

b) Idea: Introduce an additional synchronization process

$$\begin{aligned}
 Sync(\vec{d}) &= \underbrace{OPEN}_{\text{user action}} . \underbrace{\overline{open}}_{\text{internal action}} . \underbrace{ack}_{\text{acknowledgement}} . Sync(\vec{d}) + \\
 &\quad CLOSE.\overline{close}.ack.Sync(\vec{d}) + \\
 &\quad PRESS.\overline{pressed}.ack.Sync(\vec{d})
 \end{aligned}$$

$\overline{ack}$  has to be introduced in other processes of the system:

$$\begin{aligned}
 Door(\vec{a}) &= \overline{Open}(\vec{a}) \\
 Open(\vec{a}) &= \overline{isOpen}.Open(\vec{a}) + \overline{close}.ack.Closed(\vec{a}) + \overline{open}.ack.Open(\vec{a}) \\
 Closed(\vec{a}) &= \overline{isClosed}.Closed(\vec{a}) + \\
 &\quad \overline{open}.(\overline{isLocked}.ack.Closed(\vec{a}) + \overline{isUnlocked}.ack.Open(\vec{a})) + \overline{close}.ack.Closed(\vec{a})
 \end{aligned}$$

$$\begin{aligned}
 Locker(\vec{b}) &= \overline{Unlocked}(\vec{b}) \\
 Unlocked(\vec{b}) &= \overline{isUnlocked}.Unlocked(\vec{b}) + \\
 &\quad \overline{activate}.(\overline{isOpen}.ALARM.ack.Unlocked(\vec{b}) + \overline{isClosed}.Locked(\vec{b})) \\
 Locked(\vec{b}) &= \overline{isLocked}.Locked(\vec{b}) + \overline{activate}.ack.Unlocked(\vec{b})
 \end{aligned}$$

$$Key(\vec{c}) = \overline{pressed}.activate.Key(\vec{c})$$

$$System(\vec{e}) = \text{new } \vec{d} (Door(\vec{a}) \parallel Locker(\vec{b}) \parallel Key(\vec{c}) \parallel Sync(\vec{d}))$$

where  $\vec{d} = open, close, ack, pressed, isOpen, isClosed, isLocked, isUnlocked, activate$ .

Notations:

- S = Sync, O = Open, C = Close, U = Unlocked, L = Locked, K = Key
- *new ...* is omitted

Note that we do not have to synchronize the alarm.

