

# CPN Tools

## An Introduction in the Context of openETCS

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# Outline

1

## Petri Nets

- The Token Game

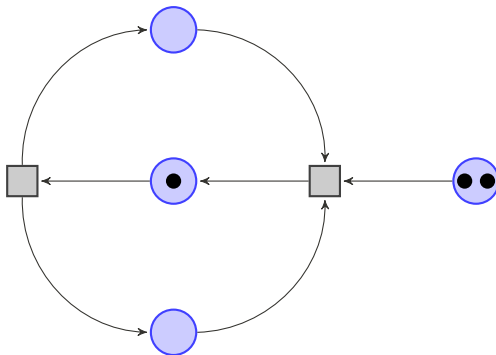
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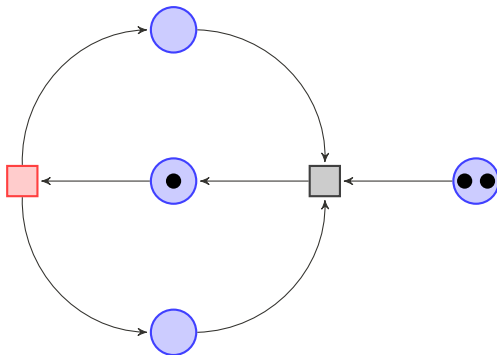
## Colored Petri Nets

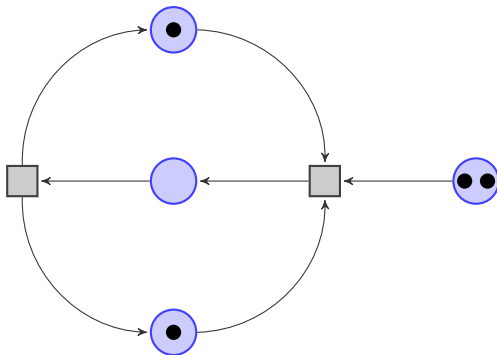
- Introducing Colors
- CPN Tools
- Start of Mission Model

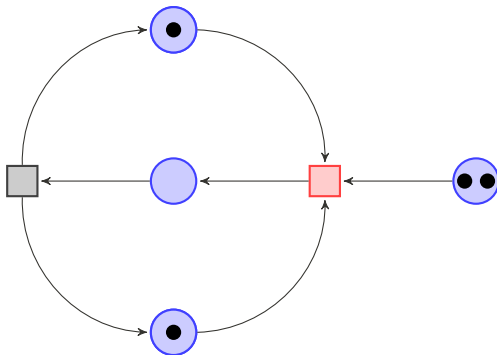
# Petri Nets

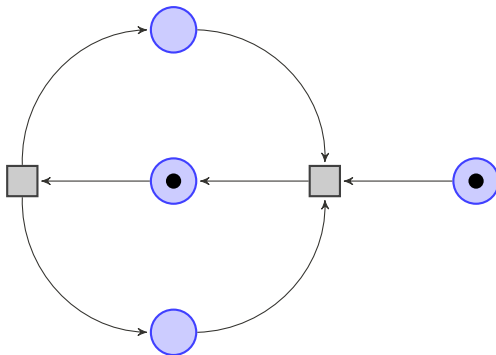
- Formal model
- Clearly defined formal semantics
- Characterized by the *token game*



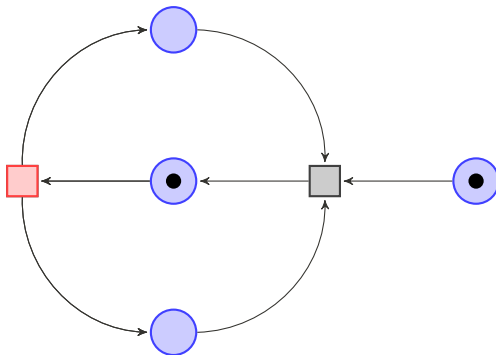


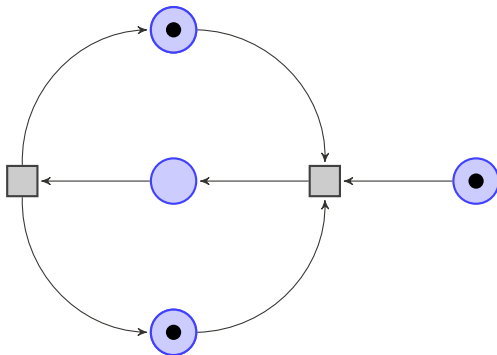


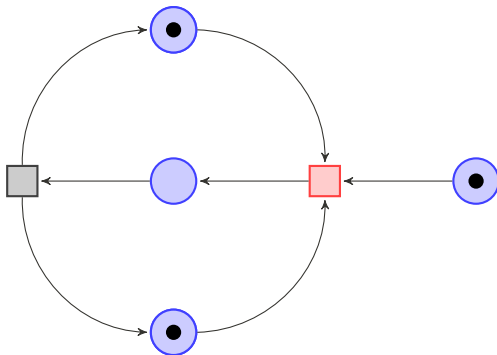


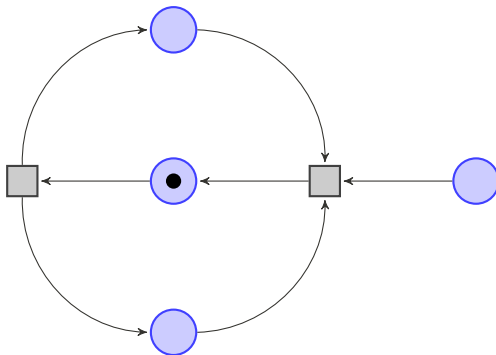


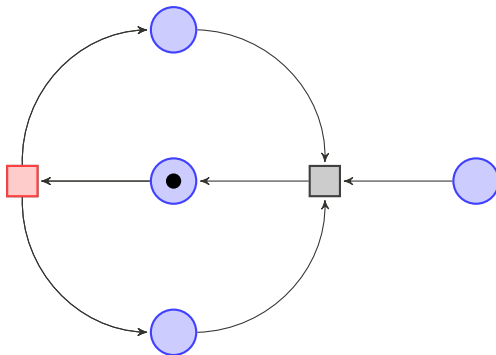


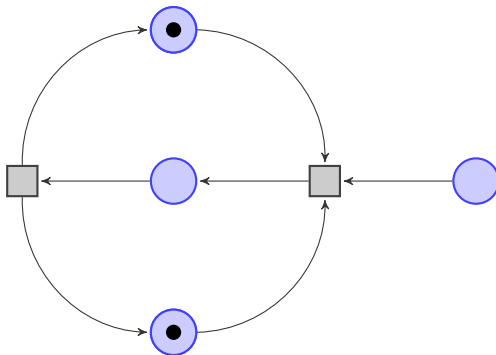


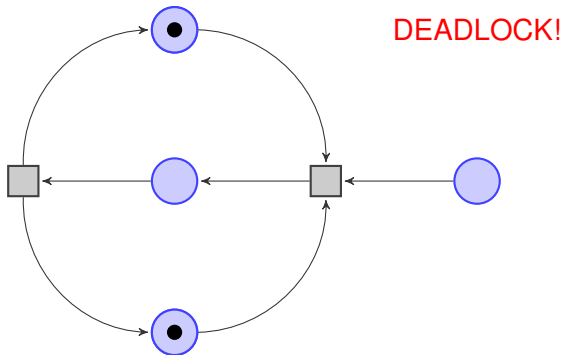










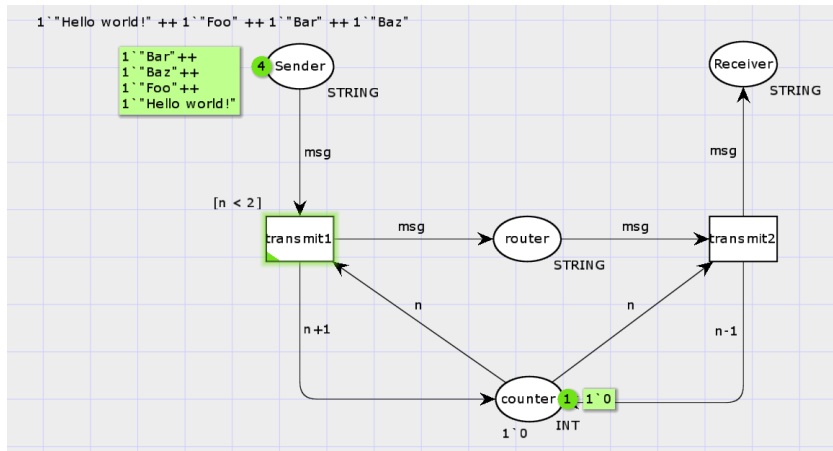


# Introducing Colors

- A *color* can be any kind of datatype
- Tokens are colored and thus represent data
- Places can hold tokens of a specific color
- Transitions may transform tokens
- Additional constructs:
  - Transition guards
  - Actions
  - Inhibitor arcs



# An Example



# CPN Tools

- Tool for modeling and simulating Petri nets
- Support for exhaustive verification & model checking
- Based on functional programming language ML
- Hierarchy support
- Open Source
- Active development
- Documentation and video tutorials available

<http://cpntools.org/>

## Model of “Start of Mission”

- “Start of Mission” modeled according to spec
- Model available on GitHub
- Several issues identified (document in work)

