# Curs 9-10

Reprezentarea cunoașterii.

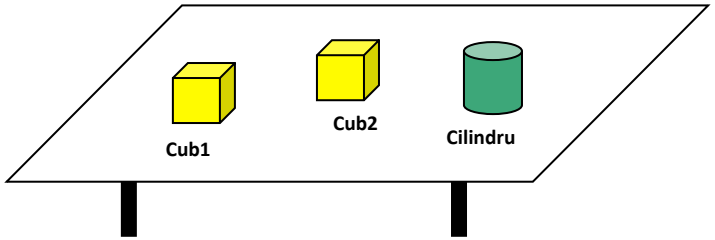
Rețele semantice

# Reţele semantice descriptive

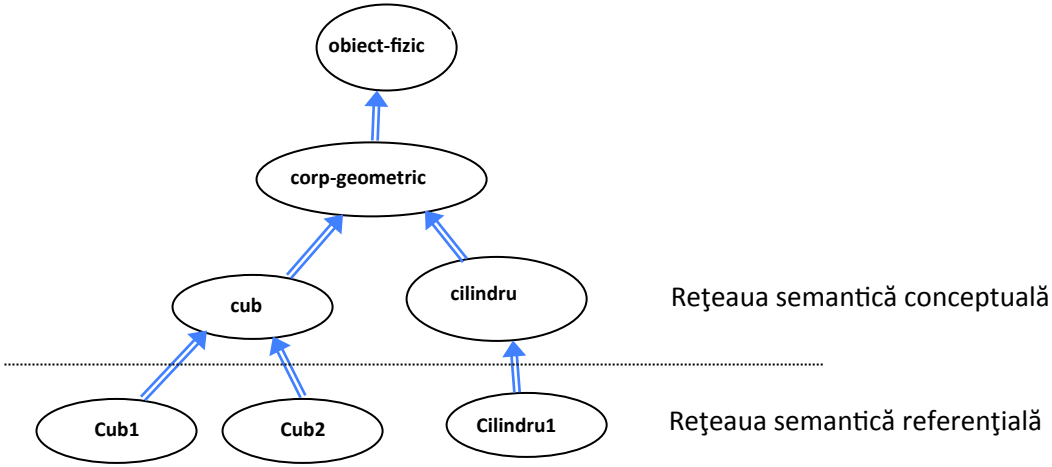
- adecvate reprezentării cunoaşterii statice
- se descriu:
  - entităţi, în ierarhia de la general spre specific
  - relaţii între entităţi
- două niveluri:
  - conceptual (intensiv): concepte (tipuri)
  - referenţial (extensiv): instanţe ale conceptelor

# Rețele semantice descriptive

O lume obiectuală:




Taxonomie:



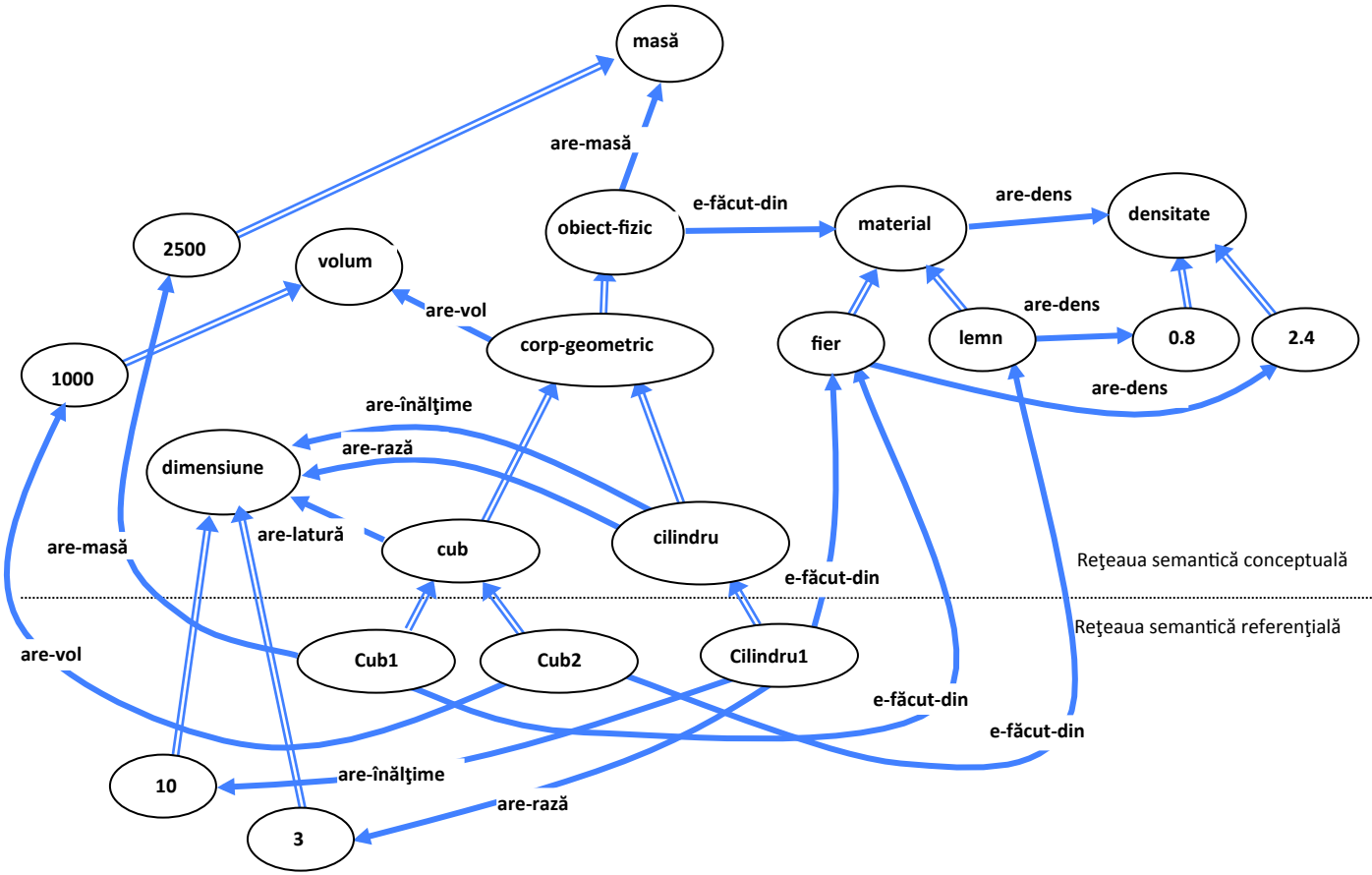
# Rețelele semantice descriptive permit reprezentarea economică

- Proprietăţile:
  - explicite – la nivelul conceptual
  - implicite (moștenite) – la nivelul referențial
- Interogări:
  - care este închiderea tranzitivă a relaţiilor taxonomice ISA ale unui nod din reţea?
  - ce valoare este ataşată prin relaţia semantică *R* nodului *n*?
  - care este valoarea regăsită prin navigare în reţea în lungul lanţului de relaţii *R1* … *Rn*, plecând din nodul *n*?
  - care este calea de relaţii semantice ce se poate stabili între două noduri *n1* şi *n2*?

# Interogări într-o rețea semantică

*Care este densitatea corpului* `Cub2`*?*

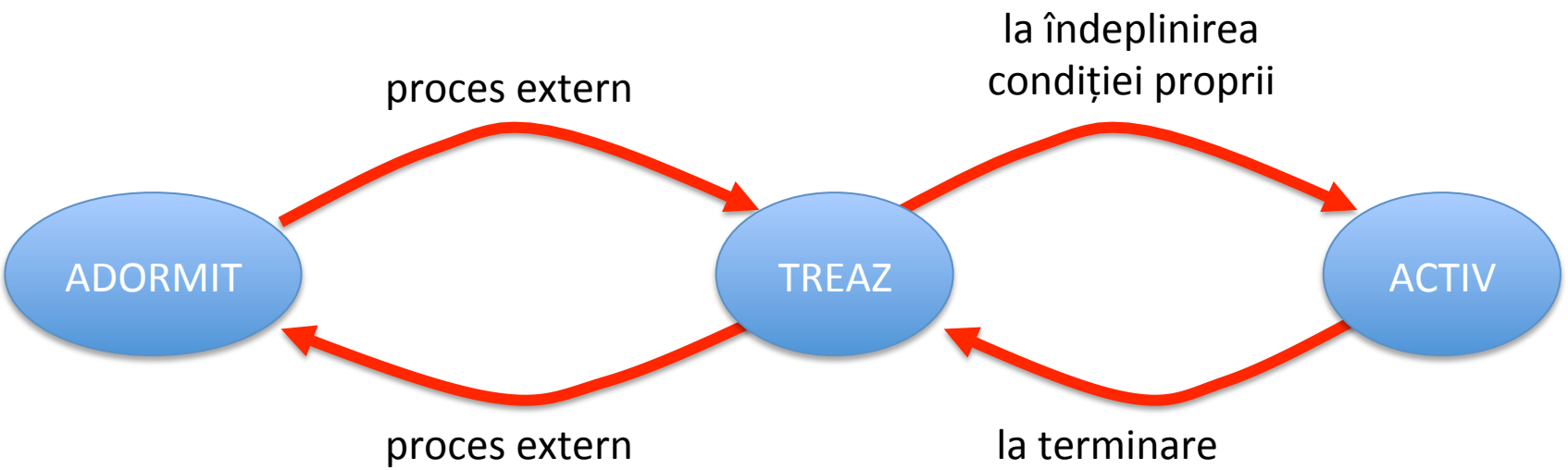
$?C_{Cub2}$: Cub2 ISA $C_{Cub2}$ ➔ $C_{Cub2}$ = cub
$?R^*$: cub $R^*$ densitate ➔ $R^*$ = e-făcut-din • are-dens
$?y$: Cub2 e-făcut-din • are-dens $y$ ➔ $y$ = 0.8



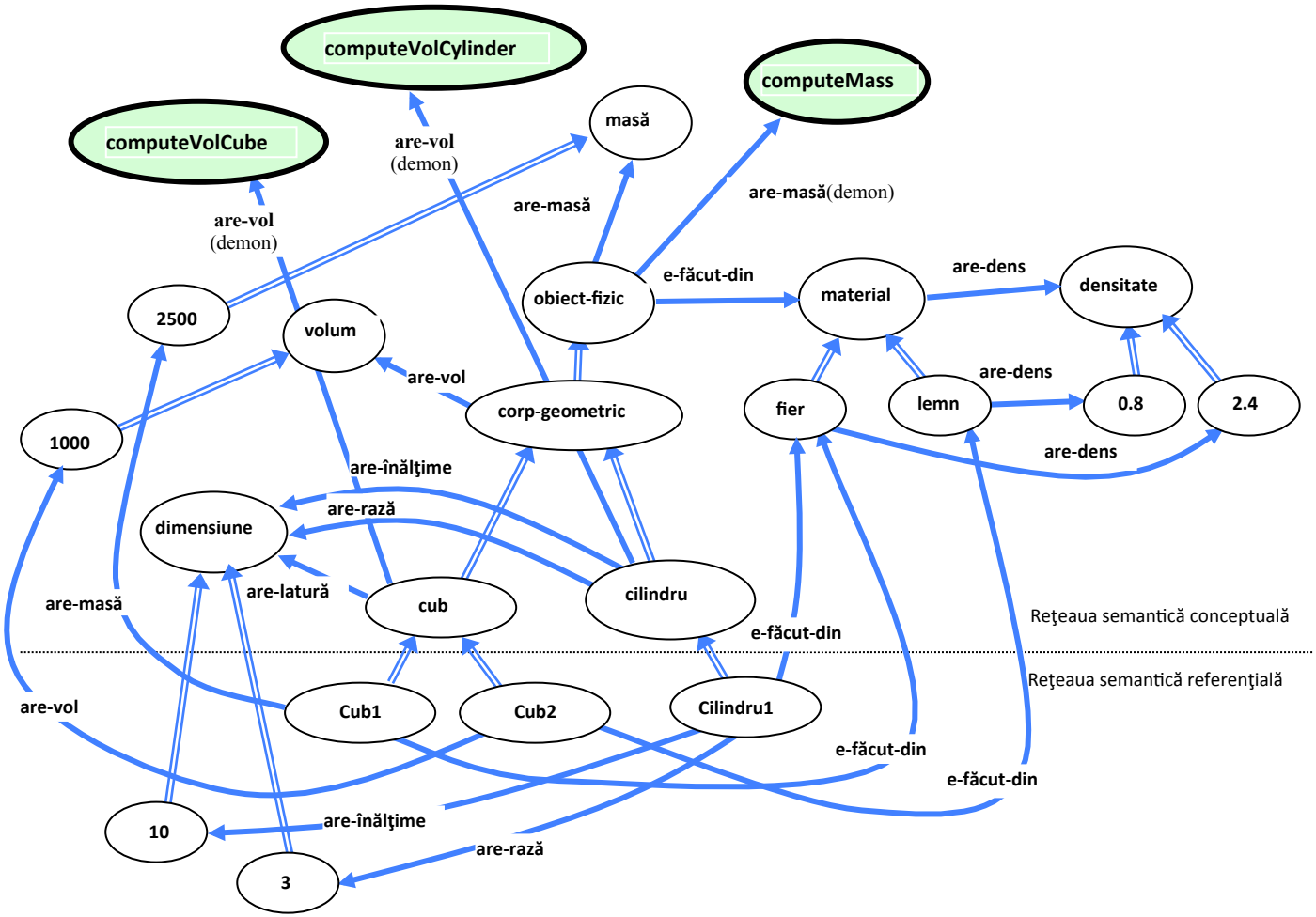
# Demoni

- Proceduri care...
  - nu se apelează
  - se activează singure când anumite condiţii pe care ei sunt pregătiţi să le sesizeze sunt îndeplinite
- Stările unui demon:
  - **adormit**
  - **disponibil** (*idle*)
  - **activ**

# Tranzițiile demonilor



# Demoni într-o rețea semantică



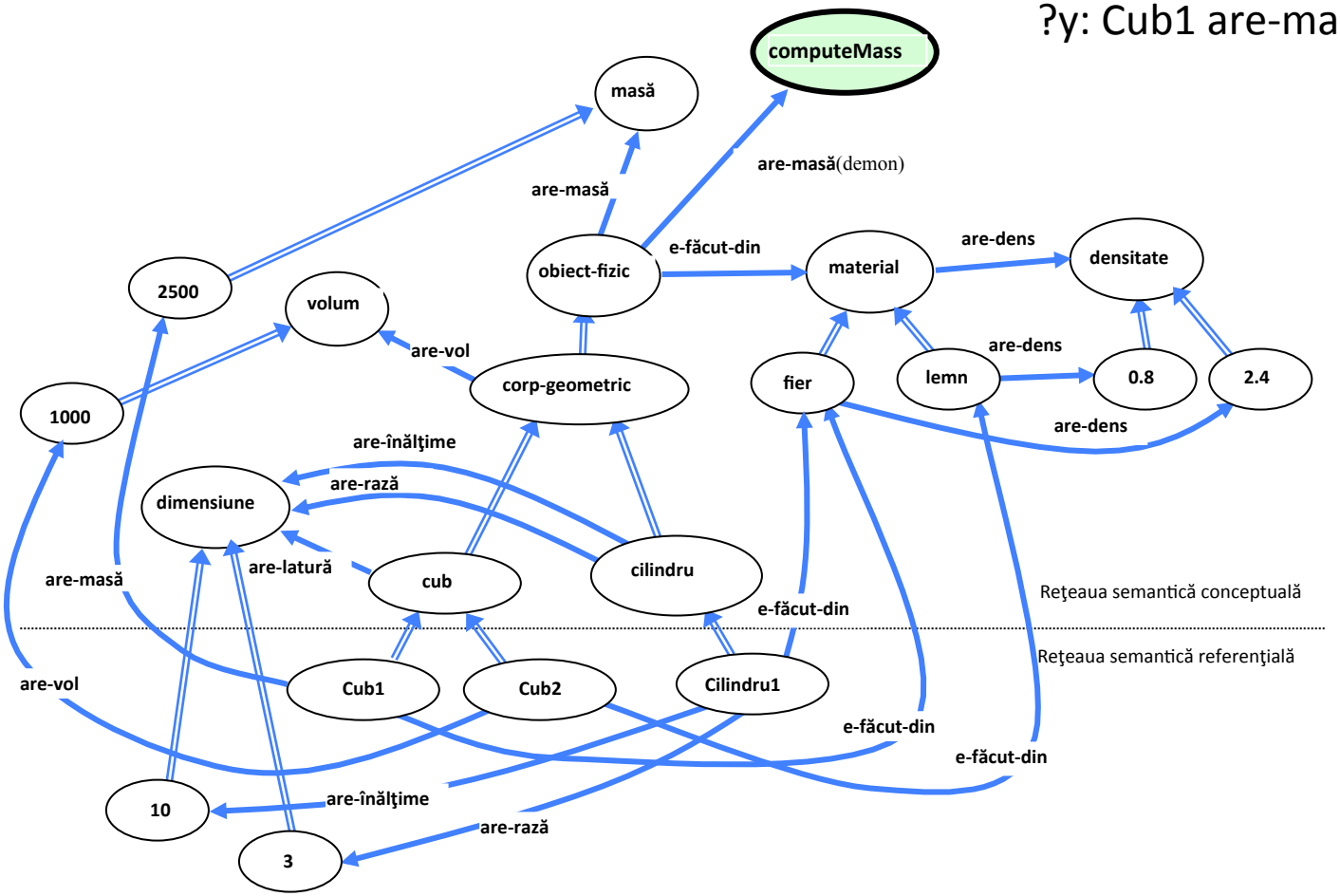
# Demonul ComputeMass

**procedure** ComputeMass(*x*)
**begin**
; află densitatea lui *x*:
  ?$C_x$: *x* ISA $C_x$
  ?$R_1$*: $C_x$ $R_1$* *densitate*
  ?$y_1$: *x* $R_1$* $y_1$
; află volumul lui *x*:
  ?$R_2$*: $C_x$ $R_2$* *volum*
  ?$y_2$: *x* $R_2$* $y_2$
; calculează masa ca *densitate * volum*:
  **return** $y_1$ * $y_2$;
**end**

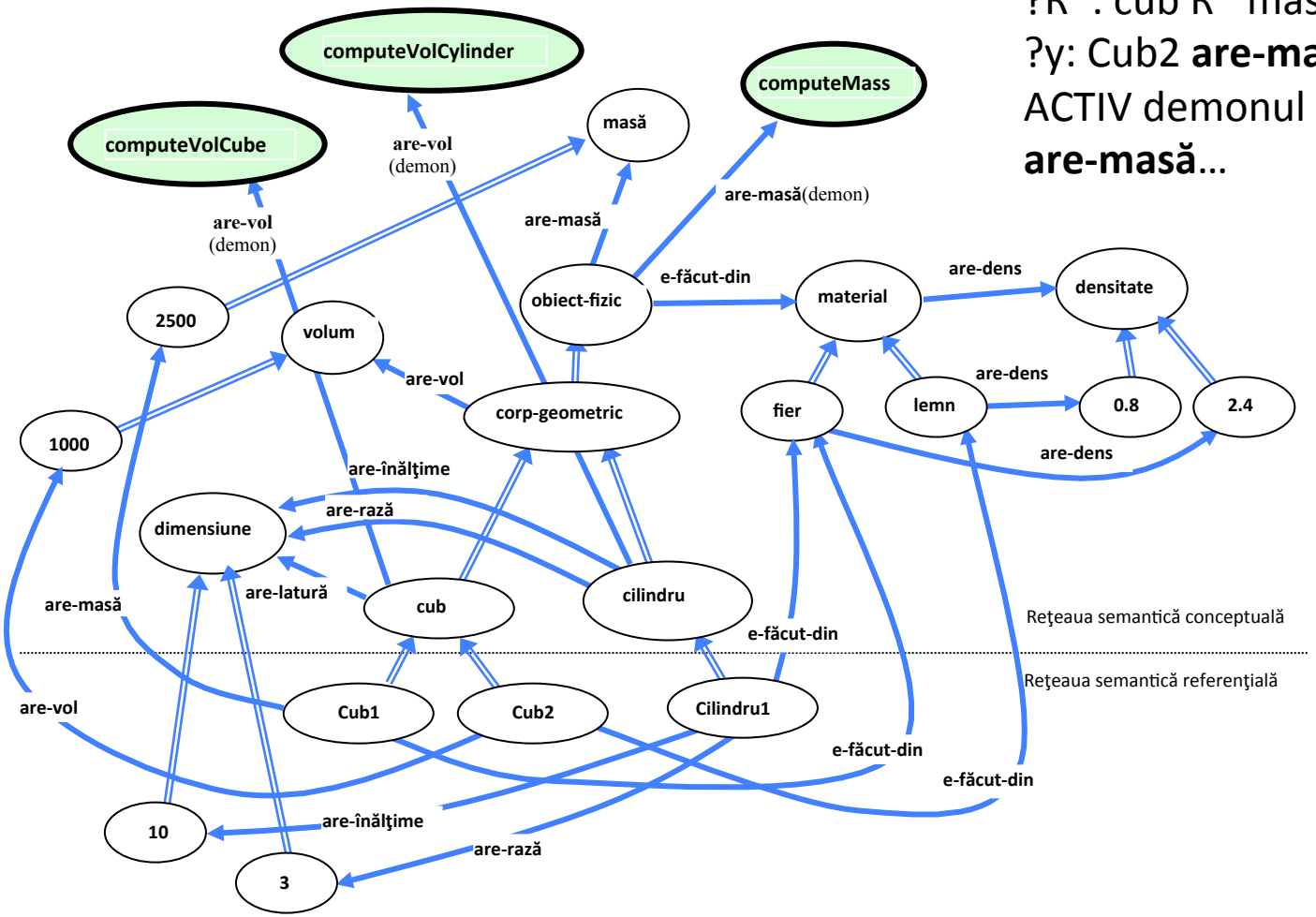
$m=\rho*V$

# Activarea demonilor (demonul nu se activează)

Care este masa lui Cub1?
?$C_{Cub1}$: Cub1 ISA $C_{Cub1}$ ➔ $C_{Cub1}$ = cub
?R*: cub R* masă ➔ R* = are-masă
?y: Cub1 are-masă y ➔ y = 2500



# Demonul devine ACTIV




Care este masa lui Cub2?
?$C_{Cub2}$: Cub2 ISA $C_{Cub2}$ ➔ $C_{Cub2}$ = cub
?R*: cub R* masă ➔ R* = **are-masă**
?y: Cub2 **are-masă** y ➔ nil ➔
ACTIV demonul din vârful relației **are-masă**…

# Demonul ComputeMass e activ!

cub2

**procedure** ComputeMass(*x*)
**begin**
; află densitatea lui *x*:
  ?$C_x$: *x* ISA $C_x$
  ?$R_1$*: $C_x$ $R_1$* *densitate*
  ?$y_1$: *x* $R_1$* $y_1$
; află volumul lui *x*:
  ?$R_2$*: $C_x$ $R_2$* *volum*
  ?$y_2$: *x* $R_2$* $y_2$
; calculează masa ca densitate * volum:
  **return** $y_1$ * $y_2$;
**end**

$m=\rho*V$

➔ $C_x$ = cub

➔ $R_1$* = **e-făcut-din • are-dens**

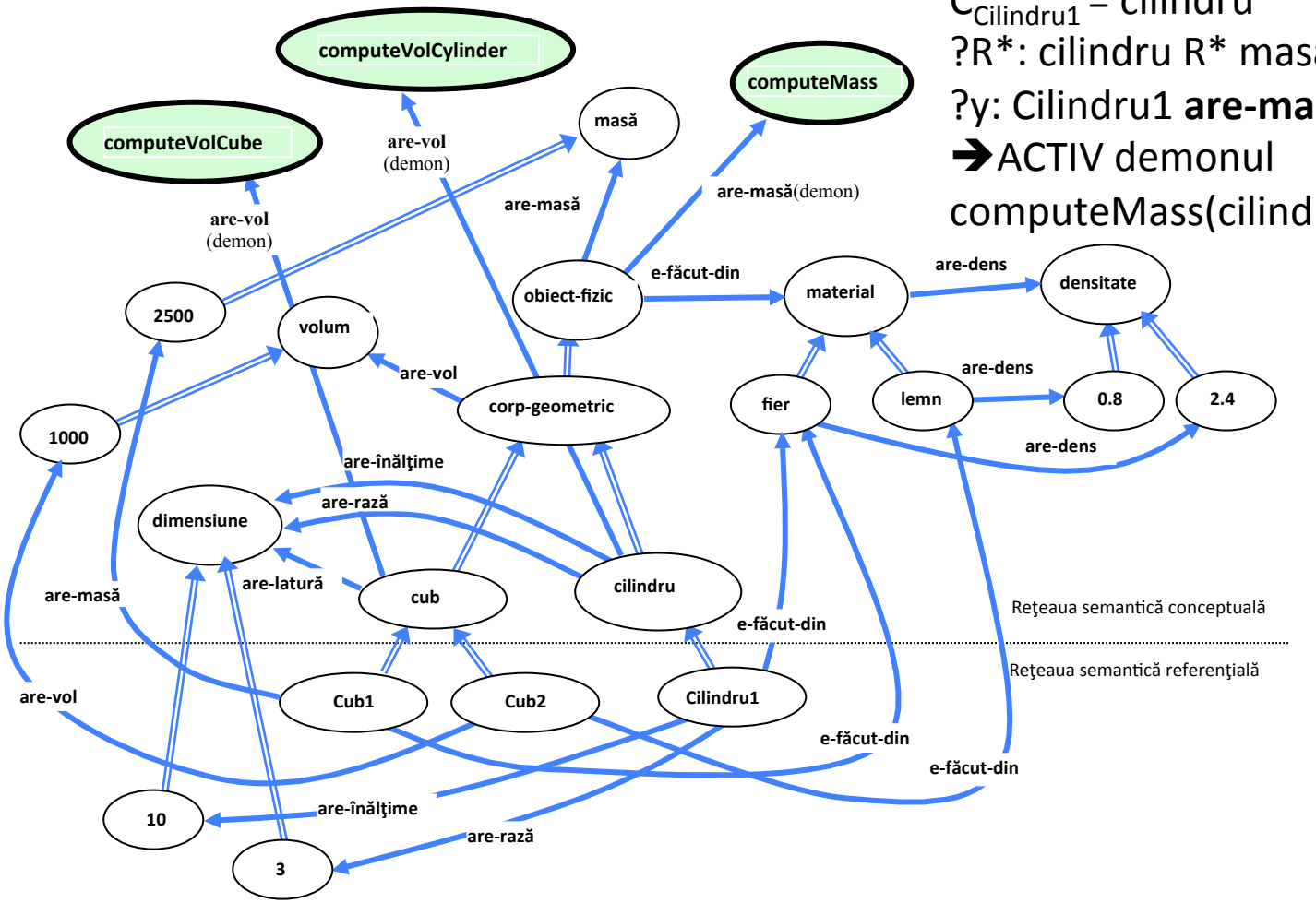
➔ $y_1$ = cub2 **e-făcut-din • are-dens** = 0.8

➔ $R_2$* = **are-vol**

➔ $y_2$: cub2 **are-vol** $y_2$ ➔ $y_2$ = 1000

return 0.8 * 1000

# Demoni într-o rețea semantică




Care este masa cilindrului 1?

?$C_{Cilindru1}$: Cilindru1 ISA $C_{Cilindru1}$ ➔

$C_{Cilindru1}$ = cilindru

?R*: cilindru R* masă ➔ R* = **are-masă**

?y: Cilindru1 **are-masă** y ➔ nil

➔ACTIV demonul computeMass(cilindru1)

# Demonul ComputeMass e activ!

Cilindru1

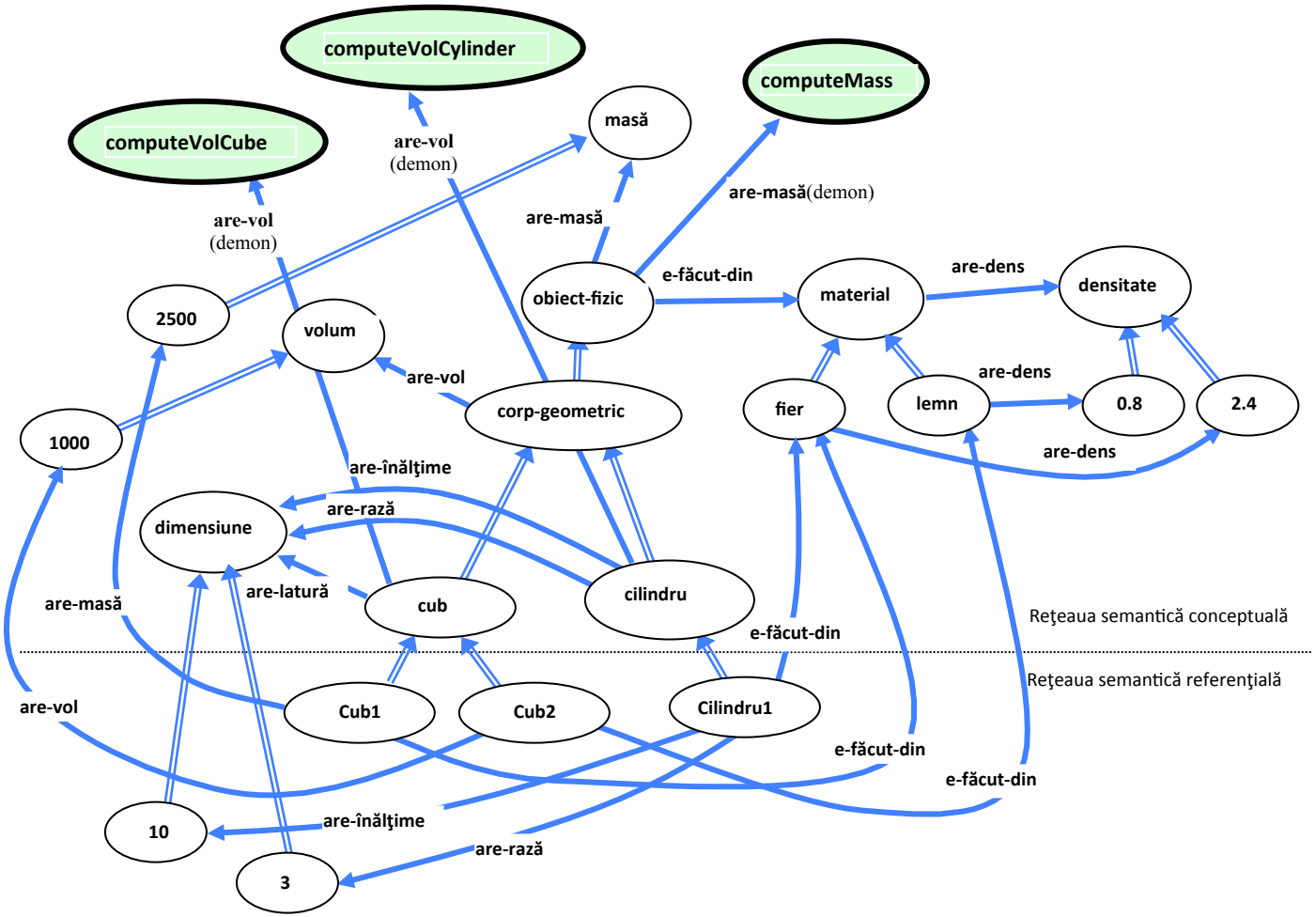
**procedure** ComputeMass(*x*)
**begin**
; află densitatea lui *x*:
  ?$C_x$: *x* ISA $C_x$
  ?$R_1$*: $C_x$ $R_1$* *densitate*
  ?$y_1$: *x* $R_1$* $y_1$
; află volumul lui *x*:
  ?$R_2$*: $C_x$ $R_2$* *volum*
  ?$y_2$: *x* $R_2$* $y_2$
; calculează masa ca densitate * volum:
  **return** $y_1$ * $y_2$;
**end**

***m=ρ*V***

➔ $C_x$ = cilindru
➔ $R_1$* = **e-făcut-din • are-dens**
➔ $y_1$ = Cilindru1 **e-făcut-din • are-dens** = 2.4
➔ $R_2$*: Cilindru $R_2$* **volum** ➔ $R_2$* = **are-vol**
➔ $y_2$: Cilindru1 **are-vol** $y_2$ ➔ nil ➔ ...

return 0.8 * 1000 = 800

# Demonul devine ACTIV



# Demonul ComputeVolCylinder e activ!

$V = \pi * r^2 * H$

Cilindru1

- **procedure** ComputeVolCylinder(*x*)
- **begin**
- ; află raza bazei lui *x*:
- ?*r*: *x* **are-rază** *r* → 3
- ; află înălţimea lui *x*:
- ?*h*: *x* **are-înălţime** *h* → 10
- ; calculează volumul:
- **return** 3.14 * *r* * *r* * h; return 3.14 * 3 * 3 * 10 = 282.6
- **end**

# Demonul ComputeMass e activ!

Cilindru1

**procedure** ComputeMass(*x*)
**begin**
; află densitatea lui *x*:
  ?$C_x$: *x* ISA $C_x$
  ?$R_1$*: $C_x$ $R_1$* *densitate*
  ?$y_1$: *x* $R_1$* $y_1$
; află volumul lui *x*:
  ?$R_2$*: $C_x$ $R_2$* *volum*
  ?$y_2$: *x* $R_2$* $y_2$
; calculează masa ca densitate * volum:
  **return** $y_1$ * $y_2$;
**end**

***m=ρ*V***

➔ $C_x$ = cilindru
➔ $R_1$* = **e-făcut-din • are-dens**
➔ $y_1$ = Cilindru1 **e-făcut-din • are-dens** = 2.4
➔ $R_2$*: Cilindru $R_2$* **volum** ➔ $R_2$* = **are-vol**
➔ $y_2$: Cilindru1 **are-vol** $y_2$ ➔ nil ➔ ... 282.6

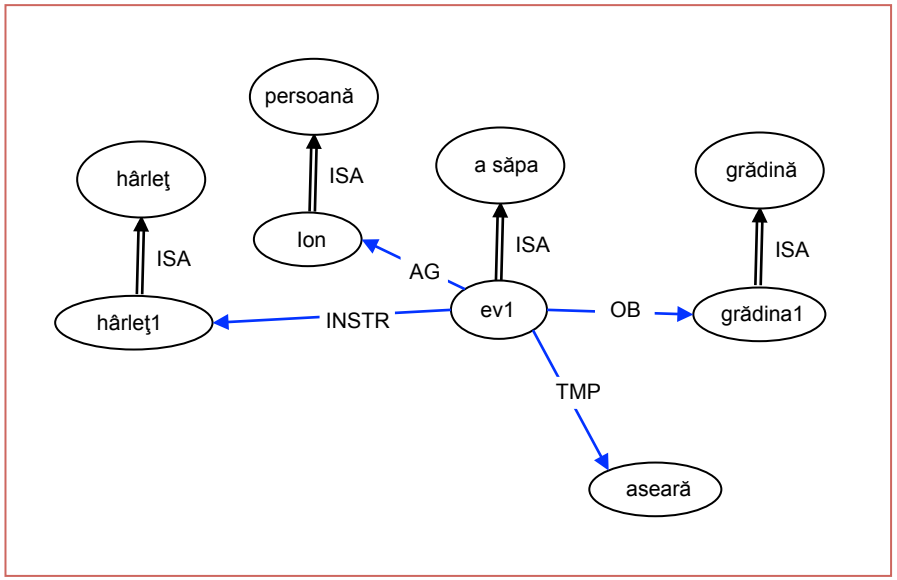
return 2.4 * 282.6 = 678.24

# Reţele semantice evenimenţiale

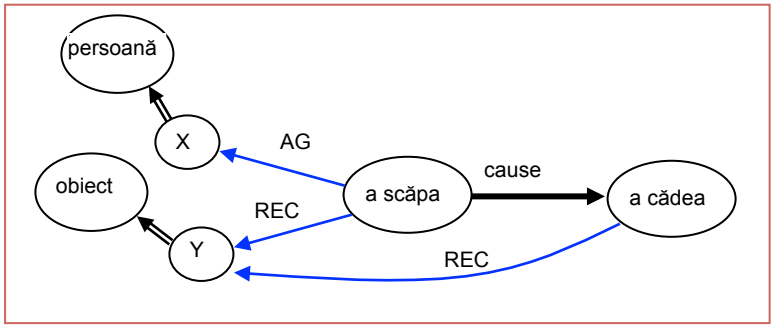
- adecvate reprezentării cunoaşterii dinamice
- se descriu:
  - entităţi şi tipuri
  - evenimente în care sunt angrenate entităţile
  - reguli de bun-simţ
  - secvenţe de evenimente
- pot fi folosite la:
  - explicarea semnificaţiei unor enunţuri
  - generarea de situaţii specifice pentru verificarea unor condiţii
  - simularea comportamentului unor societăţi de agenţi

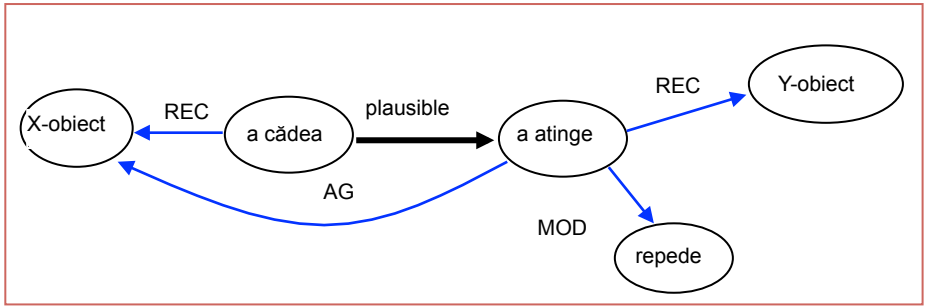
# Reprezentări evenimenţiale

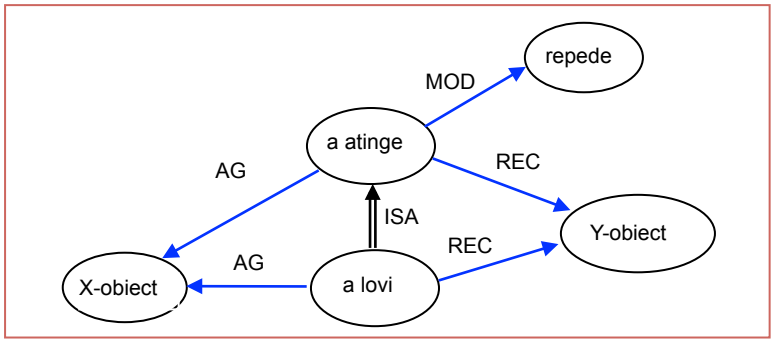
*Ion a săpat aseară gradina cu hârleţul.*

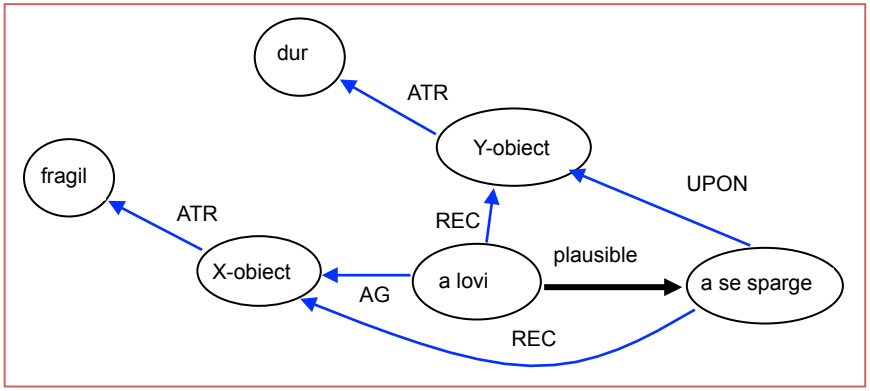


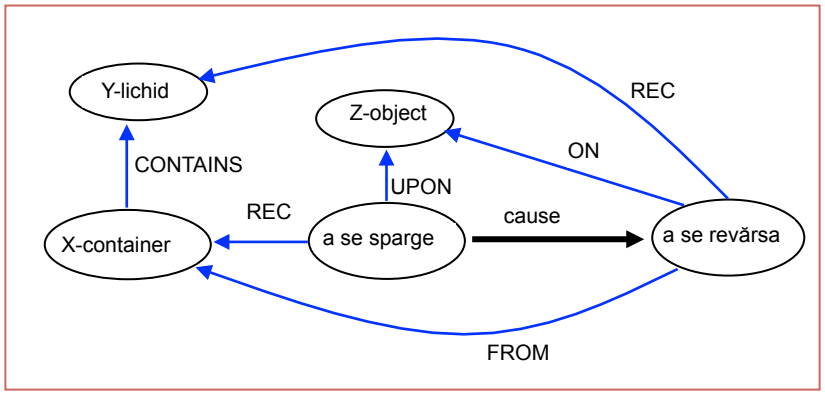
# Reguli de modelare a lumii reale

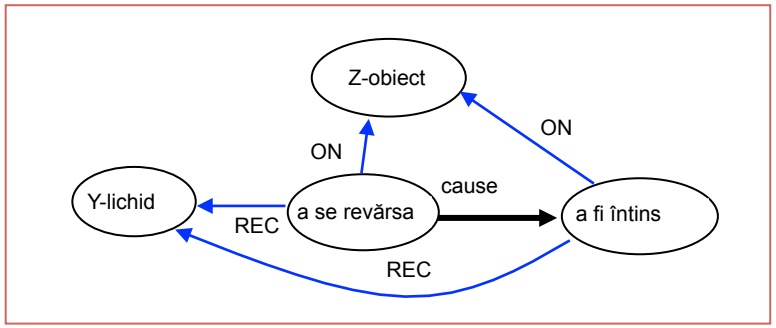


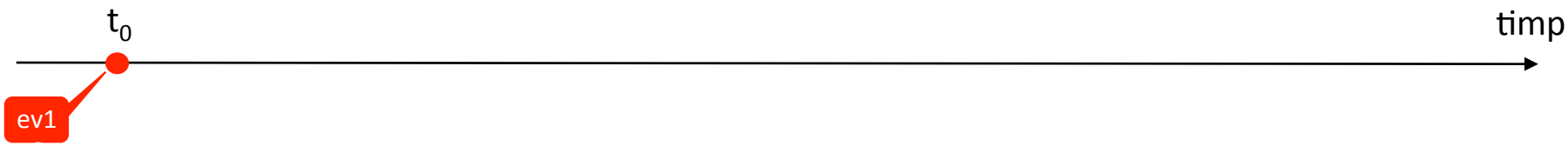



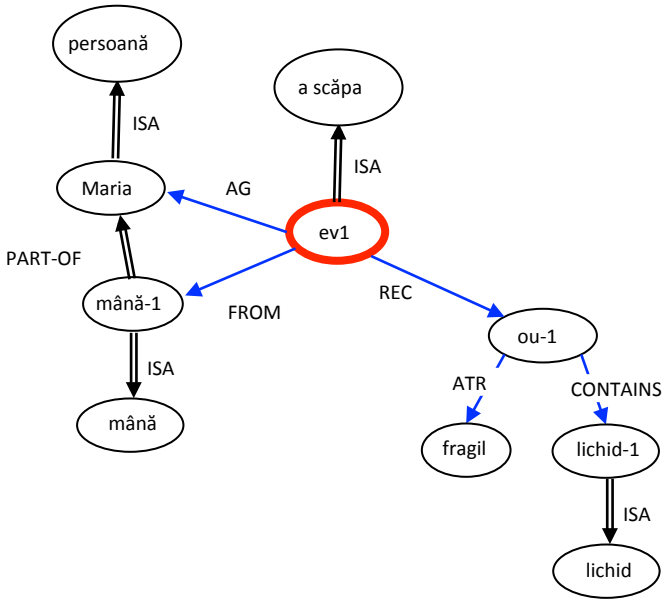
# Care sunt procesele care se dezvoltă în mintea noastră când citim un text?

*Maria a scăpat oul din mână.*

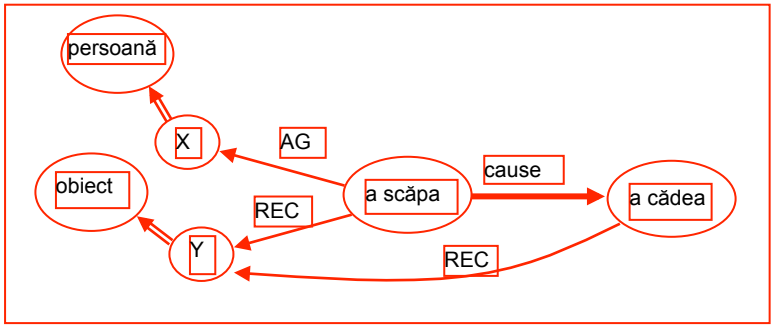
*Ea a curăţat apoi pardoseala.*

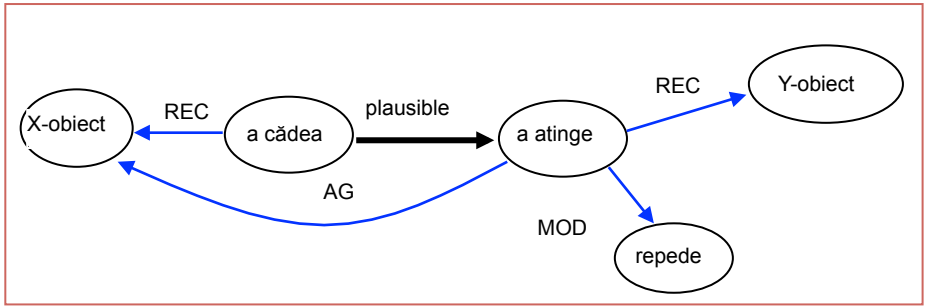


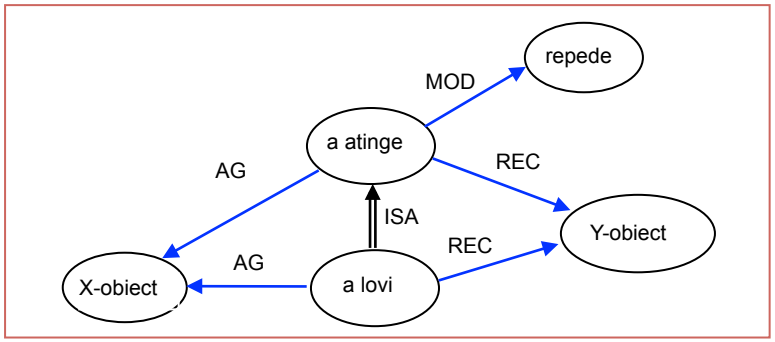

1. *Maria a scăpat oul din mână.*

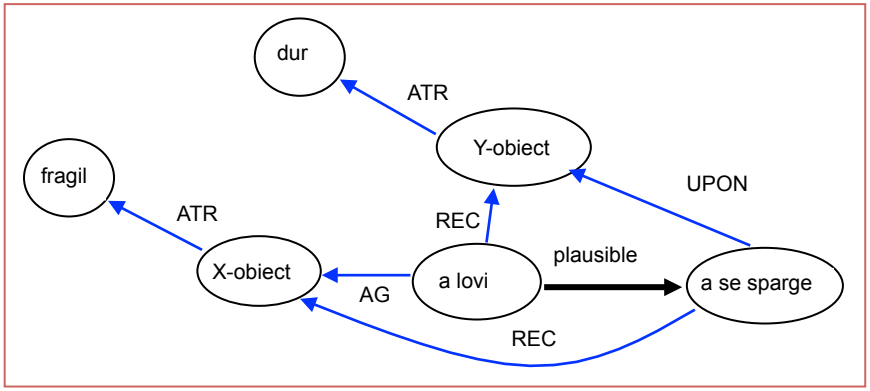


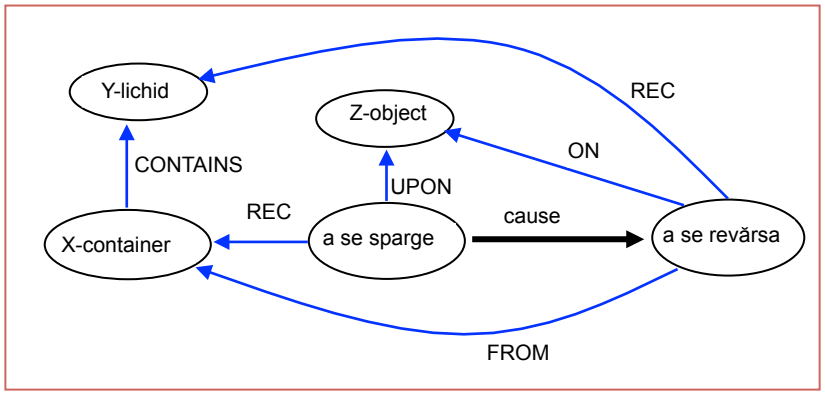
# Reguli de modelare a lumii reale

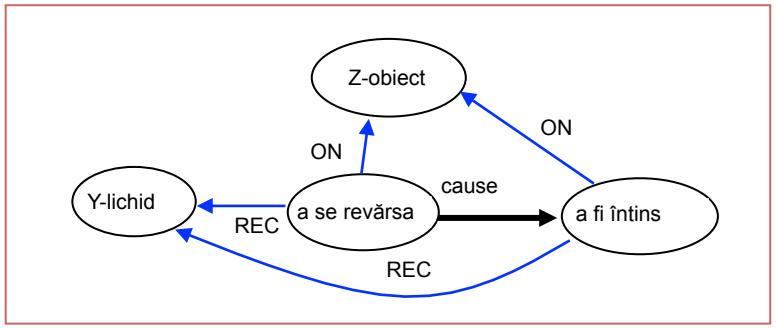


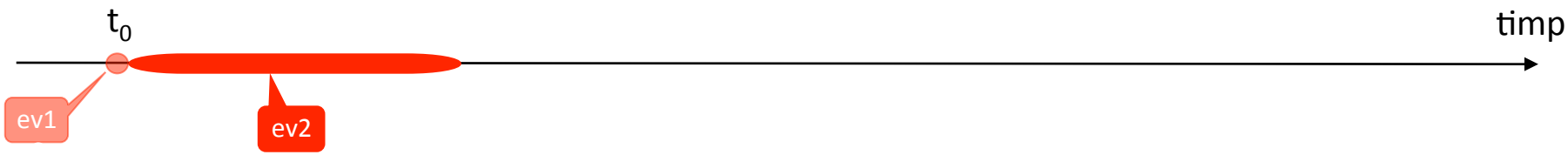



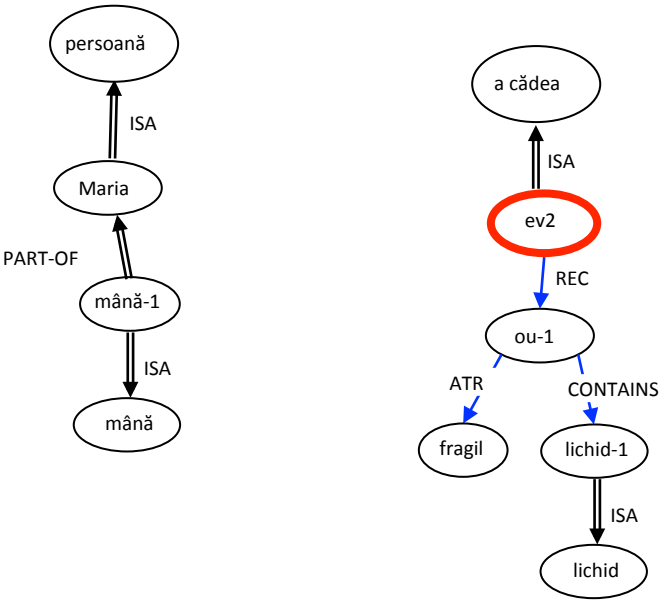



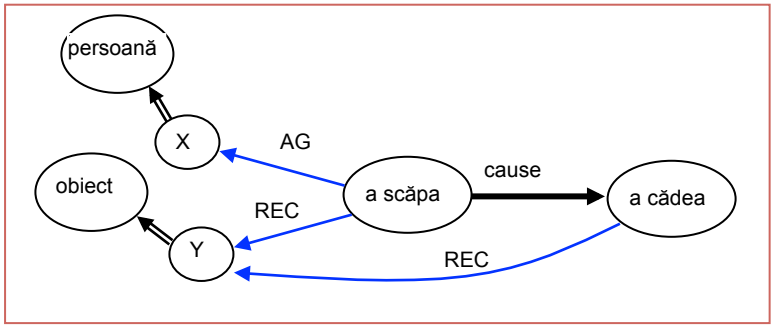



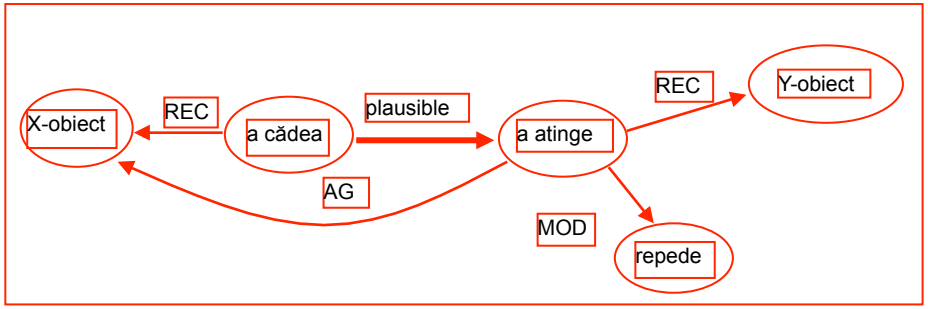


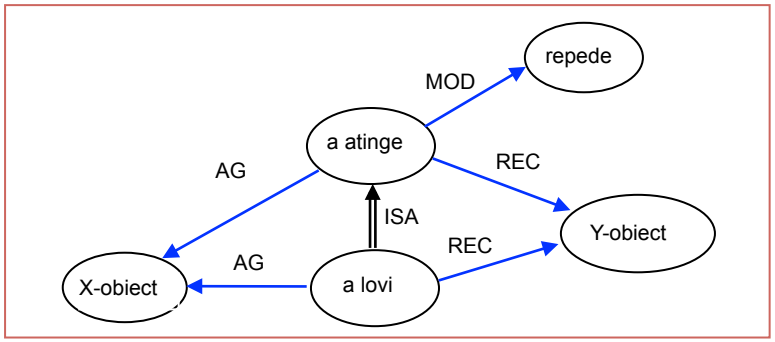

1. *Maria a scăpat oul din mână.*

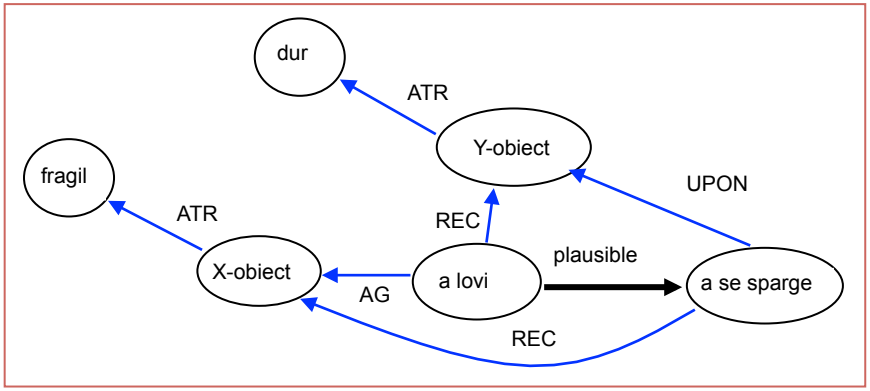


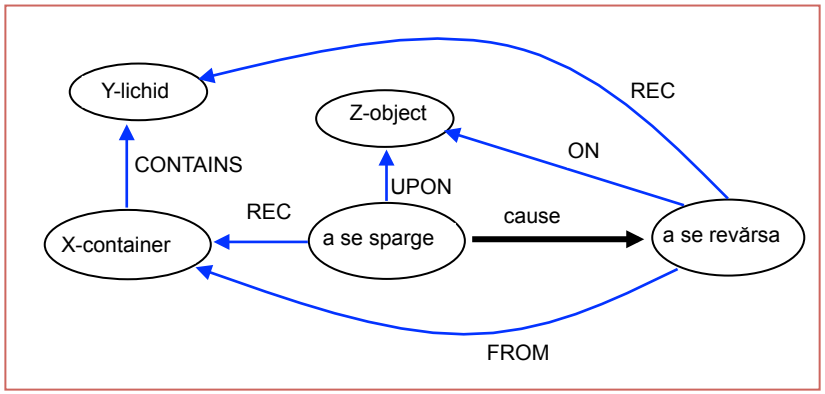
# Reguli de modelare a lumii reale

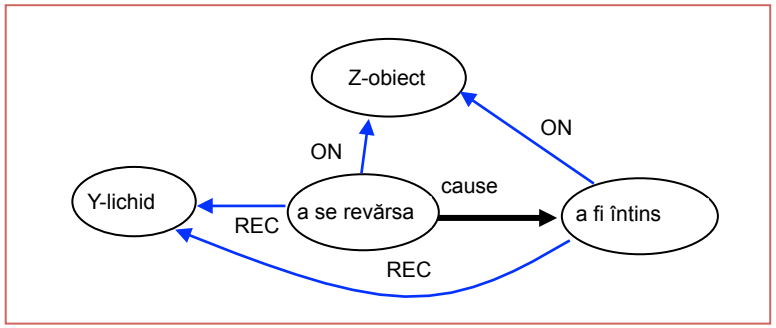


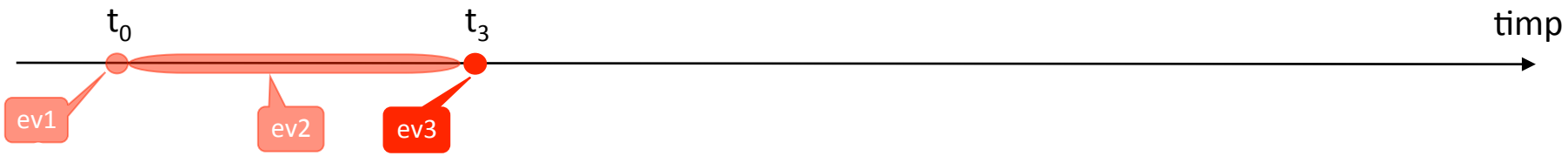



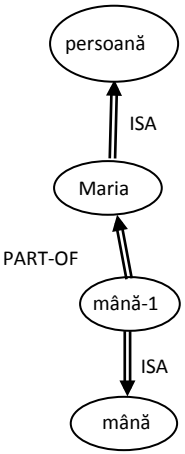



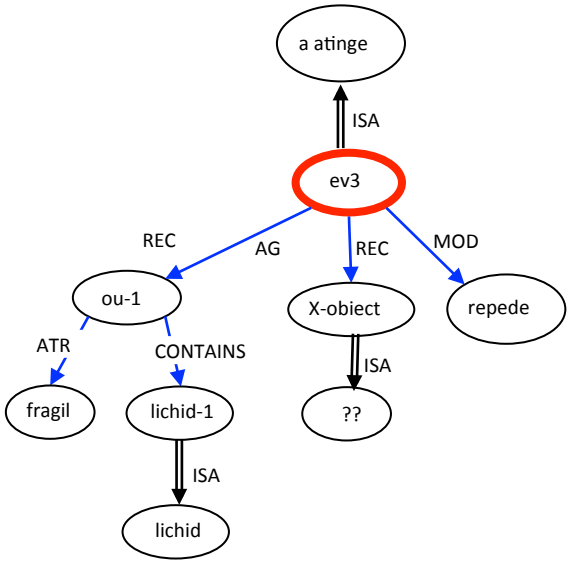



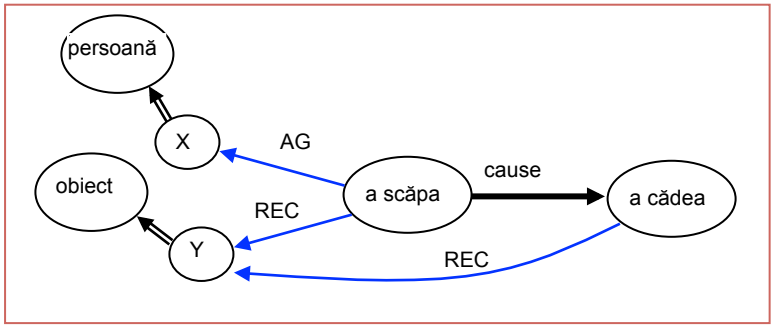


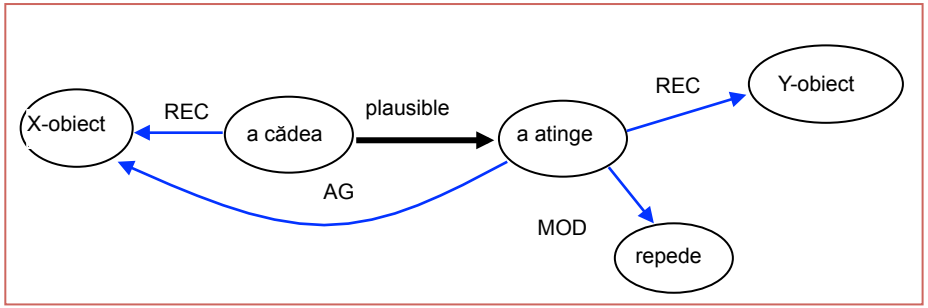

1. *Maria a scăpat oul din mână.*

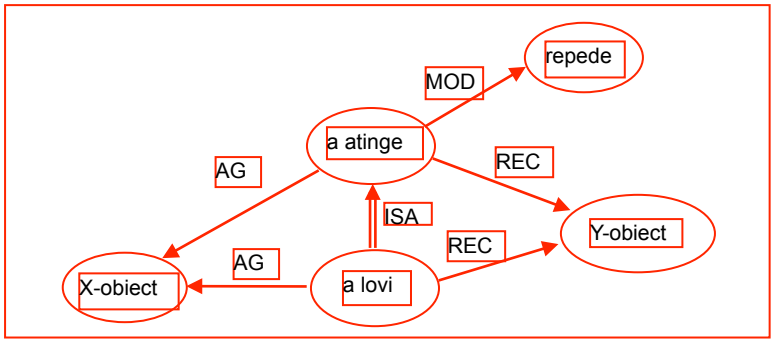


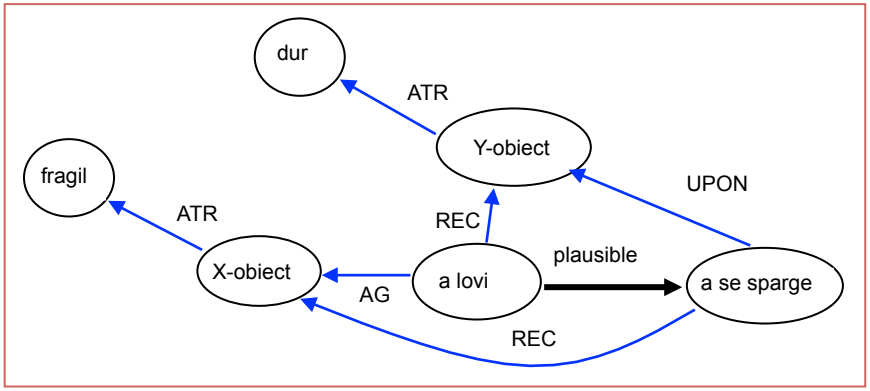



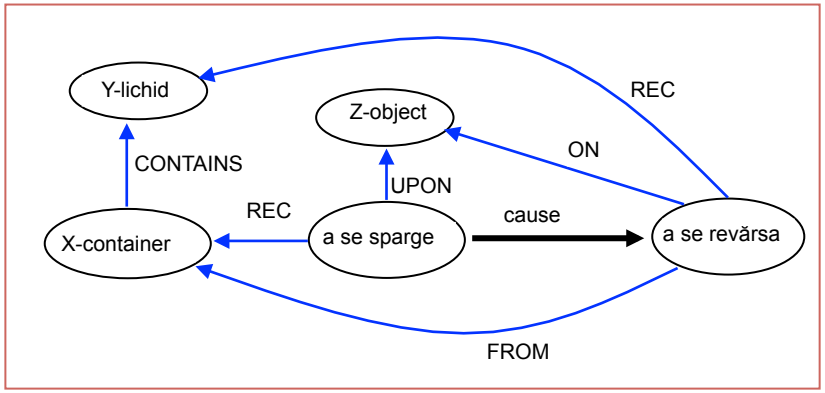
# Reguli de modelare a lumii reale

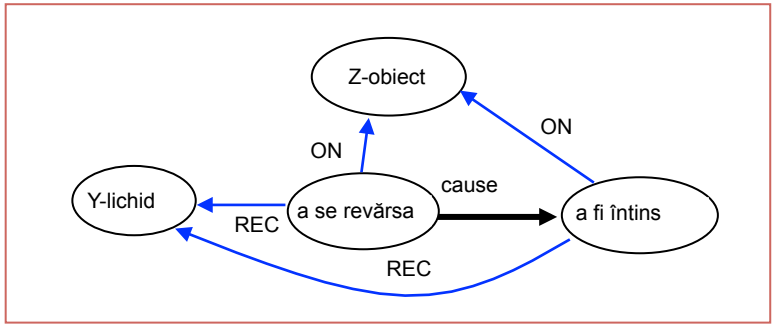


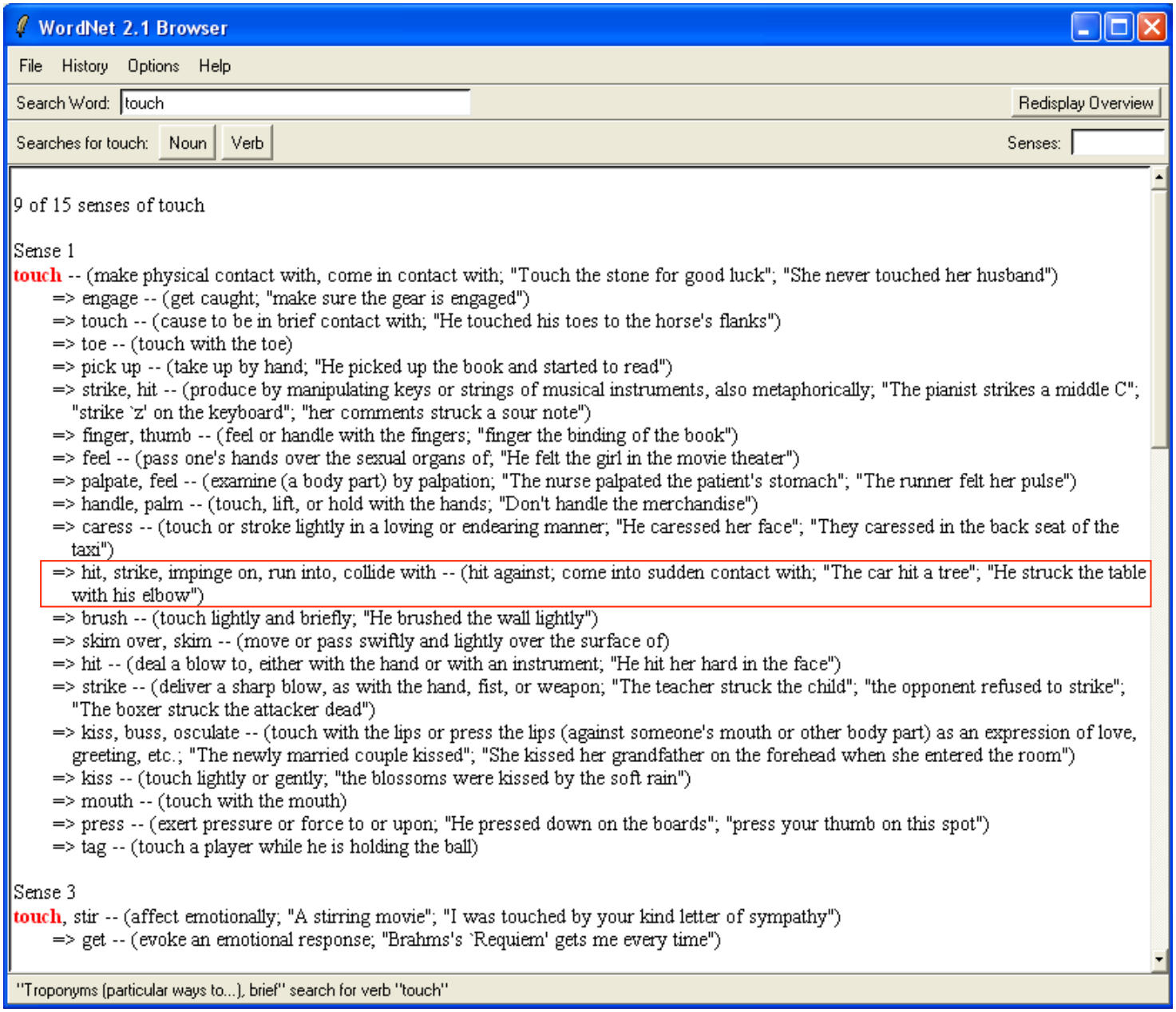



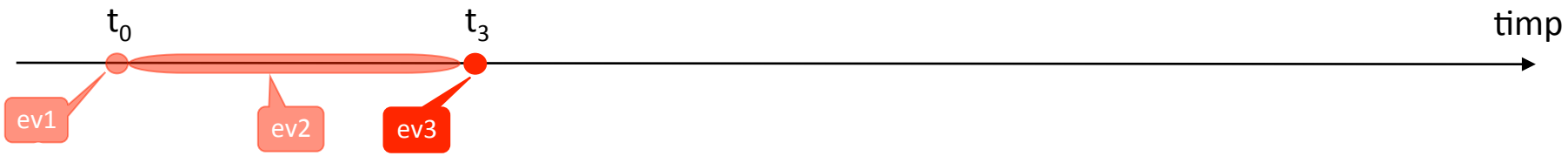



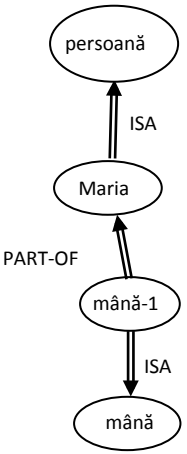



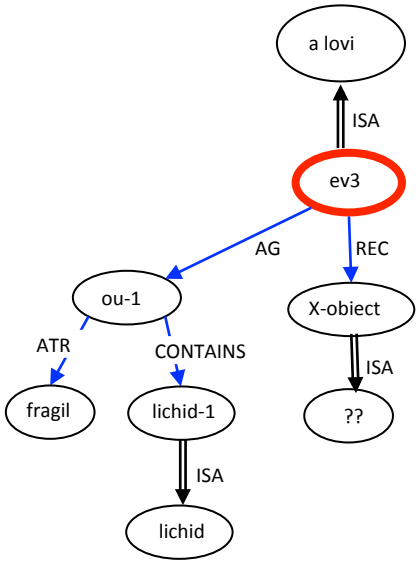
# Wordnet ca sursă de cunoaştere



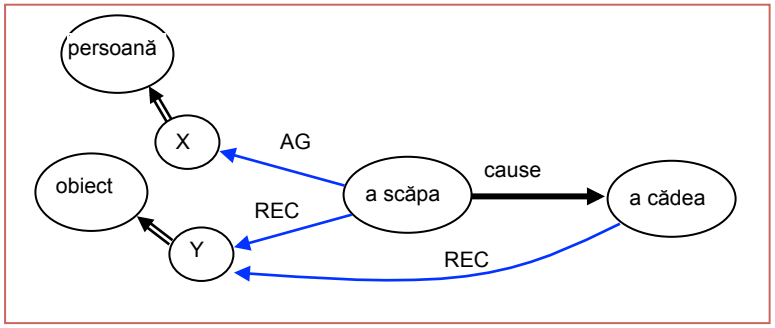


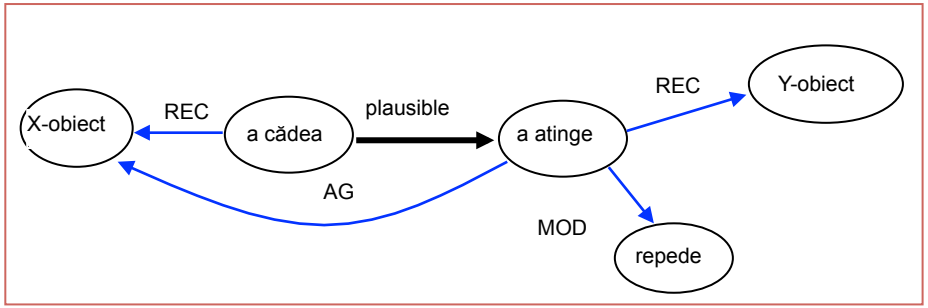

1. *Maria a scăpat oul din mână.*

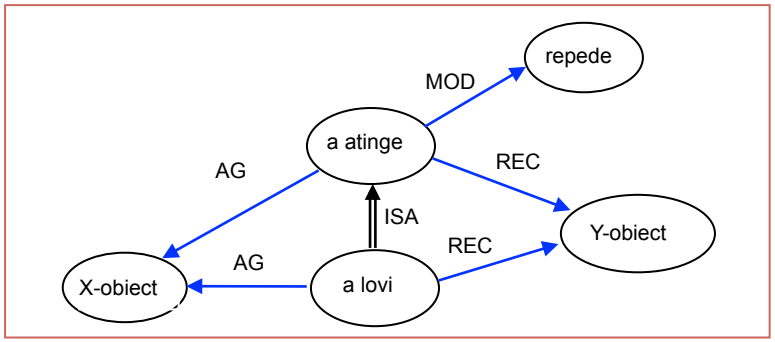


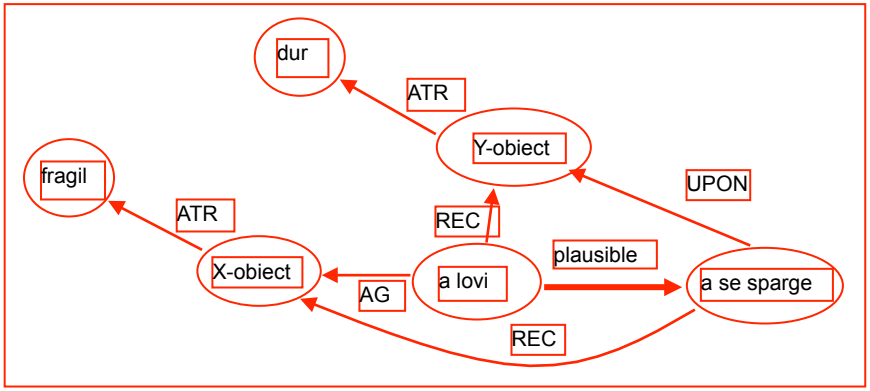



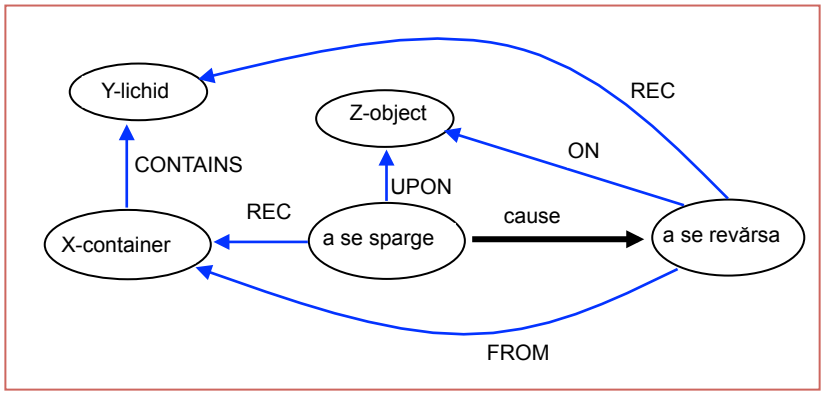
# Reguli de modelare a lumii reale

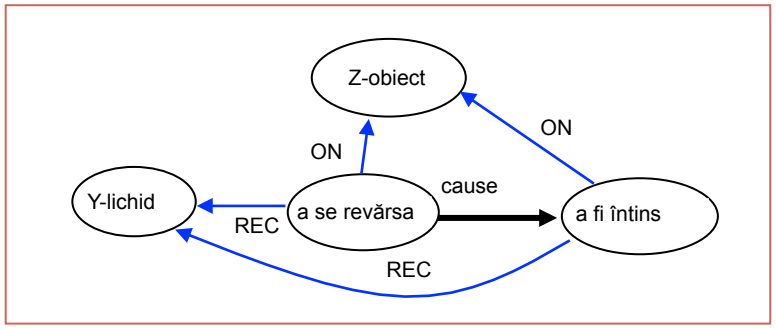


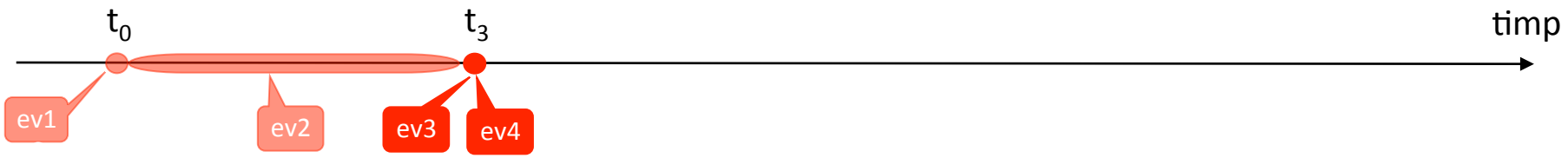



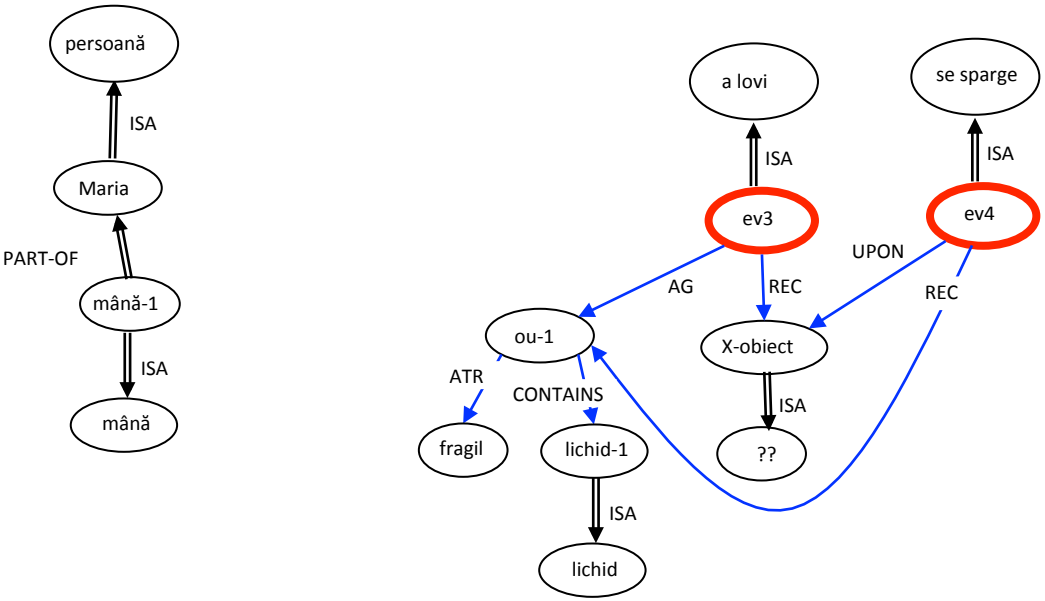



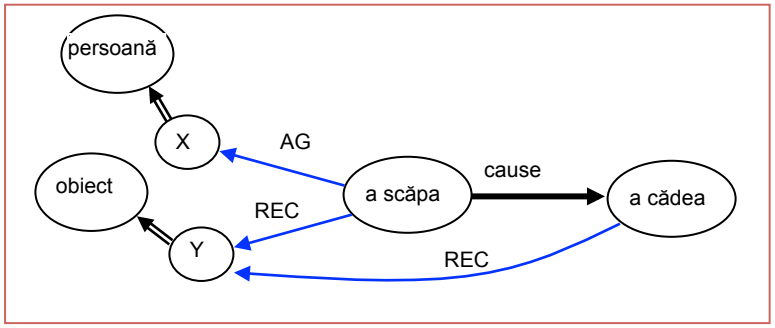



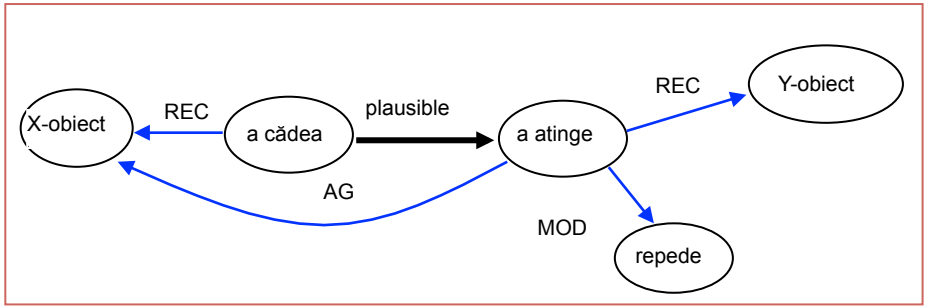


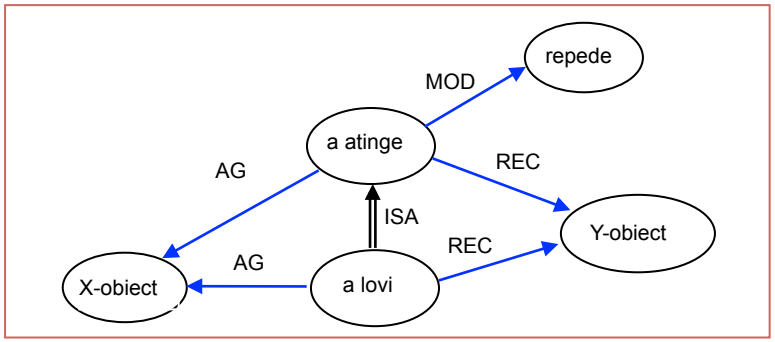

1. *Maria a scăpat oul din mână.*

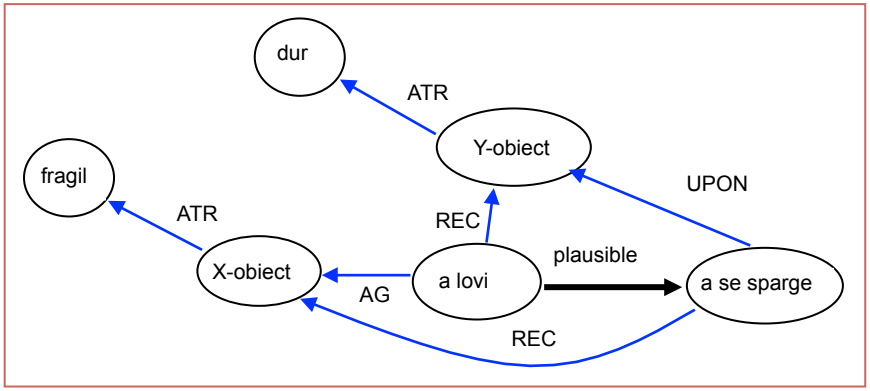


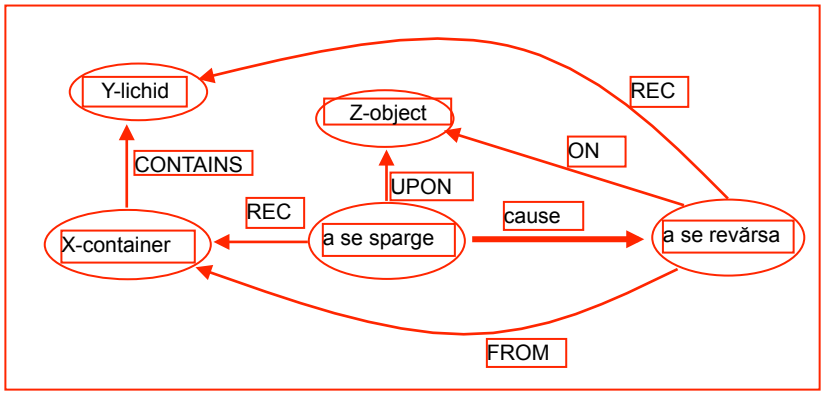
# Reguli de modelare a lumii reale

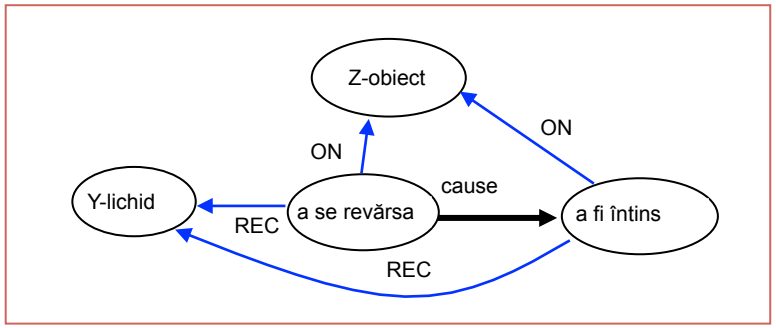


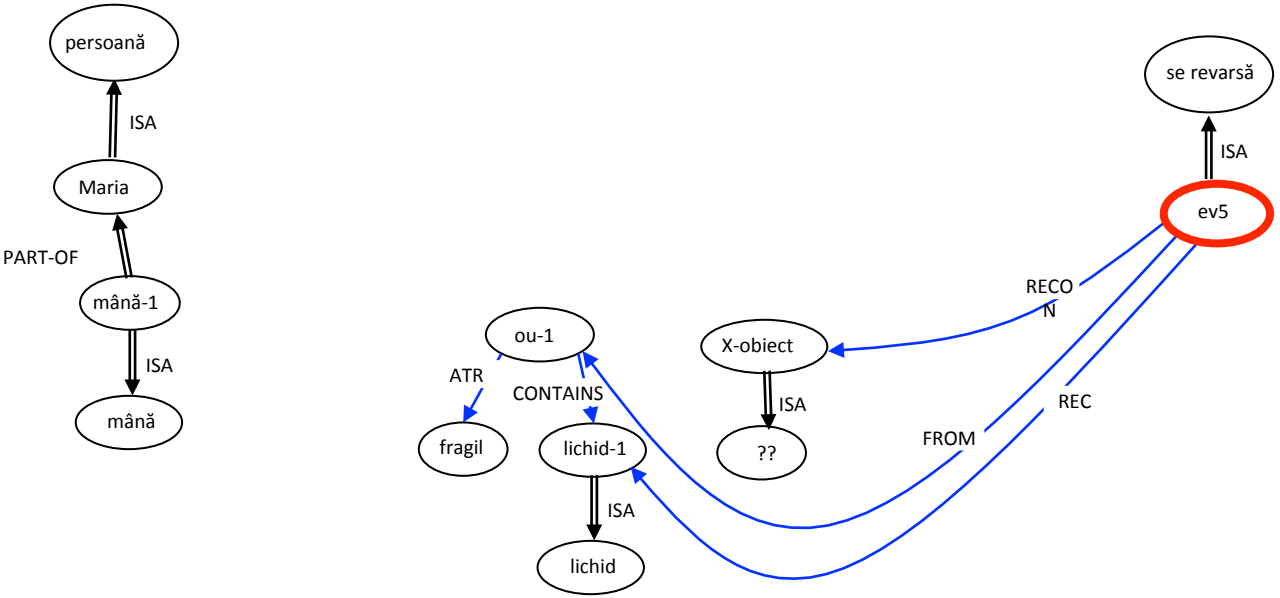



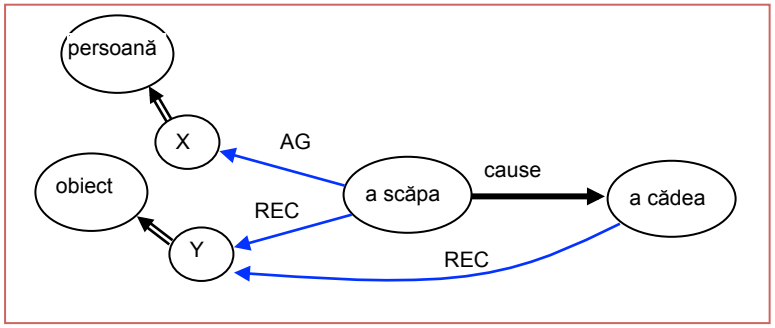



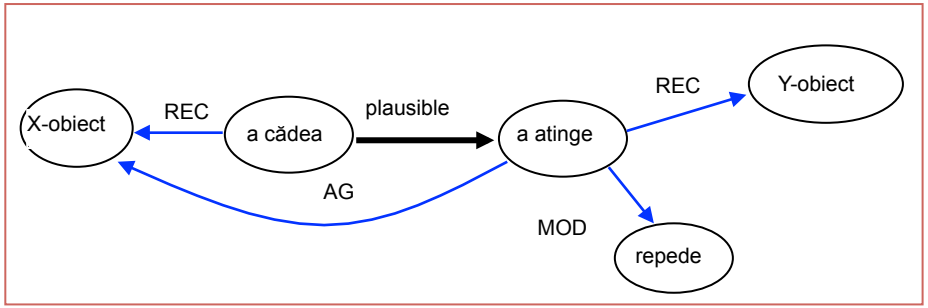



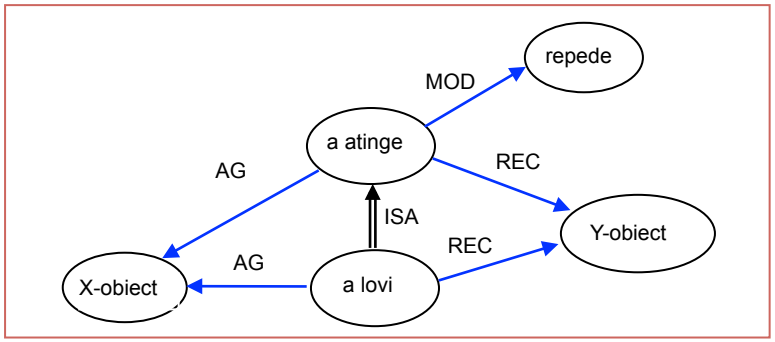

1. *Maria a scăpat oul din mână.*

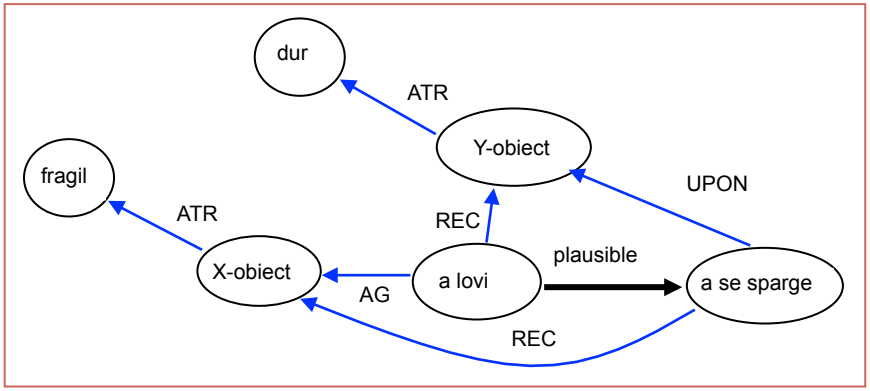


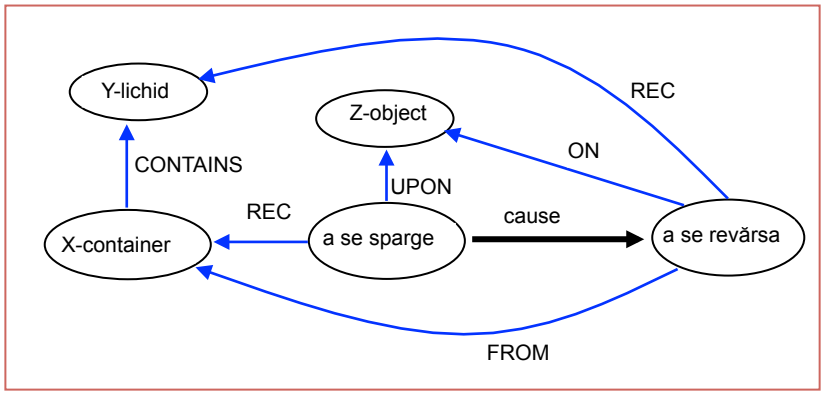
# Reguli de modelare a lumii reale

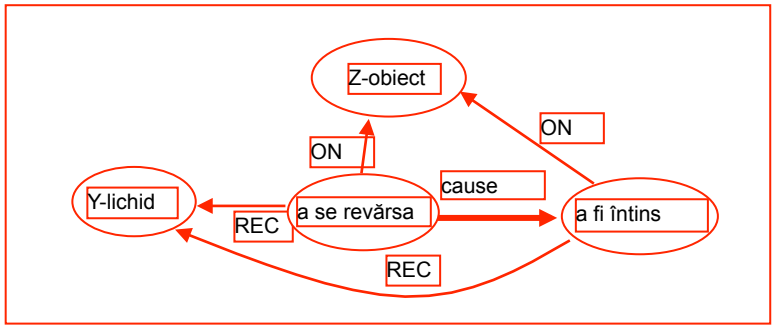


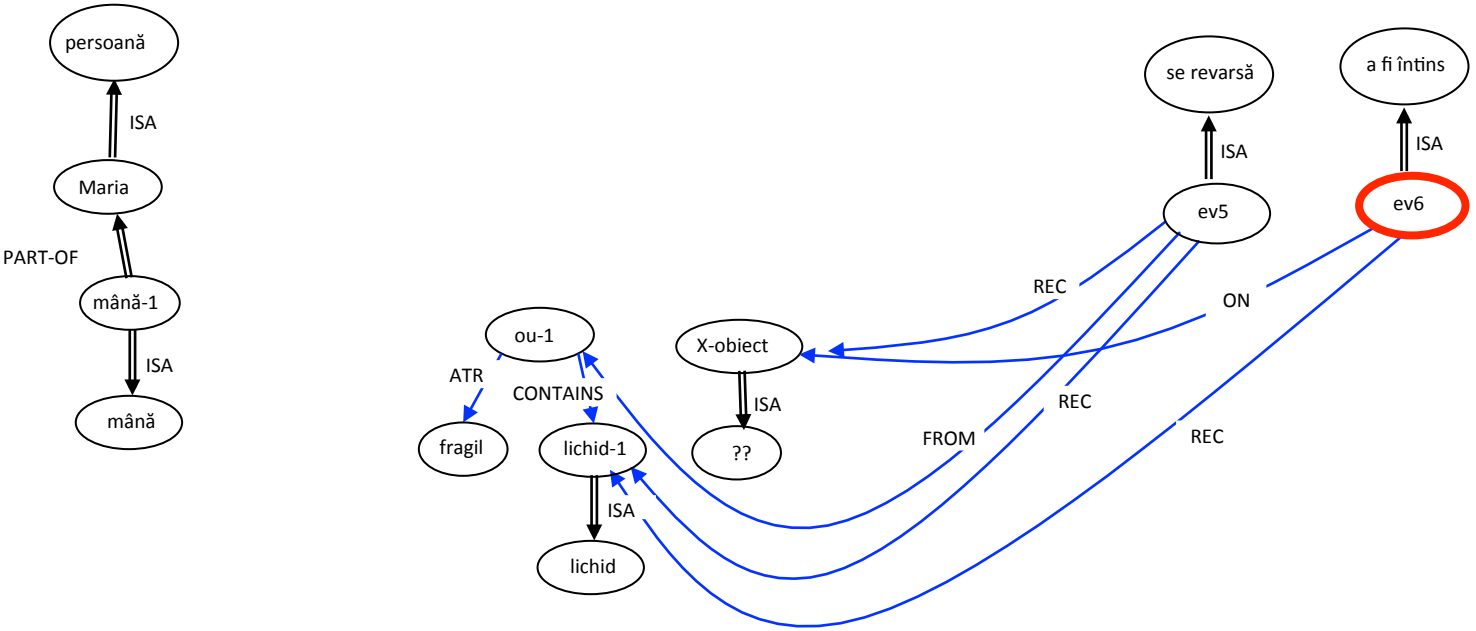



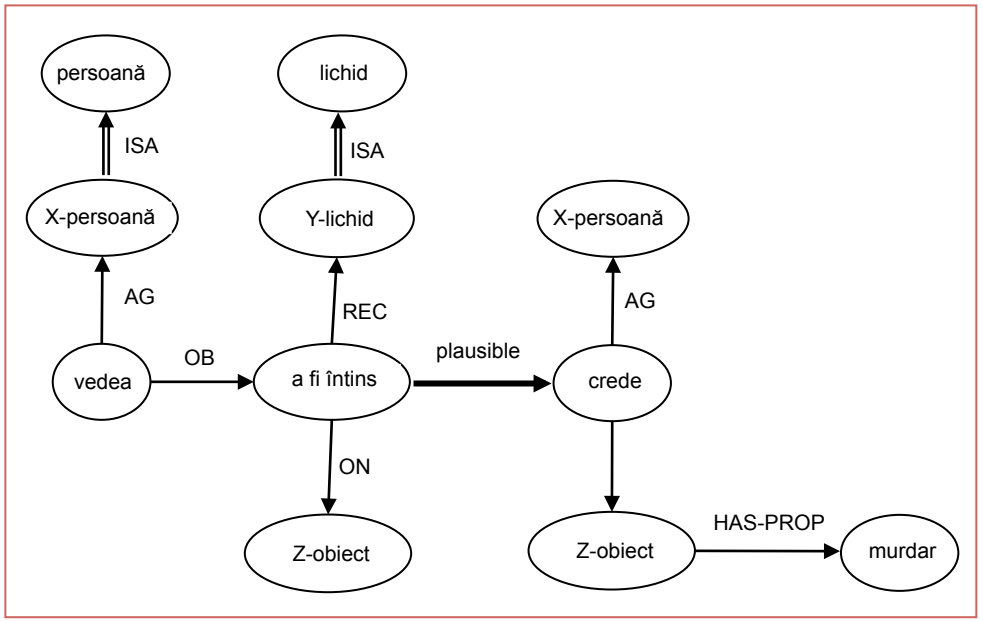



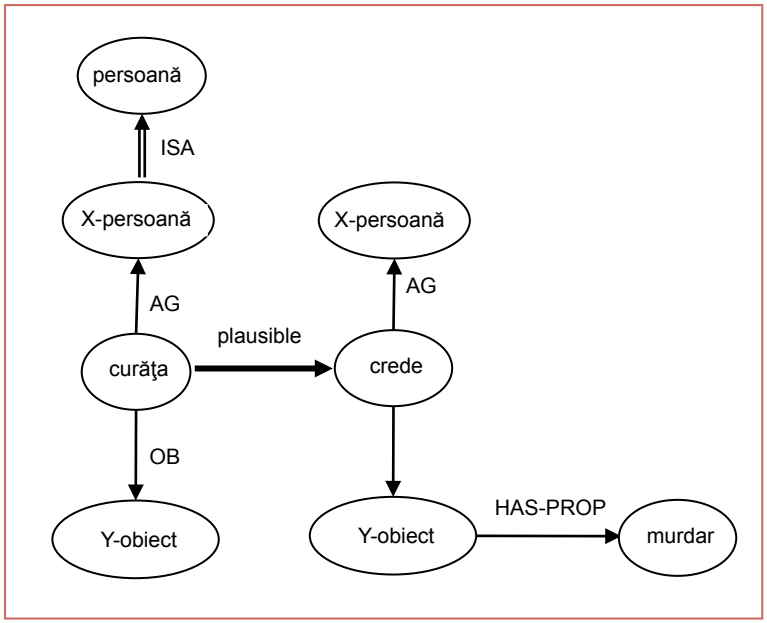




1. *Maria a scăpat oul din mână.*

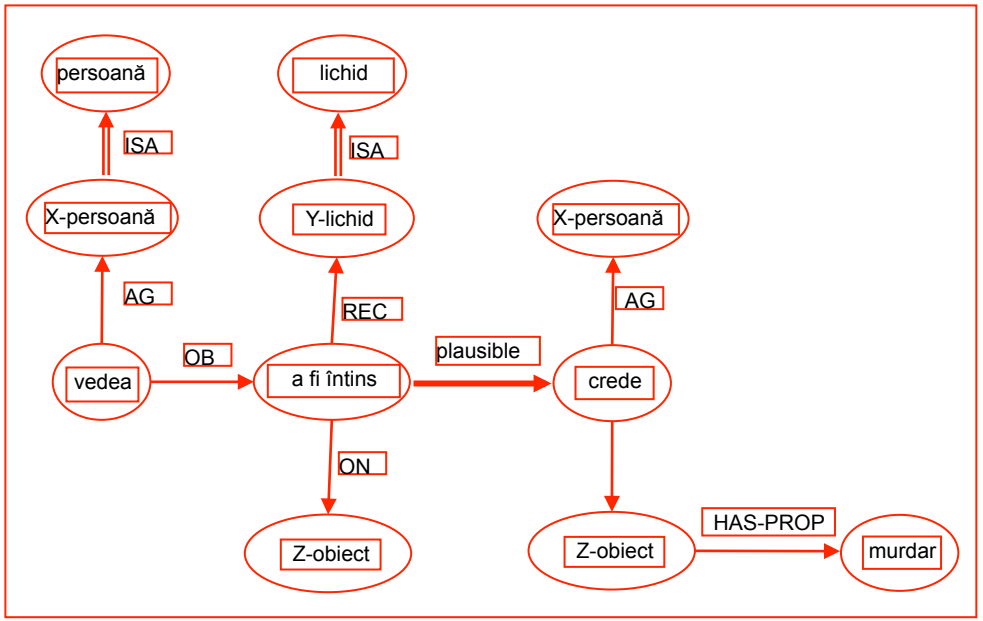


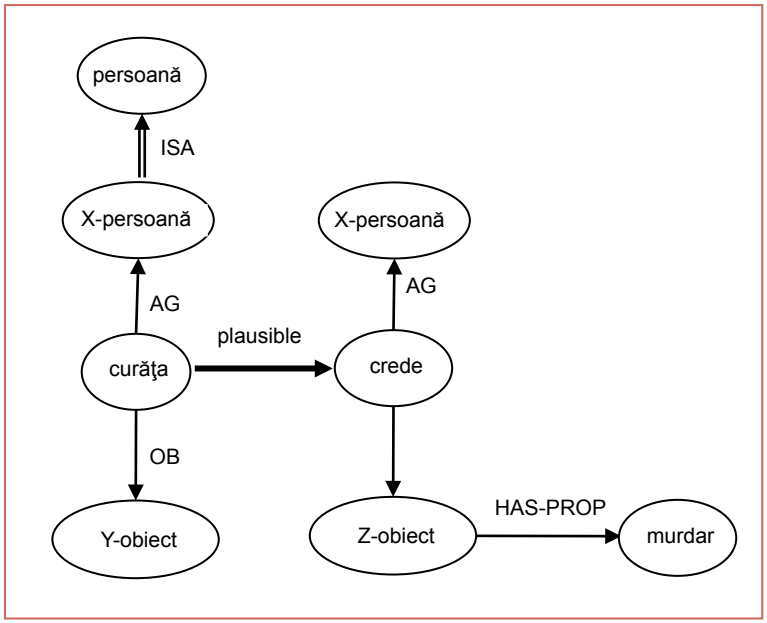
# Reguli de modelare a proceselor cognitive



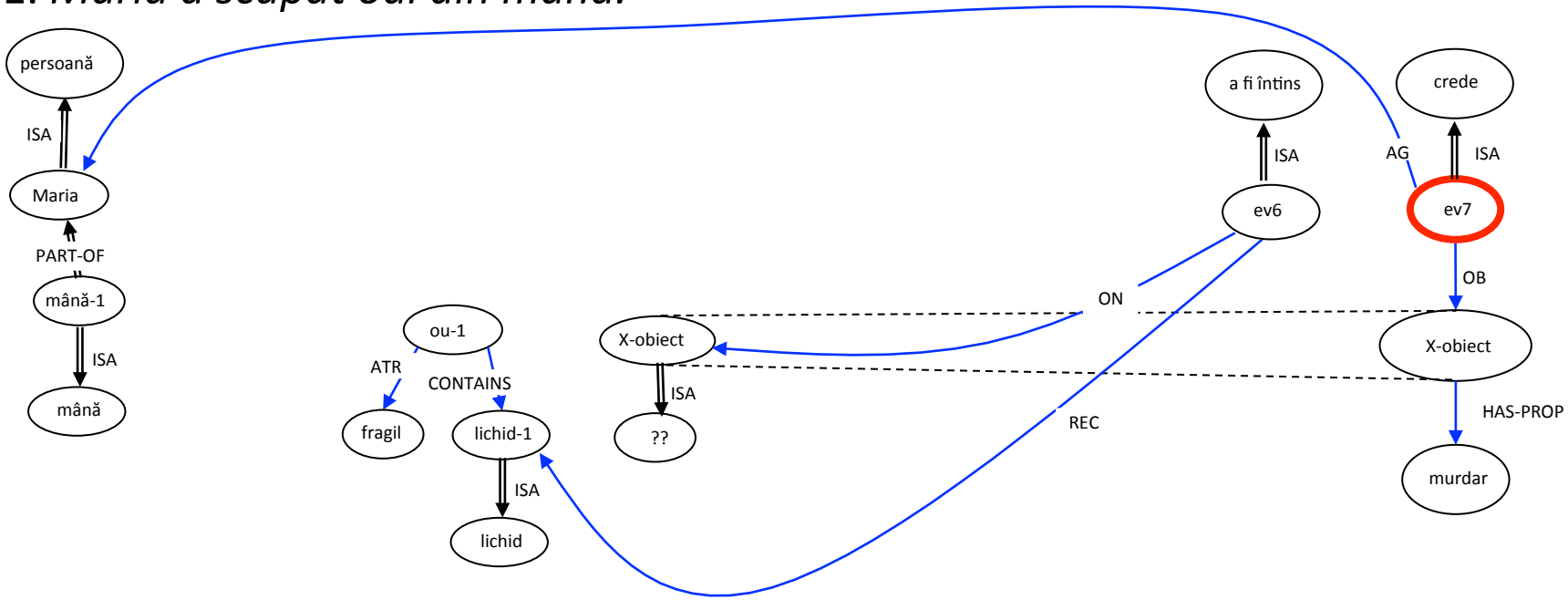



# Reguli de modelare a proceselor cognitive

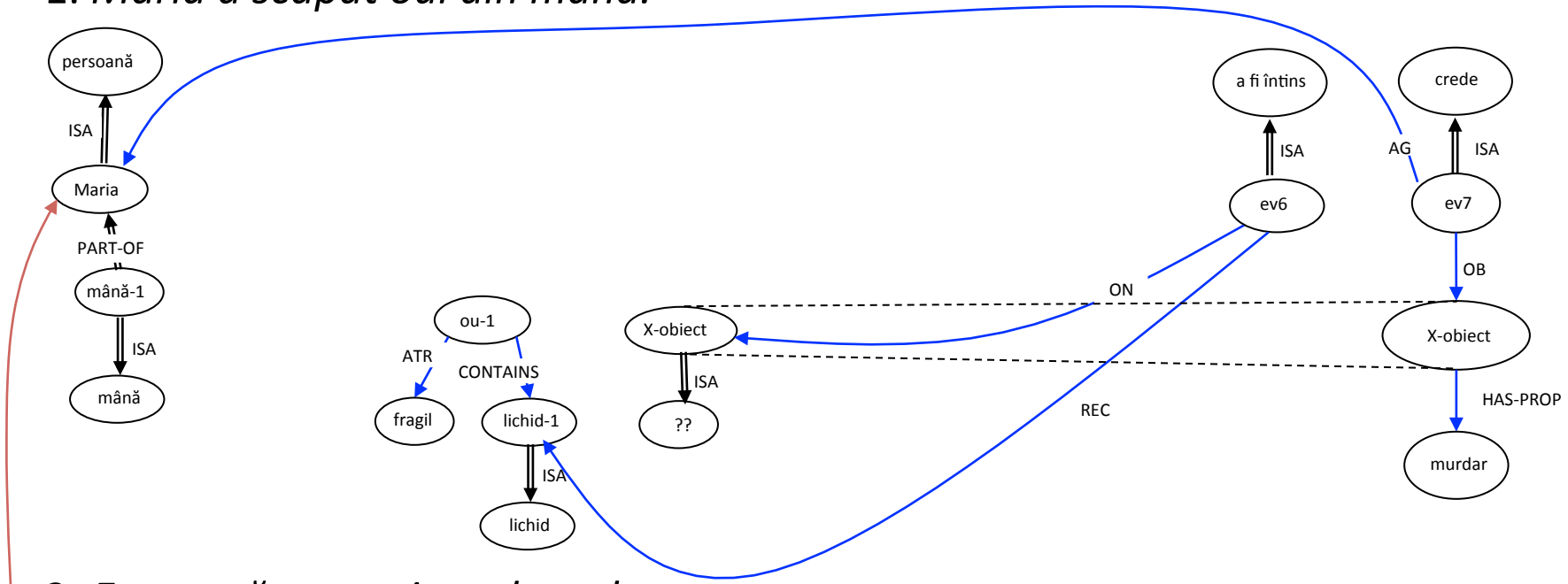


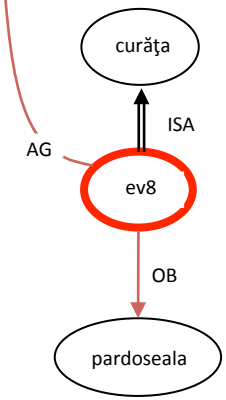

1. *Maria a scăpat oul din mână.*



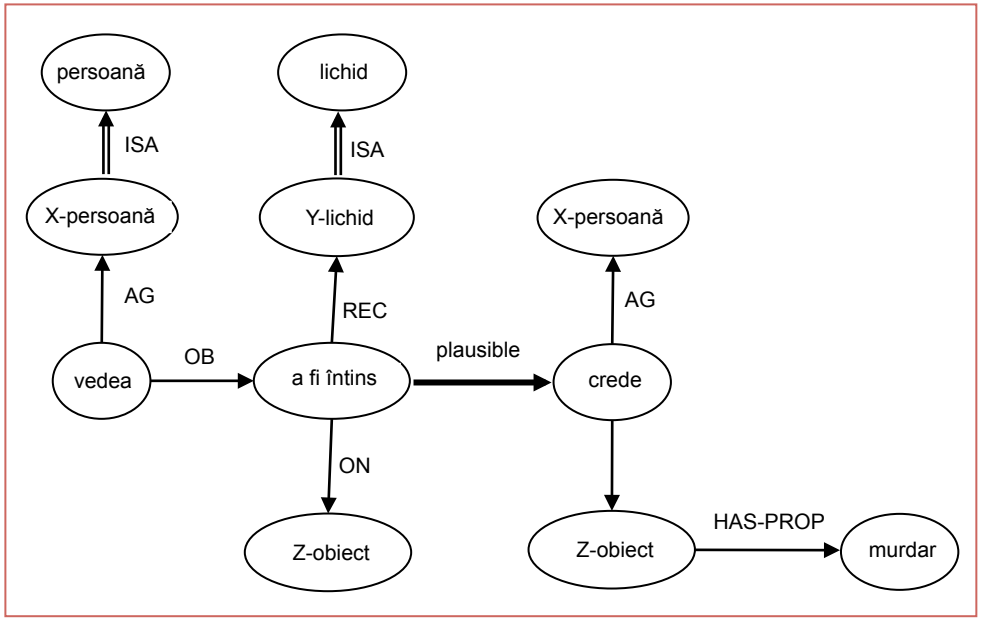

1. *Maria a scăpat oul din mână.*

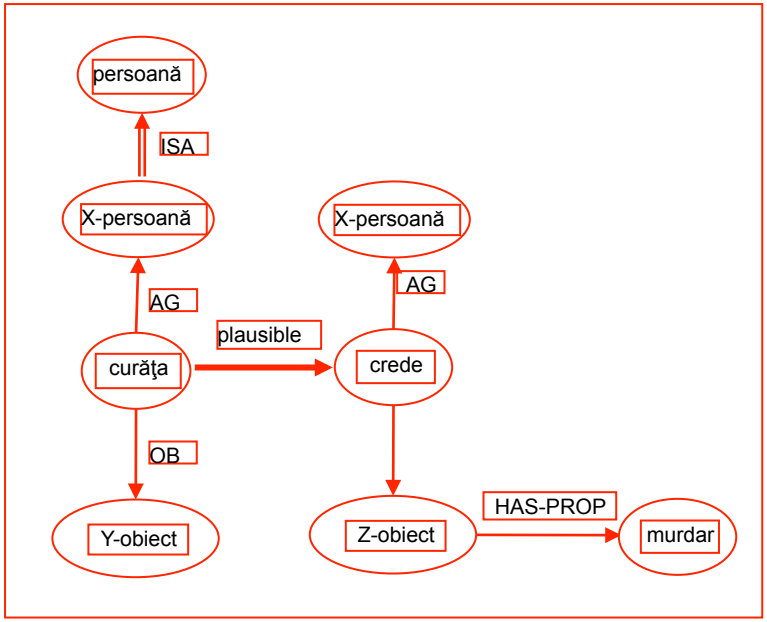


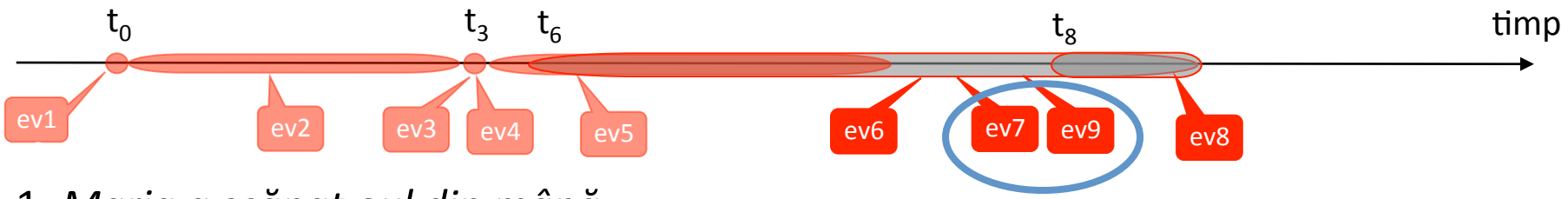

2. *Ea a curăţat apoi pardoseala.*



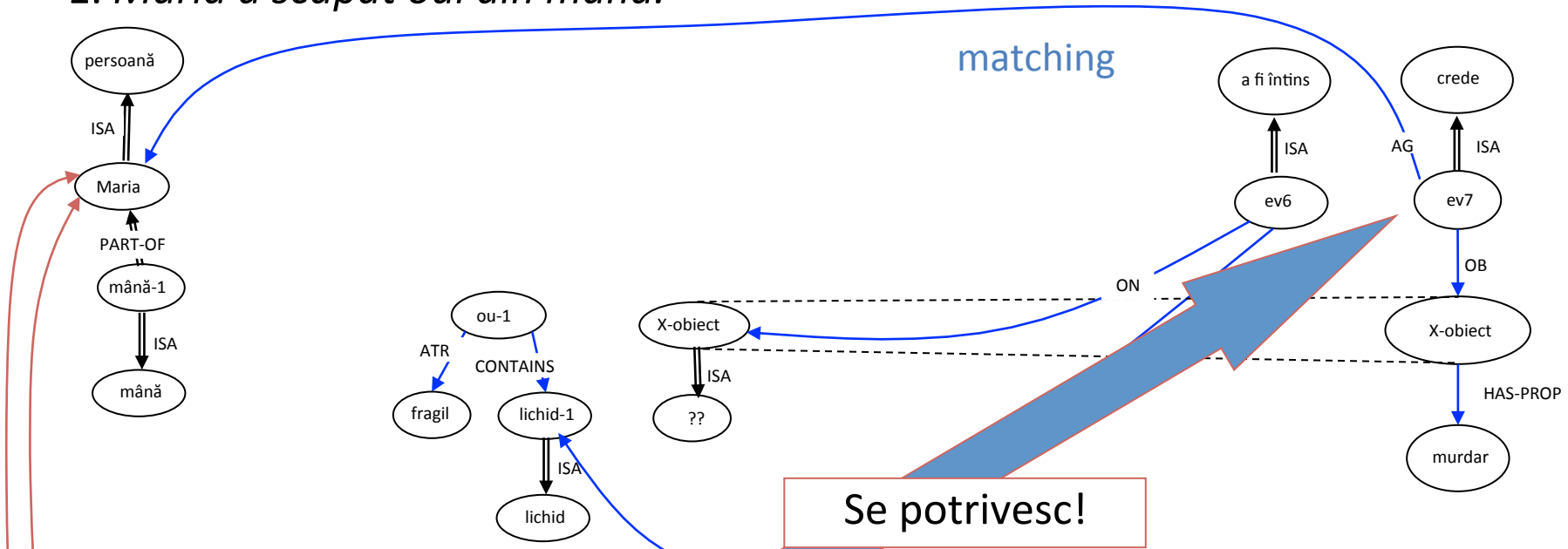
# Reguli de modelare a proceselor cognitive



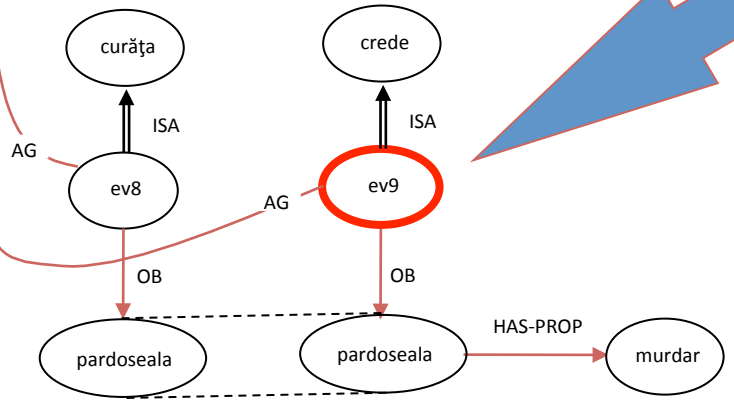






1. *Maria a scăpat oul din mână.*

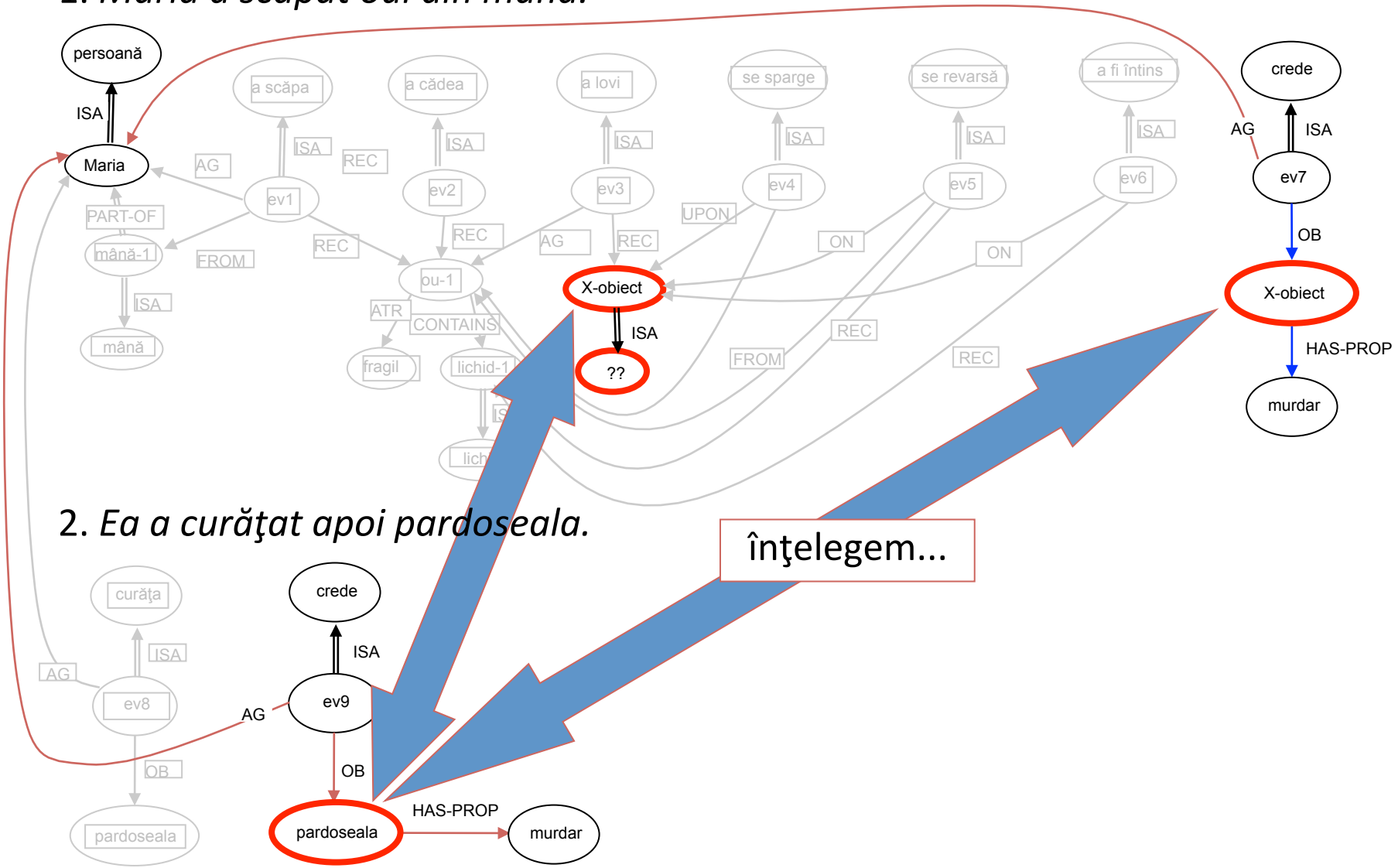


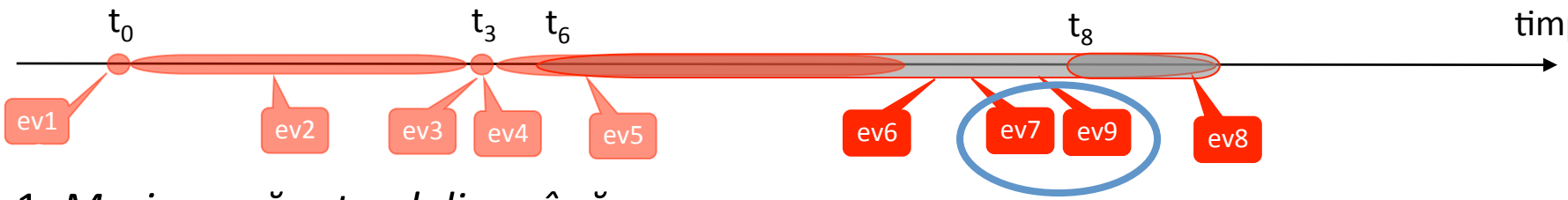

2. *Ea a curăţat apoi pardoseala.*




1. *Maria a scăpat oul din mână.*

2. *Ea a curăţat apoi pardoseala.*






1. *Maria a scăpat oul din mână.*

2. *Ea a curăţat apoi pardoseala.*