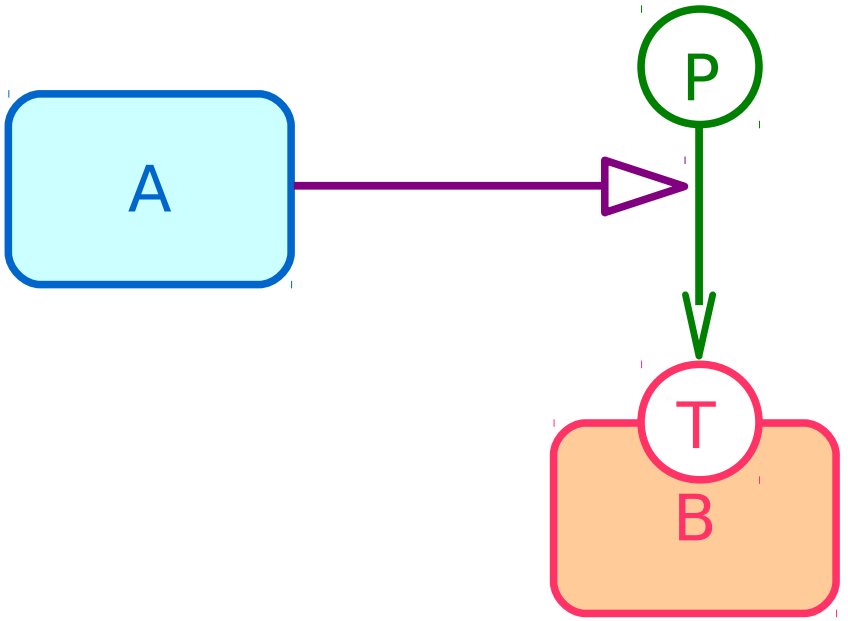
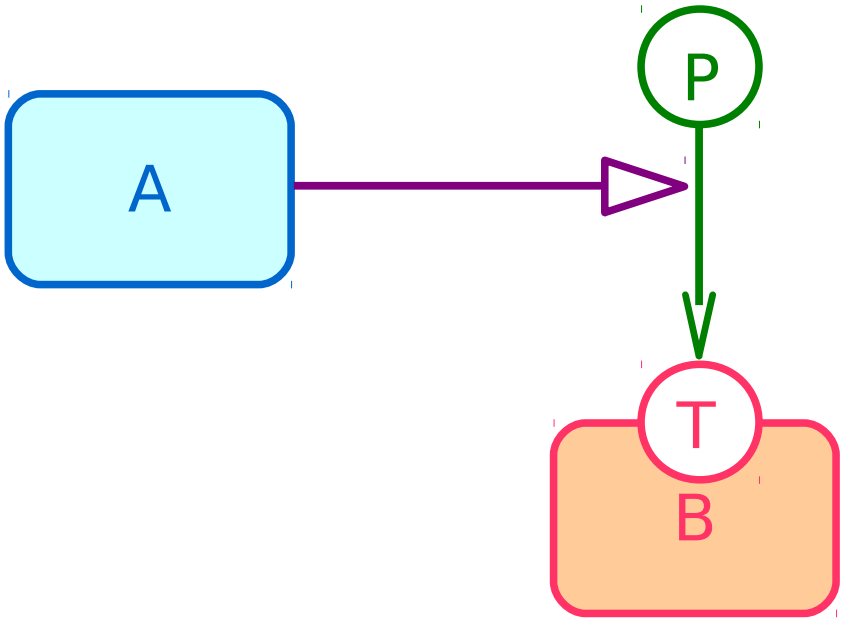
Report on the status of SBGN ER and proposed modifications/extensions

Entity Relationships can be viewed as rules



If A exists, the assignment of the value P to the state variable T of B is increased

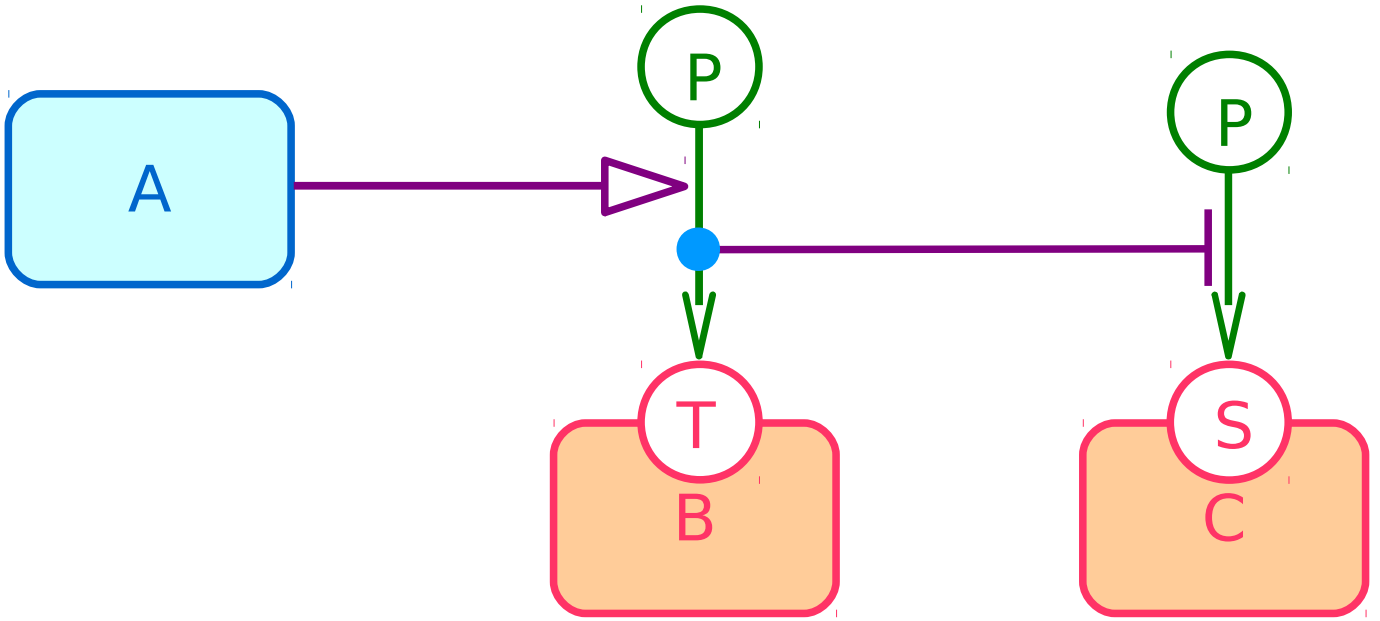
Entity Relationships can be viewed as rules



If A exists, the assignment of the value P to the state variable T of B is increased

(A stimulates the phosphorylation of B on the threonine)

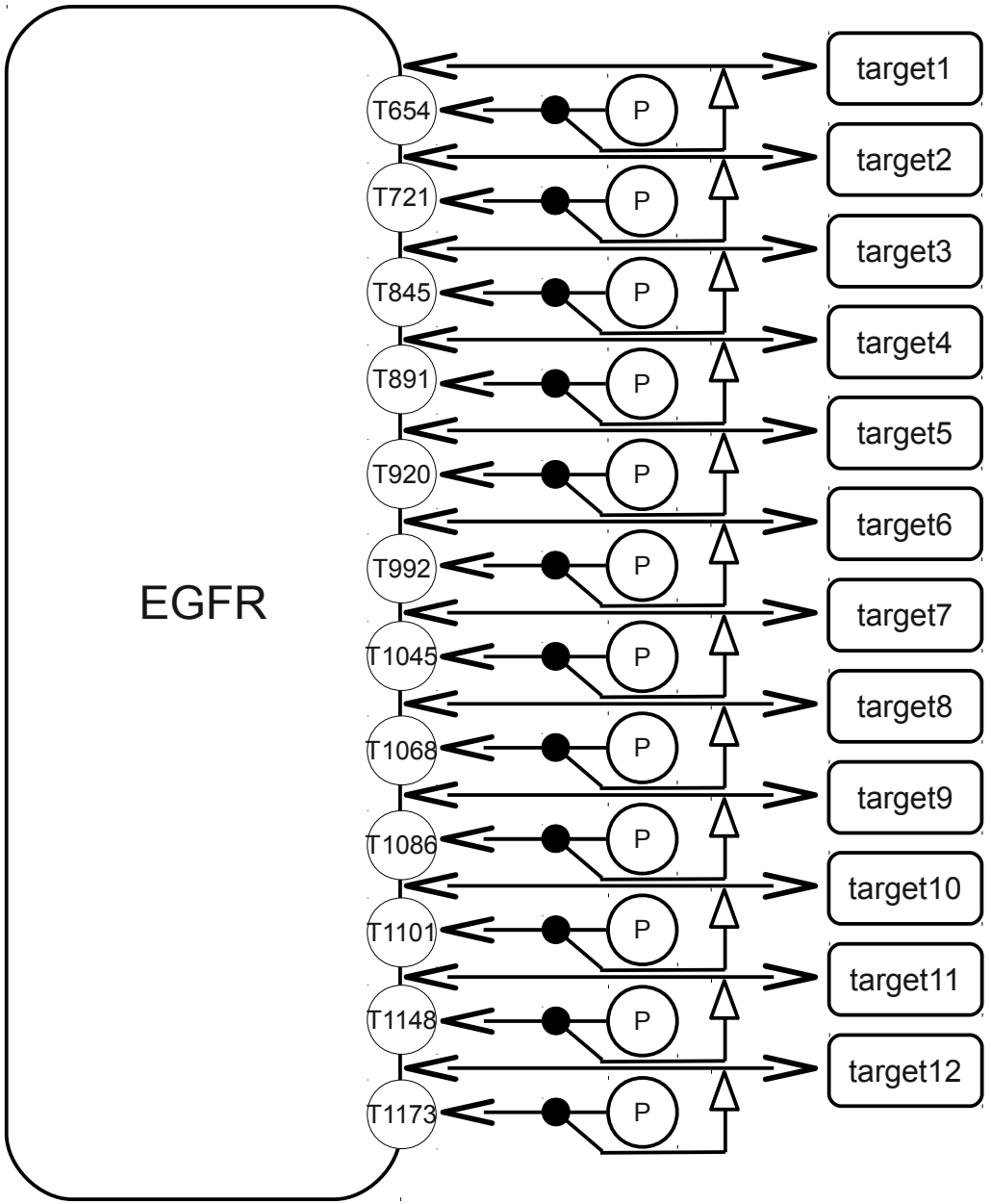
Entity Relationships can be viewed as rules



If A exists, the assignment of the value P to the state variable T of B is increased

If P is assigned to the state variable T of B, the assignment of the value P to the state variable S of C is decreased

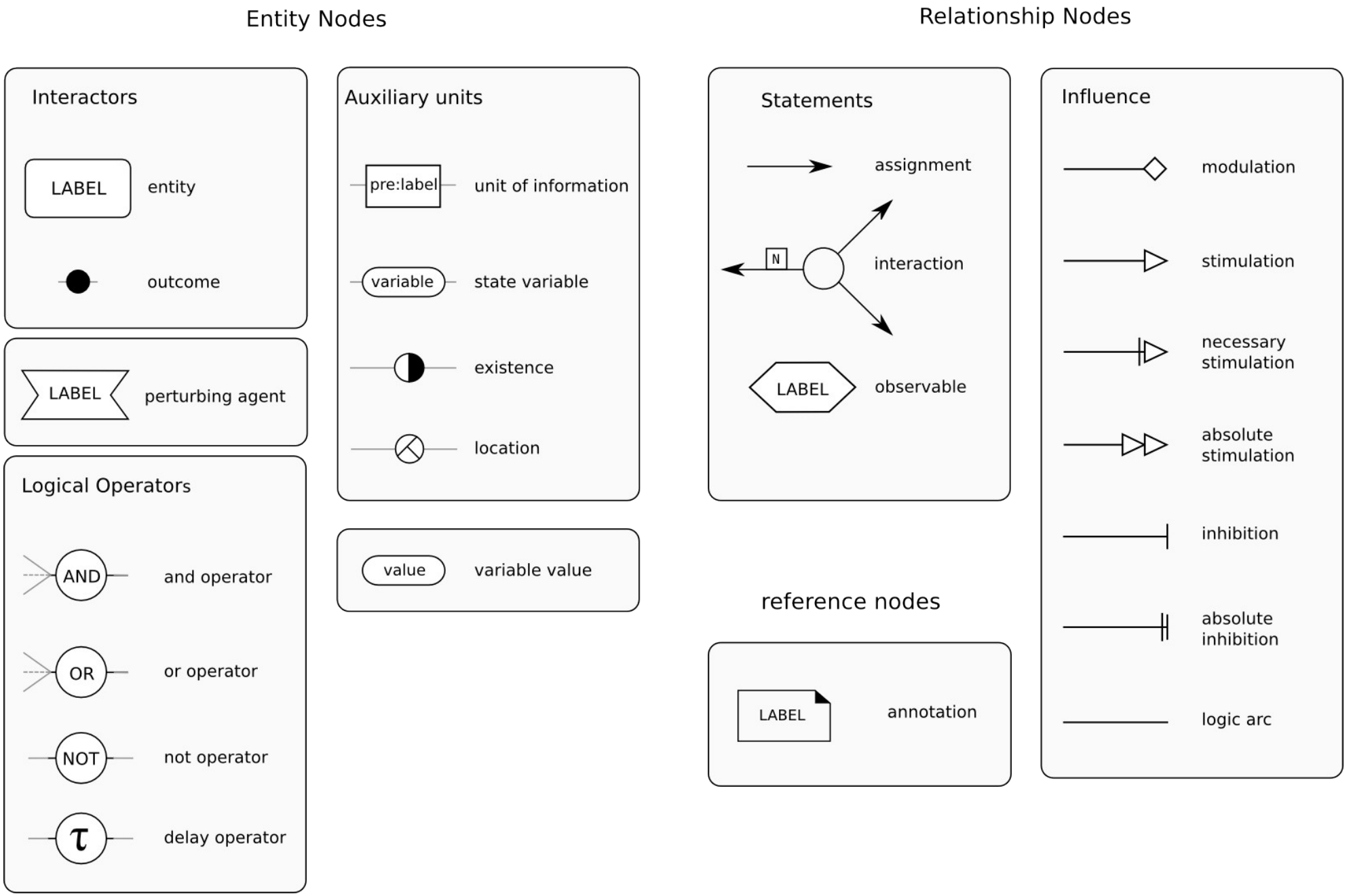
Multi-state and combinatorial explosion



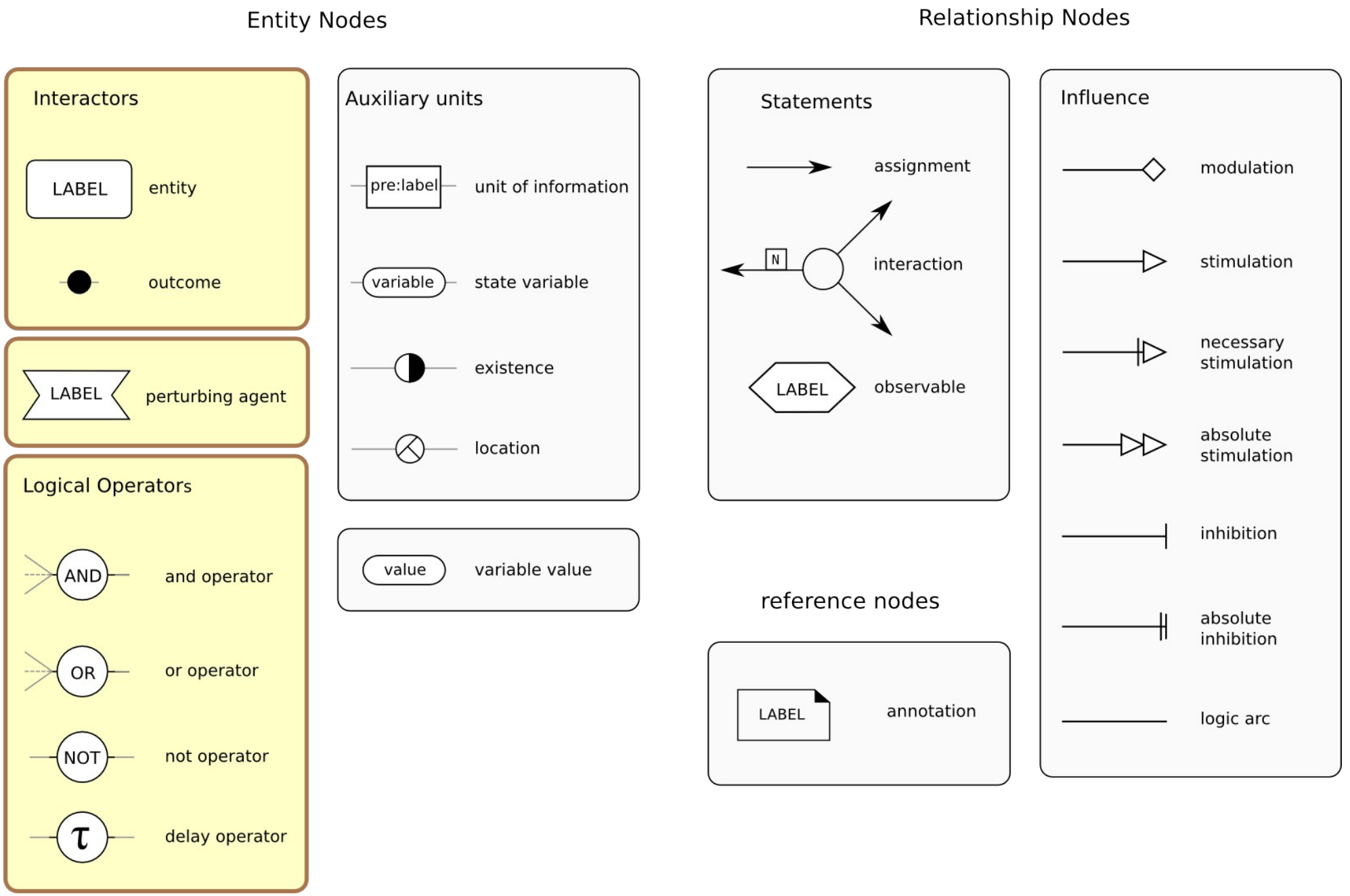
Process Descriptions:
“once a state variable value,
always a state variable value”

2^{12} = 4096 states
(i.e. EPN glyphs) for EGFR
and 4096 complexes between
EGFR and targets

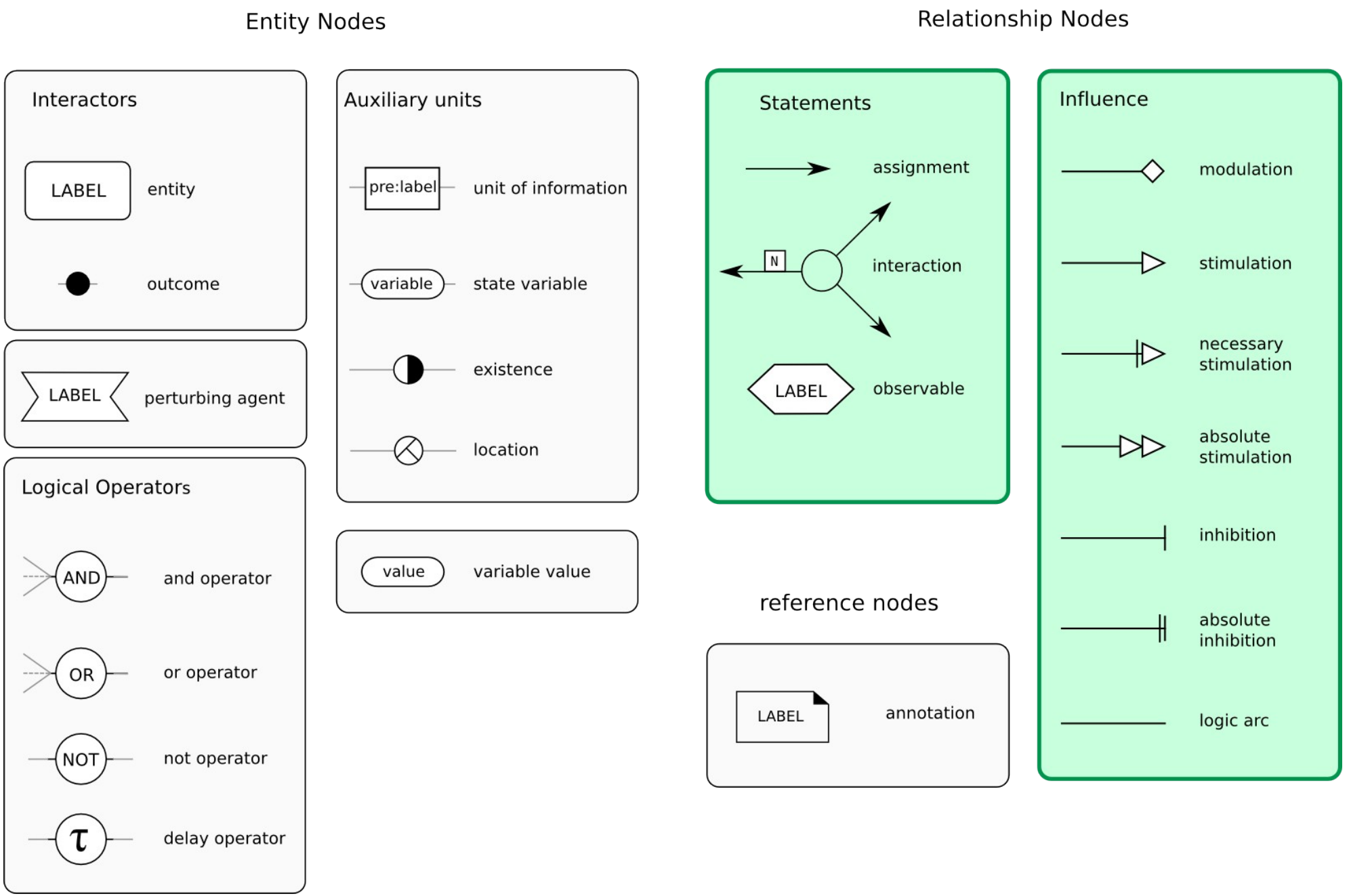
Entity Relationships L1 V1.2 reference card



Things that exist



Things that may happen



Entity Relationships L1 V1 syntax

symbols \ Arc	*assignment*	*interaction*	*modulation*	*stimulation*	*inhibition*	*necessary stimulation*	*absolute stimulation*	*absolute inhibition*	*logic arc*
entity		IO	I	I	I	I	I	I	I
outcome		I(1)O(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
and			I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)O
or			I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)O
not			I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)O(1)
delay			I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)O(1)
perturbing agent			I	I	I	I	I	I	I
unit of information		IO							
state variable	I(1)O(1)								
modulation				O	O	O	O	O	
stimulation				O	O	O	O	O	
inhibition				O	O	O	O	O	
necessary stimulation				O	O	O	O	O	
absolute stimulation				O	O	O	O	O	
absolute inhibition				O	O	O	O	O	
assignment				O	O	O	O	O	
interaction				O	O	O	O	O	
phenotype				O	O	O	O	O	

Example of Entity Relationships L1 V1 semantics

3.4.2 Influences

A *modulation* (Section 2.4.3.1) linking an *entity node* E and a relationship R means: "If E exists then R is either reinforced or weakened".

A *stimulation* (Section 2.4.3.2) linking an *entity node* E and a relationship R means: "If E exists then R is reinforced" or "If E exists then the probability of R is increased".

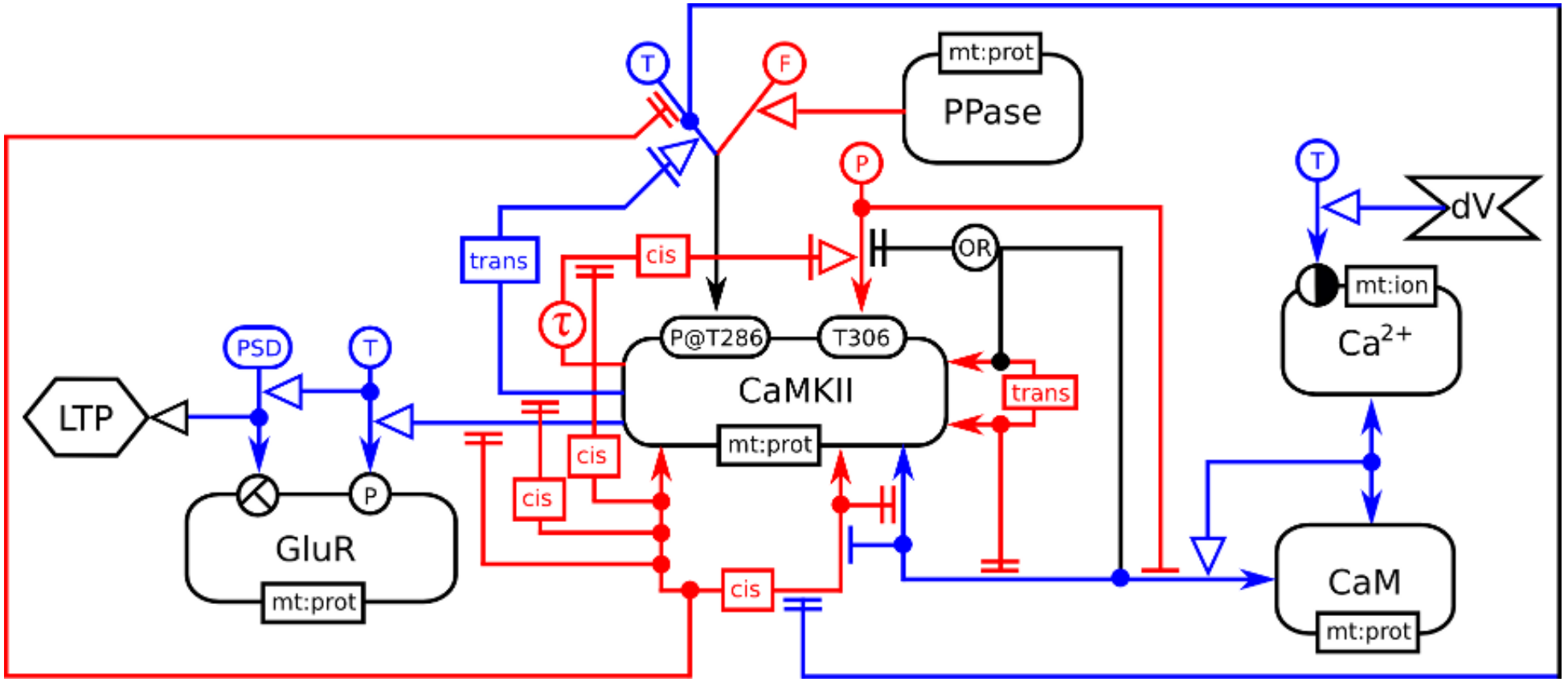
An *absolute stimulation* (Section 2.4.3.6) linking an *entity node* E and a relationship R means: "If E exists then R always takes place".

A *necessary stimulation* (Section 2.4.3.4) linking an *entity node* E and a relationship R means: "R only takes place if E exists.

An *inhibition* (Section 2.4.3.3) linking an *entity node* E and a relationship R means: "If E exists then R is weakened" or "If E exists then the probability of R is lowered".

An *absolute inhibition* (Section 2.4.3.5) linking an *entity node* E and a relationship R means: "If E exists then R never takes place".

ER map of calcium-regulated synaptic plasticity



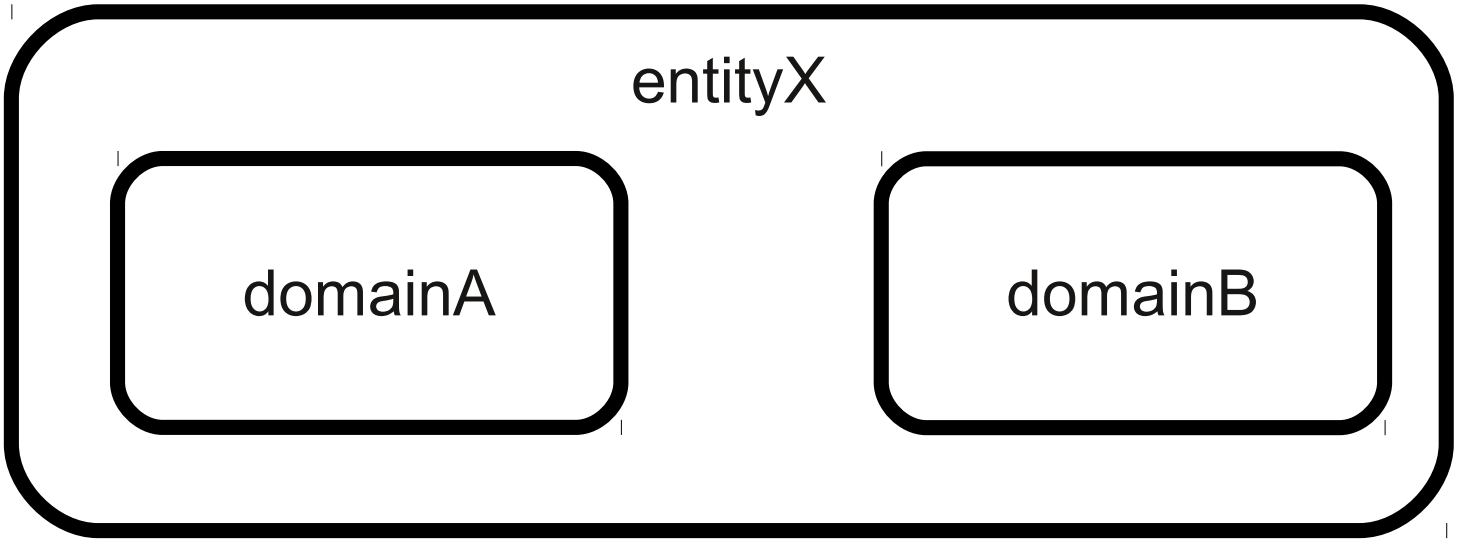
increases synaptic weight

decreases synaptic weight

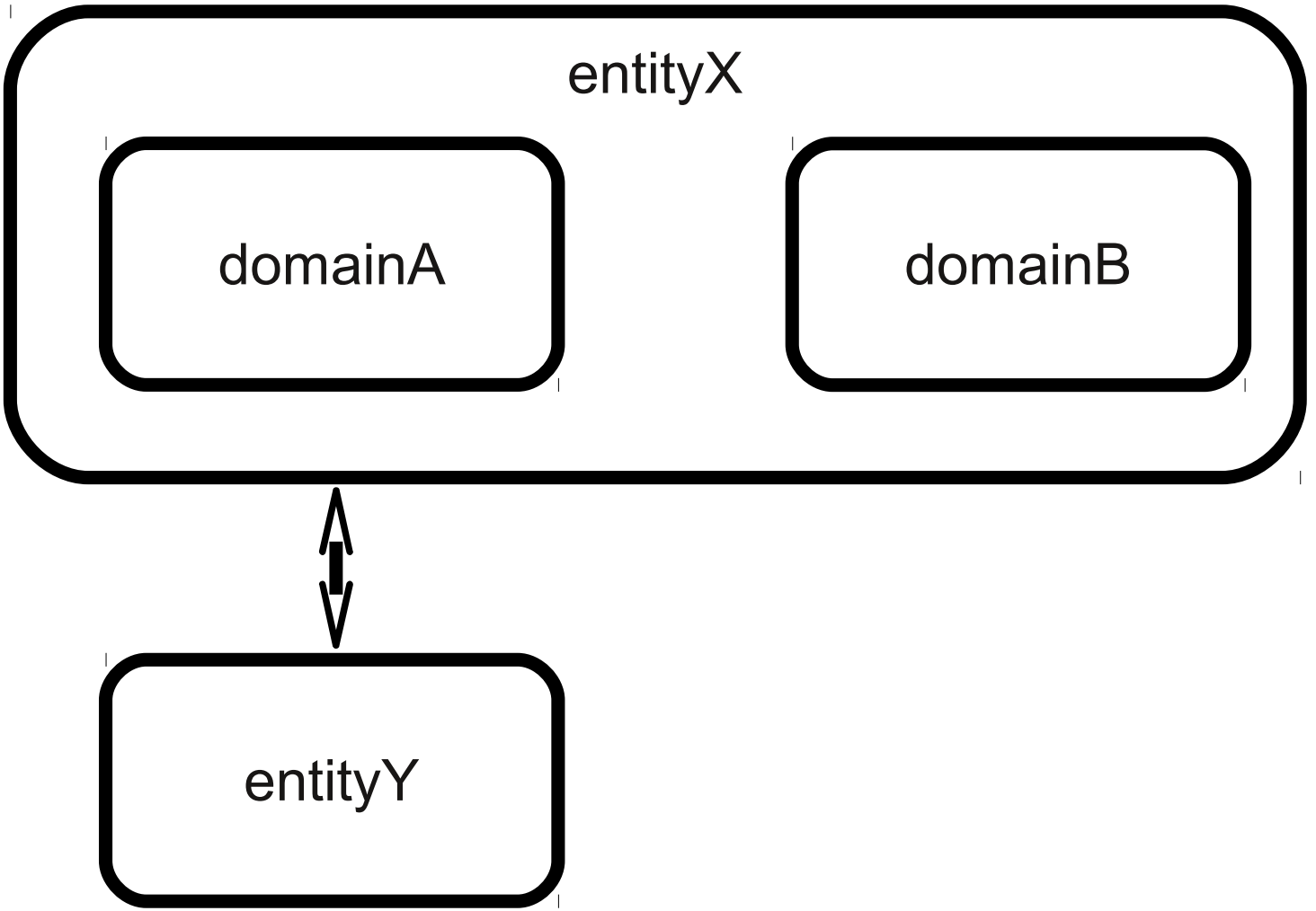
Entity Relationships L1 V2

nested entities

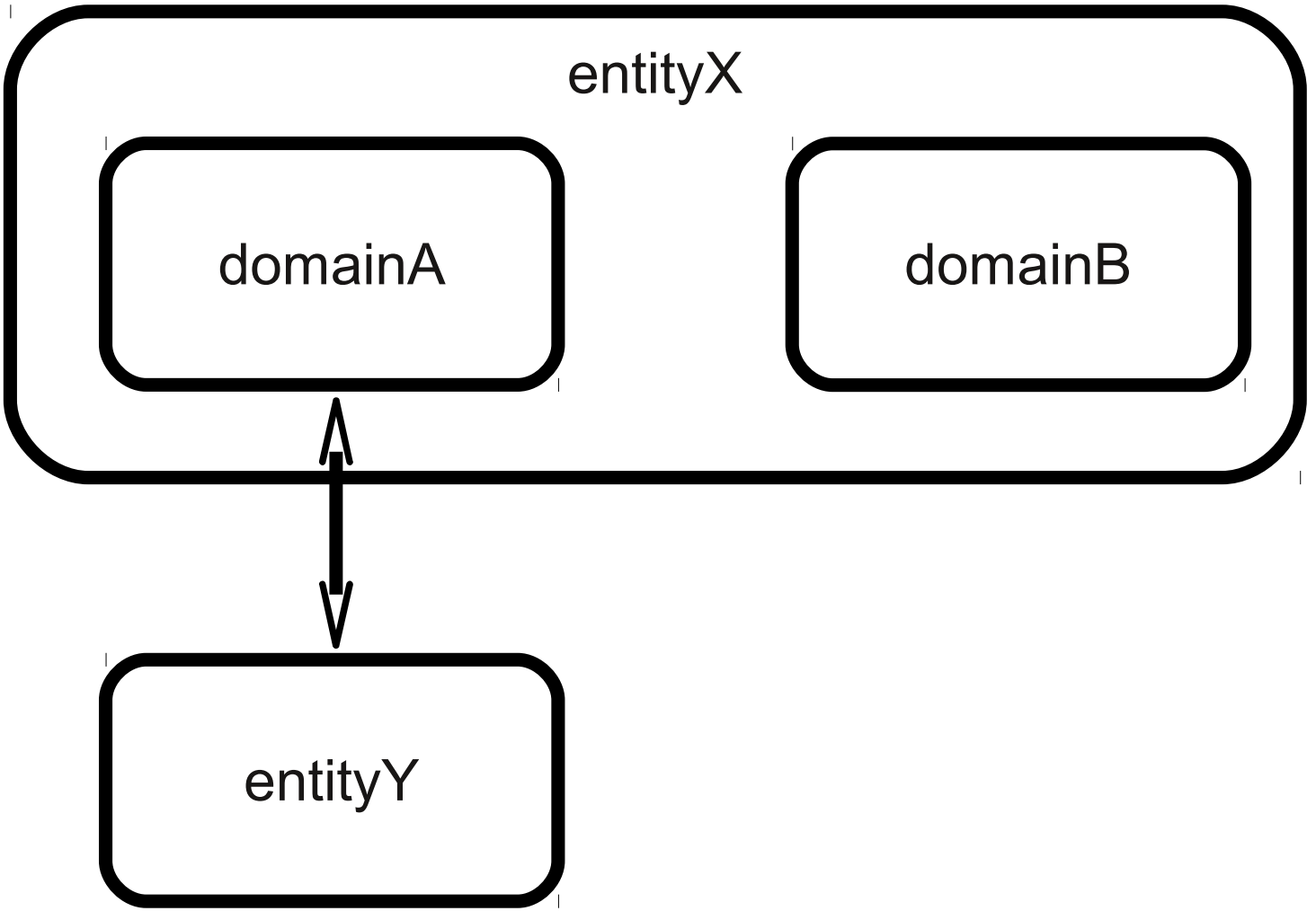
A and B are part of X



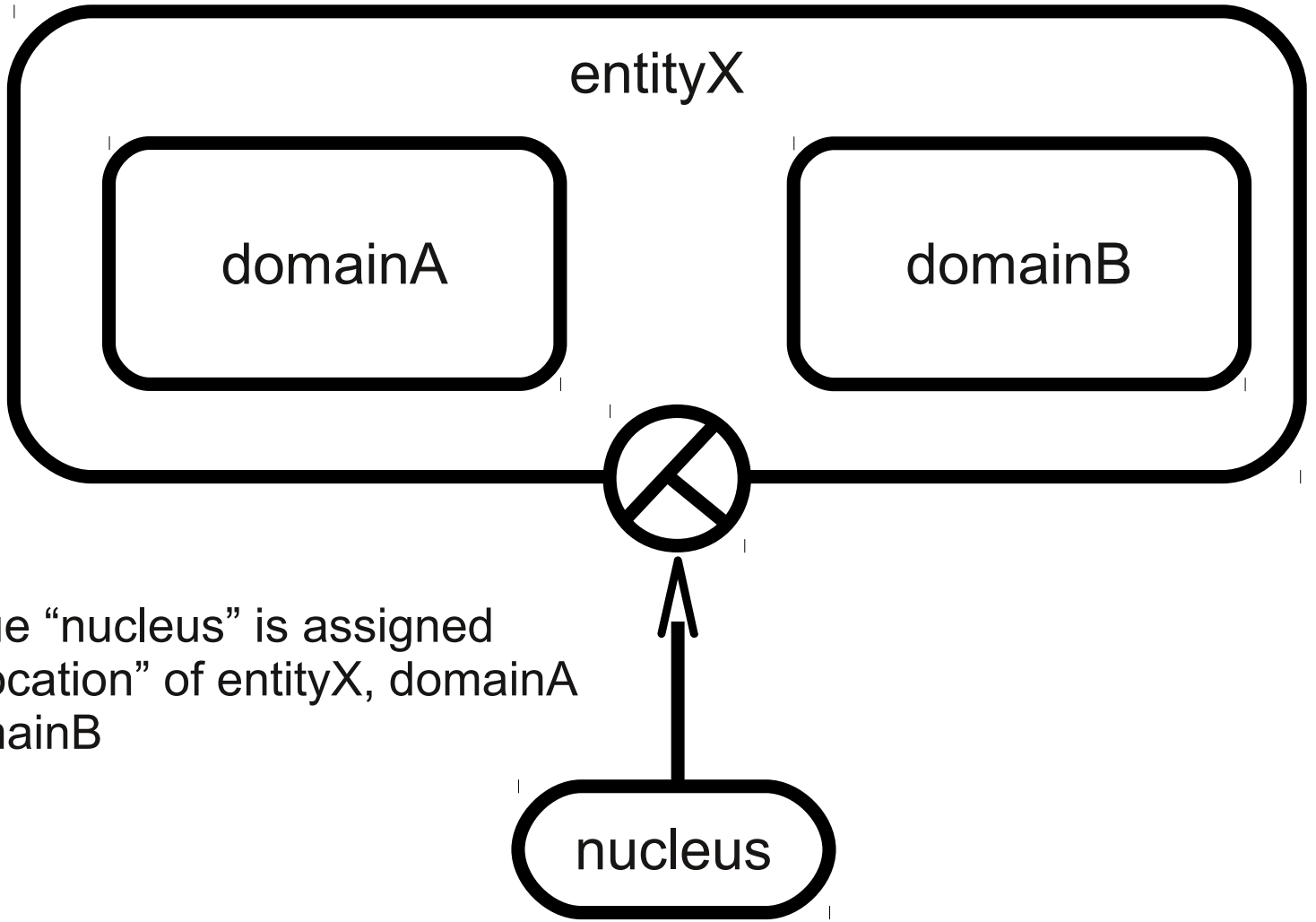
X interacts with Y



A of X interacts with Y

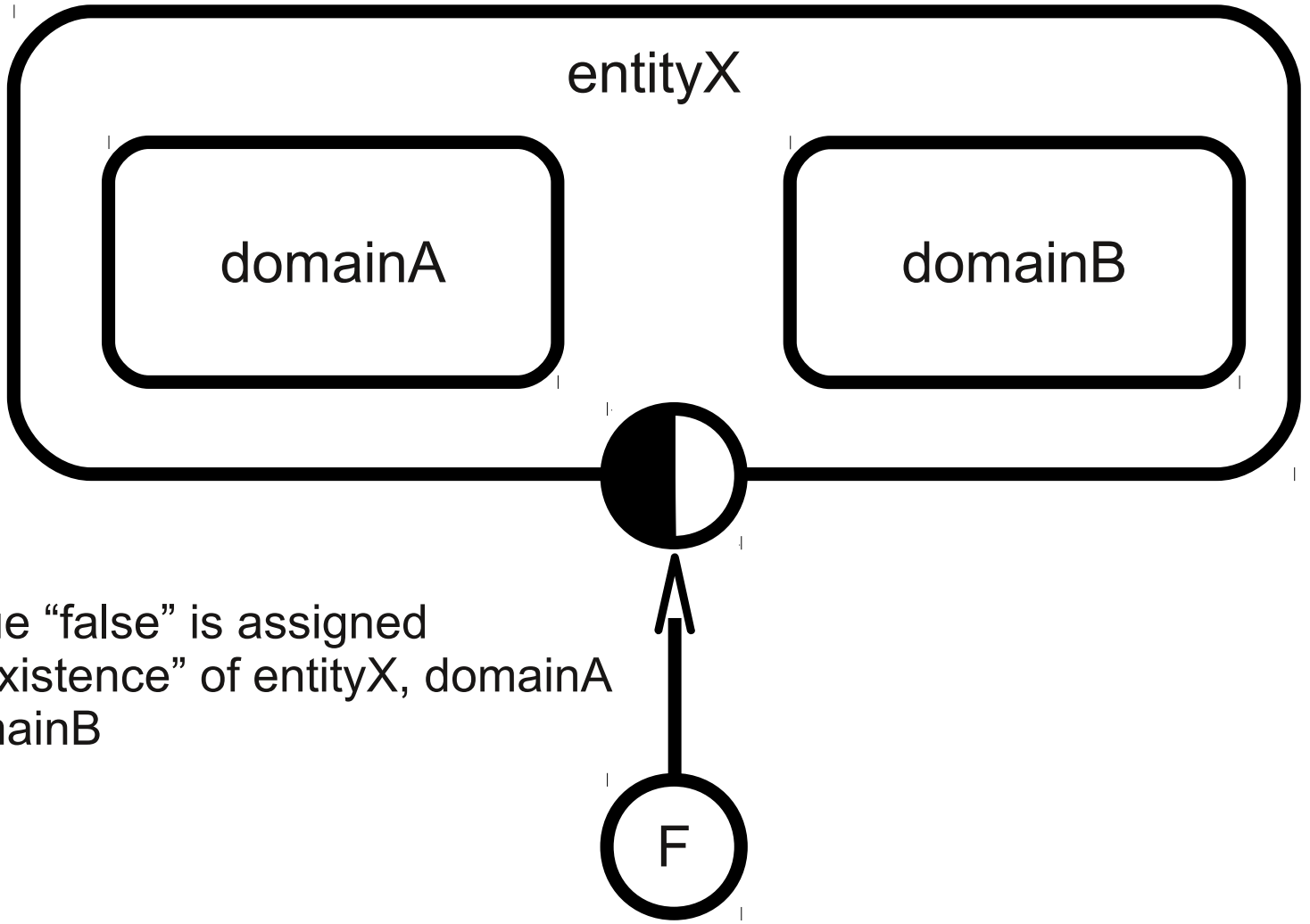


Translocation of X in the nucleus



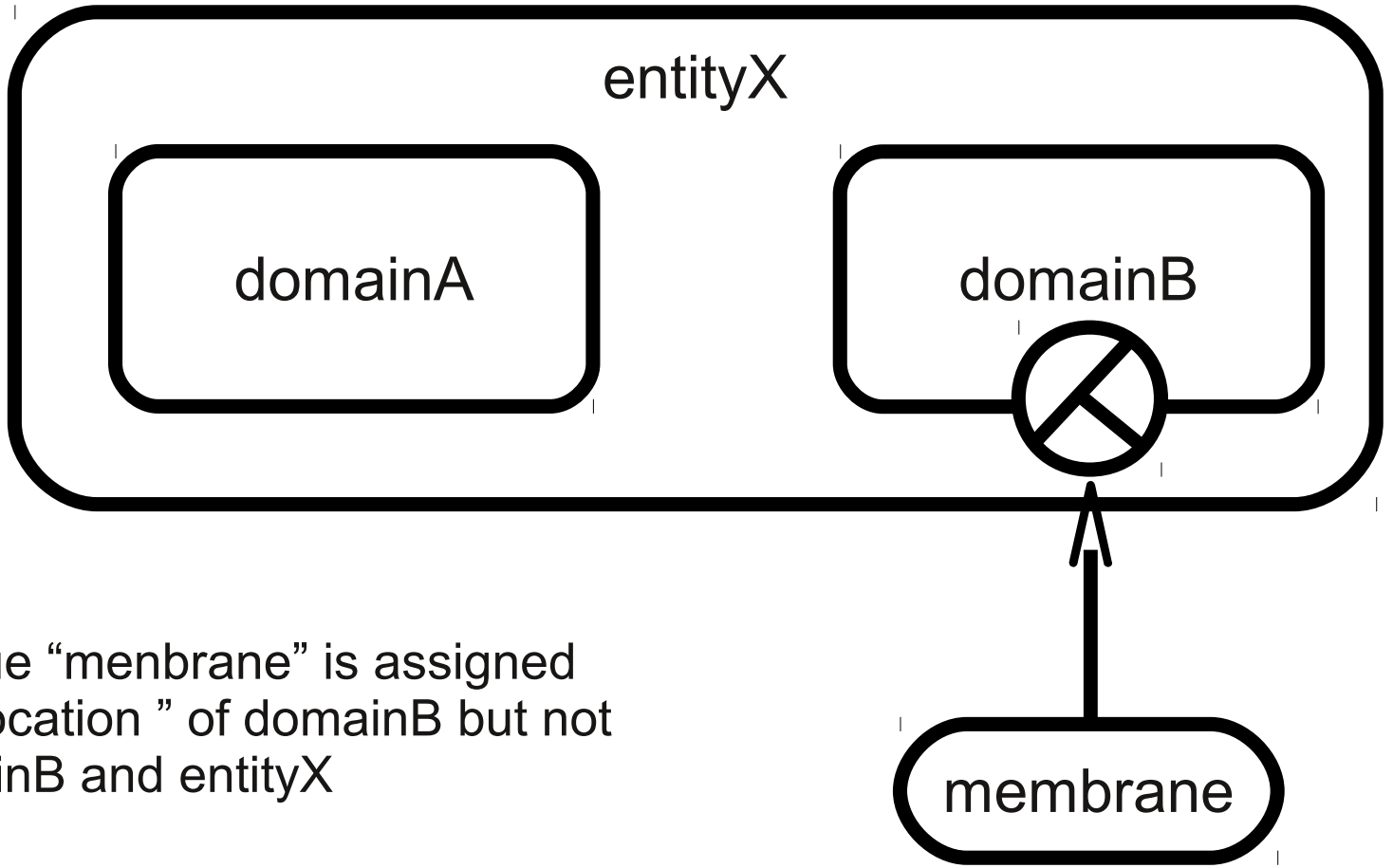
The value “nucleus” is assigned
to the “location” of entityX, domainA
and domainB

degradation of X



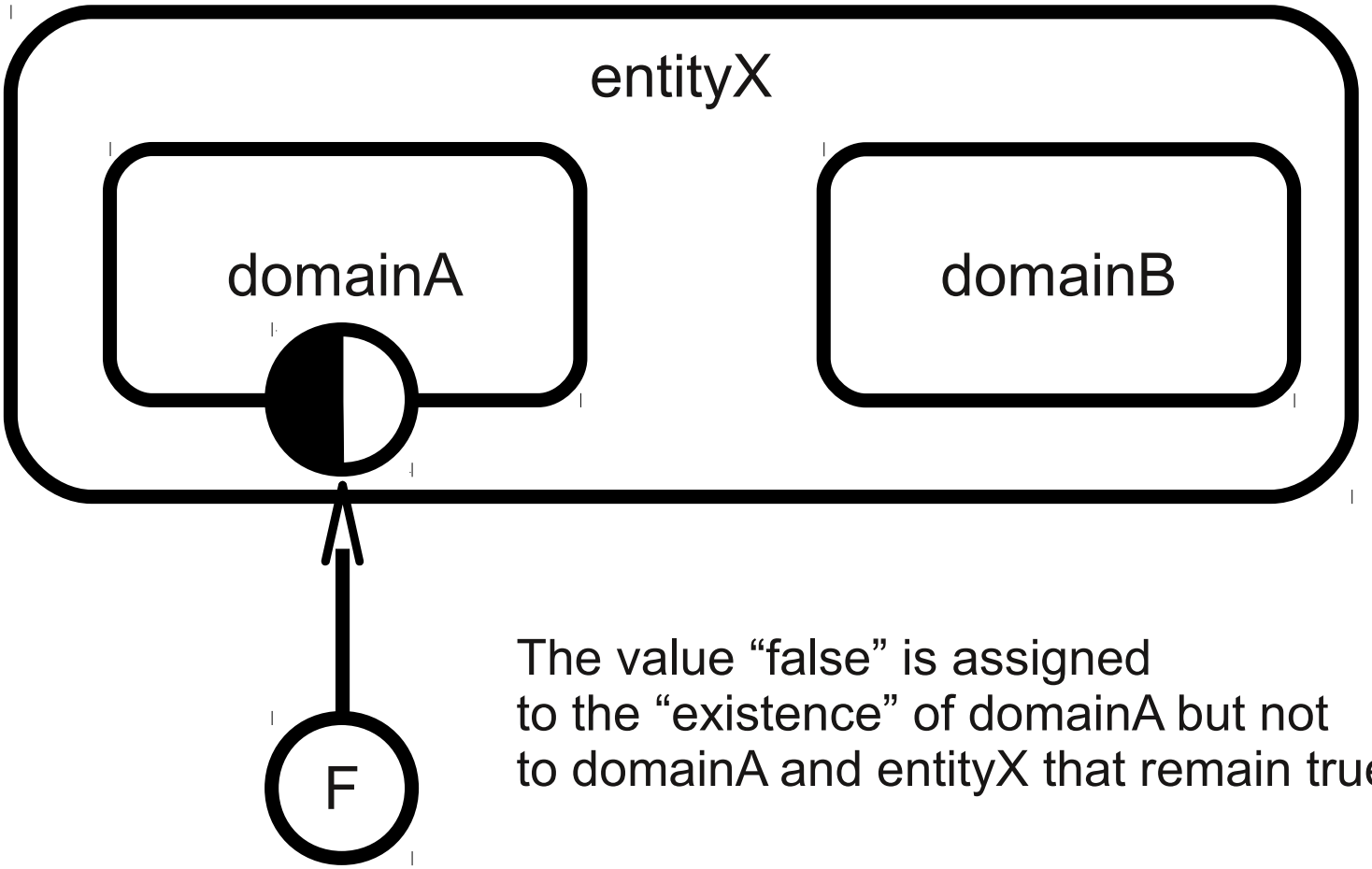
The value “false” is assigned
to the “existence” of entityX, domainA
and domainB

insertion of B of X in the membrane



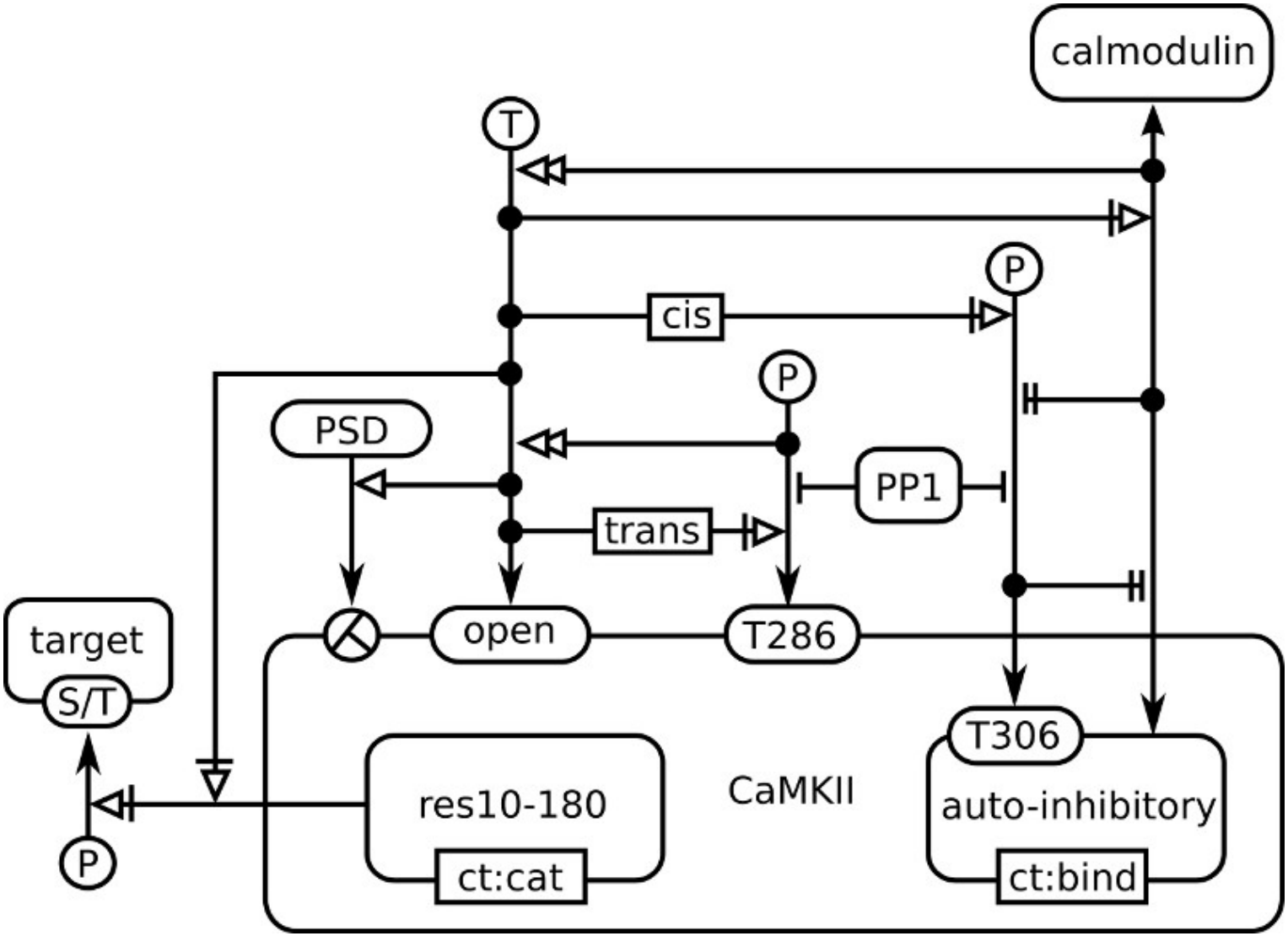
The value “menbrane” is assigned
to the “location ” of domainB but not
to domainB and entityX

degradation of domain A of X



The value “false” is assigned
to the “existence” of domainA but not
to domainA and entityX that remain true

Real example: CaMKII (of course ...)

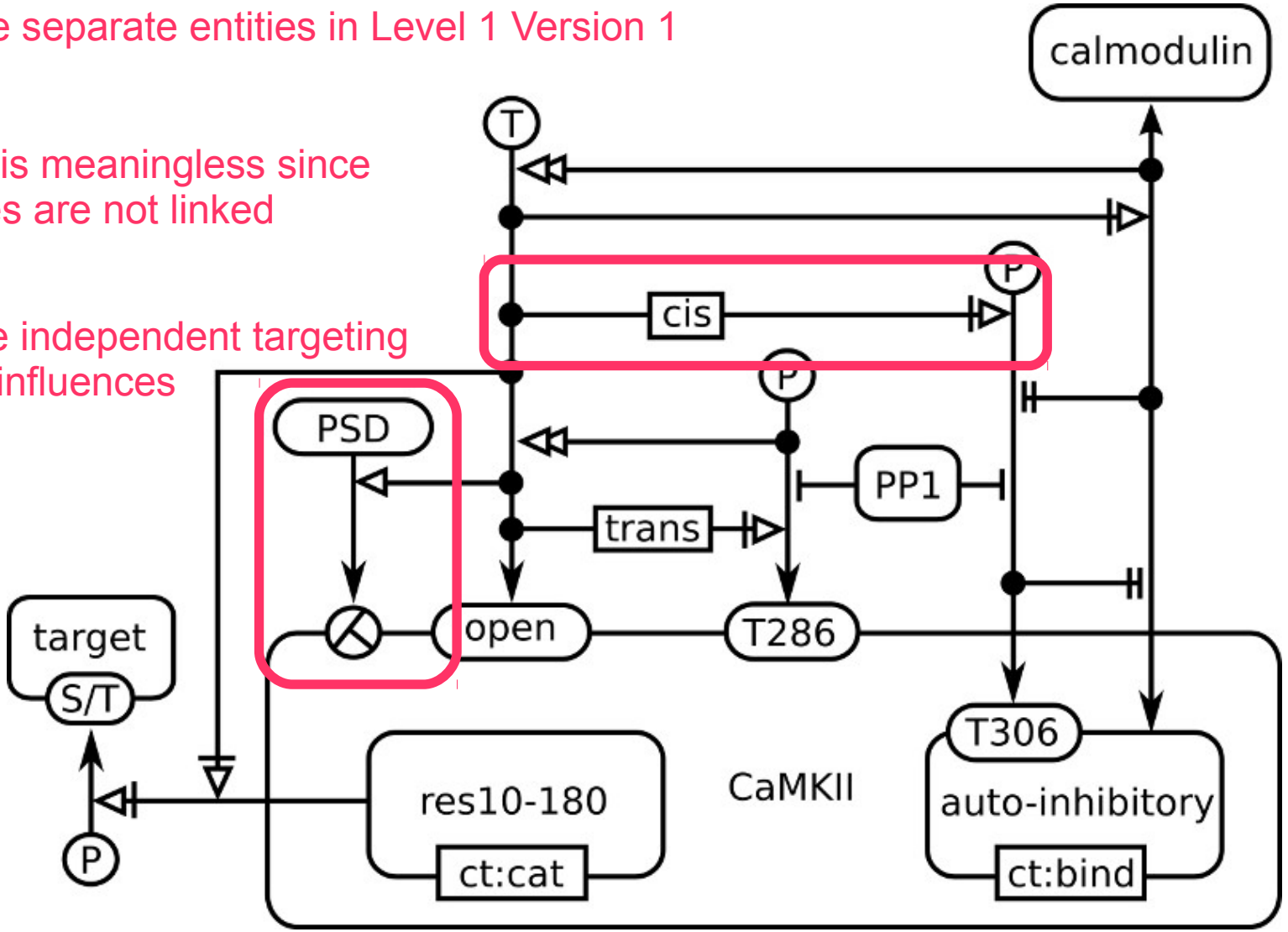


Real example: CaMKII (of course ...)

Three separate entities in Level 1 Version 1

"CIS" is meaningless since entities are not linked

Three independent targeting
With influences



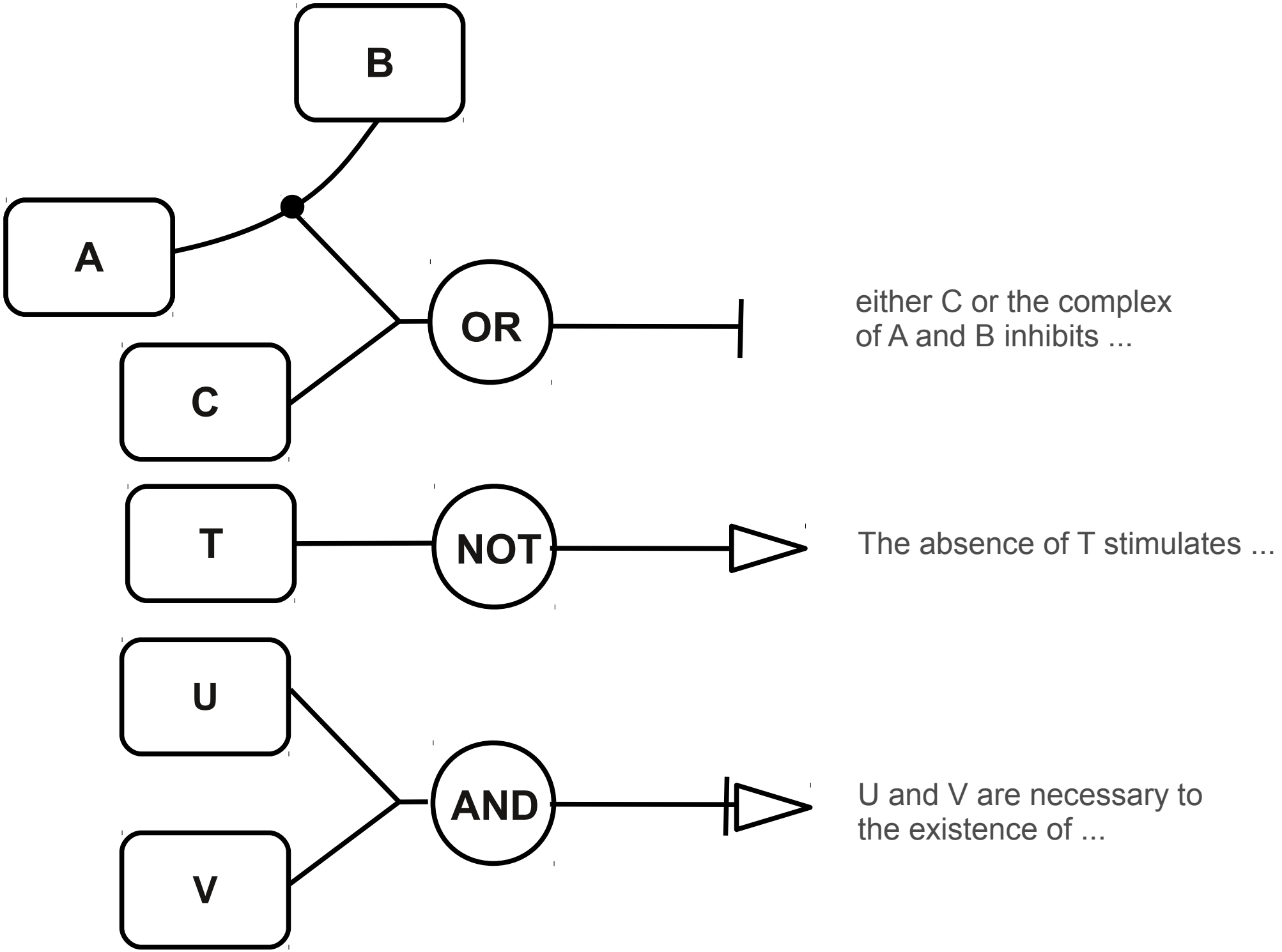
Pending issues

1) Logical operation on statements: In L1 V1, logical operators only output influences. Implicit XOR on variable assignments. Nothing for interactions. Discussions in COMBINE 2011 towards avoiding explicit logical operators for the moment.
2) Possibility to identify groups of entities and statements, for instance defining pathways [NLN]
3) Identification of generics: How to lump together several entities for a given relationships? (e.g. MAPK instead of ERK1 and ERK2) [AM]
4) Differentiating Entities (and outcomes) representing continuants and occurrents. Proposal is to follow PD and AF guidelines (round corners for continuants and acute ones for occurrents) [AL and NLN]
5) Outcomes on influences. Purpose is to differentiate the actualisation of an influence from the the effect of the influence [NLN]
6) Identification of instances: How to differentiate between several instances of the same entity, differentially involved in relationships (e.g. trans-phosphorylation)?
7) Enzymatic activity node [AM]
8) Other?

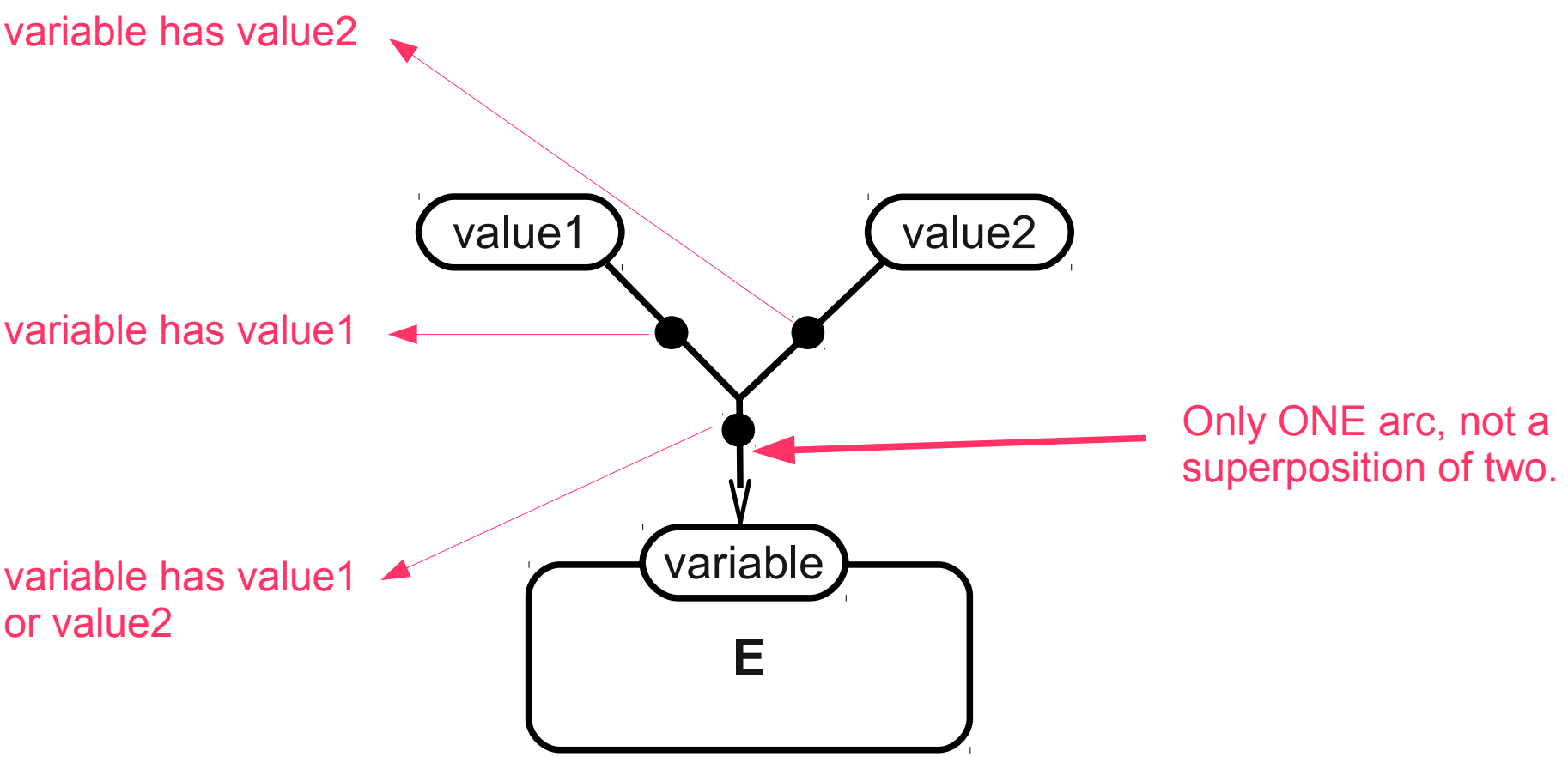
Purpose of this morning's discussions

To decide, for each issue if:

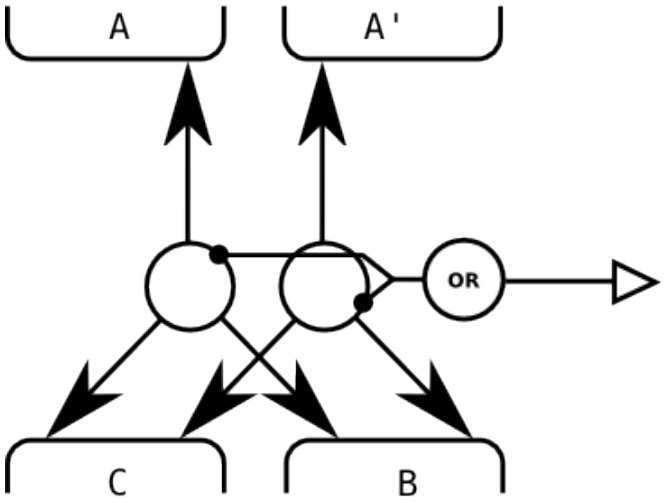
1) It is not worth discussing further because irrelevant
2) The discussion is mature and the issue should be settled by a vote
3) The issue needs more discussion, for instance during a breakout session
4) The issue should be postponed to a future meeting


B
A
OR
C
either C or the complex
of A and B inhibits ...
T
NOT
The absence of T stimulates ...
U
AND
U and V are necessary to
the existence of ...
V

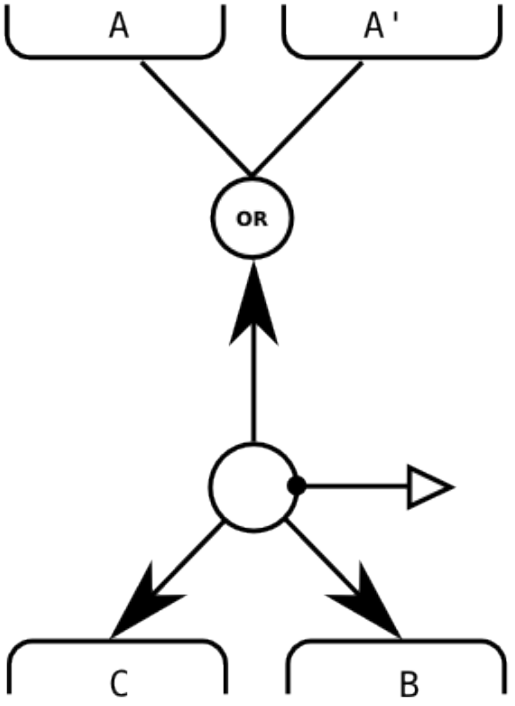
Implicit XOR on assignments



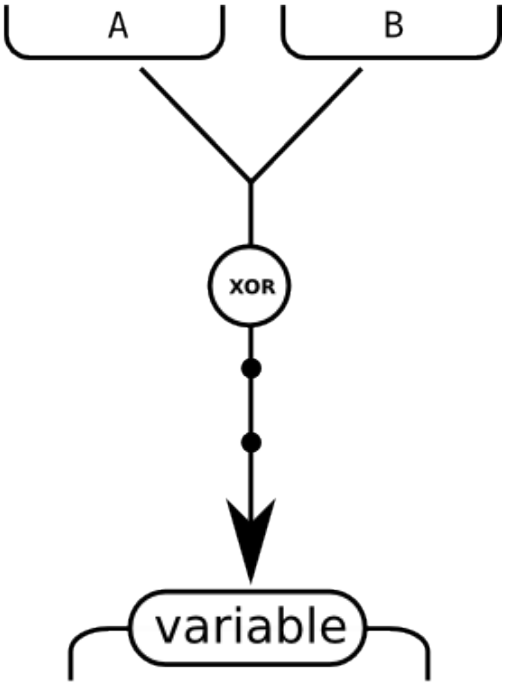
Logical operator participating to statements



current situation
for interactions

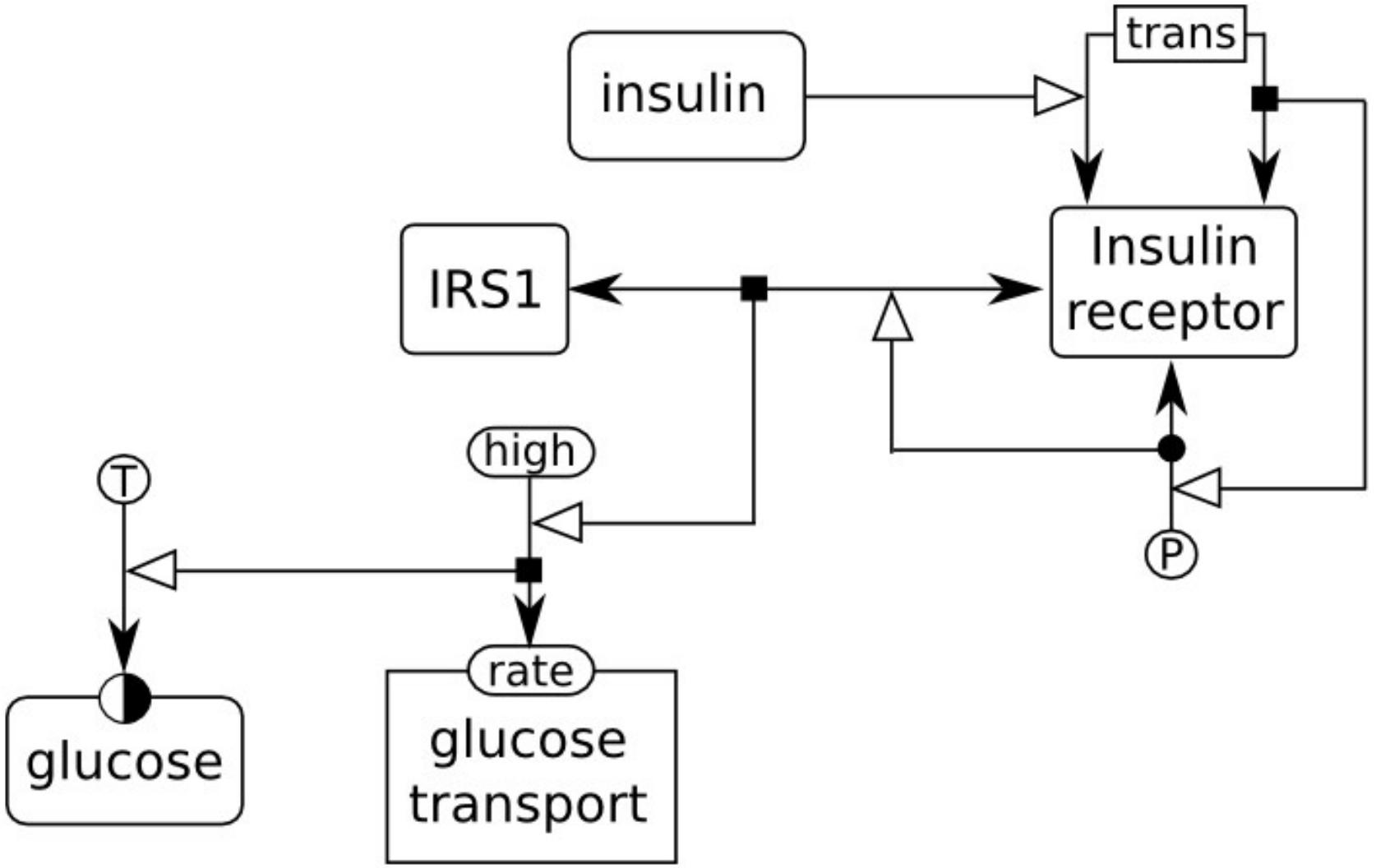


proposal for
interactions

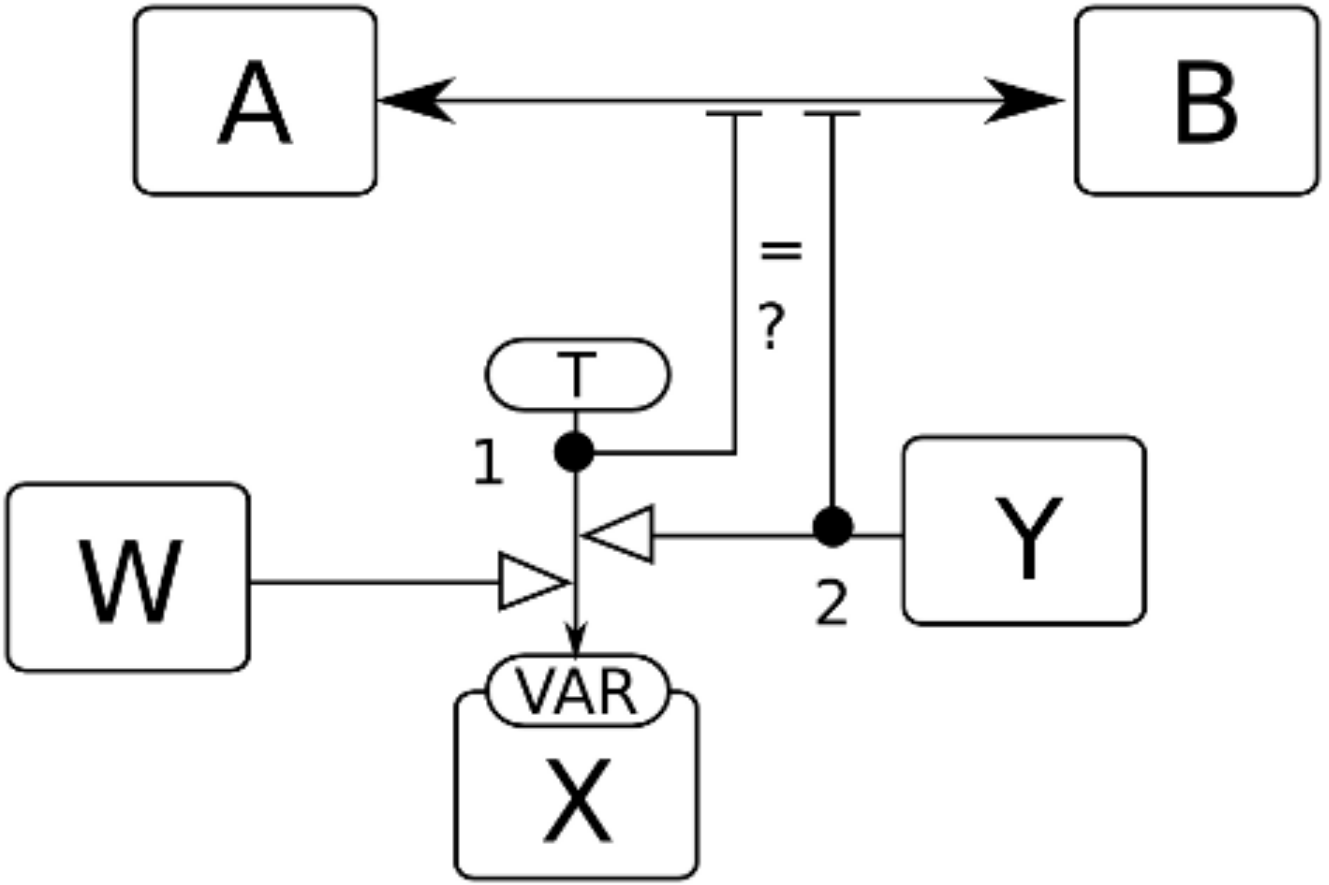


proposal for
assignment

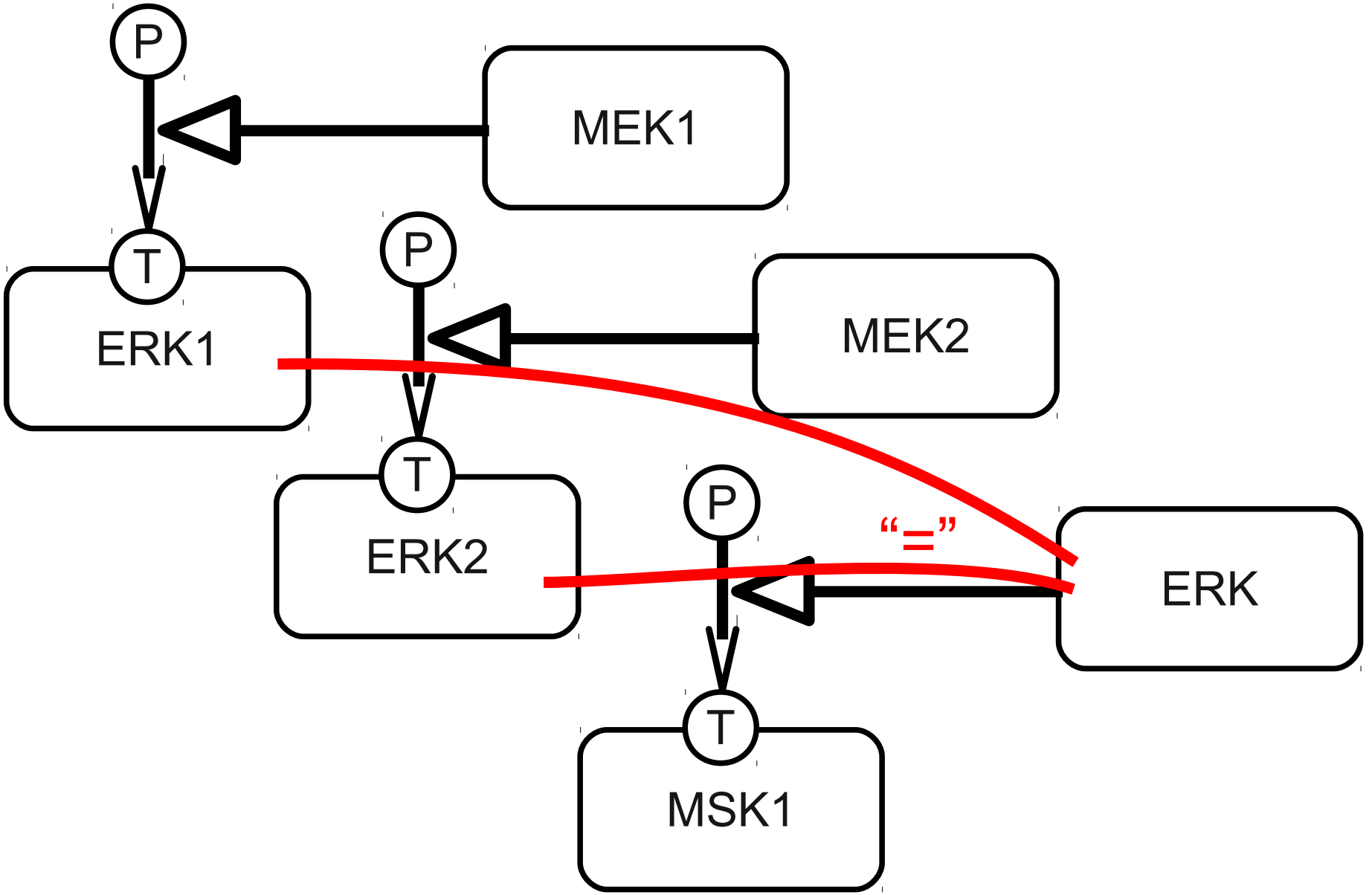
Continuant Vs occurrent entities



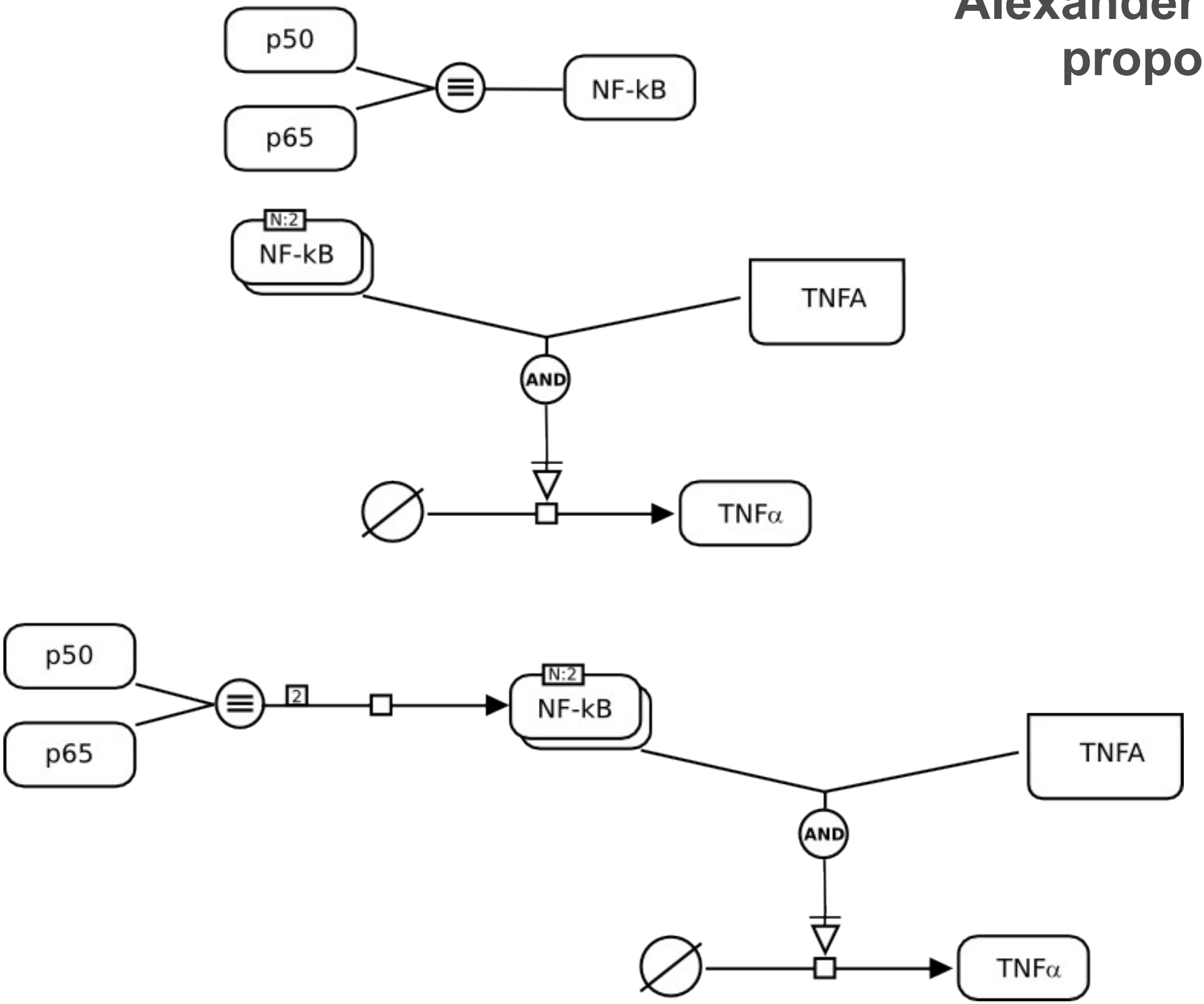
Outcome on influences



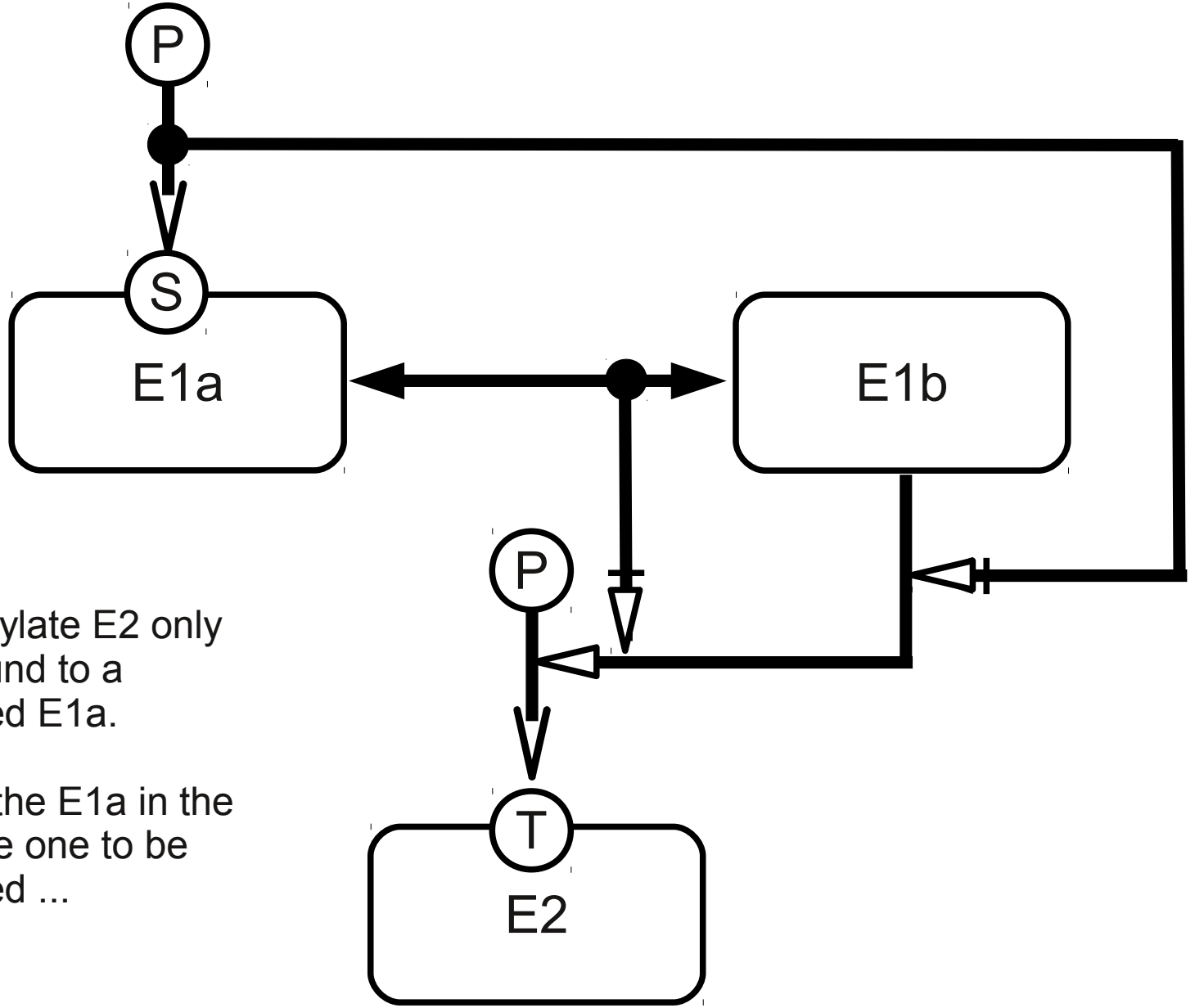
Generics in ER



Alexander Mazein proposal



Instances in ER



E1b phosphorylate E2 only
When it is bound to a
Phosphorylated E1a.

Nothing says the E1a in the
Complex is the one to be
Phosphorylated ...