Business Processes Modelling

MPB (6 cfu, 295AA)

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20 - Workflow modules

Object

We study Workflow modules to model interaction between workflows

Ch.6 of Business Process Management: Concepts, Languages, Architectures

Problem

Not all tasks of a workflow net are automatic:

they can be triggered manually or by a message

they can be used to trigger other tasks

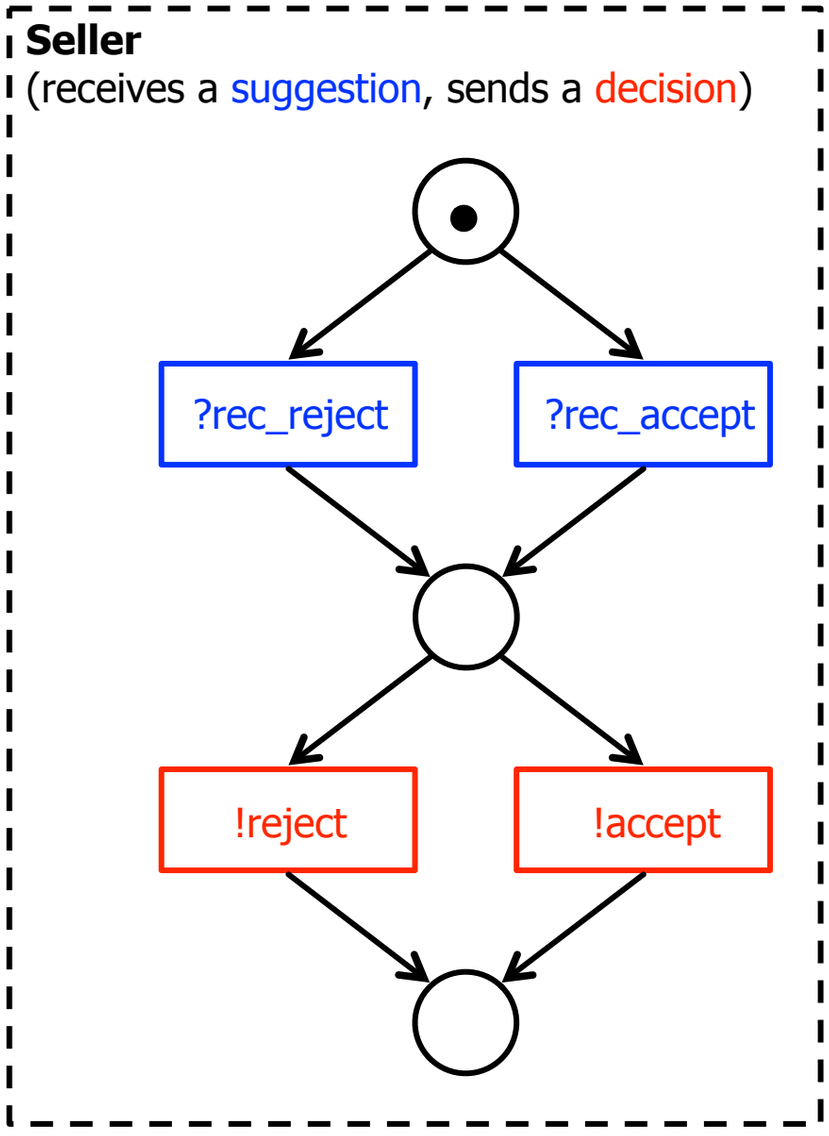
How do we represent this?

Implicit interaction

Separately developed processes

Some activities can input messages (symbol ?)

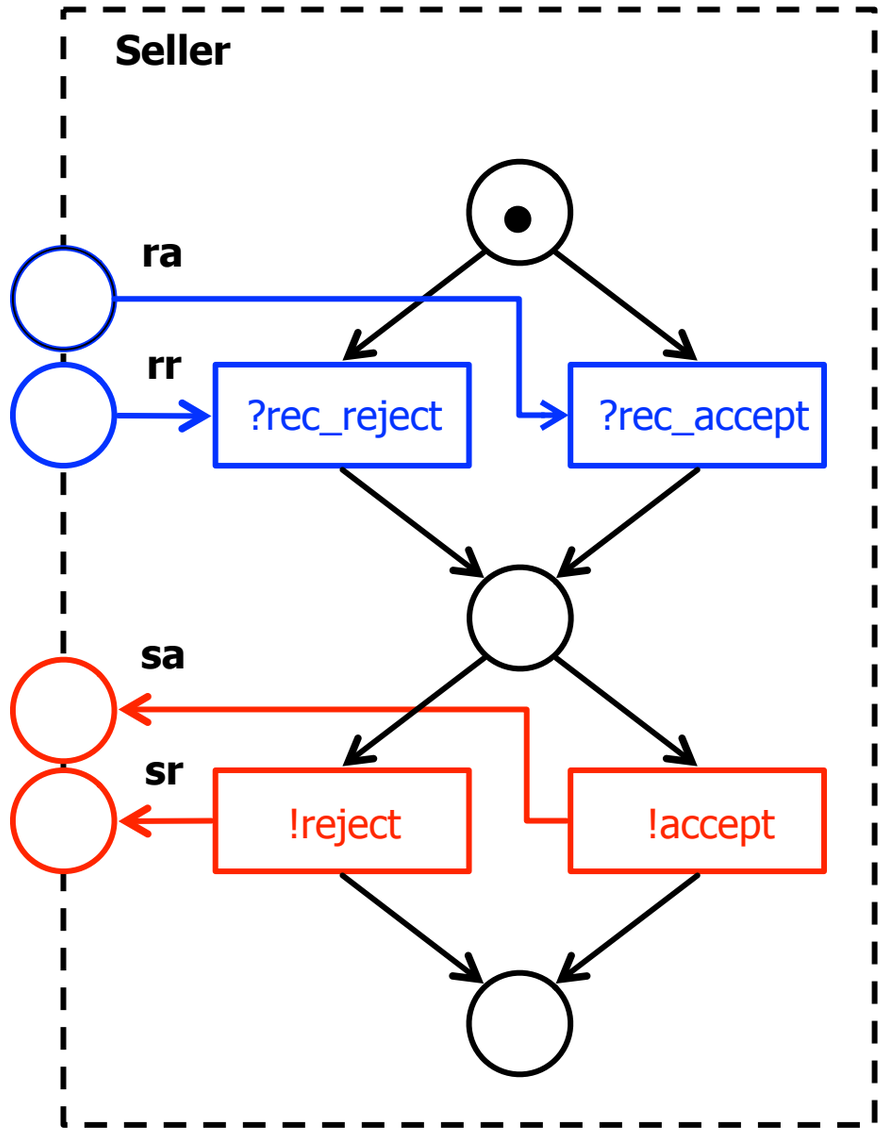
Some activities can output messages (symbol !)



Interface

Seller has an interface for interaction

It consists of some input places and some output places



From Workflow nets to Workflow modules

Assume the original workflow net has been validated:

it is a sound (and maybe safe) workflow net

When we add the (places in the) interface
it is no longer a workflow net!
It becomes a **workflow module**

Workflow Modules

Definition: A **workflow module** consists of

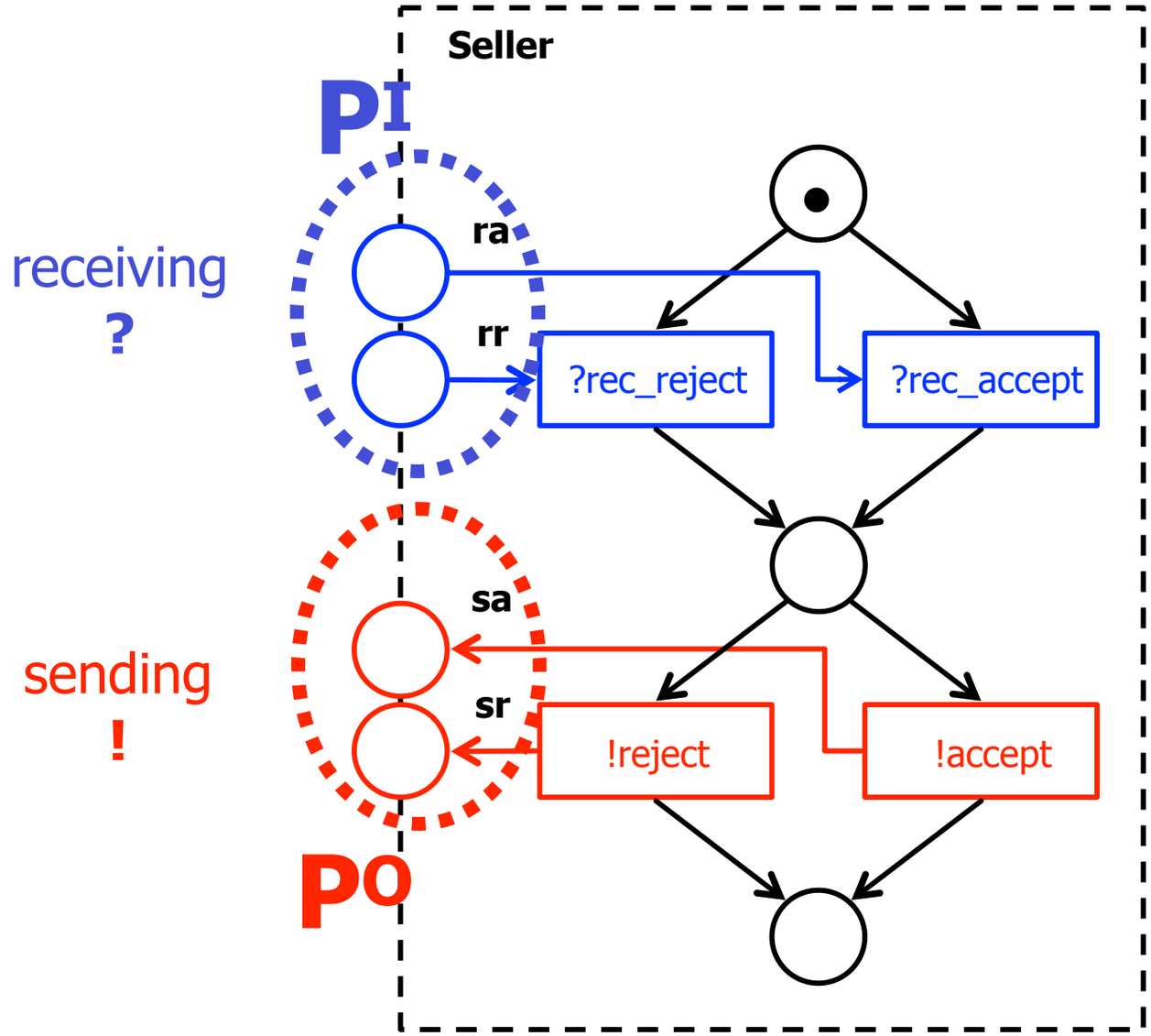
a workflow net (P,T,F)

plus a set P^I of incoming places
plus a set of incoming arcs $F^I \subseteq (P^I \times T)$

plus a set P^O of outgoing places
plus a set of outgoing arcs $F^O \subseteq (T \times P^O)$

such that each transition has
at most one connection to places in the interface

Interface

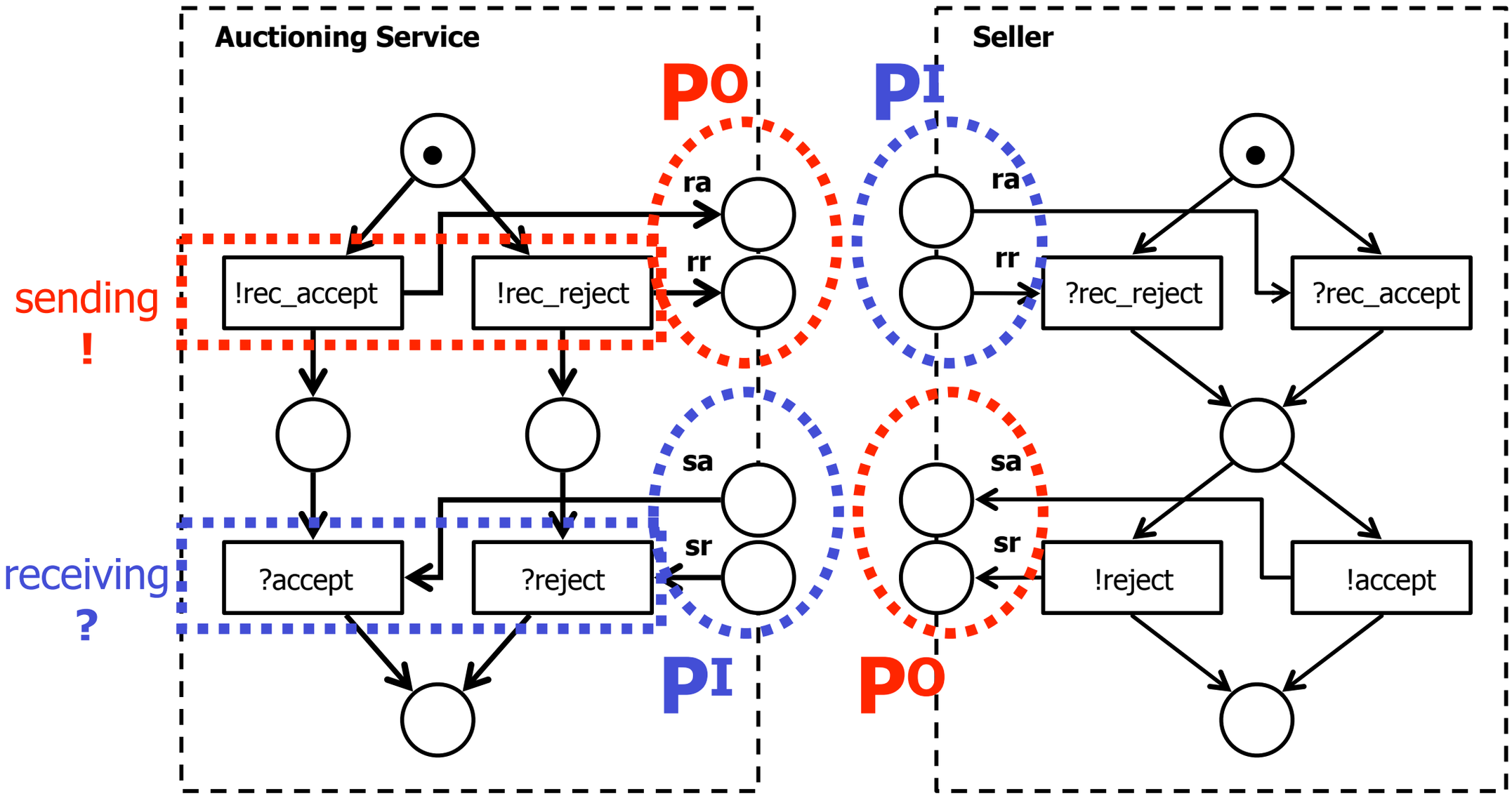


Structural compatibility

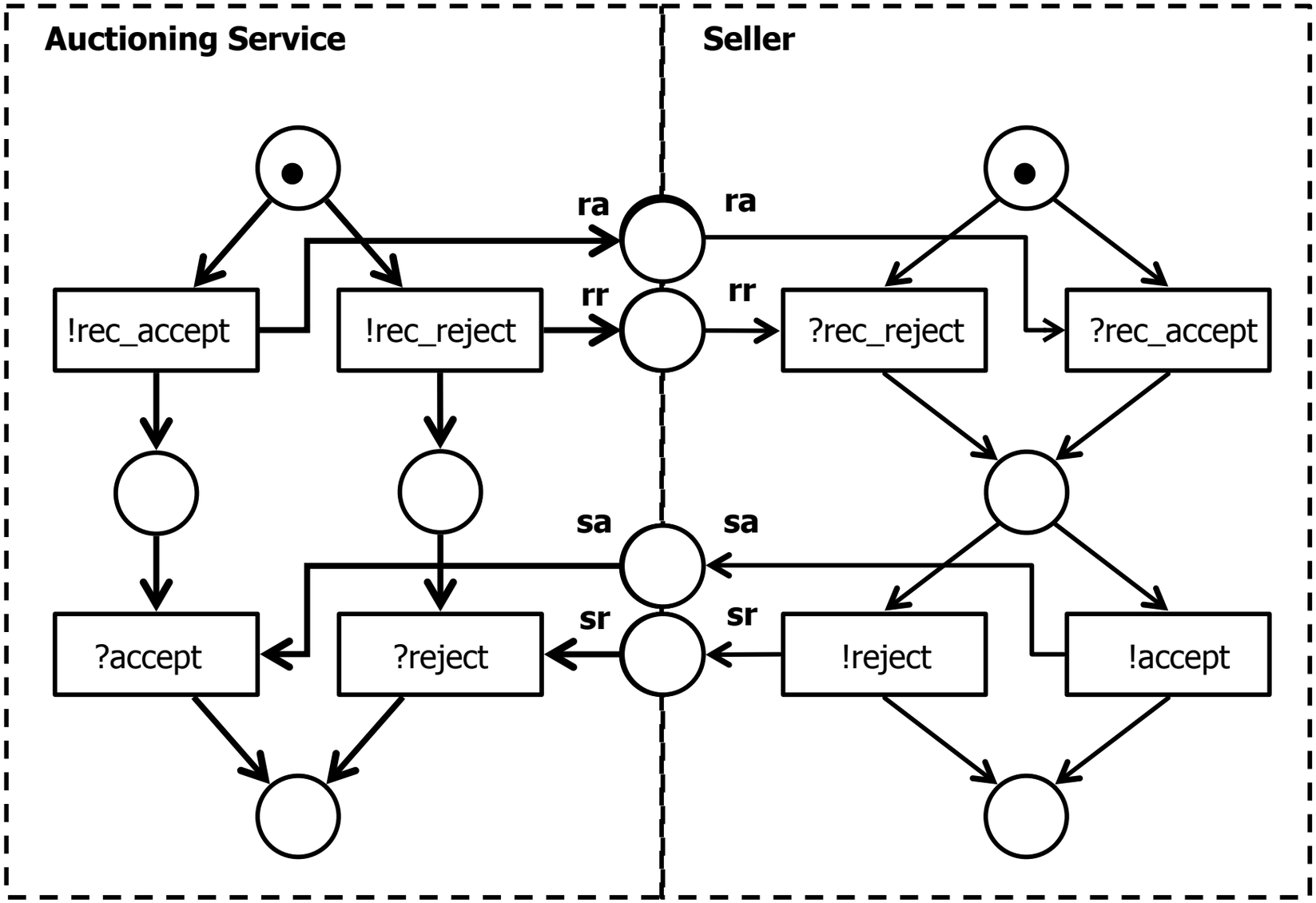
A set of workflow modules is called
structurally compatible
if
for every message that can be sent
there is exactly a module who can receive it,
and
for every message that can be received
there is exactly a module who can send it

(formats of message data are assumed to match)

Compatibility



Interaction



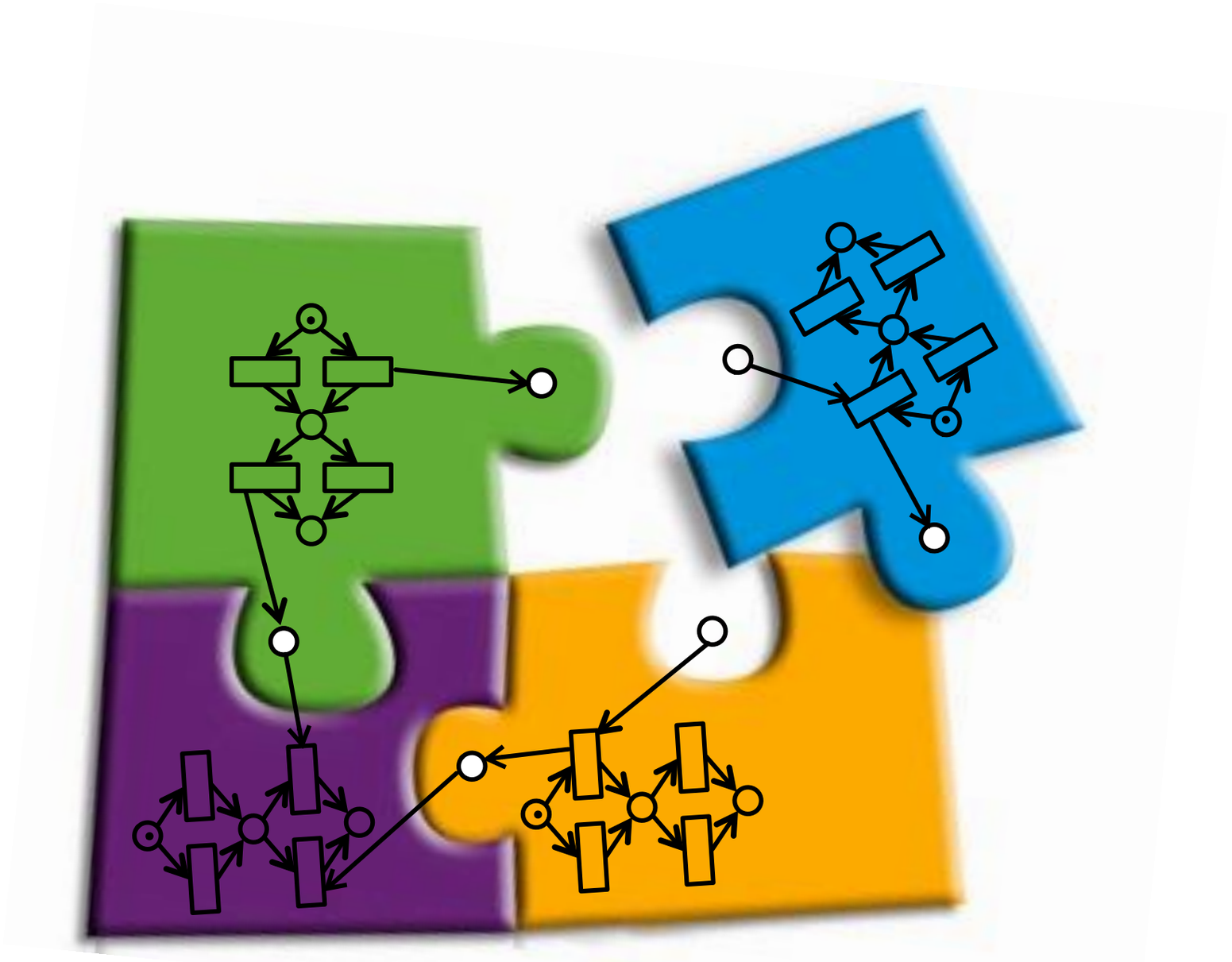
Problem

We have added places and arcs to single nets
We have joined places of different nets
We have paired their initial markings

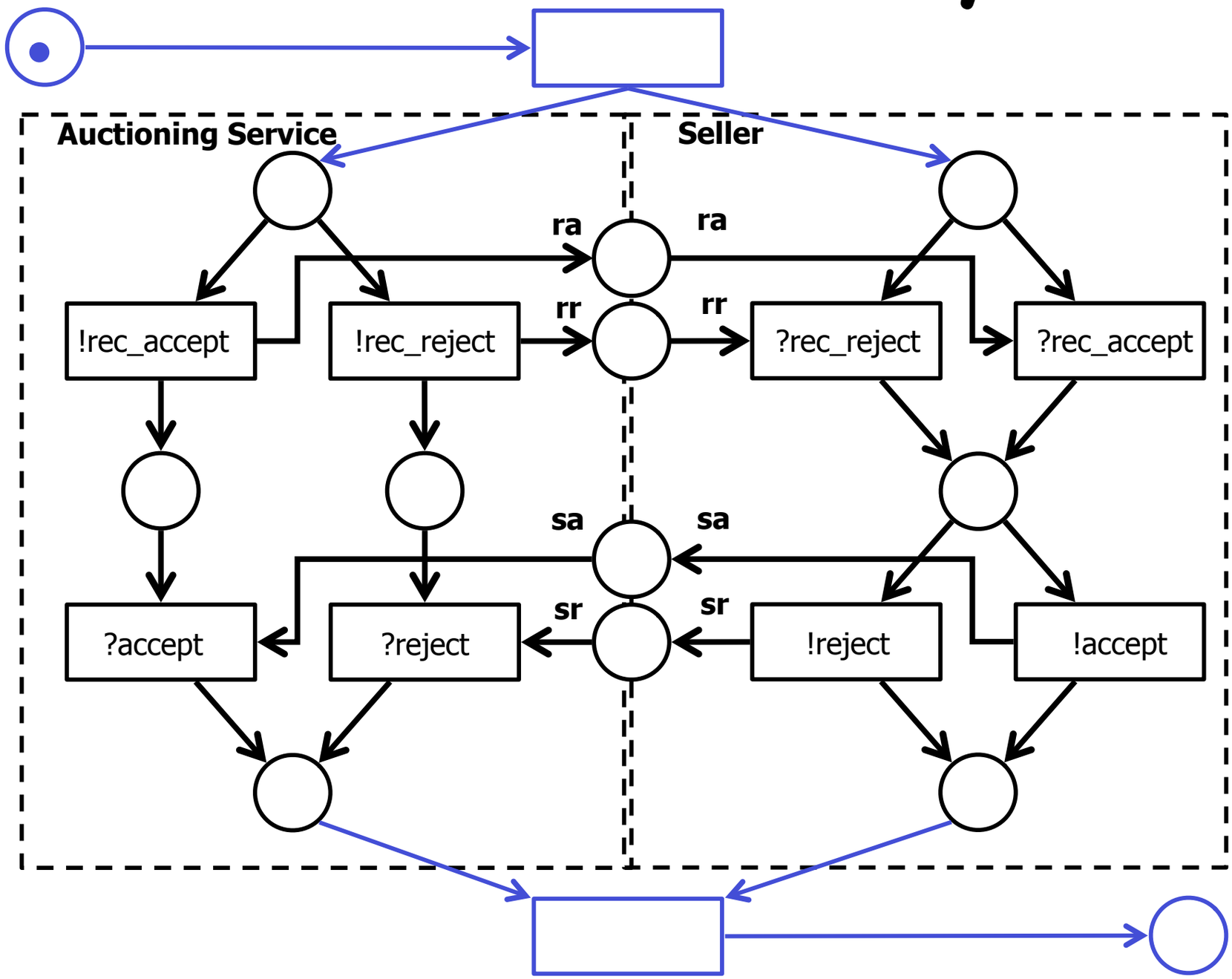
How do we check that the system behaves well?

What has this check to do with WF net soundness?

Workflow systems



Workflow system



Workflow system

Definition: A **workflow system** consists of

a set of n structurally compatible workflow modules
(initial places $i_1,...,i_n$, final places $o_1,...,o_n$)

plus an initial place **i**
and a transition t_i from **i** to $i_1,...,i_n$

plus a final place **o**
and a transition t_o from $o_1,...,o_n$ to **o**

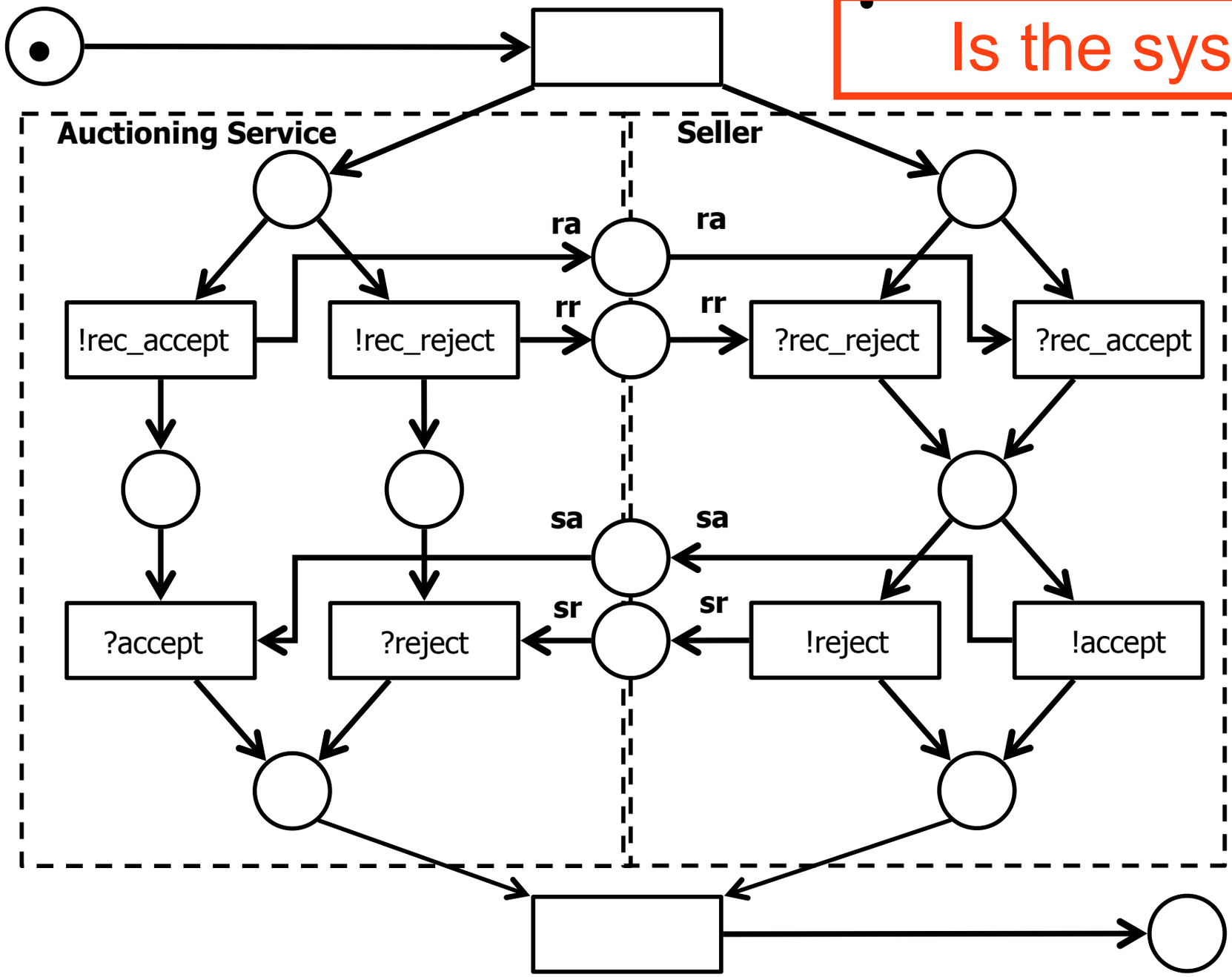
Soundness of workflow systems

A workflow system is just an ordinary workflow net

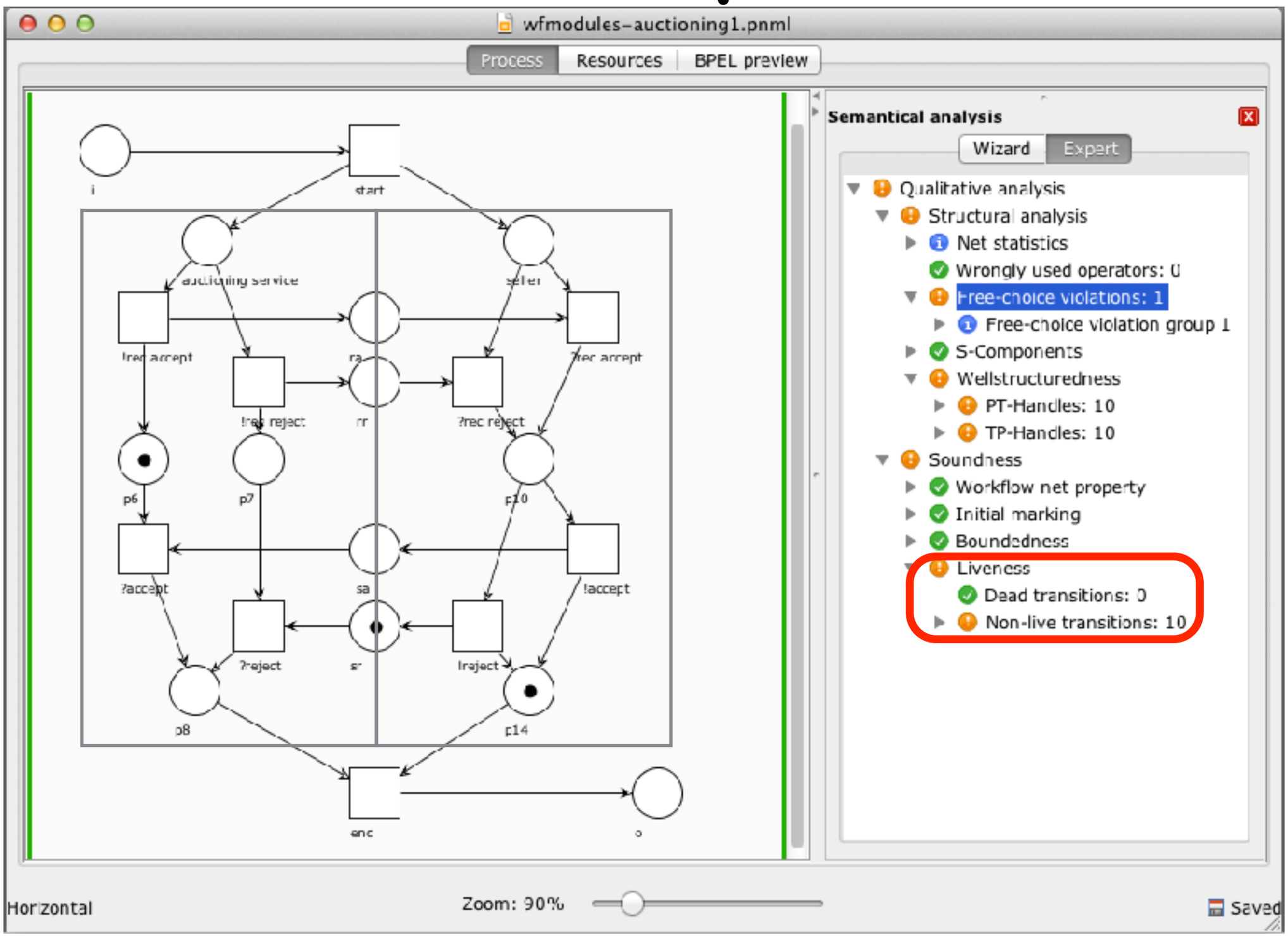
We can check its **soundness** as usual

Example

Is the system sound?

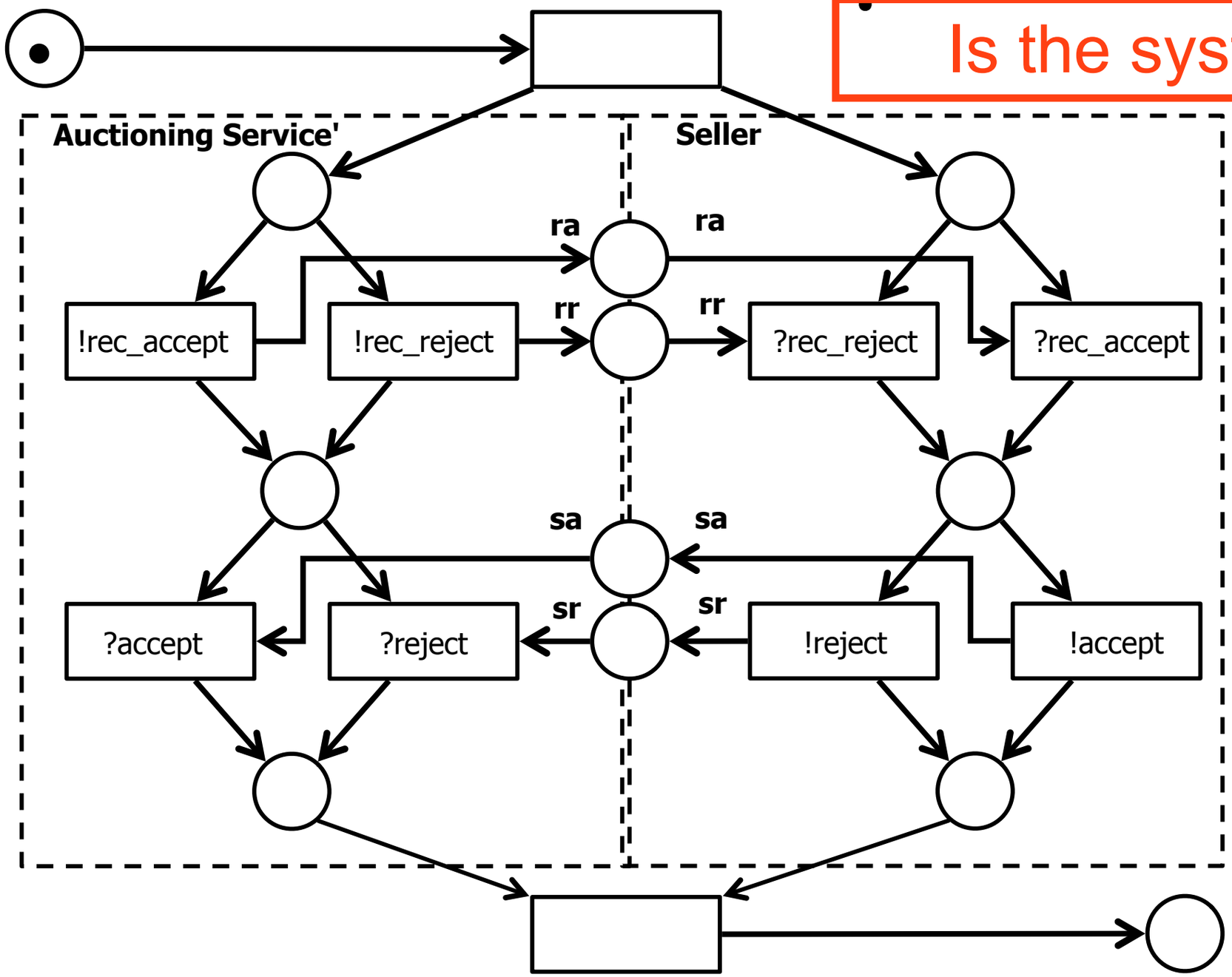


Example

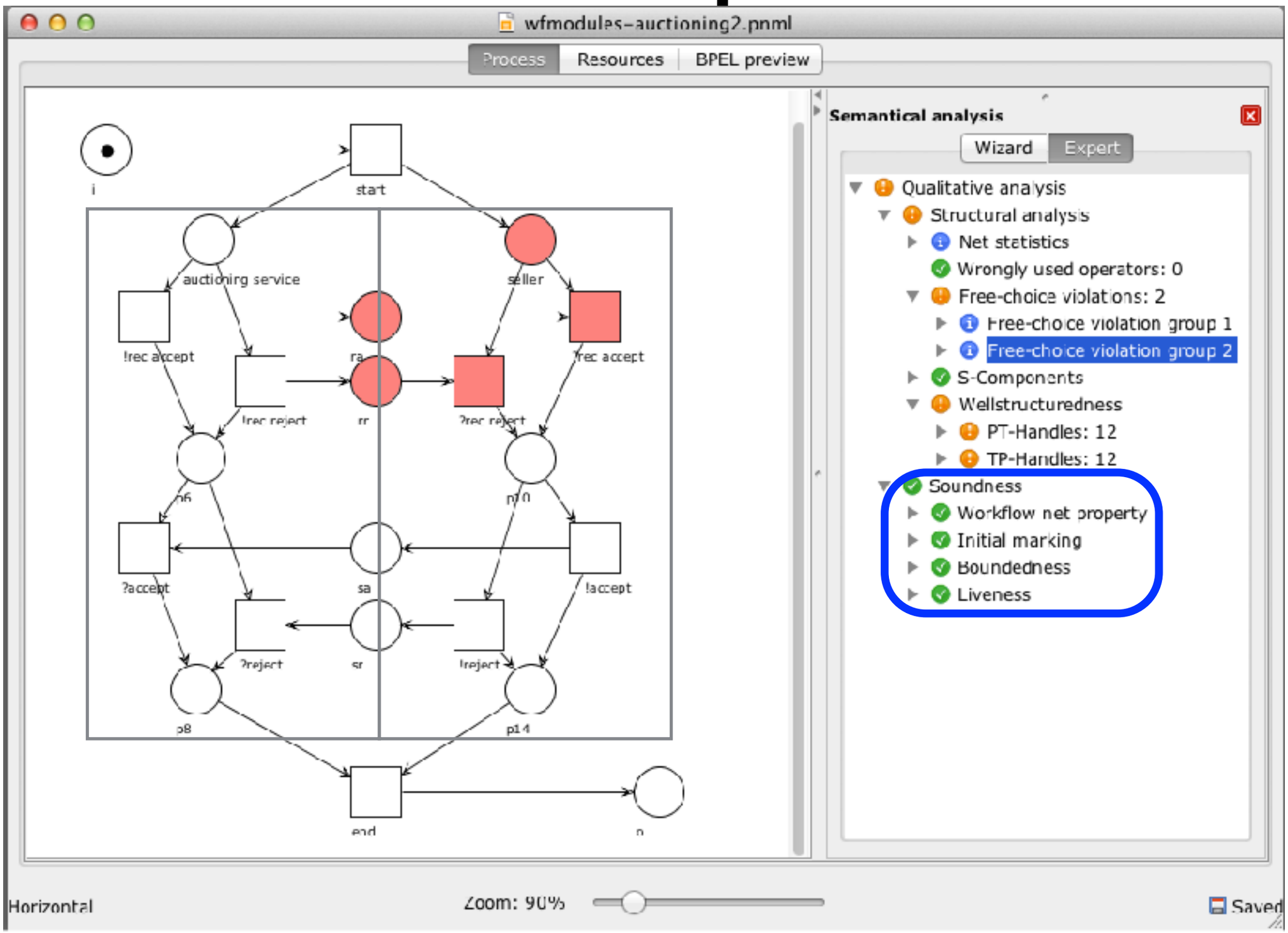

wfmodules-auctioning1.pnml
Process
Resources
BPEL preview
i
start
auctioning service
seller
?rec accept
!rec accept
!rec reject
?rec reject
p6
p7
p10
?accept
!accept
?reject
!reject
p8
p14
enc
Semantical analysis
Wizard
Expert
Qualitative analysis
Structural analysis
Net statistics
Wrongly used operators: 0
Free-choice violations: 1
Free-choice violation group 1
S-Components
Wellstructuredness
PT-Handles: 10
TP-Handles: 10
Soundness
Workflow net property
Initial marking
Boundedness
Liveness
Dead transitions: 0
Non-live transitions: 10
Horizontal
Zoom: 90%
Saved

Example

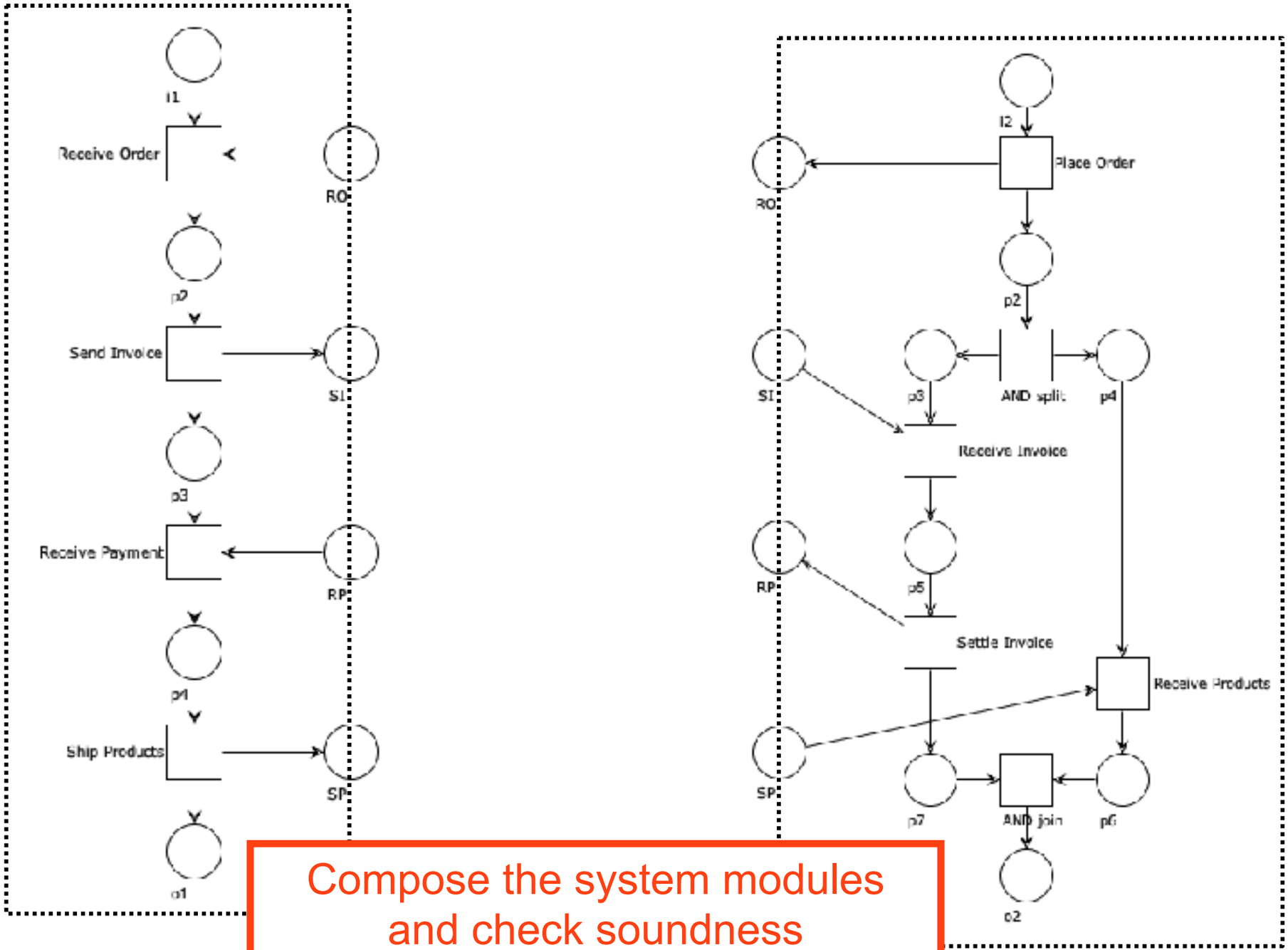
Is the system sound?



Example

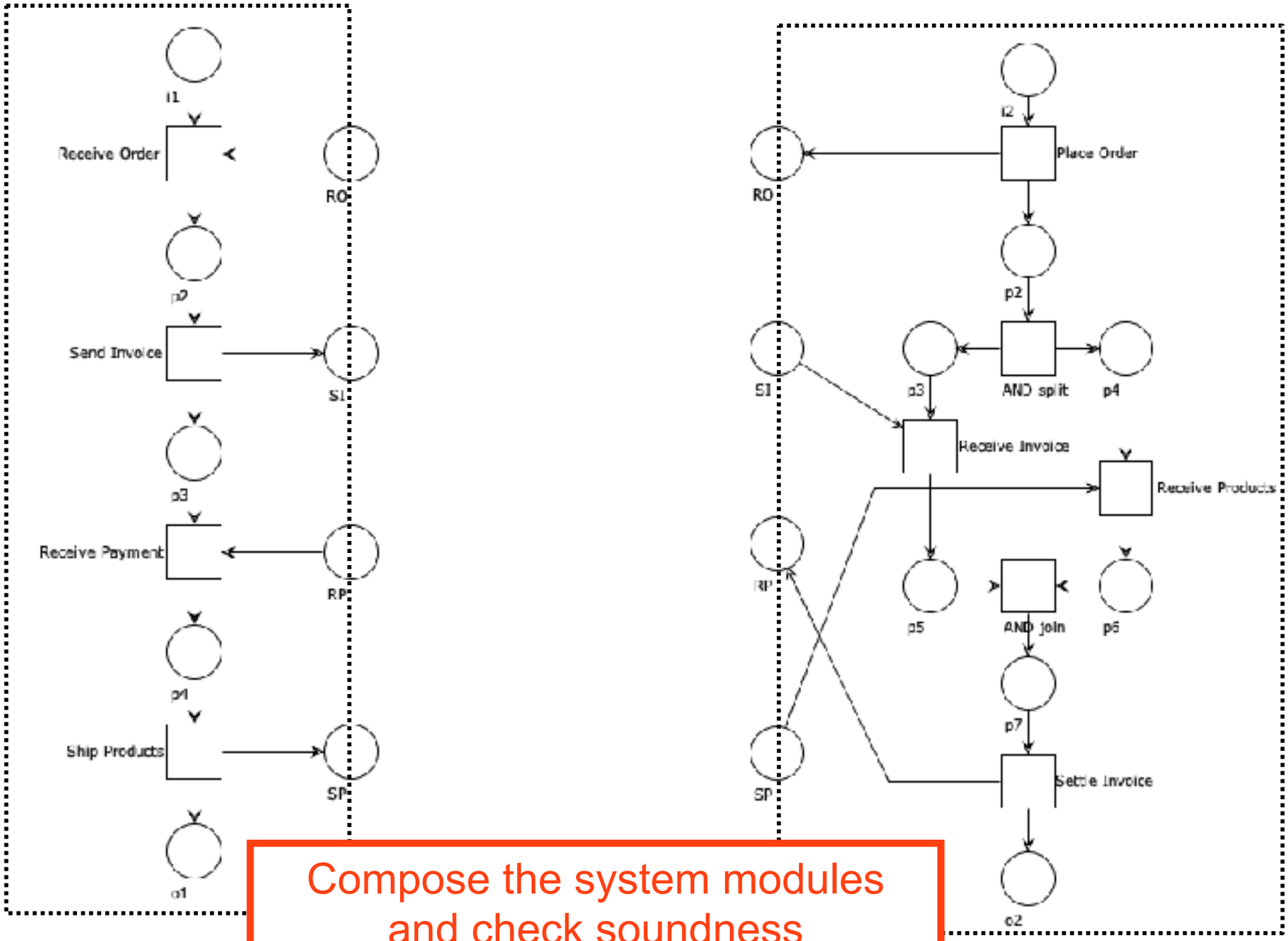

wfmodules-auctioning2.pnml
Process
Resources
BPEL preview
i
start
auctioning service
seller
!rec accept
!rec reject
?rec reject
!rec accept
?accept
!accept
?reject
!reject
p8
p14
end
Semantical analysis
Wizard
Expert
Qualitative analysis
Structural analysis
Net statistics
Wrongly used operators: 0
Free-choice violations: 2
Free-choice violation group 1
Free-choice violation group 2
S-Components
Wellstructuredness
PT-Handles: 12
TP-Handles: 12
Soundness
Workflow net property
Initial marking
Boundedness
Liveness
Horizontal
Zoom: 90%
Saved

Exercise



Compose the system modules and check soundness

Exercise



Compose the system modules and check soundness

Weak soundness

Problem

When checking behavioural compatibility
the soundness of the overall net
is a too restrictive requirement

Workflow modules are designed separately,
possibly reused in several systems
It is unlikely that every functionality they offer is
involved in each system

Problem

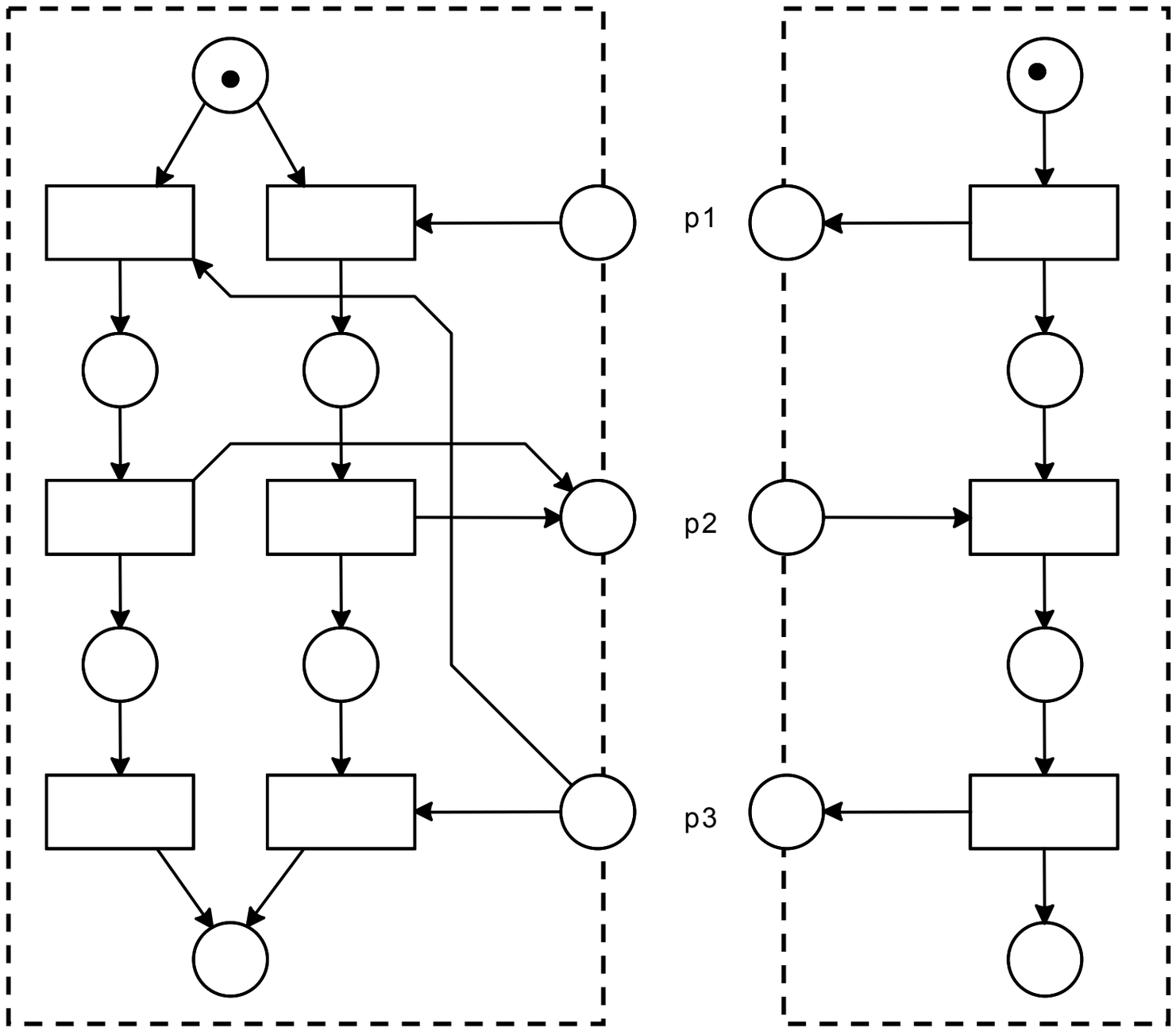
Definition: A workflow net is **weak sound** if it satisfies “option to complete” and “proper completion”

(dead tasks are allowed)

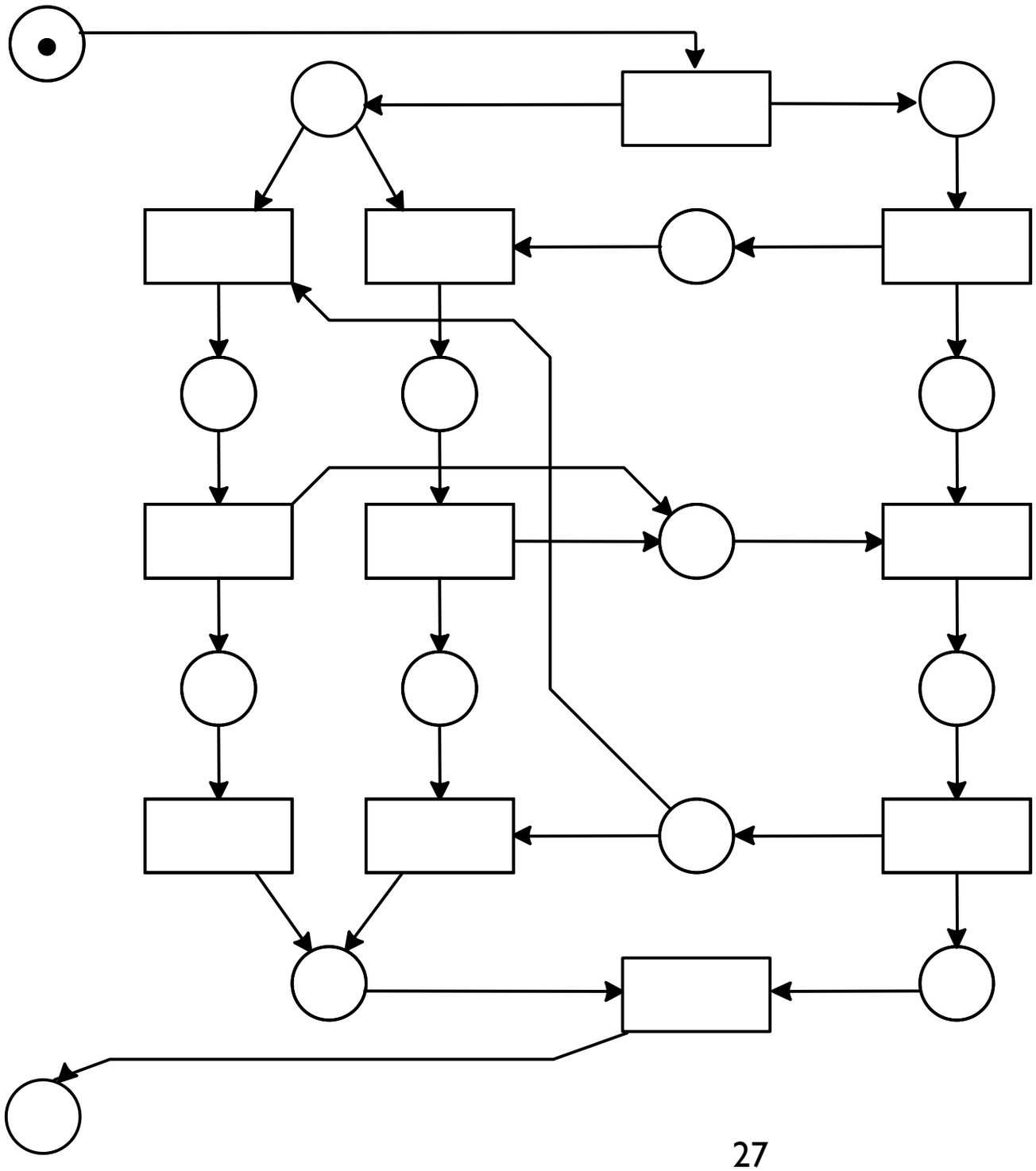
Weak soundness can be checked on the RG

It guarantees deadlock freedom and proper termination of all modules

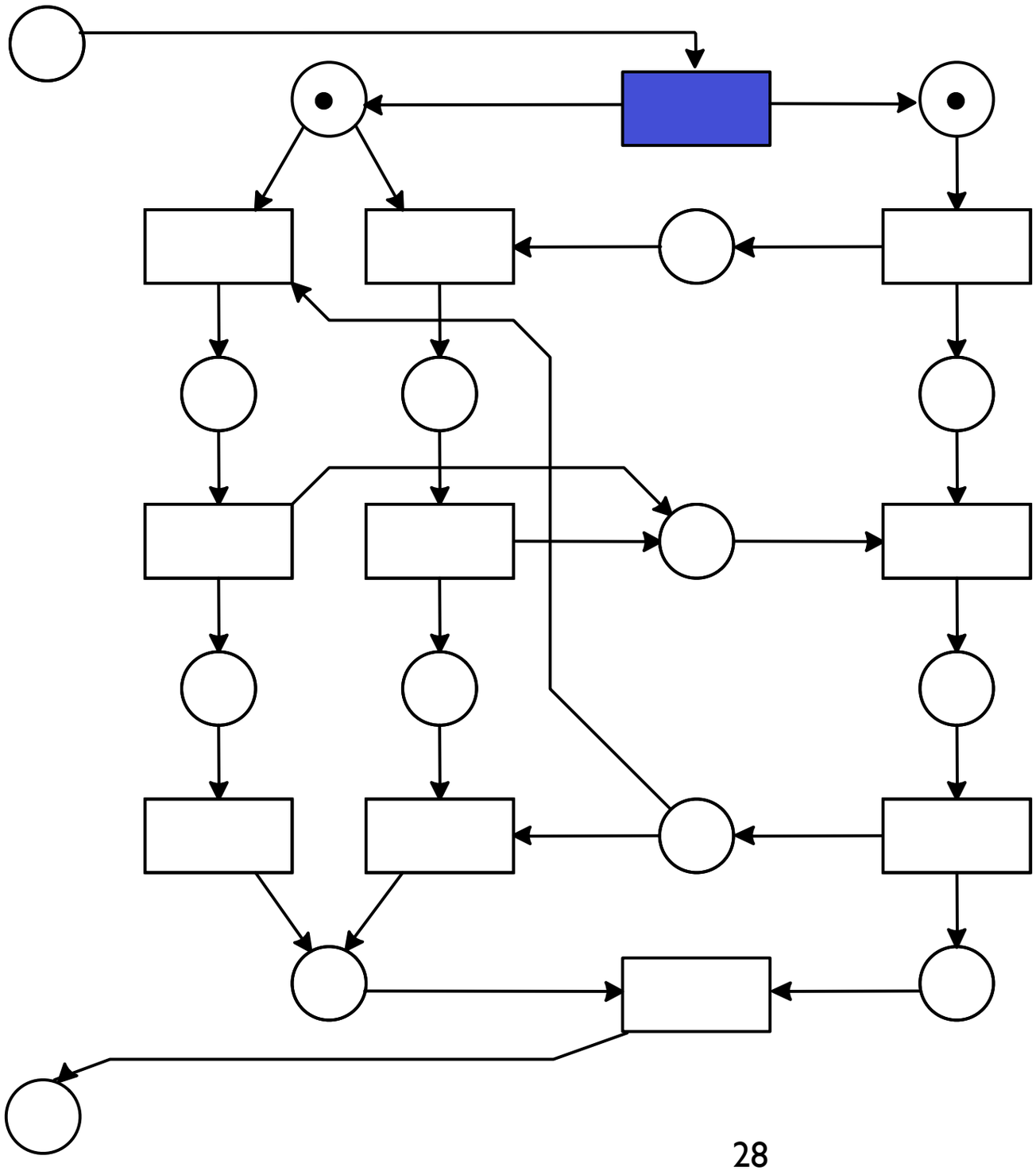
Sound + Sound = ?



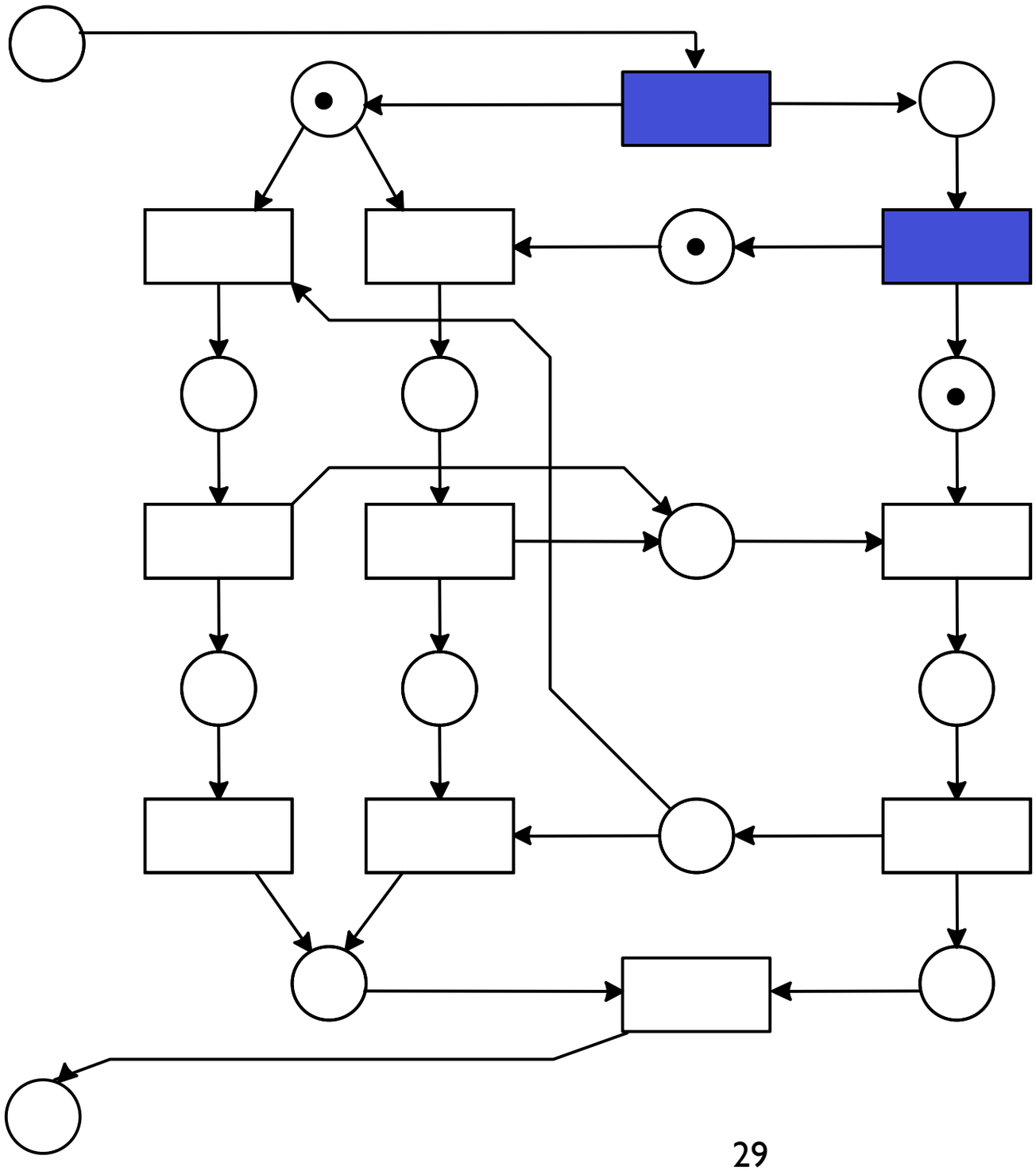
Sound + Sound = not sound



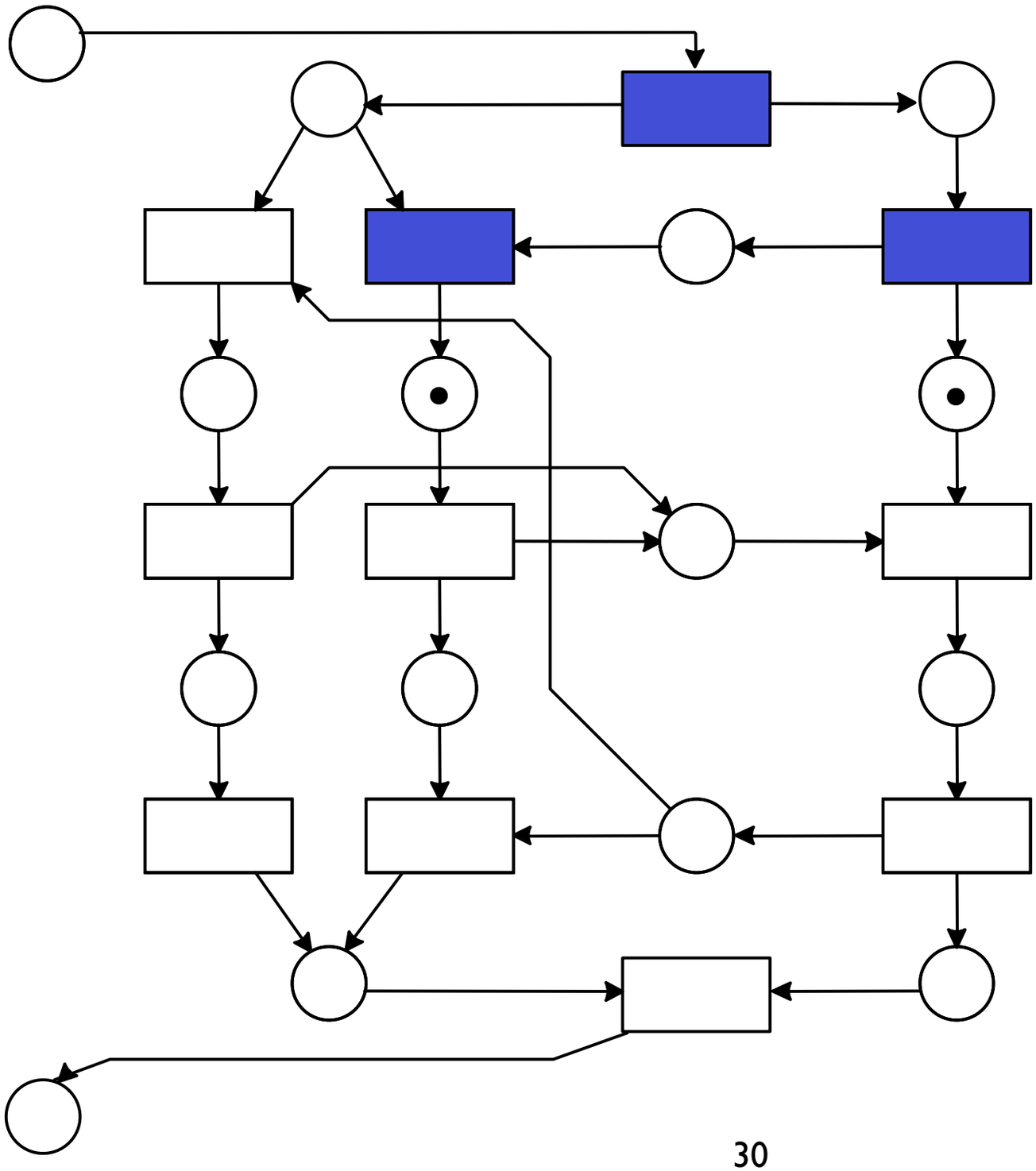
Sound + Sound = not sound



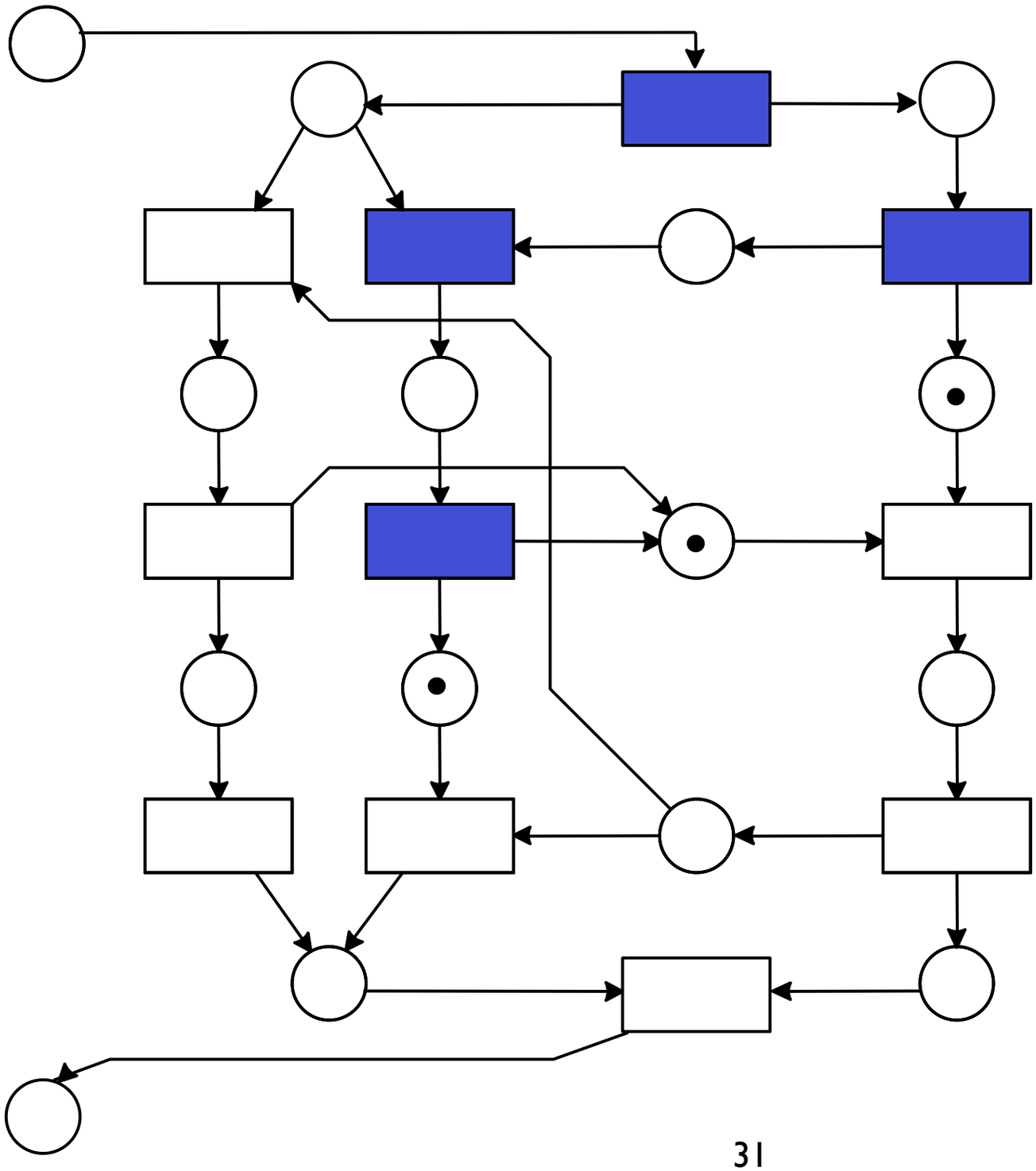
Sound + Sound = not sound



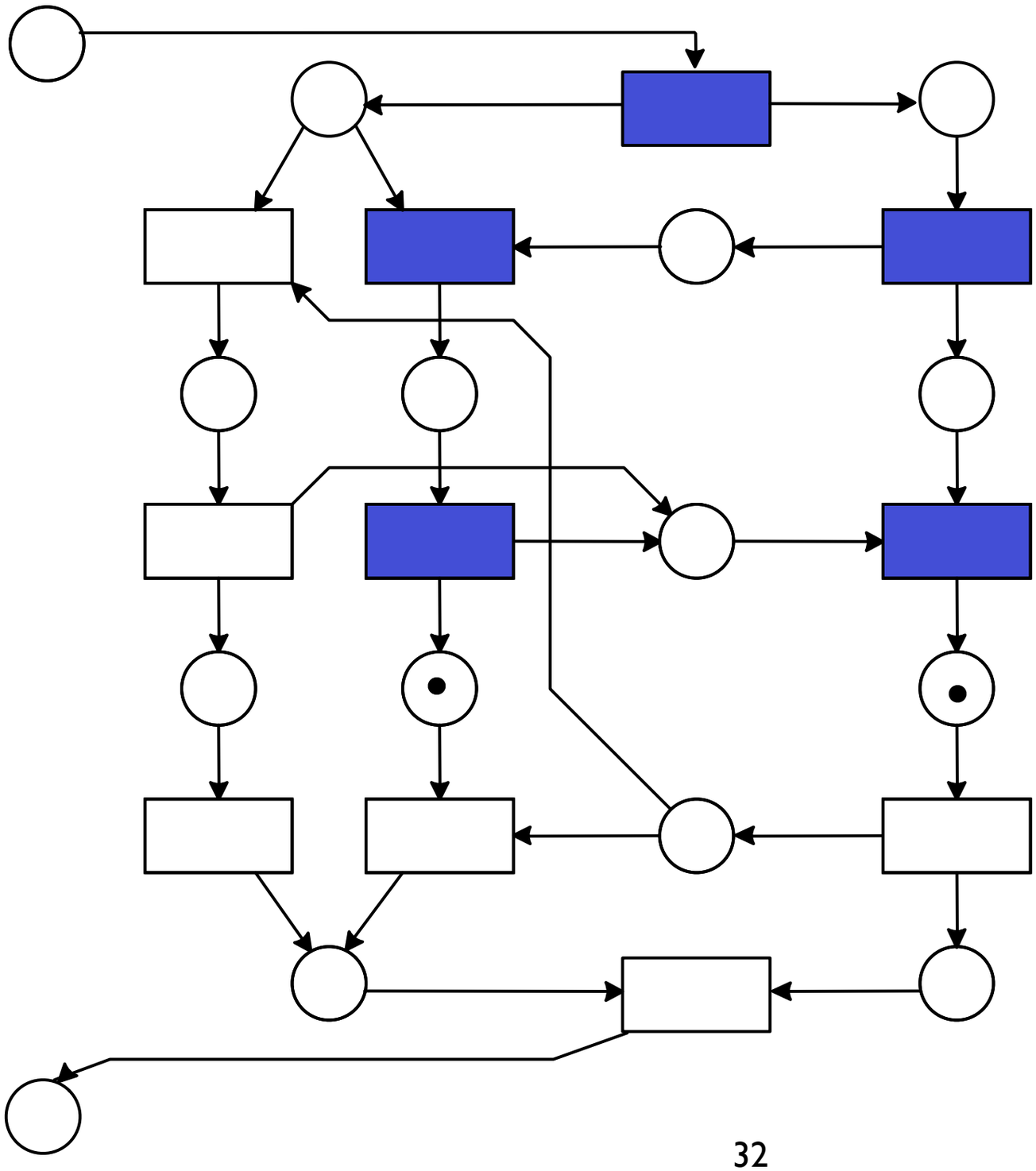
Sound + Sound = not sound



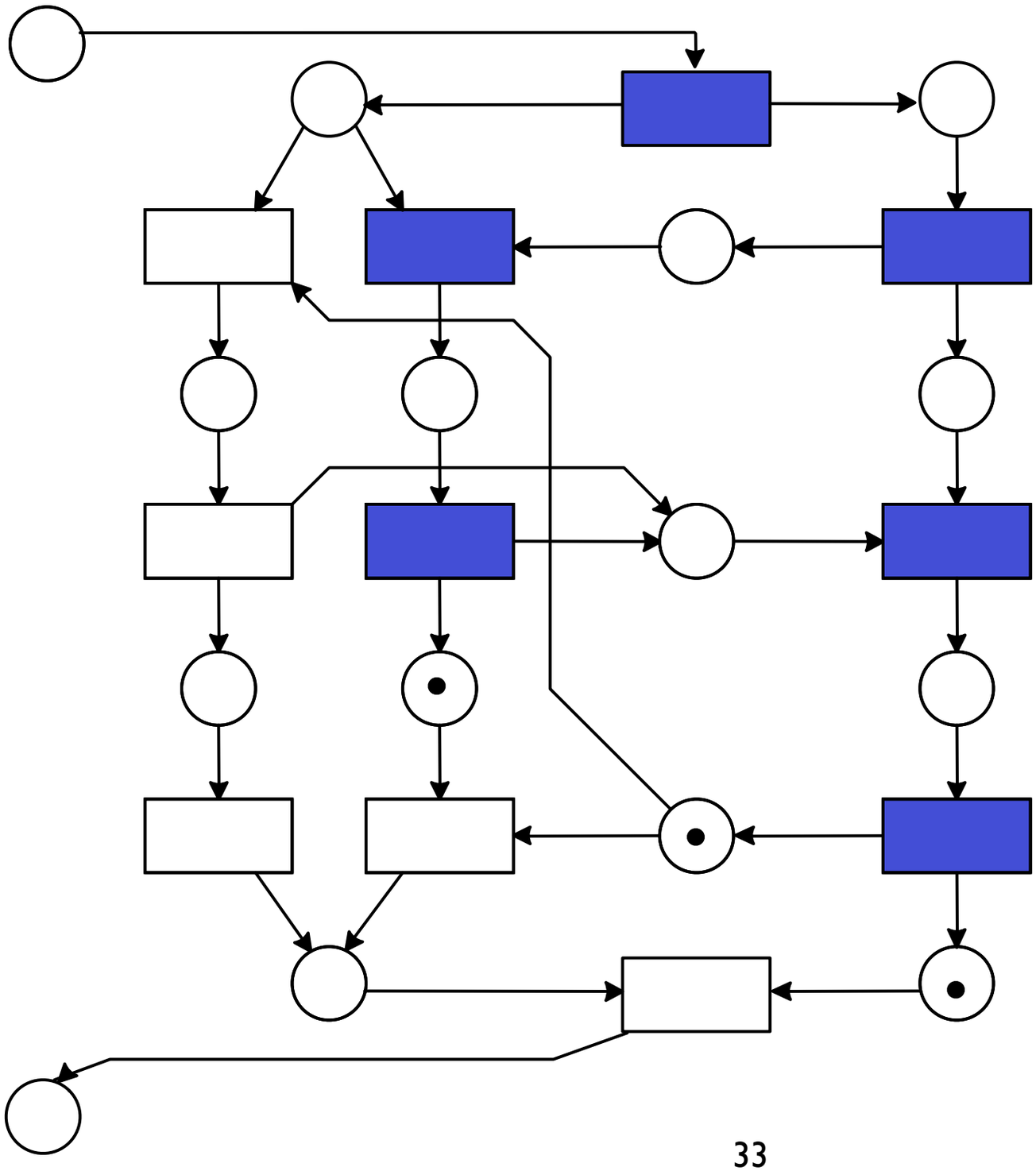
Sound + Sound = not sound



Sound + Sound = not sound



Sound + Sound = not sound



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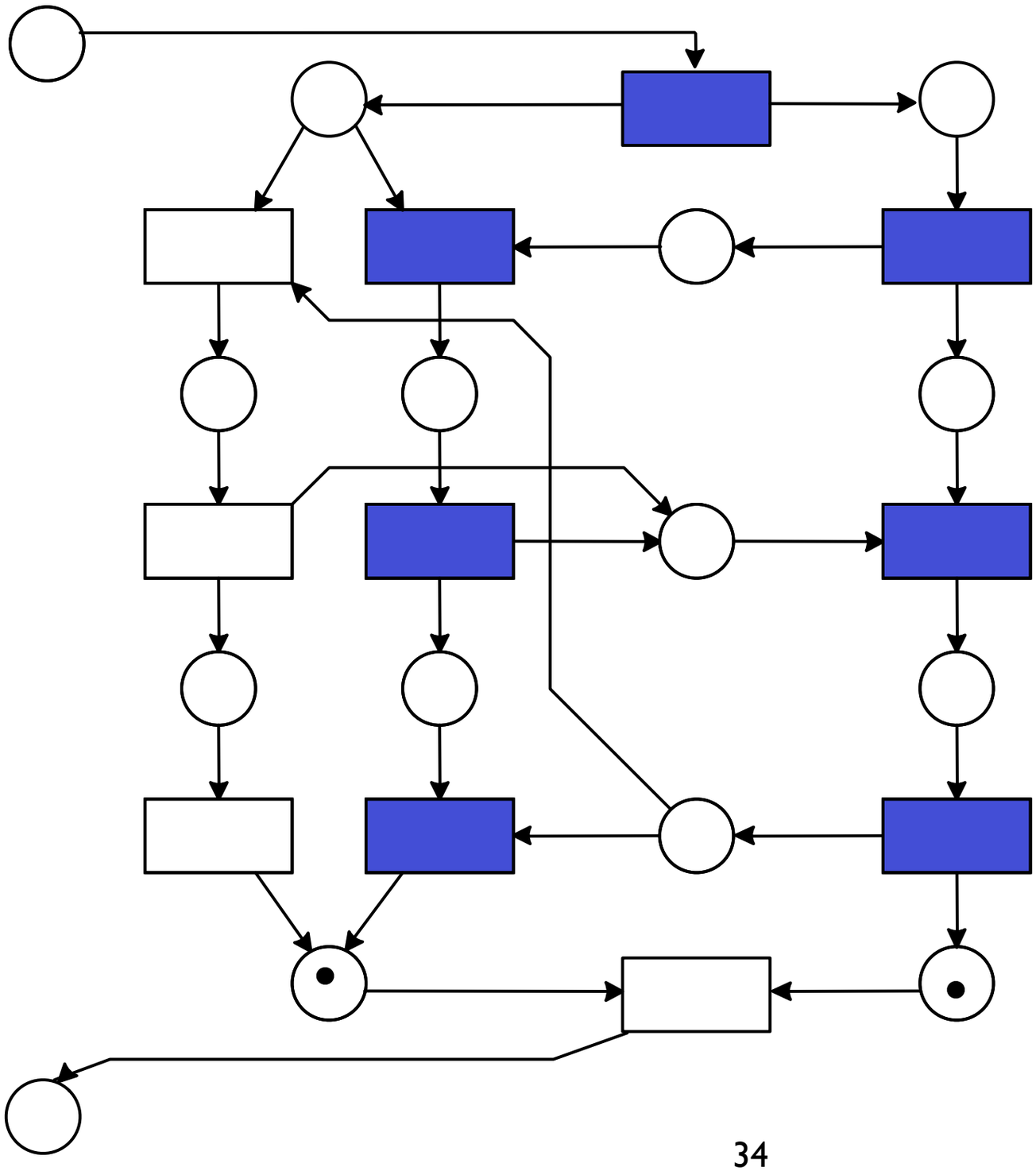

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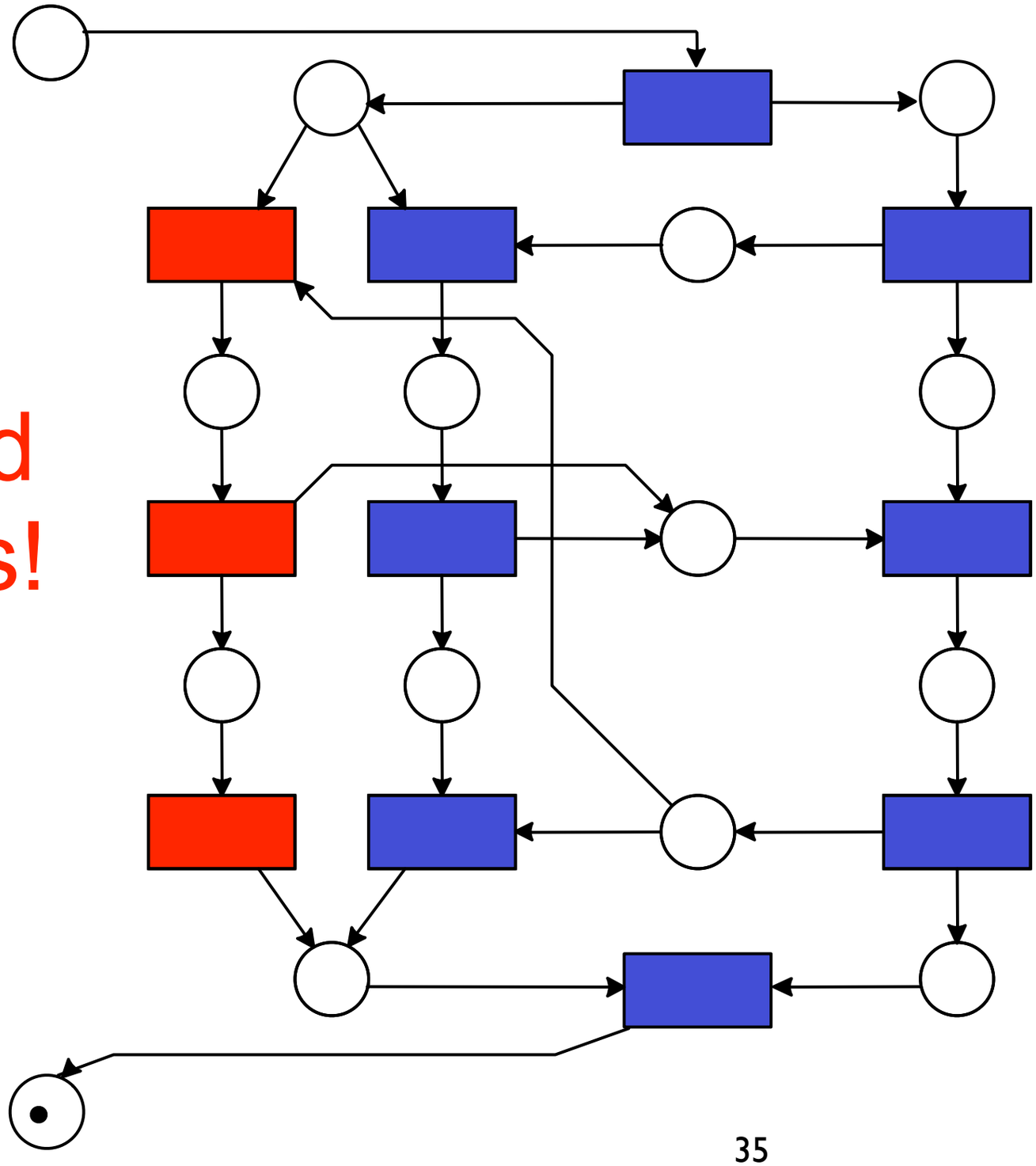
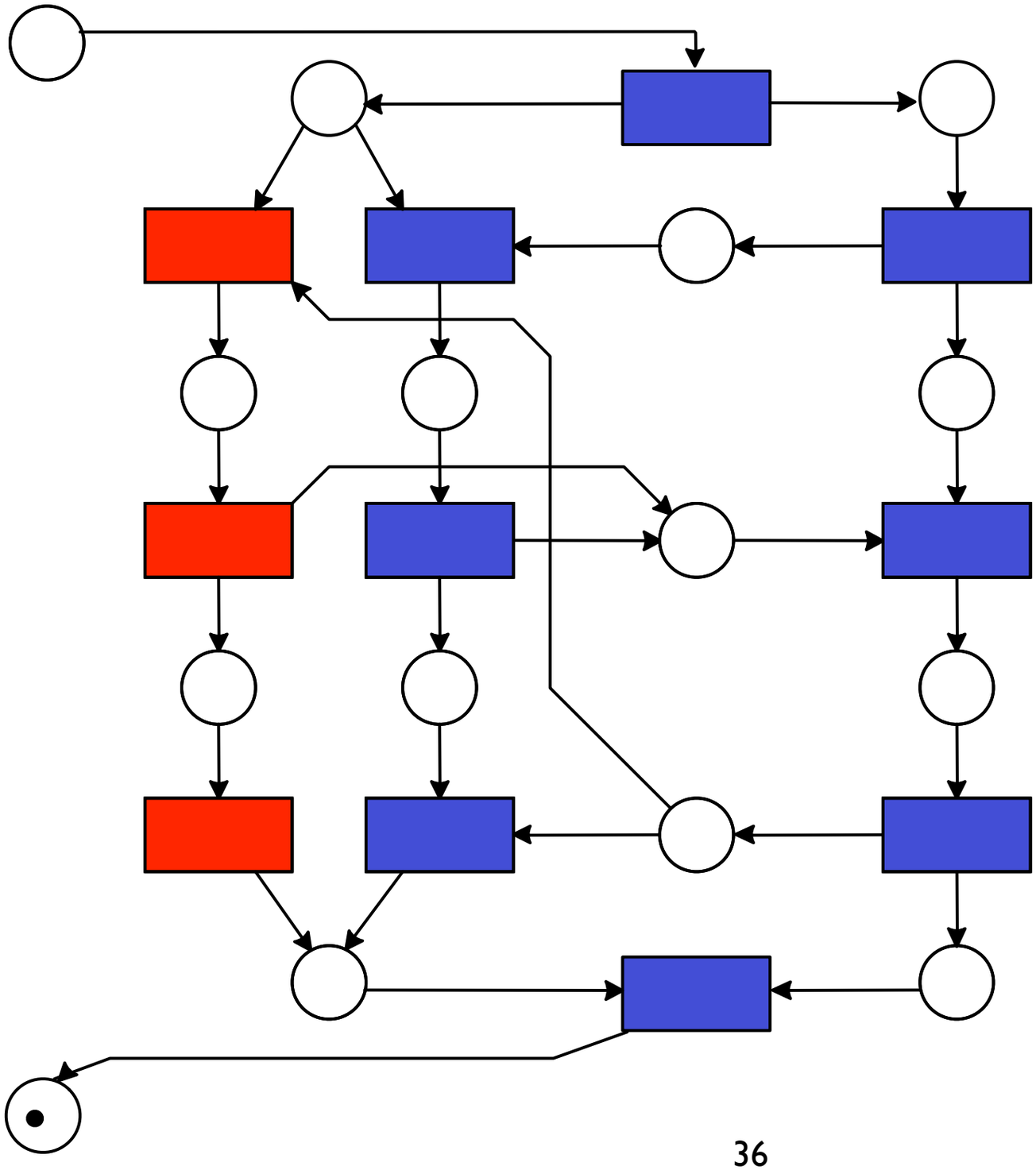


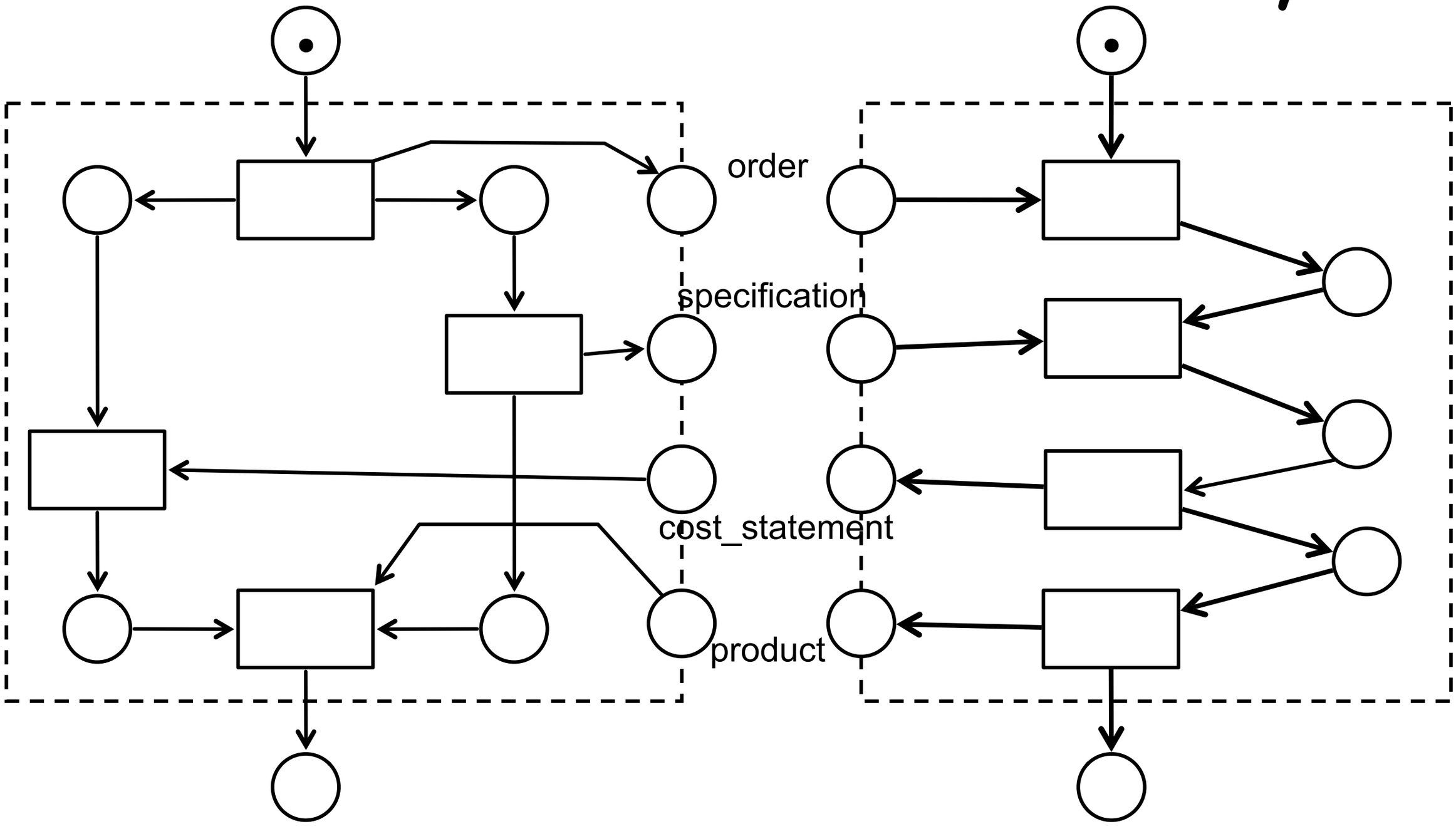
Dead tasks!

Sound + Sound = not sound



Weak Sound!

Exercise: Check Weak Soundness of The Assembly



Exercise: Check Again After Refactoring Contractor