

Práctica 4 - Procesos de Negocio

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Nota: La restricción de tiempo a 100 unidades se ha implementado como una condición más en la regla tick.

```
cr1 [tick] :< 0 : Process | gtime: T, tokens: TokenSet, Atts >
=> < 0 : Process | gtime: T plus T', tokens: delta(TokenSet, T'), Atts >
if T' := mte(TokenSet) /\ 0 lt T'
/\ (T plus T') le 100 .
```

Utiliza el comando search para buscar estados del proceso a lo largo de su ejecución limitada a 100 unidades de tiempo en que no haya ningún token en el conjunto del atributo tokens. Explica el resultado.

Comando: `search PROCESS =>* < o : Process | tokens: empty, Atts:AttributeSet > .`

Hay un patrón en las soluciones, esto se debe a los bucles que pueden hacerse. Hemos tomado nota del siguiente patrón:

- En la solución 1 llegamos al nodo *end n05* con un *gtime:=14*.
- Desde la solución 2 y 3 estamos haciendo bucles sobre la tarea “search products” hasta acabar en el nodo *end n05*.
- En la solución 4 llegamos por primera vez al nodo *end n08* con un *gtime:=32*.
- Desde la 5 hasta la 10 empezamos a intercalar los nodos *end n05* y *n08* iterando sobre la tarea “search products”.
- Al llegar a la solución 11, con *gtime:=58* llegamos al nodo *end n25*.
- Desde la 12 hasta las soluciones restante intercalamos los tres posibles nodos finales iterando sobre la tarea “search prodcut”.

Utiliza el comando search para verificar si hay situaciones de bloqueo para ejecuciones del proceso antes del transcurso de 100 unidades de tiempo. Explica el resultado.

Comando: `search PROCESS =>! < o : Process | Atts:AttributeSet > .`

Resultado: 47 estados

Comando: `search PROCESS =>! < o : Process | Atts:AttributeSet, gtime: 100 > .`

Resultado: 21 estados

Comando: `search PROCESS =>! < o : Process | tokens: empty, Atts:AttributeSet > .`

Resultado: 26 estados

Con esto podemos demostrar que tenemos un total de 47 estados de bloqueo, de ellas 21 se bloquean por agotarles el tiempo, mientras que los 26 restantes llegan a un nodo final.

Además hemos podido comprobar que todos nuestros estados sin tokens son estados de bloqueo, ya que los siguientes comandos son equivalentes.

```
search PROCESS =>! < o : Process | tokens: empty, Atts:AttributeSet > .
search PROCESS =>* < o : Process | tokens: empty, Atts:AttributeSet > .
```

Capturas de pantalla

```
search in BPMN-EX : PROCESS ==* < o : Process | Atts:AttributeSet,tokens: empty > .

Solution 1 (state 21)
states: 22 rewrites: 281 in 0ms cpu (1ms real) (~ rewrites/second)
Atts:AttributeSet --> nodes: (start(id("n00"), id("f00")), end(id("n05"), id("f06")), end(id("n08"), id("f13")), end(id("n25"), id("f28")), split(id("n04"), exclusive, id("f02"), id("f04"), id("f05"), id("f06"))), split(id("n08"), exclusive, id("f08"), id("f09"), id("f10")), split(id("n13"), parallel, id("f29"), id("f17")), id("f21")), split(id("n15"), parallel, id("f11"), id("f14"), id("f15"), id("f16")), split(id("n20"), exclusive, id("f22"), id("f23"), id("f24")), merge(id("n02"), exclusive, id("f01"), id("f04"), id("f02")), merge(id("n17"), parallel, id("f15"), id("f17")), id("f18")), merge(id("n19"), parallel, id("f19"), id("f20")), id("f22")), merge(id("n23"), exclusive, id("f25"), id("f26")), id("f27")), merge(id("n24"), parallel, id("f21"), id("f27")), id("f28")), task(id("n01"), "Sign in", id("f00"), id("f01"), 2, empty), task(id("n03"), "Search products", id("f02"), id("f03")), 2, empty), task(id("n06"), "Make an order", id("f05"), id("f07"), 2, empty), task(id("n07"), "Fill in feedback form", id("f12"), id("f13"), 2, empty), task(id("n09"), "Check availability", id("f07"), id("f08"), 2, id("clerk")), task(id("n11"), "Cancel order", id("f09"), id("f12"), 2, id("clerk")), task(id("n12"), "Pay for order", id("f14"), id("f29"), 2, empty), task(id("n14"), "Confirm order", id("f10"), id("f11"), 2, id("clerk")), task(id("n16"), "Prepare parcel", id("f16"), id("f19"), 2, id("worker")), task(id("n18"), "Payment validation", id("f18"), id("f20"), 2, empty), task(id("n21"), "Deliver by drone", id("f23"), id("f25"), 2, id("drone")), task(id("n22"), "Deliver by car", id("f24"), id("f26"), 2, id("car"), id("delivery man"))), flows: (flow(id("f00"), 2), flow(id("f01"), 2), flow(id("f02"), 2), flow(id("f03"), 2), flow(id("f04"), 2), flow(id("f05"), 2), flow(id("f06"), 2), flow(id("f07"), 2), flow(id("f08"), 2), flow(id("f09"), 2), flow(id("f10"), 2), flow(id("f11"), 2), flow(id("f12"), 2), flow(id("f13"), 2), flow(id("f14"), 2), flow(id("f15"), 2), flow(id("f16"), 2), flow(id("f17"), 2), flow(id("f18"), 2), flow(id("f19"), 2), flow(id("f20"), 2), flow(id("f21"), 2), flow(id("f22"), 2), flow(id("f23"), 2), flow(id("f24"), 2), flow(id("f25"), 2), flow(id("f26"), 2), flow(id("f27"), 2), flow(id("f28"), 2), flow(id("f29"), 2)), gtime: 14,resources: (resource(id("car"), 1, 1), resource(id("clerk"), 1, 1), resource(id("delivery man"), 1, 1), resource(id("drone"), 1, 1), resource(id("worker"), 1, 1))

Solution 2 (state 42)
states: 43 rewrites: 620 in 3ms cpu (2ms real) (186522 rewrites/second)
Atts:AttributeSet --> nodes: (start(id("n00"), id("f00")), end(id("n05"), id("f06")), end(id("n08"), id("f13")), end(id("n25"), id("f28")), split(id("n04"), exclusive, id("f02"), id("f04"), id("f05"), id("f06"))), split(id("n08"), exclusive, id("f08"), id("f09"), id("f10")), split(id("n13"), parallel, id("f29"), id("f17")), id("f21")), split(id("n15"), parallel, id("f11"), id("f14"), id("f15"), id("f16")), split(id("n20"), exclusive, id("f22"), id("f23"), id("f24")), merge(id("n02"), exclusive, id("f01"), id("f04"), id("f02")), merge(id("n17"), parallel, id("f15"), id("f17")), id("f18")), merge(id("n19"), parallel, id("f19"), id("f20")), id("f22")), merge(id("n23"), exclusive, id("f25"), id("f26")), id("f27")), merge(id("n24"), parallel, id("f21"), id("f27")), id("f28")), task(id("n01"), "Sign in", id("f00"), id("f01"), 2, empty), task(id("n03"), "Search products", id("f02"), id("f03")), 2, empty), task(id("n06"), "Make an order", id("f05"), id("f07"), 2, empty), task(id("n07"), "Fill in feedback form", id("f12"), id("f13"), 2, empty), task(id("n09"), "Check availability", id("f07"), id("f08"), 2, id("clerk")), task(id("n11"), "Cancel order", id("f09"), id("f12"), 2, id("clerk")), task(id("n12"), "Pay for order", id("f14"), id("f29"), 2, empty), task(id("n14"), "Confirm order", id("f10"), id("f11"), 2, id("clerk")), task(id("n16"), "Prepare parcel", id("f16"), id("f19"), 2, id("worker")), task(id("n18"), "Payment validation", id("f18"), id("f20"), 2, empty), task(id("n21"), "Deliver by drone", id("f23"), id("f25"), 2, id("drone")), task(id("n22"), "Deliver by car", id("f24"), id("f26"), 2, id("car"), id("delivery man"))), flows: (flow(id("f00"), 2), flow(id("f01"), 2), flow(id("f02"), 2), flow(id("f03"), 2), flow(id("f04"), 2), flow(id("f05"), 2), flow(id("f06"), 2), flow(id("f07"), 2), flow(id("f08"), 2), flow(id("f09"), 2), flow(id("f10"), 2), flow(id("f11"), 2), flow(id("f12"), 2), flow(id("f13"), 2), flow(id("f14"), 2), flow(id("f15"), 2), flow(id("f16"), 2), flow(id("f17"), 2), flow(id("f18"), 2), flow(id("f19"), 2), flow(id("f20"), 2), flow(id("f21"), 2), flow(id("f22"), 2), flow(id("f23"), 2), flow(id("f24"), 2), flow(id("f25"), 2), flow(id("f26"), 2), flow(id("f27"), 2), flow(id("f28"), 2), flow(id("f29"), 2)), gtime: 22,resources: (resource(id("car"), 1, 1), resource(id("clerk"), 1, 1), resource(id("delivery man"), 1, 1), resource(id("drone"), 1, 1), resource(id("worker"), 1, 1))
```

[illegible][illegible]

[illegible]


```

Solution 25 (state 1567)
states: 1594 rewrites: 76905 in 37ms cpu (378ms real) (206797 rewrites/second)
Atts:AttributeSet --> nodes: (start(id("n08"), id("f00")), end(id("n05"), id("f06")), end(id("n08"), id("f13")), end(id("n25"), id("f28")), split(id("n04"), exclusive, id("f03"),
(id("f04"), id("f05"), id("f06")), split(id("n10"), exclusive, id("f08"), id("f09")), split(id("n13"), parallel, id("f29"), id("f17")), id("f21")), split(id(
("n15"), parallel, id("f11"), id("f14"), id("f15"), id("f16")), split(id("n08"), exclusive, id("f22"), id("f23"), id("f24")), merge(id("n02"), exclusive, id("f01"), id(
("f04"), id("f02")), merge(id("n17"), parallel, id("f15"), id("f17")), id("f18")), merge(id("n19"), parallel, id("f19"), id("f20")), id("f22")), merge(id("n23"), exclusive,
(id("f25"), id("f26")), id("f27")), merge(id("n24"), parallel, id("f21"), id("f27")), id("f28")), task(id("n01"), "Sign in", id("f00"), id("f01"), 2, empty), task(id("n03"),
"Search products", id("f02"), id("f03"), 2, empty), task(id("n06"), "Make an order", id("f05"), id("f07"), 2, empty), task(id("n07"), "Fill in feedback form", id("f12"), id(
("f13"), 2, empty), task(id("n09"), "Check availability", id("f07"), id("f08"), 2, id("clerk")), task(id("n11"), "Cancel order", id("f09"), id("f12"), 2, id("clerk")), task(id(
("n12"), "Pay for order", id("f14"), id("f29"), 2, empty), task(id("n14"), "Confirm order", id("f18"), id("f11"), 2, id("clerk")), task(id("n16"), "Prepare parcel", id("f16"),
id("f19"), 2, id("worker")), task(id("n18"), "Payment validation", id("f18"), id("f20"), 2, empty), task(id("n21"), "Deliver by drone", id("f23"), id("f25"), 2, id("drone")),
task(id("n22"), "Deliver by car", id("f24"), id("f26"), 2, id("car"), id("delivery man")), flows: (flow(id("f00"), 2), flow(id("f01"), 2), flow(id("f02"), 2), flow(id(
("f03"), 2), flow(id("f04"), 2), flow(id("f05"), 2), flow(id("f06"), 2), flow(id("f07"), 2), flow(id("f08"), 2), flow(id("f09"), 2), flow(id("f10"), 2), flow(id("f11"), 2),
flow(id("f12"), 2), flow(id("f13"), 2), flow(id("f14"), 2), flow(id("f15"), 2), flow(id("f16"), 2), flow(id("f17"), 2), flow(id("f18"), 2), flow(id("f19"), 2), flow(id("f20"),
2), flow(id("f21"), 2), flow(id("f22"), 2), flow(id("f23"), 2), flow(id("f24"), 2), flow(id("f25"), 2), flow(id("f26"), 2), flow(id("f27"), 2), flow(id("f28"), 2), flow(id(
("f29"), 2)), gtime: 96, resources: (resource(id("car"), 1, 1), resource(id("clerk"), 1, 1), resource(id("delivery man"), 1, 1), resource(id("drone"), 1, 1), resource(id(
"worker"), 1, 1))

Solution 26 (state 1643)
states: 1669 rewrites: 80703 in 39ms cpu (398ms real) (205968 rewrites/second)
Atts:AttributeSet --> nodes: (start(id("n08"), id("f00")), end(id("n05"), id("f06")), end(id("n08"), id("f13")), end(id("n25"), id("f28")), split(id("n04"), exclusive, id("f03"),
(id("f04"), id("f05"), id("f06")), split(id("n10"), exclusive, id("f08"), id("f09")), split(id("n13"), parallel, id("f29"), id("f17")), id("f21")), split(id(
("n15"), parallel, id("f11"), id("f14"), id("f15"), id("f16")), split(id("n20"), exclusive, id("f22"), id("f23"), id("f24")), merge(id("n02"), exclusive, id("f01"), id(
("f04"), id("f02")), merge(id("n17"), parallel, id("f15"), id("f17")), id("f18")), merge(id("n19"), parallel, id("f19"), id("f20"), id("f22")), merge(id("n23"), exclusive,
(id("f25"), id("f26")), id("f27")), merge(id("n24"), parallel, id("f21"), id("f27")), id("f28")), task(id("n01"), "Sign in", id("f00"), id("f01"), 2, empty), task(id("n03"),
"Search products", id("f02"), id("f03"), 2, empty), task(id("n06"), "Make an order", id("f05"), id("f07"), 2, empty), task(id("n07"), "Fill in feedback form", id("f12"), id(
("f13"), 2, empty), task(id("n09"), "Check availability", id("f07"), id("f08"), 2, id("clerk")), task(id("n11"), "Cancel order", id("f09"), id("f12"), 2, id("clerk")), task(id(
("n12"), "Pay for order", id("f14"), id("f29"), 2, empty), task(id("n14"), "Confirm order", id("f18"), id("f11"), 2, id("clerk")), task(id("n16"), "Prepare parcel", id("f16"),
id("f19"), 2, id("worker")), task(id("n18"), "Payment validation", id("f18"), id("f20"), 2, empty), task(id("n21"), "Deliver by drone", id("f23"), id("f25"), 2, id("drone")),
task(id("n22"), "Deliver by car", id("f24"), id("f26"), 2, id("car"), id("delivery man")), flows: (flow(id("f00"), 2), flow(id("f01"), 2), flow(id("f02"), 2), flow(id(
("f03"), 2), flow(id("f04"), 2), flow(id("f05"), 2), flow(id("f06"), 2), flow(id("f07"), 2), flow(id("f08"), 2), flow(id("f09"), 2), flow(id("f10"), 2), flow(id("f11"), 2),
flow(id("f12"), 2), flow(id("f13"), 2), flow(id("f14"), 2), flow(id("f15"), 2), flow(id("f16"), 2), flow(id("f17"), 2), flow(id("f18"), 2), flow(id("f19"), 2), flow(id("f20"),
2), flow(id("f21"), 2), flow(id("f22"), 2), flow(id("f23"), 2), flow(id("f24"), 2), flow(id("f25"), 2), flow(id("f26"), 2), flow(id("f27"), 2), flow(id("f28"), 2), flow(id(
("f29"), 2)), gtime: 98, resources: (resource(id("car"), 1, 1), resource(id("clerk"), 1, 1), resource(id("delivery man"), 1, 1), resource(id("drone"), 1, 1), resource(id(
"worker"), 1, 1))

No more solutions.
states: 1708 rewrites: 84839 in 488ms cpu (414ms real) (205753 rewrites/second)

```