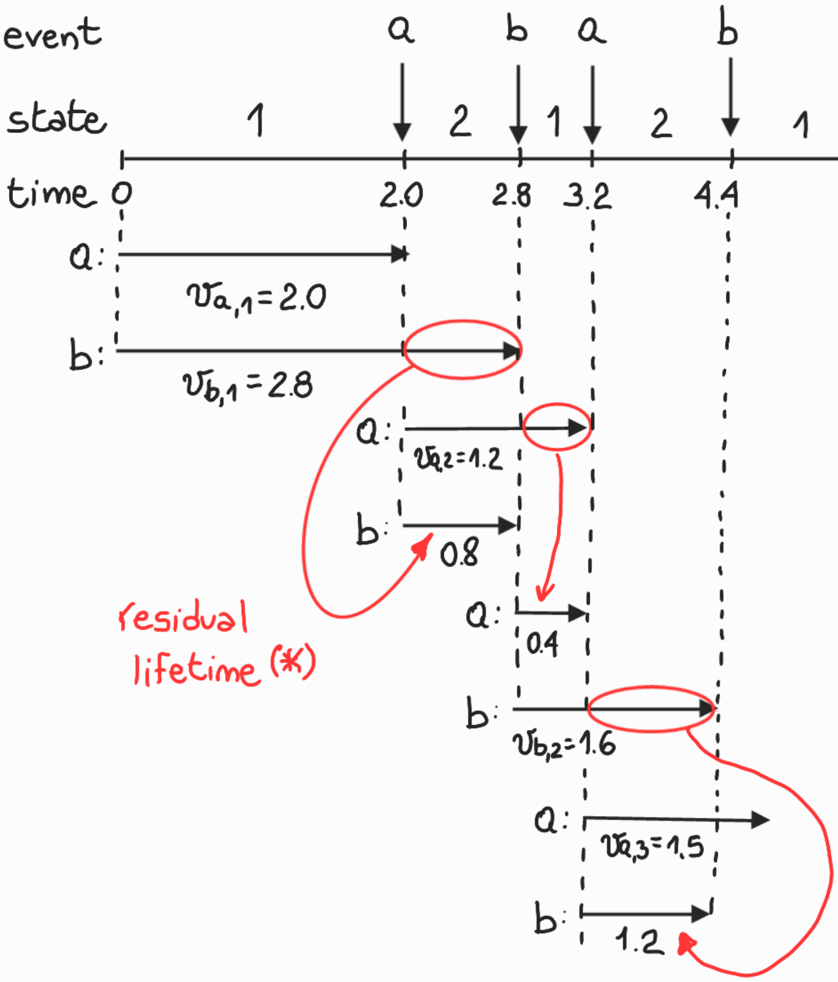

$\mathcal{E} = \{a, b\}$

↳ two events, always possible

$V = \{V_a, V_b\}$ where $V_a = \{\underset{v_{a,1}}{2.0}, \underset{v_{a,2}}{1.2}, \underset{v_{a,3}}{1.5}, \dots\}$

↙ clock structure

$V_b = \{\underset{v_{b,1}}{2.8}, \underset{v_{b,2}}{1.6}, \underset{v_{b,3}}{3.0}, \dots\}$

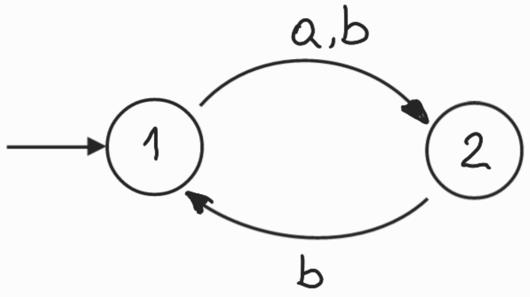



(*) We assume that, when an event is possible in the current state, it does not occur, and it remains possible in the next state, the corresponding process continues

⇒ we use its residual lifetime

- Event a is activated at times $t = 0, 2, 3.2$
- Event a occurs at times $t = 2, 3.2$
- Event b is activated at times $t = 0, 2.8$
- Event b occurs at times $t = 2.8, 4.4$

3)

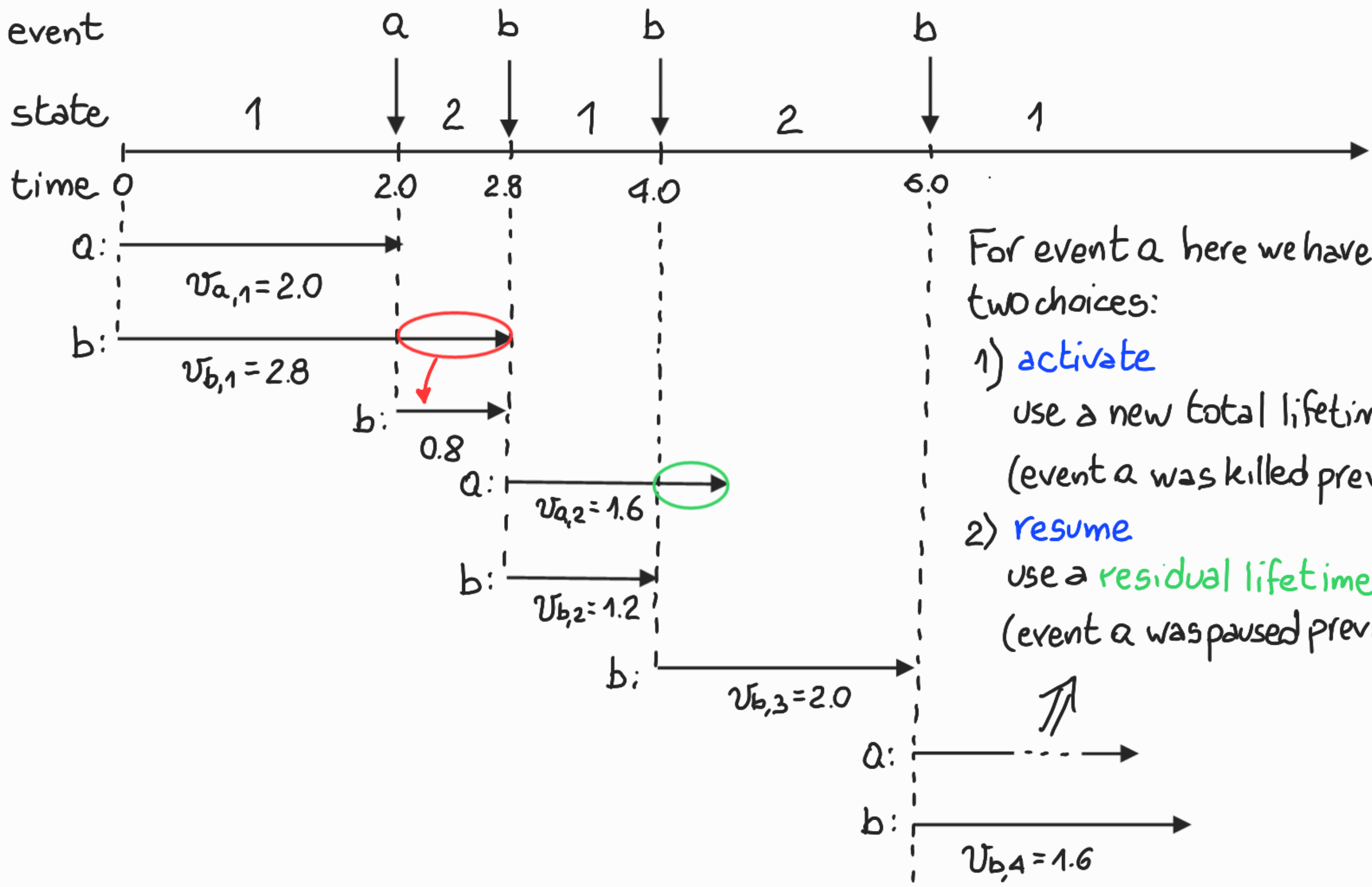



$\mathcal{E} = \{a, b\}$ ↪ two events, one not always possible

$V = \{V_a, V_b\}$ where $V_a = \{\underbrace{2.0}_{v_{a,1}}, \underbrace{1.6}_{v_{a,2}}, \underbrace{1.5}_{v_{a,3}}, \dots\}$

clock structure

$V_b = \{\underbrace{2.8}_{v_{b,1}}, \underbrace{1.2}_{v_{b,2}}, \underbrace{2.0}_{v_{b,3}}, \underbrace{1.6}_{v_{b,4}}, \dots\}$




For event a here we have two choices:

1) activate
use a new total lifetime
(event a was killed previously)

2) resume
use a residual lifetime
(event a was paused previously)

→ Choosing 1) or 2) depends on the particular system.

Assume we choose 1).

- Event a is activated at times $t = 0, 2.8, 6.0$
- Event a occurs at time $t = 2.0$

- Event $a$ is killed at time $t=4.0$

Assume we choose 2).

- Event $a$ is activated at times $t=0, 2.8$
- Event $a$ occurs at time $t=2.0$
- Event $a$ is paused at time $t=4.0$
- Event $a$ is resumed at time $t=6.0$

For event b:

- Event $b$ is activated at times $t=0, 2.8, 4.0, 6.0$
- Event $b$ occurs at times $t=2.8, 4.0, 6.0$

Keeping the previous examples in mind, we are ready to write down a basic algorithm implementing the event timing dynamics (under some assumptions...)

Some additional definitions and notations are useful to this purpose.

DEFINITION: the score of event $e$ at time $t$, denoted $n_e(t)$, is the number of total lifetimes of event $e$ used up to time $t$.