



Title: E-commerce transaction modeling formalisms

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Editorial label ECORFAN: 607-8695

BCIERMMI Control Number: 2022-01

BCIERMMI Classification (2022): 261022-0001

Pages: 19

RNA: 03-2010-032610115700-14

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Introduction



Introduction

Works
review



(Raju & Vivekanandam, 2019)



(Gonzalez et al, 2021)

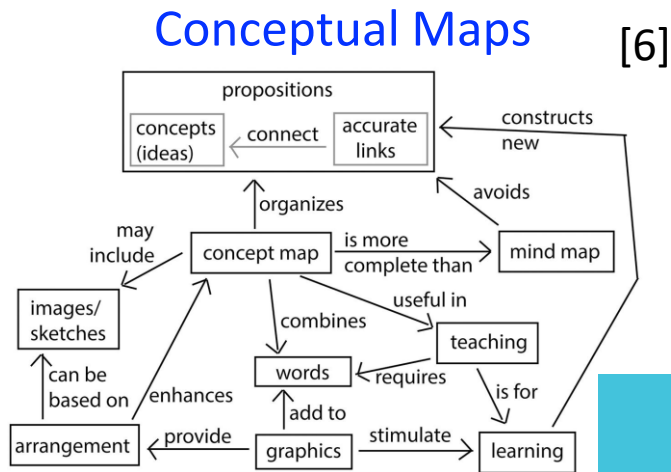


(Raissi & Matoussi, 2019)



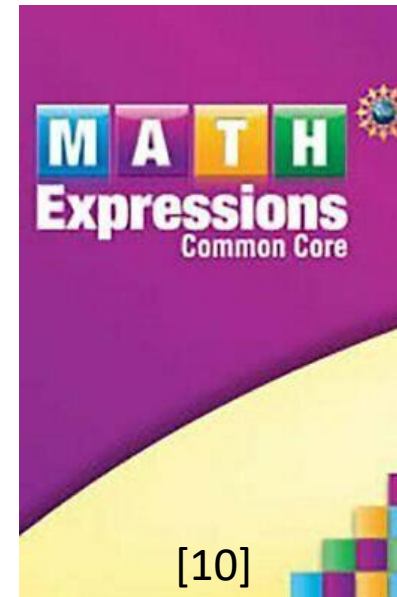
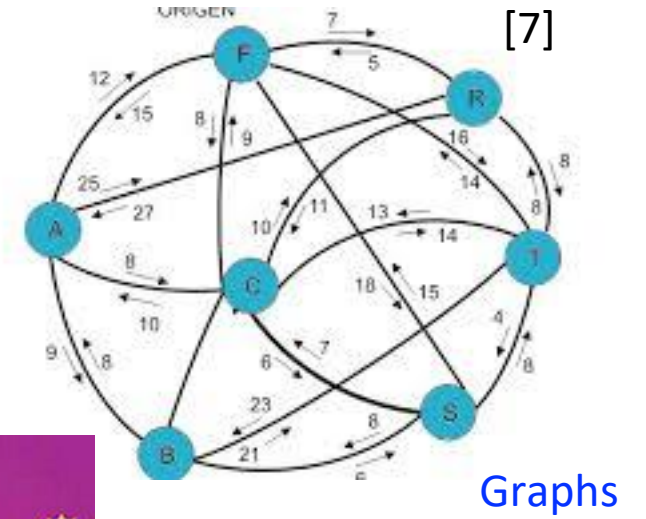
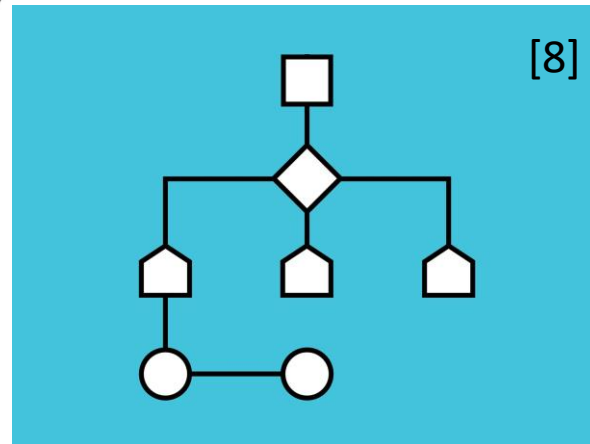
(Dhingra et al, 2020)

Background

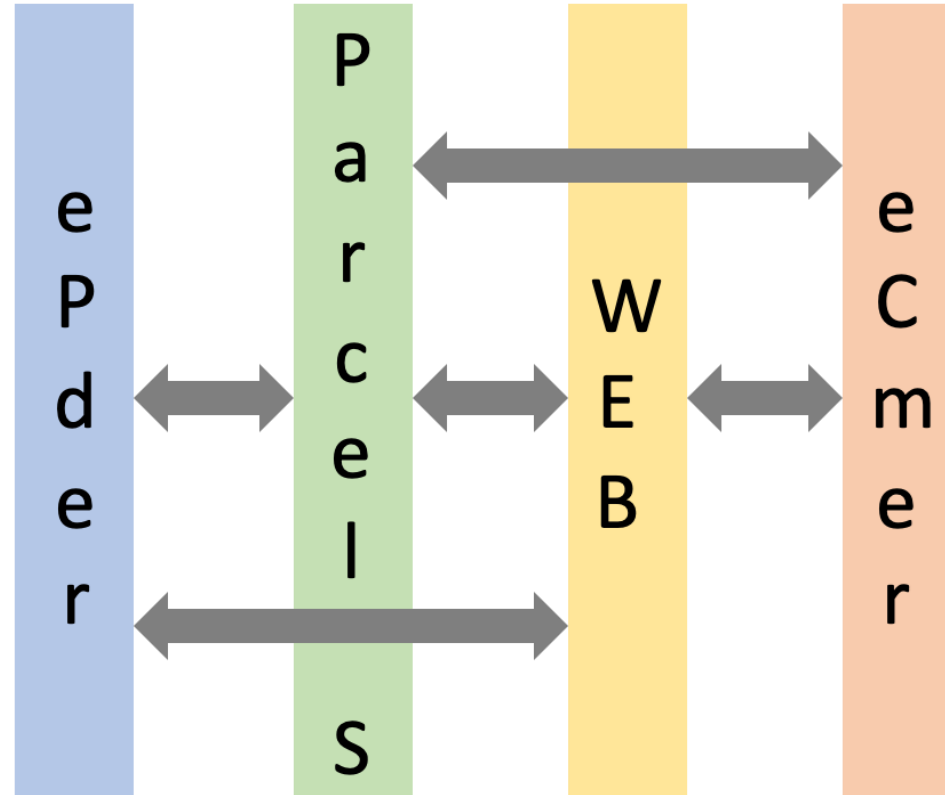


[9]

pseudocode



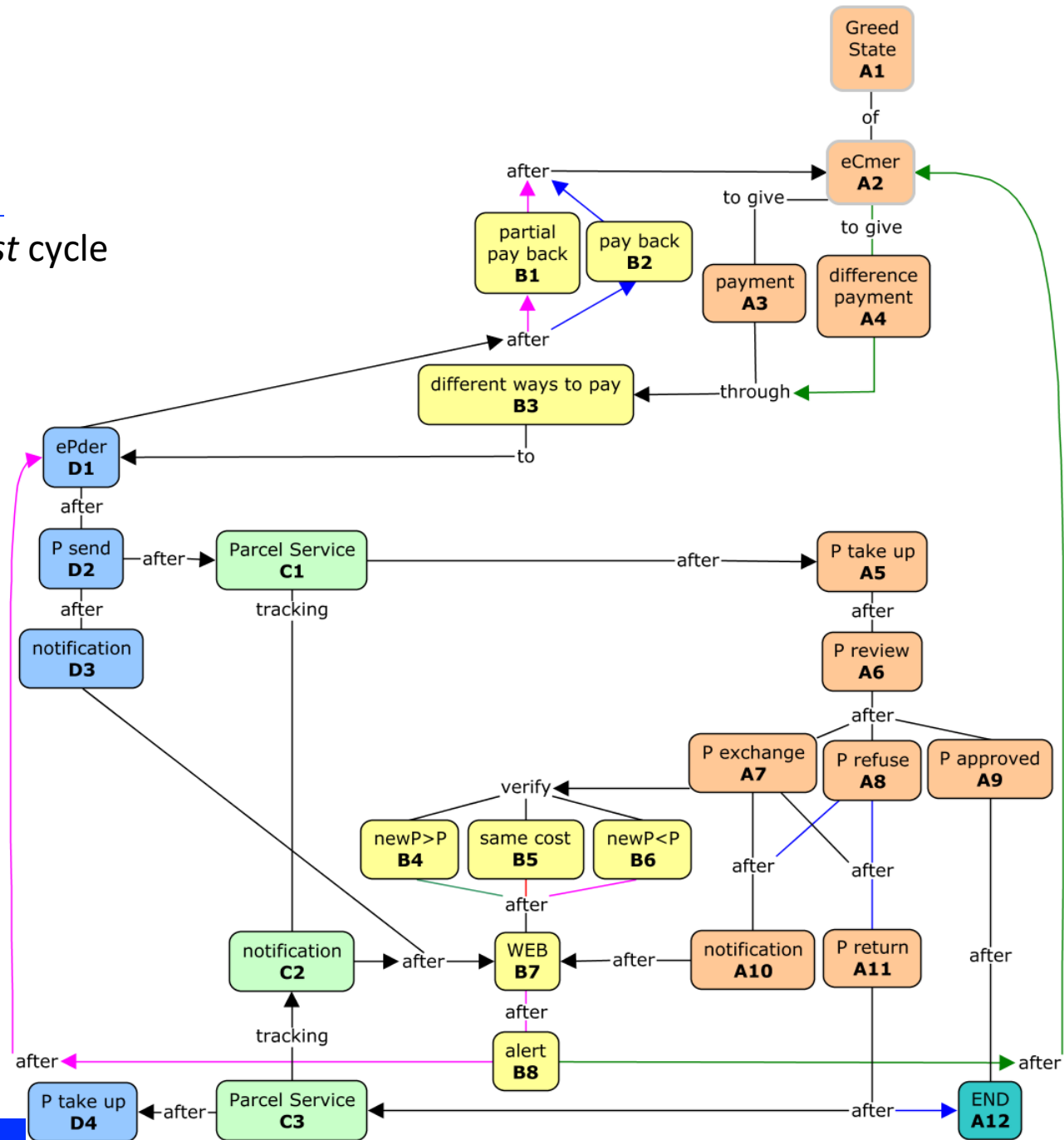
Results



Actors in *direct pst*

Results

Conceptual map of direct pst cycle



Results

Table 1. Description of e-Commerce transaction

node	Description
A1	The <i>eCmer</i> has a <i>Gs</i>
A2	<i>eCmer</i> is ready to continue or finish the <i>pst</i>
A3	<i>eCmer</i> is going to pay to <i>ePder</i>
B3	The payment could be made in different electronic ways
D1	After <i>ePder</i> received the money and/or <i>P</i> return, <i>ePder</i> has taken steps to serve <i>eCmer</i>
D2	Logistics to send <i>P</i> to <i>eCmer</i> in a parcel service
D3	The <i>ePder</i> notifies through WEB portal that <i>P</i> was sent
B7	WEB register
C1	Parcel service transit
C2	Tracking <i>P</i> also involves when it is received ...B7, A5...
A5	The <i>eCmer</i> receives <i>P</i>
A6	<i>eCmer</i> reviews <i>P</i> and takes a decision: exchange, reject or approved
A9	<i>eCmer</i> is satisfied with <i>P</i> <ul style="list-style-type: none"> Indirect elements notify <i>ePder</i> that <i>eCmer</i> is satisfied with <i>P</i> but, are not mentioned here
A12	The <i>pst</i> is finished (END)
A8	<i>P</i> refuse
A10	Notifies to <i>ePder</i> that <i>eCmer</i> has refused <i>P</i> or wants to change <i>P</i>
	...B7, B8...
B8	The alert is activated after registering on the WEB the refuse of <i>P</i> or the change of <i>P</i>
A11	Logistics to send <i>P</i> to <i>ePder</i> in a parcel service
C3	Parcel service transit ...C2, B7, D4...
D4	The <i>ePder</i> receives <i>P</i> ...D1, B2...
B2	<i>ePder</i> returns the payment to <i>eCmer</i> and the <i>pst</i> is finished ...A2, A12
A7	<i>eCmer</i> wants to change <i>P</i> and one of three cases are presented (B4, B5, B6)
B4	Price of the new selected <i>P</i> is higher <ul style="list-style-type: none"> <i>B7, B8</i>: Notifies <i>eCmer</i> that it is necessary to cover a price difference <i>A2</i>: <i>eCmer</i> is ready to continue the <i>pst</i> ...A4...
A4	<i>eCmer</i> is going to pay the difference to <i>ePder</i> <ul style="list-style-type: none"> <i>B3</i>: The payment is through different electronic ways <i>D4</i>: <i>eCmer</i> returns <i>P</i> to <i>ePder</i>. <i>D1</i>: After <i>ePder</i> received the money and <i>P</i>, <i>ePder</i> has taken steps to attend <i>eCmer</i> and the <i>pst</i> cycle continue ...D2...
B5	Price <i>P</i> is the same as the new selected <i>P</i> <ul style="list-style-type: none"> <i>B7, B8</i>: Notifies <i>ePder</i> that the money is OK <i>D4</i>: <i>eCmer</i> returns <i>P</i> to <i>ePder</i> <i>D1</i>: After <i>ePder</i> received <i>P</i>, <i>ePder</i> has taken steps to attend <i>eCmer</i> and the <i>pst</i> cycle continue ...D2...
B6	Price of the new selected <i>P</i> is lower <ul style="list-style-type: none"> <i>B7, B8</i>: Notifies <i>ePder</i> that the price of the new selected <i>P</i> is lower <i>D4</i>: <i>eCmer</i> returns <i>P</i> to <i>ePder</i> <i>D1</i>: After <i>ePder</i> received <i>P</i>, it has taken steps to attend <i>eCmer</i> and the <i>pst</i> cycle continue ...D2
B1	<i>ePder</i> returns the partial payment to <i>eCmer</i> <ul style="list-style-type: none"> This is a parallel and asynchrony event, and it is necessary to end <i>pst</i> ...A2...

Results

Pseudocode

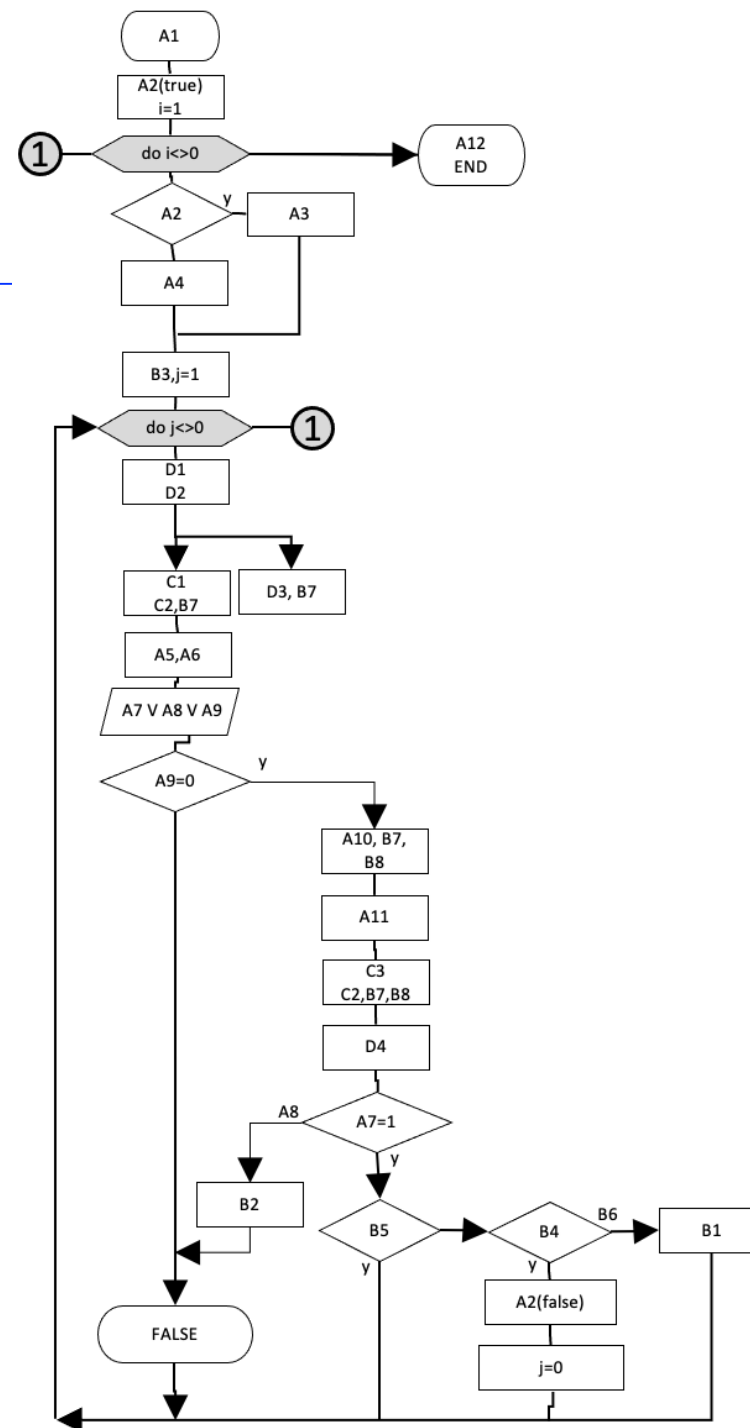
```
input A1 //Greed State
A2 => eCmer=startTrans
i=1 //loop
do i<>0{
if eCmer=startTrans then
A3 //Payment
else
A4 //Difference payment
end if
B3 //different ways to pay
j=1 //loop
do j<>0{
D1 //ePder
D2 //P send
|| D3 //notification->B7 //Web
|| C1 //Parcel Service(C2 //tracking)->B7 //Web
A5 //take up by eCmer
A6 //review
input A7 V A8 V A9
if A9=0 //P approved
A10 //notification
B7 //Web
B8 //alert
A11 //P return
```



```
C3 //Parcel Service
C2 //tracking
B7 //Web
B8 //alert
D4 //P take up by ePder
if A7=1 //P exchange
//B5->out if
if B4 //newP>P
A2 => eCmer=adjustTrans
j=0 //out loop
else //B6 //newP<P
B1 //partial pay back
end if
else // A8 => P refuse
B2 //pay back
ALL FALSE //end_if end_loop_j end_loop_i
end if
else //P approved
ALL FALSE //endif end_loop_j end_loop_i
end if
} //j
} //i
A12 END
```

Results

Flowcharts of direct *pst*



Results

Reduce pseudocode

```
start A1
A2=true
i true
do i <> false
if A2 true
A3
else
A4
end if
B3
j=1
do j <> 0
D1
D2
||D3,B7
||C1,C2,B7
A5
A6
```



```
input A7 V A8 V A8
if A9=0
A10,B7,B8,A11,C3,C2,B7,B8,D4
if A7=1
//B5 same cost
if B4=1
A2=false
j=0 //out_loop_j
else //B6
B1
endif
else
B2
all_variables=0
endif
else
all_variables=0
endif
enddo
enddo
A12 //END
```

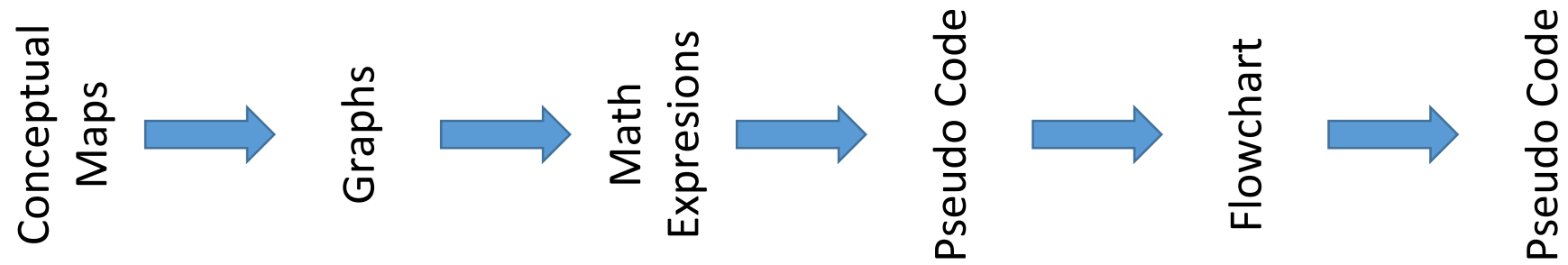
Results

E-commerce math expression

$$\begin{aligned} pst_loop = & A1, A2, A3, B3, D1, D2 \dots \\ & \dots D2, ((D3 \dots) \wedge (C1 \dots)) \\ & \dots C1, C2, B7, A5, A6 \dots \\ & \dots A6, ((A7 \dots) \vee (A8 \dots) \vee (A9 \dots)) \\ & \dots A9, A12 \\ & (\dots A8 \Delta D4), D1, B2, A2, A12 \\ & \dots A7, ((B4 \dots) \vee (B5 \dots) \vee (B6 \dots)) \wedge (A10 \dots) \\ & \dots A10, B7, B8, A11 \dots \\ & \dots ((A10, B7, B8) \wedge (A11 \dots)) \\ & \dots A11, C3, C2, B7, D4 \dots \\ & \dots B5, B7, (B8 \blacktriangle D4), D1, D2 \dots \\ & \dots B6, B7, (B8 \blacktriangle D4), D1, ((B1, A2) \wedge D2 \dots) \\ & \dots B4, B7, B8, A2, (B3 \blacktriangle D4), D1, D2 \dots \end{aligned}$$

Conclusions

E-Commerce Process



Conclusions

Conceptual maps are easy tools for representing complex processes, but they are limited because they cannot show their flow without an adjunct explication.

The *coverture tree* shows the *pst* but can't differentiate sequential and parallel events.

The *math expressions* are more precise to describe the *pst* but lost the visual representation and it's difficult to identify the *loops*.

The *pseudocode*, as *math expressions*, is precise with the process flow but lost the visual representation.

Finally, the *flowchart* is a recurse that helps to describe the *pst* with minimal elements that omit some important events.

Future work

In the near future, this work will be extended to represent the coverage graph in **Petri nets** with the aim of optimizing the *pst*

Acknowledgements

CUCEA, CUVALLES

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GRACIAS!!!!

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